INTERNAL HEALTH LOCUS OF CONTROL PREDICTS WILLINGNESS TO TRACK HEALTH BEHAVIORS ONLINE AND WITH SMARTPHONE APPS

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Abstract

As the style of behavioral health interventions continues to move towards greater use of technology, health locus of control and willingness to use technology-based interventions, or “mHealth” may be important factors in the success of these interventions. Research illustrates higher internal locus of control predicts better health-promoting and preventative health behaviors. Research has also demonstrated the initial results for technology-based programs are successful as interventional tools. However, more research is needed on the factors that make individuals more likely to participate in technology-based interventions, such as current rates of participation in risky health behaviors and health locus of control. It was hypothesized internal and powerful other health locus of control beliefs and lower participation in risky health behaviors would predict willing to use online trackers and apps as intervention tools in contrast with chance health locus of control beliefs. This investigation used established measures of health locus of control and risky health behaviors as well as measures of willingness to use online trackers and apps that were created for this study. Overall, those with internal and powerful other health locus of control beliefs were more willing to use online trackers and apps. Additionally, no relationship was found between participation in risky health behaviors and willingness to use technology-based intervention tools. These results suggest health locus of control serves as a mediating factor for use of technological tools for intervention. Furthermore, these results suggested that individualized interventions may increase willingness to participate.
INTERNAL HEALTH LOCUS OF CONTROL PREDICTS WILLINGNESS TO TRACK HEALTH BEHAVIORS ONLINE AND WITH SMARTPHONE APPS

Health locus of control (HLC) dictates the amount of control an individual believes they have over their own health (Wallston & Wallston, 1978). Health locus of control can become a very influential factor in the success of interventions targeting risky health behaviors as it dictates the amount of motivation an individual may have towards participating in the intervention (Ryan & Deci, 2000). Health locus of control may predict which kind of intervention would be most successful for each individual (Balch & Ross 1975). Research on novel intervention techniques coincides with the rapid increase of technology consumption. The use of technology such as phone applications (apps) and online trackers as interventions has become a possibility. With the rapid expansion of technology, tools such as apps and trackers are becoming more convenient and available to all. For example, 87% of 16-24 year olds in the United States have readied access to a cell phone (Nielsen Reports, 2013). Technology based interventions have a great amount of potential for success in terms of individualized interventions and the reduction of participation in risky health behaviors. The present study aimed to investigate health locus of control, participation in risky health behaviors, and willingness to use technology-based interventions. It was hypothesized that lower participation in risky health behaviors would be associated with greater willingness to use technology-based interventions. It was also hypothesized that internal and powerful other health locus of control beliefs would be associated with greater willingness to use technology-based interventions, while chance health locus of control beliefs would be associated with less willingness to use technology-based interventions. The following paragraphs aim to
review the literature on health locus of control, intervention styles, and the implementation of mHealth.

HEALTH LOCUS OF CONTROL

Previous research on health locus of control has found that locus of control plays a role in a multitude of risky health behaviors (Wallston & Wallston, 1987; Helmer, Krämer & Mikołajczyk, 2012; Harkapaa et al., 1990; Kaplan & Cowles, 1978; Buckelew et al., 1990; Steptoe & Wardle, 2001; Balch & Ross, 1975). In a literature review of previous research conducted by Wallston and Wallston (1978), it was found that individuals with a higher internal locus of control (higher belief in their own control of their health) were more likely to engage in behaviors that aid physical well-being such as dental care, smoking, and weight loss. In their examination of the literature on smoking, it was found that nonsmokers were more likely to have an internal locus of control than smokers. In terms of weight loss, it was found that those with an internal locus of control weighed less to begin with and lost more weight overall. Additionally, those with internal locus of control were more likely to report using contraception, while only 37% of those with external locus of control did so. In their summary of preventative behaviors, it was found that those with internal locus of control reported greater seat belt use and dental care. Those with internal locus of control were also more likely to have received the flu shot in comparison to those with external locus of control. The findings of this study provided initial evidence that the locus of control construct is pertinent to the prediction of health behaviors. This study provided multiple implications for health practitioners. It
called for the usage of a locus of control scale prior to intervention programs. It also called for programs to be individualized based on the results of the scale as well as the implementation of a training focused on helping individuals change their locus of control beliefs. This study provided the need for further research on locus of control and the possible incorporation of locus of control into health education materials.

Further investigation into the connection between health locus of control beliefs and health behaviors conducted by Helmer, Krämer & Mikołajczyk found that individuals with internal health locus of control beliefs were more likely to be healthier (2012). Previous research had reported associations between participation in healthy behaviors and health locus of control beliefs, but had not been consistent within the young adult population. Helmer, Krämer & Mikołajczyk (2012) used the Multidimensional Health Locus of Control (MHLC) scale in order to assess the associations between three varying control beliefs and healthy behaviors among University students. The first belief subscale is Internal health locus of control, in which an individual believes they have control over their own health. Individuals with higher internal health locus of control were more likely to have healthier nutrition and higher rates of physical activity. The second belief subscale is Powerful Other, in which an individual believes another person such as a doctor can influence their health. Individuals with higher belief in doctors were less likely to do drugs and more likely to focus on healthy nutrition. The third belief subscale is Chance, in which an individual believes their health is dictated by luck. Individuals that believed in luck were more likely to be smokers, less likely to have healthy nutrition, and less likely to participate in physical
activity. Overall, individuals with higher internal health locus of control were more likely to be healthier while individuals who believed luck determined their health outcome were more likely to be unhealthy in all aspects. The outcome of this research suggests that health practitioners consider health control beliefs while designing preventative strategies for use in the young adult population.

Further research on health locus of control has shown that HLC beliefs are also associated with successful outcomes in intervention and treatment programs. Harkapaa et al. (1990), investigated health locus of control and psychological distress as predictors for treatment outcomes in low-back pain patients in a follow-up study three-months post treatment. A sample of 459 participants ranging 35-54 years old with recurrent or chronic lower back pain were used in this study. Participants were split into three groups for treatment, inpatient, outpatient and the control group which received no treatment. The follow-up results found that both of the treatment groups reported improvement in their pain symptoms and mobility in comparison to the control group. However, individuals with internal health locus of control were associated with a more successful outcome. Those individuals reported getting more out of the treatment in comparison to those with external locus of control. Additionally, these internal individuals were found to have learned the exercises better and had completed the exercises more frequently in the follow-up period. The results of this study support the original suggestions made by Wallston and Wallston (1978); those with higher internal locus of control are more likely to partake in health-promoting behaviors. This study showed that health locus of control can also dictate the success of an intervention when all individuals are receiving the same...
type of treatment and intervention. This study prompts further research on the success of interventions as dictated by individual characteristics. This study also provides an indication that individualized interventions and treatments may garner the most successful results.

The predictive power of HLC beliefs on long-term success and maintenance of an intervention and treatment program was also investigated through additional research on health locus of control. Kaplan and Cowles (1978) investigated health locus of control as a predictor of smoking reduction. In this study, 35 participants met once a week for seven weeks. Following the seven week treatment, the participants were randomly assigned to one of four follow-up procedures for the following eight weeks. Data on smoking levels was collected from participants at baseline, after the seven week period, after the two month follow-up period and five months later. As Kaplan and Cowles predicted, those with internal health locus of control were more successful regardless of follow-up condition. Those with internal health locus of control were more likely to reach their goals and more likely to maintain the changes in their behavior. These results provided an intriguing insight based on the prior problems of maintaining of the change in behaviors. Smoking cessation patients often have the most difficulty in preventing relapse, and yet having an internal health locus of control was found to be a predictive measure in success of avoiding relapse. The results of this study attest to the power of health locus of control on making the results of a treatment and intervention last long-term. This study provides further insight into health locus of control as a predictive measure and demands more
research on the factors that contribute to the long-term success of interventions and treatments.

Health locus of control research has also found that HLC beliefs can dictate use of cognitive self-management techniques regardless of gender. Buckelew et al. (1990), investigated health locus of control, gender differences, and adjustment to persistent pain in a population of participants in a comprehensive pain rehabilitation program. In this study 160 participants from the pain rehabilitation program were used (67 males and 93 females). Participants were given the Multidimensional Health Locus of Control Questionnaire (MHLC). Their coping strategies were also examined along with their basic demographic information. In terms of gender differences, it was found that males vary in health locus of control based on age. Younger males were more likely to report a high internal attribution style while older males were more likely to attribute their health to chance and outside factors. Females did not vary in health locus of control. Health locus of control was a significant predictor of coping strategies employed by the participants. Those with higher internal locus of control were more likely to report self-management of health care needs as well as use of Information-Seeking, Self-Blame, and Threat Minimization as coping strategies. The results of this study suggest that examination of an individual’s health locus of control prior to beginning treatment would provide insight into the individual’s coping strategies. This study also suggests that health practitioners teach patients with high internal locus of control alternative coping strategies in order to maximize the success of the treatment and intervention. This study
calls for further investigation into the success of individualized treatments and interventions as determined by individual differences.

Previous research on health locus of control reported inconsistent and small associations between health locus of control and health behaviors. Research by Steptoe and Wardle (2001) found that these reports may be due to small sample size and use of correlational measures within previous studies. Steptoe and Wardle conducted a multivariate analysis of young adults from 18 countries in order to better assess the relationship between locus of control and health behavior. In this study, 4358 female and 2757 male university students were examined. Data on health locus of control, ten health behaviors (exercise, smoking, alcohol consumption, breakfast consumption, tooth-brushing, seat belt use, fruit consumption, fiber consumption, salt intake, and fat consumption), and health values were collected for this study. It was found that for five of the behaviors, individuals with internal locus of control were 40% more likely to be partaking in healthy behavior. Additionally, for those individuals with powerful other and chance locus of control beliefs had a 20% reduction in healthy behavior participation for six of the behaviors. The results suggest that individuals with a higher internal locus of control are more likely to remain healthy across behaviors. Additionally, due to the large sample size of this study, the results provide a more salient effect size, therefore helping combat prior inconsistent results within small sample sizes. Furthermore, because this study took into account 18 countries, it suggests the generalizability of health locus of control. The results of this study demonstrates that further research into the
generalizability of health locus of control as a predictor of participation in healthy behaviors is needed.

Further research conducted on health locus of control found that investigation into the characteristics of individuals prior to admittance into an intervention or treatment program is likely to benefit the success of the individual and the program. Balch and Ross (1975), investigated the predictive ability of locus of control in terms of success in weight reduction. Balch and Ross used a unidimensional and multidimensional approach in their study. 34 female participants took part in a weight loss program which consisted of nine weekly one-hour meetings. Participants were then split into categories for analysis based on their attendance of the program. Individuals with higher internal health locus of control had both higher attendance in the program and greater weight loss success. These results suggest that locus of control is relevant to self-control weight reduction therapy. Furthermore, it was found that the technique of identifying individuals likely to benefit from specific treatments to be promising. This study calls for further investigation into intervention techniques that are tailored towards individuals in order to enhance their success.

INTERVENTIONS

The call for individualized intervention techniques first requires some investigation of prior and current intervention techniques and their success rates. Although research shows promising results for traditional interventional methods, the results are modest at best (Vandelnoot et al., 2008; Werch et al., 2010; Koelewijn-van et
al, 2010; Johnson et al., 2008; Krist et al., 2010; Eakin et al., 2009; Spink & Wilson, 2010). Additionally, these results have been difficult to generalize and would benefit from further research (Prochaska, 2008; Fernald et al, 2008). In order to combat the lackluster results of traditional interventions, Smyth and Stone (2003) proposed a new type method of data collection and began the prospect of a new type of intervention. In their article, *Ecological Momentary Assessment Research in Behavioral Medicine*, Smyth and Stone propose the collection of data using self-report from participants in any given moment throughout their day. Instead of hosting the participant in a research setting and attempting to collect data based on their recall abilities, Ecological Momentary Assessment (EMA) would provide researchers the ability to disseminate a tool to participants that would allow them to respond as they continue on in their natural setting and schedule. The most efficient and reliable means through which to collect data from an individual is through technological advances such as iPods, iPhones, and palm pilots. Smyth and Stone recommend the usage of this technology-based collection tools in order to evaluate symptoms as related to the natural environment. Rather than relying on recall days later in the lab, the participant is able to document their symptoms and the natural environment as it is happening, making it easier to track the relation between the two. This article provides the basis for the use of technology as a collection tool. Furthermore, this article began the trend of using technology as a tracker of individual behavior and a potential intervention tool. The suggestions made in this article demand further research to examine the success and reliability of ecological assessment and technology-based interventions.
TECHNOLOGY

The research on the success of technology-based interventions thus far appears to be promising. Consolvo et al created an awareness display for cell phones that was designed to increase physical activities (2006). They received improvement in the rates of physical activity and participant willingness to use the device in their pilot study (2006). Consolvo later found improvements in the maintenance of physical activity through the usage of awareness displays on the backgrounds of participant’s mobile phones (2008). Obermayer et al. (2010) used a text message based intervention to help participants quit smoking and received high rates of attempts and a 22% quit rate according to self-report based on a seven-day prevalence criterion (2004). Furthermore, Bannik et al found that the employment of a computer program or the combination of a computer program and counseling led to an overall lower rate of mental health problems and participation in risky behavior (2012). Migneault et al. (2012) found that physical activity, diet quality, and medication adherence among hypertensive African-Americans were improved through the use of a telecommunication system. An improvement in overall energy expenditure and diet was found although the blood pressure results were not statistically significant. King et al. (2007) found improvements in physical activity rates at both the six-month and 12-month follow-up through the use of an automated telephone-linked delivery system. Furthermore, Krebs, Prochaska, and Rossi (2010) conducted a meta-analysis of computer-tailored interventions for health behavior change. They focused on four health behaviors: smoking cessation, physical activity, eating a healthy diet, and receiving regular mammography screening. Significant overall effect sizes were found
across each of the four behaviors. While it was found that effect sizes decreased after the completion of the intervention, tailored interventions were found to have increased efficacy for participants over time.

Technology-based interventions for adherence seem to be a particularly salient topic and the results have also been mostly promising, both in terms of increased adherence rates and participant-reported willingness to use the systems. Foreman et al. (2012) found that those individuals that chose to subscribe to a text-message reminder system had higher rates of adherence for their oral-based medications than those attempting to adhere on their own. Miloh et al. (2009) also found improved adherence rates in pediatric liver transplant patients following the implementation of a text message reminder system. Pena-Robichaux, Kvedar, and Watson (2010) also found improvements to adherence scores in adolescents and adults following the application of a text-message reminder system. Participants in the experimental condition in this study also reported overall high satisfaction with the system as an intervention tool. Pena-Robichaux, Kvedar, and Watson recommended further investigation into this cost-effective and simple intervention tool. The majority of participants in a study conducted by Haberer et al. (2011) also reported liking the technology-based intervention which was used as a tool to improve adherence. Heinrich and Kuiper (2011) garner an 89.64% adherence rating from their chronically ill participants using a hand-held device. Furthermore, Linn et al.'s review of eHealth interventions on adherence literature (2011) found that there was promising results for the effectiveness of Internet interventions to improve adherence.
Regardless of the outcomes of the usage of mobile phones and internet technology as an intervention tool, the point is moot if the population is unwilling to use them. Gibbons and Gerrard emphasized the importance of willingness to participate in an activity in their study on the prototype model of risk behavior (1995). Gibbons and Gerrard examined perceptions of the prototype associated with four health risk behaviors (smoking, drinking, reckless driving, and ineffective contraception) in a population of 679 college students. These perceptions were assessed along with self-reports of the same behaviors. It was found that the perception of the prototype was related to actual and predicted participation in risk behavior. Therefore, perceptions changed as a function of behavior change. Perceptions also served to predict the behavior changes. Additionally, the link between perception and change in behavior was strong among individuals who frequently partake in social comparison. Therefore, social comparison served as the moderator between perceptions and change in behaviors. Thus, there results demonstrate that willingness to participate in a behavior influences how that individuals perceives that activity and vice versa. If an individual is willing to participate in a technology-based intervention, there is a higher chance that they will view the intervention program in a favorable manner. If an individual views the intervention program in a favorable light, there is a higher probability that they will participate in the program. Thus the results serve to emphasize the importance of knowing willingness to participate and perceptions of a behavior prior to administering an intervention-program.

Research is lacking in the area of willingness to use technology as an interventional tool. There have only been a few studies that have investigated the
potential of interventional technology and the results have been mixed. Walsh et al. found that there is potential for technological interventions based on the high rates and patterns of technology usage in youth populations (2007). In contrast, Parkka et al found that the usage of internet health-based apps was limited because participants found the usability to be poor, the security and accessibility to be questionable, and the limited personalization to be discouraging (2000). Furthermore, Economides & Grousopoulou found that participants reported using mobile phones for direct contact with other people (2007). Due to the mixed outcomes of existing research, further research on the willingness to use mobile applications and online trackers to change behavior is needed.

HYPOTHESIS

This study is examining the various subscales of health locus of control beliefs and participation in risky health behavior as predictors of willingness to use phone applications (apps) and online trackers as tools for interventions. The hypothesis has four parts: 1) it is predicted that lower participation in risky health behaviors will be correlated with higher willingness to use phone apps. 2) It is predicted that lower participation in risky health behaviors will be correlated with higher willingness to use online trackers. 3) It is predicted that individuals with internal or powerful other health locus of control beliefs will be correlated with higher willingness to use phone apps and online trackers. 4) It is predicted that individuals with chance health locus of control beliefs will not be correlated with higher willingness to use phone apps and online trackers.

Methods
Participants

Two hundred seventy seven students from a large Midwestern public University (n = 277), ages 18 to 52, participated in this study in partial fulfillment of research requirements for courses. The mean age was 19.78. The breakdown of participants by education level is as follows: 41.2% of these participants were freshmen, 19.5% of the participants were sophomores, 18.4% of the participants were juniors, 16.5% were seniors, and 4.3% were post-undergraduate students. The gender breakdown was 82.3% female and 17.7% male. The ethnicity breakdown of the sample was as follows: 91.7% of the sample was Caucasian, 8.3% of the sample was Black or African American, 1.1% of the sample was Asian, 1.8% of the sample was American Indian or Alaska Native, and 0.4% of the sample was Native Hawaiian or Pacific Islander. Furthermore, the BMI breakdown of the sample is as follows; 3.6% of the sample was reported as underweight, 67.9% of the sample was reported as normal weight, 17.3% of the sample was reported as overweight, and 8.7% of the sample was reported as obese.

Materials

All data was collected through a series of online self-report questionnaires administered to college students. All data was collected using secure-socket layer technology, hosted through the Qualtrics program. Targets of measurement in this study include health locus of control, risky health behaviors, and willingness to use apps and online trackers.
Measures

First, there was a demographic questionnaire administered in order to gather background information about the participants (See Table 1). Age, gender, education, height and weight were included in this questionnaire.

**Multidimensional Health Locus of Control Questionnaire.** The Multidimensional Health Locus of Control Questionnaire (Wallston, Wallston & DeVellis, 1978) was used to assess the perceived health locus of control. The Multidimensional Health Locus of Control Questionnaire (MHLC) was developed to assess people's beliefs about the control they have over their own health. The MHLC examines three major causes of health beliefs; internal, powerful other, and chance. Individuals with internal health locus of control beliefs believe that they have control over their own health. Individuals with powerful other health locus of control beliefs believe that a powerful individual such as their doctor can influence their overall health. Individuals with chance health locus of control beliefs believe that their health outcome is determined through luck. The MHLC is broken into series of six-question forms that divide individuals into these three subscales based The MHLC is made up eighteen questionnaires scored on a six-point Likert scale. The MHLC has an estimated reliability of $r=.720$ with subscale reliability ranging from $r = .508$ to $r = .733$.

**Health Risk Behaviors Inventory.** The Health Risk Behaviors Inventory (Irish, L, 2011) was used to assess participation in risky health behaviors. The Health Risk Behaviors Inventory was developed to examine seven subscales of risky behaviors. The
reliability for the subscales ranged from $r = .048-0.88$; physical activity ($r = .68$), diet ($r = .68$), sleep ($r = .48$), smoking ($r = .76$), alcohol use ($r = .69$), drug use ($r = .82$) and sexual behavior ($r = .88$). The HRBI is a 33-item questionnaire with scoring specific to each question. Overall, the higher the total score, the higher the health risk.

**Survey of Online Tracker Usage.** Perception of online trackers as well as willingness to use trackers as interventional tools was assessed by a questionnaire created for this study titled the Survey of Online Tracker Usage (SOTU). The SOTU is a 32-item questionnaire with five-point Likert scale responses. It specifically investigates willingness to track body image, calorie intake, exercise patterns, overall nutrition, adherence to medication, sleep patterns, stress levels, overall health, self-care of illness/injury, overall diet, anxiety, energy drink consumption, driving habits, and desire for cosmetic surgery. The SOTU has an estimated test-retest reliability of $r = .766$ and an estimated internal consistency of $r = .956$. These results suggest that the questionnaire maintains reliability over time and produces valid data. These results also suggest that the individual items on the questionnaire are appropriately measuring willingness to use online trackers and are consistent in this measurement.

**Survey of Health App Usage.** Perception of phone applications (apps) and willingness to use apps as interventional tools was assessed by a questionnaire created for this study titled the Survey of Health App Usage (SHAU). The SHAU is a 32-item questionnaire with five-point Likert scale responses. It specifically investigates willingness to track body image, calorie intake, exercise patterns, overall nutrition,
adherence to medication, sleep patterns, stress levels, overall health, self-care of illness/injury, overall diet, anxiety, energy drink consumption, driving habits, and desire for cosmetic surgery. A Cronbach's alpha of the SHAU demonstrated an estimated test-retest reliability of $r = .777$ and an estimated internal consistency of $r = .957$. These results suggest that the questionnaire maintains reliability over time and produces consistent responses. These results also suggest that the individual items on the questionnaire are appropriately measuring willingness to use health apps and are consistent in this measurement.

**Procedure**

Subjects participated in this study by signing up the study through a website that hosts the research projects being conducted at the University. Once they signed up, students were provided a link to the informed consent. Once they signed the consent, students participated in part one of the study via a series of questionnaires that assessed their participation in risky health behaviors, their health locus of control, their willingness to use apps and trackers, and some basic demographic information. These questionnaires were administered through a secure-socket layer technology program. Subjects were provided the option to participate from a personal computer or from a computer hosted in the lab of the research team.

Approximately three weeks later, participants received an email containing a participant-specific link for participation in part two of the study. In part two, participants were administered a reduced number of questionnaires. This second time point was used
to ensure reliability of the SOTU and SHAU, which were created for this study. The questionnaires once again assessed their participation in risky health behaviors, their health locus of control, and their willingness to use apps and trackers.

**Analytic Strategy**

Pearson’s correlations were used to predict willingness to use online apps and trackers. A correlation was run to determine if internal, powerful other or chance health loci of control beliefs were correlated with a higher willingness to use online trackers. A second correlation was run to determine if higher participation in risky health behaviors was correlated with a higher willingness to use online trackers. A third correlation was run to determine if internal, powerful other or chance health loci of control beliefs were correlated with a higher willingness to use smartphone apps. A fourth correlation was run to determine if a higher participation in risky health behaviors was correlated with a higher willingness to use smartphone apps.

It was found that there was no need to control for age, gender, or ethnicity in terms of the SOTU or SHAU due to a lack of correlation between the demographic information and willingness to use apps or online trackers.

Additionally, a test-retest analysis and Cronbach’s alpha were run to determine the reliability and internal consistency of the SOTU and the SHAU.
Results

Primary Outcomes

Age, gender and ethnicity were not associated with willingness to use apps (See Table 2). Furthermore, age, gender and ethnicity were not associated with willingness to use online trackers (see Table 2).

Four Pearson’s correlations were conducted to test the hypotheses. A correlation was conducted to investigate whether participation in risky health behaviors was associated with willingness to use online trackers scores. Results showed that participation in risky health behaviors was not associated with willingness to use online trackers, $r = -.16, p = .788$ (see Table 3). Second, a correlation was conducted to examine whether participation in risky health behaviors predicted willingness to use apps. Results showed that participation in risky health behaviors was not associated with willingness to use apps, $r = -.032, p = .599$ (see Table 3).

A Pearson’s correlation was conducted to investigate whether health locus of control beliefs predicted willingness to use apps. Results showed that health locus of control beliefs were associated with willingness to use apps. Individuals with internal and powerful other health locus of control beliefs were positively correlated with willingness to use apps, $r = .119, p = .048$; $r = .211, p = .000$ (see Table 3). However, chance locus of control was not correlated with willingness to use apps, $r = -.009, p = .888$ (see Table 3). A fourth Pearson’s correlation was conducted to investigate whether health locus of control beliefs predicted willingness to use online trackers. Results showed that health
locus of control beliefs were associated with willingness to use online trackers. Individuals with internal and powerful other health locus of control beliefs were positively correlated with willingness to use online trackers, $r = .147, p = .014$; $r = .183, p = .002$ (see Table 3). However, chance locus of control was not correlated with willingness to use online trackers, $r = -.060, p = .323$ (see Table 3).

Discussion

This study examined health locus of control and participation in risky health behavior as predictors of willingness to uses phone applications (apps) and online trackers tools for intervention. It was hypothesized that lower participation in risky health behaviors would be significantly correlated with higher willingness to use online trackers. The hypothesis was not supported, as there was no significant correlation between participation in risky health behaviors and willingness to use online trackers. Therefore, current levels of self-reported participation in risky health behaviors cannot be used as an indicator of willingness to use online trackers for an intervention.

It was hypothesized that lower participation in risky health behaviors would be significantly correlated with higher willingness to use phone apps. This hypothesis was not supported, as there was no significant relationship between willingness to use apps and participation in risky health behaviors. Therefore, the results suggest that current levels of participation in risky health behaviors cannot be used as an indicator of willingness to use apps for an intervention.
It was hypothesized that individuals with internal and powerful other health locus of control beliefs would be correlated with higher willingness to use phone apps and online trackers. This hypothesis was supported, as there was a significant correlation between internal health locus of control beliefs and higher willingness to use apps and online trackers. This indicates that individuals reporting higher internal locus control beliefs are more likely to use apps and online trackers as opposed to those with lower internal locus of control. Furthermore, the hypothesis was supported as there was a significant correlation between powerful other health locus of control beliefs and higher willingness to use apps and online trackers. This indicates that individuals reporting powerful other health locus of control beliefs are more likely to use apps and online trackers as opposed to those with lower internal and powerful other health loci of control.

It was hypothesized that individuals with chance health locus of control beliefs would be correlated with lower willingness to use smartphone apps and online trackers. This hypothesis was supported, as there was no correlation between chance health locus of control beliefs and willingness to use smartphone apps and online trackers. This indicates that individuals reporting chance health locus of control beliefs are less likely to use smartphone apps and online trackers as opposed to those with internal or powerful other locus of control beliefs. Furthermore, these results suggest that health locus of control beliefs can serve as a predictor for an individual’s willingness to use smartphone apps and online trackers for an intervention.
The results of this study are congruent with results of previous research. In terms of participation in risky health behavior, research has found that those less likely to participate in risky health behaviors are more likely to express a desire to take care of their health. Therefore, it was anticipated that those with lower rates of participation in risky health behaviors would be willing to use a tool such as apps or online trackers in which they are able to control the amount of tracking. However, this was not the case as participation in risky health behaviors did not serve as a predictor of willingness to use apps or trackers. These null findings may have occurred because there may be too many confounding variables for participation in risky health behaviors to predict willingness to use apps and online trackers. For example, an individual may be have terrible nutrition habits due to lack of education on the topic, but that does not mediate the relationship between participation in risky health behaviors and willingness to use technology-based interventions. These results suggest that when attempting an intervention for risky health behaviors, the current level of participation in said risky behaviors will not serve as a strong predictor for type of intervention method. Therefore, a clinician may want to consider basing the choice of intervention off of individual characteristics rather than the behavior being addressed.

The results of this study in the context of previous research on health locus of control matched what was expected. Previous research has overwhelmingly found that individuals with a high internal locus of control are more likely to partake in preventative health behaviors and far less likely to partake in risky health behaviors. Therefore, it was anticipated that individuals with a high internal locus of control would be more willing to
use apps and online trackers as a form of intervention due to their tendency to monitor their health behavior. It has also been shown in previous research that individuals with powerful other health locus of control beliefs are more likely to monitor their behavior for fear of violating their doctor's suggestions. The results supported previous research as it was found that those with internal and powerful other health locus of control beliefs were more willing to use apps and online trackers as a tool for intervention. Previous research also supported the findings on chance health locus of control as it has been previously found that individuals who attribute their health to luck are less likely to partake in preventative health behaviors such as the use of apps and online trackers. A possible explanation for these results is based around matching typical behaviors with the system of beliefs. Individuals with internal health locus of control beliefs believe that their health outcome is determined by their actions. Therefore, these individuals are more likely to partake in preventative health measures in order to assure their health outcome is positive. Individuals with powerful other health locus of control beliefs believe that suggestions provided by doctors and other health practitioners are what is keeping them healthy. Therefore, these individuals are more likely to partake in a health intervention in order to follow their doctor's suggestion. Individuals with chance health locus of control beliefs believe that their health is determined by luck and therefore nothing they do can affect the outcome. Therefore, it is unlikely that these individuals would partake in any preventative health measures including tracking their behavior through apps or online trackers. These results suggest that clinicians can use health locus of control as a predictor for willingness to use a technology-based intervention.
Therefore, if an individual scores high on internal or powerful other health locus of control beliefs, there is a greater chance of success with the use of apps and online trackers than with an individual that scores high on chance health locus of control beliefs.

There were a few possible limitations to this research study. For example, the sample was not very diverse. The participants were largely Caucasian, which did not provide a diverse ethnicity range. Furthermore, the sample was largely skewed in the female to male ratio. There was a significantly larger amount of females in this sample. If this study were to be repeated, a larger, more diverse sample should be used. Another possible limitation of the study comes from the use of self-report measures. There is always a risk with using self-report measures that participants are not fully disclosing their participation in risky health behaviors, which could have altered the results. If individuals chose to under-report participation in risky health behaviors, there is a chance that participation in risky health behaviors could still predict willingness to use apps or online trackers. Another limitation of the study comes from the assumption that all participants had daily access to technology such as apps or trackers. Despite the rapid growth of technology, it is still presumptuous to assume that the entire population has readied access to tools such as apps and online trackers. If participants did not have access to these technological tools, there is a chance that they may have answered the questions regarding willingness to use apps and online trackers differently than those with daily access. If this study were to be repeated, a measure of each participants daily technology use should be included in order to provide a more realistic view of technology access. Lastly, a possible limitation of this study was the method of distribution. This
study was addressing willingness to use technology-based interventions and yet was distributed through an online forum. Therefore individuals that participated in the study already have access to the internet in some form and are at least willing to use it for participating in studies such as this. If this study was repeated, the measures should be distributed to individuals in person to assure that the sample is not biased by individuals already willing to use technology.

The results of this study have multiple applications for health practitioners and clinicians. First, it was found that there was no significant relationship between current participation in risky health behaviors and willingness to use apps and online trackers. These null findings suggest that it may be beneficial for health practitioners and clinicians to take into consideration an individual’s characteristics rather than the health behavior being addressed while creating interventions.

Moreover there were significant differences between individuals found based on their scores on health locus of control. Therefore, health practitioners and clinicians should consider administering a measure of health locus of control such as the Multidimensional Health Locus of Control prior to creating an intervention. Furthermore, it was found that individuals with internal and powerful other health locus of control beliefs were more willing to use technology-based interventions. Therefore, health practitioners and clinicians should consider recommending the use of apps and online trackers for those individuals. It was also found that individuals with chance health locus of control beliefs were less willing to use technology-based interventions to monitor their
health behaviors. Consequently, health practitioners and clinicians should consider implementing a health locus of control education program for those individuals that believe their health is determined by chance prior to assigning these individuals to an intervention program.

Additionally, these results reflect that individual’s willingness to partake in different types of interventions vary and therefore health practitioners and clinicians should further consider creating assessing individual characteristics prior to treatment. Intervention programs should be created based on the individual characteristics in order to gain the most willingness to partake as they can from individuals. Interventions and treatment programs have a better chance of being successful when the participant is at least willing to try that particular mode of intervention.

In conclusion, the results of this study contribute further insight to the research field in multiple dimensions. First, this study provided evidence that health locus of control can be used a predictor of willingness to partake in a technology-based intervention. Second, the results suggest that individuals with internal and powerful other health locus of control beliefs are more willing to partake in a technology-based intervention in contrast to those individuals with chance health locus of control beliefs. Furthermore, the results of this study suggest that technology-based interventions would be well-received by participants in a treatment or intervention program as long as their personality characteristics are a compatible match. Lastly, the results of this study provide further evidence for treatment-matching in which individuals are assigned to a
particular type of treatment or intervention based on individual characteristics such as health locus of control.
References


international conference on Ubiquitous computing (pp. 54-63). ACM. DOI 10.1145/1409635.1409644.


Appendix A: Tables

Table 1

_Demographic Information_

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<th>Gender</th>
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Table 2

Correlations Between Demographic Variables and Measures

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*p < .05. **p < .01. ***p < .001.
Table 3

Correlations Between Health Locus of Control, Risky Behaviors, and Willingness to use Smartphone Apps and Online Trackers

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*p < .05. **p < .01. ***p < .001.
Appendix B: Questionnaires

Multidimensional Health Locus of Control

1. If I get sick, it is my own behavior which determines how soon I get well again
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
2. No matter what I do, if I am going to get sick, I will get sick
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
3. Having regular contact with my physician is the best way for me to avoid illness
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
4. Most things that affect my health happen to me by accident.
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
5. Whenever I don’t feel well, I should consult a medically trained professional.
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
6. I am in control of my health.
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
7. My family has a lot to do with my becoming sick or staying healthy.
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
8. When I get sick I am to blame.
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
9. Luck plays a big part in determining how soon I will recover from an illness.
   -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
10. Health professionals control my health.
    -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
11. My good health is largely a matter of good fortune.
    -Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
12. The main thing which affects my health is what I myself do.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree

13. If I take care of myself, I can avoid illness.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree

14. When I recover from an illness, it’s usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree

15. No matter what I do, I’m likely to get sick.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree

16. If it’s meant to be, I will stay healthy.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree

17. If I take the right actions, I can stay healthy.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree

18. Regarding my health, I can only do what my doctor tells me to do.

-Strongly Disagree -Disagree -Neutral -Neither Agree nor Disagree -Agree -Strongly Agree
Health Risk Behaviors Inventory

Each item lists a series of statements describing a specific behavior. Please check the box next to the option that best describes your actual behavior over the past month.

1. During the past month…
   - While awake, I spent almost all of my time sitting or laying down (5)
   - While awake, I spent more time sitting or laying down than I spent standing or moving around (4)
   - While awake, I spent about equal amounts of time sitting or laying down and standing or moving (3)
   - While awake, I spent more time standing or moving than I spent sitting or lying down. (2)
   - While awake, I spent almost all of my time standing or moving around. (1)

2. During the past month…

(Note: Aerobic exercise refers to any activity that raises your heart rate and makes you sweat, like jogging, elliptical, sports like basketball or any other activity that involves similar amounts of effort)
   - I got a lot of aerobic exercise at my job, so I did not need to work out or play sports for exercise. (1)
   - Every week, I got at least 2 ½ hours of aerobic exercise. (1)
   - Most weeks I got at least 2 ½ hours of aerobic exercise, but there were some weeks I did not get that much. (2)
   - Sometimes I got at least 2 ½ hours of aerobic exercise in a single week but it was not usually that much. (3)
   - I did do some aerobic activity, but I never did more than 2 ½ hours in a single week in the past month. (4)
   - I hardly did any aerobic exercise in the past month. (5)

3. During the past month…

(Note: Resistance training includes activities to strengthen muscles like lifting weights or using resistance bands.)
   - I did a lot of heavy lifting at my job, so I did not need to do resistance training for exercise. (1)
• Every week, I did resistance training at least twice per week. (1)
• Most weeks I did resistance training at least twice, but there were some weeks I did not do that much. (2)
• Sometimes I did resistance training at least twice in a single week but it was not usually that much. (3)
• I did some resistance training, but I never did it more than once in a single week in the past month. (4)
• I did not do any resistance training in the past month. (5)

5. During the past month…
• When I had leisure time (when I was not doing work or housework), I almost always did some sort of physical activity (hiking, swimming, bowling, playing sports, etc.), but almost never sat and relaxed. (1)
• When I had leisure time, I almost always sat and relaxed (watched TV, socialized with friends, read, etc.), but almost never did things that were more physically active. (5).
• When I had leisure time, I spent about half the time doing physical activity and the other half doing more sedentary activity (watching TV, etc.). (3)
• When I had leisure time, I usually did physical activity, but sometimes I sat and relaxed. (2)
• When I had leisure time, I usually just sat and relaxed, but sometimes I did physical activity (hiking, playing sports, etc.). (4)
• I didn’t really have leisure time, so I couldn’t do much physical activity for fun. (9)

6. During the past month…
• Most of my work (including employment, school, housework, yardwork, and childcare) required some physical effort. (1)
• Most of my work required very little or no physical effort. (5)
• The work at my job did not require much physical effort, but the work I do at home (housework, yardwork, and/or childcare) did require physical effort. (3)
• My work at home did not require much physical effort, but my work at my job did require physical effort. (3)
• Some of my work required physical activity but most of it did not. (4)
• Some of my work did not take any physical effort, but most of it did take physical effort. (2)
• I didn’t really do much work (employment, school, housework, yardwork, childcare) over the past month. (9)
Diet

7. During the past month…
   - I ate 3 or more servings of vegetables almost every day. (1)
   - I ate 3 or more servings of vegetables about 5 days per week. (2)
   - I ate vegetables most days, but only sometimes ate 3 or more servings in a day. (3)
   - I ate vegetables some days, but rarely ate 3 or more servings in a day. (4)
   - I rarely ate vegetables. (5)

8. During the past month…
   - I ate 2 or more servings of fruit almost every day. (1)
   - I ate 2 or more servings of fruit about 5 days per week. (2)
   - I ate fruit most days, but only sometimes ate 2 or more servings in a day. (3)
   - I ate fruit some days, but rarely ate 2 or more servings in a day. (4)
   - I rarely ate fruit. (5)

9. During the past month…
   - I very rarely or never ate any grains (bread, cereal, pasta). (9)
   - When I ate grains (bread, pasta, cereal), I always chose whole grain options over white/enriched options. (1)
   - When I ate grains, I usually chose whole grain options, but I sometimes ate white/enriched grains. (2)
   - I chose whole grains for some types of food, but not others (for example, I ate whole wheat bread, but ate white/enriched pasta). (3)
   - I sometimes chose whole grains, but about half of the time I ate white/enriched grains. (3)
   - Once in a while I chose whole grains, but usually ate white/enriched grains. (4)
   - I always chose white/enriched grains over whole grains. (5)

10. During the past month…
   - I never ate any dairy products. (9)
   - When I had dairy products (milk, cheese, yogurt), I always chose low-fat or fat-free options (like skim milk). (1)
   - When I had dairy products, I usually chose low-fat or fat-free options, but I sometimes ate regular dairy products. (2)
• I chose low-fat or fat-free options for some types of dairy, but not others (for example, I drink skim milk, but eat regular cheese rather than low-fat cheese). (3)
• I sometimes chose low-fat or fat-free dairy products, but about half of the time I ate regular fat dairy products. (3)
• Once in a while I chose low-fat or fat-free dairy products, but usually ate regular dairy products (like 2% milk). (4)
• I always chose regular dairy products over low-fat or fat-free dairy products. (5).

11. During the past month...

• I never ate fried foods (for example, french fries, fried chicken, donuts or other foods cooked by deep-frying). (1)
• I ate fried foods a few times. (2)
• I ate fried foods a few times per week. (3)
• I ate fried foods most days per week. (4)
• I ate fried foods almost every day. (5)

12. During the past month...

• I had sugar-sweetened foods or beverages multiple times per day almost every day (for example, non-diet soda, sweet tea, cookies, candy or other sweet foods or beverages). (5)
• I had sugar-sweetened foods or beverages most days. (4).
• I had sugar-sweetened foods or beverages a few times per week. (3)
• I had sugar-sweetened foods or beverages a few times. (2)
• I almost never had sugar-sweetened foods or beverages. (1)

13. During the past month...

• I did not smoke any cigarettes in the past month. (1)
• I smoked a few cigarettes, but not every week. (2)
• I did not smoke every day, but I smoked a few cigarettes per week. (3)
• I smoked at least one cigarette per day. (4)
• I smoked at least 10 cigarettes per day. (5)
• I did not smoke cigarettes, but I did smoke cigars or pies, or used chewing tobacco. (3)

14. During the past month...
15. During the past month...

- I did not purchase cigarettes for myself. (1)
- I purchased cigarettes for myself once in the past month. (3)
- I purchased cigarettes for myself more than once in the past month. (5)

16. During the past month...

- I was almost never exposed to secondhand smoke. (1)
- I was sometimes exposed to secondhand smoke, but never for more than a few seconds at a time. (2)
- I spent time with people while they were smoking a few times, but it wasn’t for a very long time. (3)
- I was around people while they were smoking almost every day, but it wasn’t for a very long time. (4)
- I was around people while they were smoking almost every day for long periods of time. (5)

17. During the past month...

- I allowed people to smoke in my house any time. (5)
- I allowed people to smoke in my house once in a while. (3)
- I never allowed people to smoke in my house. (1)

18. During the past month...

- I allowed people to smoke in my car any time. (5)
- I allowed people to smoke in my car once in a while. (3)
- I never allowed people to smoke in my car. (1)
- I did not have a car. (9)

Alcohol use

19. During the past month...
• I did not drink any alcohol in the past month. (2)
• I drank some alcohol, but never had more than 1-2 drinks in a single day. (1)
• I drank at least 4-5 drinks in a single day on one or two days. (3)
• I drank at least 4-5 drinks in a single day about once or twice a week. (4)
• I drank at least 4-5 drinks in a single day 3 or more days per week. (5)

20. During the past month...
• I did not drink any alcohol in the past month. (1)
• I never drove after drinking alcohol in the past month. (1)
• I drove after drinking 2 or more drinks once or twice. (2)
• I drove after drinking 2 or more drinks a few times. (3)
• I drove after drinking 2 or more drinks about once per week. (4)
• I drove after drinking 2 or more drinks more than once per week. (5)

21. During the past month...
• I did not drink any alcohol in the past month. (1)
• Once I started drinking, I had no problem stopping at any time for any reason. (2)
• Once in a while after I started drinking, I did not want to stop because I was enjoying it, but I could stop if I had to. (3)
• Most times once I started drinking, I did not want to stop because I was enjoying it, but I could stop if I had to. (4)
• Once I started drinking, it was usually difficult for me to stop for any reason. (5)

22. During the past month...
• I did not drink any alcohol in the past month. (1)
• Drinking or being hungover never interfered with my usual activities or responsibilities (like work, school, family responsibilities). (1)
• Drinking or being hungover interfered with my usual activities or responsibilities once or twice. (2)
• Drinking or being hungover interfered with my usual activities or responsibilities about once per week. (3)
• Drinking or being hungover interfered with my usual activities or responsibilities multiple times per week. (4)
• Drinking or being hungover interfered with my usual activities or responsibilities almost every day. (5)
23. During the past month, I got into trouble because of my drinking...
   • Never (1)
   • Once (3)
   • More than once (5)

Drug use

24. During the past month...
   • I did not take any prescription drugs during the past month. (1)
   • I only took prescription drugs for medical purposes as prescribed by a doctor. (1)
   • I took someone else’s prescription drugs or took prescription drugs in a way that did not follow the instructions, but it was only for medical purposes. (2)
   • I took prescription drugs to get a buzz or get high once or twice. (3)
   • I took prescription drugs to get a buzz or get high once or twice a week. (4)
   • I took prescription drugs to get a buzz or get high most days. (5)

25. During the past month...
   • I never smoked marijuana in the past month. (1)
   • I smoked marijuana once or twice. (2)
   • I smoked marijuana a few times. (3)
   • I smoked marijuana once or twice a week. (4)
   • I smoked marijuana most days. (5)

26. During the past month...
   • I never used any illegal drugs in the past month. (1)
   • I used marijuana and/or prescription drugs (for non-medical purposes) in the past month, but did not use any other illegal drugs. (2)
   • I used illegal drugs besides marijuana once or twice. (3)
   • I used illegal drugs besides marijuana about once or twice a week. (4)
   • I used illegal drugs besides marijuana most days. (5)

27. During the past month...
   • I did not use any illegal drugs in the past month (including marijuana and prescription drugs taken for non-medical reasons). (1)
   • I used illegal drugs in the past month but they never interfered with my usual responsibilities (work, school, family responsibilities). (2)
• My drug use interfered with at least one of my usual responsibilities once or twice. (3)
• My drug use interfered with at least one of my usual responsibilities about once or twice per week. (4)
• My drug use interfered with at least one of my usual responsibilities most days. (5)

28. During the past month, I got into trouble because of my drug use...

• Never (1)
• Once (3)
• More than once (5)

Sexual behavior

29. During the past month...

• I have not had sex in the past month. (1)
• I have only had sex with one committed partner. (2)
• I have only had sex with someone I knew well, but was not in a committed relationship with. (2)
• I have only had sex with someone that I did not know well (like a one night stand) in the past month. (3)
• I had multiple sexual partners in the past month, but most or all of my sexual experiences were with a partner I knew well. (4)
• I had multiple sexual partners in the past month, most of whom I did not know well. (5)

30. During the past month...

• I did not have sex in the past month. (1)
• I had sex a few times in the past month (less than once per week). (2)
• I had sex about once per week. (3)
• I had sex 2-3 times per week. (4)
• I had sex 4 or more times per week. (5)

31. During the past month...

• I did not have sex in the past month. (1)
• Because I know my sexual partner(s) well, I am confident that they did not have STDs during the past month. (2)
32. During the past month...

- I did not have sex in the past month. (1)
- Because I know my sexual partner(s) well, I am confident that they were not also having sex with other people during the past month. (2)
- Although I know my sexual partner(s) well, they were probably also having sex with other people. (3)
- Although I know that one of my sexual partners did not also have sex with other people during the past month, I am not sure about all my sexual partners over the past month. (4)
- I am pretty sure that at least one of my sexual partners was also having sex with other people during the past month. (5)

33. During the past month...

- I did not have sex in the past month. (1)
- I always used a condom during vaginal and/or anal sex. (2)
- I usually used a condom during vaginal and/or anal sex. (3)
- I sometimes used a condom during vaginal and/or anal sex. (4)
- I never used a condom during vaginal and/or anal sex. (5)
Survey of Online Tracker Use (SOTU)

1. How willing would you be to use online health trackers for self-monitoring (to track and measure a behavior)?
   
   Very willing    Willing    Neutral    Unwilling    Very Unwilling

2. How willing would you be to use online health trackers for self-intervention (to change a behavior)?
   
   Very willing    Willing    Neutral    Unwilling    Very Unwilling

3. How effective do you think online trackers would be for self-monitoring?
   
   Very effective    Effective    Neutral    Ineffective    Very Ineffective

4. How effective do you think online trackers would be for self-intervention?
   
   Very effective    Effective    Neutral    Ineffective    Very Ineffective

5. How likely would you be to use an online tracker to monitor body image?
   
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

6. How likely would you be to use an online tracker to try to change body image?
   
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

7. How likely would you be to use an online tracker to monitor calorie intake?
   
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

8. How likely would you be to use an online tracker to try to change calorie intake?
   
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

9. How likely would you be to use an online tracker to monitor exercise patterns?
   
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

10. How likely would you be to use an online tracker to try to change exercise patterns?
    
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely
11. How likely would you be to use an online tracker to monitor overall nutrition?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

12. How likely would you be to use an online tracker to try to change overall nutrition?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

13. How likely would you be to use an online tracker to monitor adherence to medication?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

14. How likely would you be to use an online tracker to try to change adherence to medication?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

15. How likely would you be to use an online tracker to monitor sleep patterns?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

16. How likely would you be to use an online tracker to try to change sleep patterns?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

17. How likely would you be to use an online tracker to monitor stress levels?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

18. How likely would you be to use an online tracker to try to change stress levels?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

19. How likely would you be to use an online tracker to monitor overall health?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

20. How likely would you be to use an online tracker to try to change overall health?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

21. How likely would you be to use an online tracker to monitor self-care of illnesses and injuries?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely
22. How likely would you be to use an online tracker to try to change self-care of illnesses and injuries?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

23. How likely would you be to use an online tracker to monitor overall diet?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

24. How likely would you be to use an online tracker to try to change overall diet?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

25. How likely would you be to use an online tracker to monitor anxiety?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

26. How likely would you be to use an online tracker to try to change anxiety?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

27. How likely would you be to use an online tracker to monitor energy drink usage?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

28. How likely would you be to use an online tracker to try to change energy drink usage?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

29. How likely would you be to use an online tracker to monitor driving habits?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

30. How likely would you be to use an online tracker to try to change driving habits?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely

31. How likely would you be to use an online tracker to monitor desire for cosmetic surgery?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely
32. How likely would you be to use an online tracker to try to change desire for cosmetic surgery?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

Survey of Health App Use (SIIAU)

1. How willing would you be to use health apps for self-monitoring (to track and measure a behavior)?

Very willing  Willing  Neutral  Unwilling  Very Unwilling

2. How willing would you be to use health apps for self-intervention (to change a behavior)?

Very willing  Willing  Neutral  Unwilling  Very Unwilling

3. How effective do you think health apps would be for self-monitoring?

Very effective  Effective  Neutral  Ineffective  Very Ineffective

4. How effective do you think health apps would be for self-intervention?

Very effective  Effective  Neutral  Ineffective  Very Ineffective

5. How likely would you be to use a health app to monitor body image?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

6. How likely would you be to use a health app to try to change body image?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

7. How likely would you be to use a health app to monitor calorie intake?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

8. How likely would you be to use a health app to try to change calorie intake?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely

9. How likely would you be to use a health app to monitor exercise patterns?

Very Likely  Likely  Neutral  Unlikely  Very Unlikely
10. How likely would you be to use a health app to try to change exercise patterns?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

11. How likely would you be to use a health app to monitor overall nutrition?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

12. How likely would you be to use a health app to try to change overall nutrition?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

13. How likely would you be to use a health app to monitor adherence to medication?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

14. How likely would you be to use a health app to try to change adherence to medication?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

15. How likely would you be to use a health app to monitor sleep patterns?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

16. How likely would you be to use a health app to try to change sleep patterns?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

17. How likely would you be to use a health app to monitor stress levels?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

18. How likely would you be to use a health app to try to change stress levels?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

19. How likely would you be to use a health app to monitor overall health?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

20. How likely would you be to use a health app to try to change overall health?
   Very Likely    Likely    Neutral    Unlikely    Very Unlikely
21. How likely would you be to use a health app to monitor self-care of illnesses and injuries?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

22. How likely would you be to use a health app to try to change self-care of illnesses and injuries?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

23. How likely would you be to use a health app to monitor overall diet?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

24. How likely would you be to use a health app to try to change overall diet?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

25. How likely would you be to use a health app to monitor anxiety?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

26. How likely would you be to use a health app to try to change anxiety?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

27. How likely would you be to use a health app to monitor energy drink usage?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

28. How likely would you be to use a health app to try to change energy drink usage?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

29. How likely would you be to use a health app to monitor driving habits?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

30. How likely would you be to use a health app to try to change driving habits?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely

31. How likely would you be to use a health app to monitor desire for cosmetic surgery?

   Very Likely    Likely    Neutral    Unlikely    Very Unlikely
32. How likely would you be to use a health app to try to change desire for cosmetic surgery?

Very Likely    Likely    Neutral    Unlikely    Very Unlikely