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Internal health locus of control predicts willingness to track health behaviors online and with smartphone applications[‡]

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Abstract

Given rising technology use across all demographic groups, digital interventions offer a potential strategy for increasing access to health information and care. Research is lacking on identifying individual differences that impact willingness to use digital interventions, which may affect patient engagement. Health locus of control, the amount of control an individual believes they have over their own health, may predict willingness to use mobile health (mHealth) applications ('apps') and online trackers. A cross-sectional study ($n = 276$) was conducted to assess college students' health locus of control beliefs and willingness to use health apps and online trackers. Internal and powerful other health locus of control beliefs predicted willingness to use health apps and online trackers while chance health locus of control beliefs did not. Individuals with internal and powerful other health locus of control beliefs are more willing than those with chance health locus of control beliefs to utilize a form of technology to monitor or change health behaviors. Health locus of control is an easy-to-assess patient characteristic providers can measure to identify which patients are more likely to utilize mHealth apps and online trackers.

Keywords

Locus of control; mHealth; emerging adulthood; health behavior change; smartphone application; online tracker

Introduction

Smartphone applications ('apps') and online trackers are increasingly convenient and available. Adults ages 18–29 have the highest rates of technology usage; 96% of young

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adults use the Internet (Perrin & Duggan, 2015) and 86% own smartphones (Anderson, 2015). More research on this group is needed to predict willingness to incorporate health care into technology use.

Between the Apple iTunes and Android app stores, an estimated 165,000 mobile health, or 'mHealth' apps are available for use (Terry, 2015). The Internet provides access to an abundance of online trackers, such as the American Heart Association's Heart360, which tracks blood pressure and physical activity (American Heart Association [AHA], 2017). Electronic and mobile health, or 'eHealth' and mHealth, interventions are efficacious for health behaviors including: increased physical activity (Krebs, Prochaska, & Rossi, 2010), reduced smoking (Obermayer et al., 2010), improved diet (Migneault et al., 2012), and increased medication adherence (Foreman et al., 2012). Finding predictors of willingness to use health apps or online trackers is necessary for understanding the potential reach of these interventions.

Health locus of control (HLOC) may be a key predictor of willingness to engage in digital interventions. HLOC is the level of control that individuals believe they have over their own health (Strudler Wallston & Wallston, 1978). Three types of beliefs have been identified; (1) internal – an individual controls their health, (2) powerful other – a powerful individual such as their doctor influences their health, and (3) chance – health outcome is determined through luck. Locus of control impacts many health behaviors (Helmer, Krämer, & Mikolajczyk, 2012; Strudler Wallston & Wallston, 1978). Individuals with internal HLOC are more likely to engage in behaviors that aid physical well-being such as frequent dental care, smoking cessation, weight loss, contraceptive use, receiving a flu shot, and seatbelt use (Strudler Wallston & Wallston, 1978). HLOC may be an influential factor in health interventions' success as it reflects motivation towards participation (Ryan & Deci, 2000). It may also predict which interventions would be most successful for individuals (Balch & Ross, 1975). Together, locus of control is pertinent to predicting engagement in healthy behaviors, which may include willingness to engage in digital interventions for health behavior change.

Consistent with the theory of planned behavior (Ajzen, 1991), individuals' beliefs about their ability to control their health are associated with their willingness to engage in online behaviors that could monitor or improve their health. The present study investigated links between HLOC beliefs and willingness to use smartphone apps and online trackers as intervention tools. It was hypothesized that internal HLOC beliefs will predict willingness to use smartphone apps and online trackers.

Method

Participants

College students ($n = 276$) from a large, Midwestern, public university, participated for partial fulfillment of course research requirements (Table 1). The sample was 82.25% female ($M_{\text{age}} = 19.78$, $SD = 2.98$).

Measures

Demographic information including age, gender, education, height and weight was assessed through self-report.

Multidimensional health locus of control questionnaire (MHLC)—The MHLC (Wallston, Strudler Wallston, & DeVellis, 1978) assessed the perceived control individuals have over their health. In this study, the MHLC had an internal consistency of $\alpha = .634$.

Survey of health app usage & survey of online tracker usage—Willingness to use apps and online trackers was assessed by two questionnaires created for the present study. Each was a 32-item questionnaire with five-point Likert scale responses. Items investigated willingness to use apps or online trackers to monitor and change body image, calorie intake, exercise patterns, overall nutrition, adherence to medication, sleep patterns, stress levels, overall health, self-care of illness/injury, diet, anxiety, energy drink consumption, driving habits, and desire for cosmetic surgery (e.g. how willing would you be to use health apps/online trackers to monitor overall diet? How willing would you be to use health apps/online trackers to try to change overall diet?) Health apps were defined as ‘apps on smartphones used to keep track of various behaviors, which may include health-related behaviors’. Online trackers were defined as ‘online tools used to keep track of various behaviors, which may be health behaviors’. The survey of app usage demonstrated a test-retest reliability of $r = .777$ and an internal consistency of $\alpha = .957$. The survey of online tracker usage had a test-retest reliability of $r = .766$ and an internal consistency of $\alpha = .956$.

Procedure

This study was approved by the university’s Institutional Review Board. Recruitment occurred through the psychology department’s SONA system. Participants completed informed consent and questionnaires via Qualtrics. Participants were administered questionnaires at three time-points across one semester to obtain test-retest reliability on the willingness to use health apps and online trackers surveys. The present study used data only from the first time-point.

Statistical analyses

Correlations between demographic variables and willingness to use smartphone apps/online trackers were conducted to determine whether demographic variables needed to be controlled for in regressions. Each type of HLOC was treated as an independent and non-overlapping factor. Six linear regressions were conducted to ascertain the portion of variance each type of HLOC accounted for in willingness to use apps and online trackers. Linear regressions were conducted with internal, powerful other, and chance HLOC as predictors and willingness to use smartphone apps or online trackers as outcomes.

Results

Age was excluded from the correlation and regression analyses due to the restricted range; approximately 89% of participants were between the ages of 18–25. Gender and ethnicity were not related to willingness to use apps or online trackers (Table 2).

Internal HLOC explained a significant proportion of variance in willingness to use health apps, $R^2 = .01$, $F(1, 273) = 3.95$, $p = .048$ and online trackers, $R^2 = .02$, $F(1, 274) = 6.04$, $p = .015$ (Tables 3 and 4). Powerful other HLOC explained a significant proportion of variance in willingness to use health apps, $R^2 = .04$, $F(1, 273) = 12.69$, $p < .001$ and online trackers, $R^2 = .03$, $F(1, 274) = 9.53$, $p = .002$. Chance HLOC did not explain a significant proportion of variance in willingness to use health apps, $R^2 < .001$, $F(1, 273) = .02$, $p = .887$ and online trackers $R^2 = .004$, $F(1, 274) = .97$, $p = .325$.

Discussion

This study examined the relationship between HLOC and willingness to use smartphone apps and online trackers as intervention tools. As predicted, internal HLOC explained significant variance within willingness to use apps and online trackers. These results converge with existing research demonstrating that individuals with internal HLOC beliefs are more likely to partake in preventative health behaviors (Strudler Wallston & Wallston, 1978). Digital self-monitoring tools for health-related behaviors such as diet, exercise, and sleep can be considered preventative care, especially if patients use the information to make behavior changes.

Unexpectedly, powerful other HLOC explained significant variance within willingness to use health apps and online trackers. Previous research on HLOC demonstrated that individuals with powerful other HLOC are more likely to monitor behavior for fear of violating their doctor's recommendations (Strudler Wallston & Wallston, 1978). A current limitation of digital interventions is difficulty keeping participants engaged and active (Yardley et al., 2016); interventions that involve the provider may offer a solution. The present results support this proposition; individuals with high powerful other HLOC may be willing to use provider-recommended digital interventions.

The present study adds to the literature examining digital interventions to target health behaviors. The identification of HLOC as a predictor of willingness to use apps and trackers provides an easy-to-assess patient characteristic within primary and mental health care settings. Care providers should assess HLOC beliefs before recommending apps or trackers to identify which patients are most likely to embrace digital platforms as part of their health care.

Internet and smartphone use are on the rise; the present study is timely and contributes directly to gaps in this research area. There were limitations to this study. First, the sample was relatively homogeneous. Future research should examine how demographics may influence the relationship between HLOC and willingness to use apps and trackers. Given the newness of this research area, the authors were unable to locate existing validated measures of app and tracker usage. Lastly, this study addressed willingness to use technology-based interventions but was distributed through an online forum. In future studies, the measures could also be made available on paper to assure non-technology-users participate. Future research should also examine questions that can provide insight on the theoretical processes on why and how HLOC impacts health-related outcomes.

The present study demonstrated that HLOC is associated with willingness to use a technology- based intervention. The findings provide researchers, physicians, and mental health care providers with a relatively easy-to-assess patient characteristic to determine which patients would be most willing to embrace digital interventions as part of their health care plan. As technology availability continues to grow, digital interventions may provide researchers and health care providers with the unprecedented ability to reach patients from underserved groups.

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Table 1

Demographic information.

	<i>n</i>	Percent
<i>Gender</i>		
Male	49	17.75
Female	227	82.25
<i>Age</i> ($M = 19.78$, $SD = 2.98$)		
18–25	245	88.77
26+	4	1.45
Did not answer	27	9.78
<i>Year in school</i>		
Freshman	113	40.94
Sophomore	54	19.57
Junior	51	18.48
Senior	28	10.14
Senior (4+ years)	30	10.87
<i>Ethnicity</i>		
Hispanic	9	3.26
Non-Hispanic	265	96.01
Did not answer	2	.72
<i>Race</i>		
American Indian	2	.72
Asian	1	.36
African American	16	5.80
Pacific Islander	1	.36
Caucasian	246	89.13
Mixed race	9	3.26
Did not answer	1	.36
<i>BMI category</i> ($M = 23.07$, $SD = 5.93$)		
Underweight	10	3.62
Normal weight	188	68.11
Overweight	48	17.39
Obese	24	8.70
Did not answer	6	2.17

Table 2

Pearson correlation values between demographic variables and measures.

	Willingness to use health apps	Willingness to use online trackers	Health locus of control
Age	N/A	N/A	N/A
Gender	.03	.08	-.05
Ethnicity	-.04	-.02	.01

Table 3

Summary of relationship between health locus of control and willingness to use health apps.

	<i>b</i>	<i>t</i>	<i>df</i>	<i>p</i>
Health locus of control				
Internal	.65	1.99	273	.048 *
Powerful other	1.14	3.56	273	<.001 ***
Chance	-.05	-.14	273	.887

*
 $p < .05$;

 $p < .001$.

Table 4

Summary of relationship between health locus of control and willingness to use online trackers.

	<i>b</i>	<i>t</i>	df	<i>p</i>
Health locus of control				
Internal	.75	2.46	274	.015 *
Powerful other	.93	3.09	274	.002 **
Chance	-.31	-.99	274	.325

*
 $p < .05$;

**
 $p < .01$