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The Use of Applications on Mobile Devices in a Midwestern Population

By

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In

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Abstract

Mobile phone technology has increased over the past decade so much that most of the population owns a smart phone or a tablet device. Many applications can be downloaded on these devices. However, limited research exists examining the efficacy and effectiveness of these applications. In addition, attrition rates for these studies are extremely high. This study explored characteristics of the population who would be willing to use an application for help. College students (N=836) in a Midwestern metropolitan area were surveyed to determine if alcohol consumption or depressive symptoms influence an individual's willingness to use an application as an adjunct to psychological treatment. The results showed that depressive symptoms significantly predict an individual's willingness to use a mobile phone application in a positive direction, but alcohol consumption did not. More research needs to be completed to determine the characteristics of the population who would be willing to use applications for mental health assistance.

Introduction

Technology has allowed mental health assistance to be provided to individuals in isolated areas. It has offered hope to bridge the gap between mental health professionals and clients (Farrell, & McKinnon, 2003). This offers a new alternative to traditional psychotherapy and provides education and support to clients who would normally be unable to seek help for mental health issues. In addition, the use of technology has allowed fewer stigmas to be attached to the individuals seeking mental health treatment.

Several studies have explored the use of teleconferencing to raise awareness of mental health. Hoolahan, Grosvenor, Kurtz, and Kelly (2007) conducted a study exploring whether providing interactive video conferencing on mental health issues was beneficial to health care providers and community members. Another study conducted by Thorp, Fidler, Moreno, Floto, and Agha (2012) explored using video conferencing to administer psychotherapy for posttraumatic stress disorder to veterans. Both studies found that the participants preferred this type of approach due to saving time and money (Hoolahan et al.; Thorp et al.). Participants could receive the sessions at a local facility or receive the intervention in the comfort of their own homes. Both methods have shown to be more efficient compared to meeting with a mental health professional. In addition, the clients have reported willingness to share more information with therapist due to being in a familiar comfortable environment (Thorp et al.) compared to a counselor's office.

Some agencies have explored the use of videos in a clinic setting to replace the clinician. Kay-Lambkin, Baker, Lewin, and Carr (2011) compared clinician assisted computer based (CAC) psychological intervention to a brief intervention and a therapist

delivered intervention. The CAC intervention involved the client watching a DVD in a clinic setting. The study found significant differences did not exist between the three conditions. The clients in the CAC condition did state they felt they had more client initiative compared to the other conditions.

Furthermore, studies have investigated the use of web-based interventions for psychopathology and health issues. Obesity has become a major health concern for many individuals in the United States. A study examined whether a web-based approach would increase activity level in over weight individuals (Watson, Bickmore, Cange, Kulshreshtha, & Kvedar, 2012). The study found that individuals with a virtual coach along with access to websites were more active compared to individuals with access only to a health website. In addition, Van der Kriek, Emerencia, Aiello, and Sytema (2012) examined whether a web-based program would be a good support system for individuals diagnosed with schizophrenia. The study found the participants liked the idea of having access to information about symptoms in order to increase awareness of their functioning to help with treatment options and adherence.

Since, technology is pushing every field to explore new ways of providing information to the public to make daily life easier, many agencies have started to utilize services through Mobile Health (mHealth). The World Health Organization (2011) defines mHealth as assessing and providing health information through portable wireless devices such as cell phones, tablets, and other mobile devices. mHealth was developed to provide health information to large masses of individuals in a short period of time.

Due to mobile phone usage increasing dramatically over the past several years, sharing health information and implementing interventions through mobile phones is a practical, cost efficient way of helping many individuals. Mobile phones are portable, convenient, and easily connected to others (Whittaker, Merry, Dorey, & Maddison, 2012). Mobile phones are frequently carried and are usually never turned off. This allows information to be sent or received continuously throughout the day.

Mobile phone technology has expanded in the last decade. Smart phones have replaced the traditional mobile phone. Smart phones accounted for only 10% of purchased mobile phones in 2008 (Luxton, McCann, Bush, Mishkind, & Reger, 2011), but in 2011, 83% of adults had mobile phones (Smith, 2011). Of those adults owning mobile phones, 35% owned smart phones (Smith). It is projected that smartphones will become the most used mobile phone device due to 55% of individuals purchasing a mobile phone device purchasing a smartphone over a basic mobile phone (Choney, 2011).

Intervention programs have utilized text messaging to administer treatments. Several studies have explored using text messaging to encourage smoking cessation. These studies have found that participants utilizing these programs are less dependent on nicotine (Obermayer, Riley, Asif, & Jean-Mary, 2004) and report higher rates of smoking cessation (Free, Whittaker, Knight, Abramsky, Rodgers, & Roberts, 2009). In addition, research has shown text message can be utilized in an anti-obesity program. Individuals who receive weekly text messages encouraging them to monitor calorie intake and

exercise have had significant reductions in body mass, weight and waist circumference (Joo & Kim, 2007).

Furthermore, text messaging has been utilized in prevention programs for adolescents and individuals suffering from bulimia nervosa. MEMO is prevention program that offers cognitive behavior therapy to adolescents using text messaging (Whittaker et al., 2012). MEMO produced a better quality of life for the adolescents by decreasing negative thoughts, improving problem solving skills, relaxation, and positive thinking (Whittaker et al.). Furthermore, researchers have explored the use of text messaging for a preventative tool for relapse with individuals diagnosed with bulimia nervosa (Robinson, Perkins, Bauer, Hammond, Treasure, & Schmidt, 2006).

Many studies have examined using mobile phones to monitor emotions/behavior (Dobkin & Dorsch, 2011), record objective data (Aguilera & Muench, 2012), encourage smoking cessation (Abroms, Padmanabhan, Thaweethai, & Phillips, 2011; Free, Whittaker, Knight, Abramsky, Rodgers, & Roberts, 2009; Obermayer et al., 2004) and to monitor alcohol use (Bernhardt, Usdan, Mays, Martin, Cremeens, & Arriola, 2009). Even though studies have explored ways to utilize mobile phones to provide interventions, many studies have focused on using text messaging as a mobile intervention (Aguilera & Muench) and very few studies have focused on using downloaded applications to provide mental health assistance.

In addition to the smartphone usage increasing, the use of iPod Touches, iPads, Kindles, and other mobile tablets have increased. These devices are included in mHealth intervention strategies. Applications or “apps” can be downloaded on these portable

devices. Different application categories exist such as games, travel, food and drink, educational, health, and so on. By the end of 2010, roughly 8,000 health applications could be downloaded on these mobile devices (Luxton et al., 2011). In a study examining 3336 health and fitness applications on iTunes, about 12% of the applications were related to mental and emotional health while about 4% were related to alcohol, tobacco, and other drugs (Aguilera & Muench, 2012). These mental health and substance use apps incorporate intervention and symptom monitoring. Some of these applications include PTSD coach, Blood Alcohol Tracker, and Mood Journal Plus just to name a few (Luxton et al.).

Even though numerous mental health applications exist, few studies have been able to determine the efficacy of such apps (Aguilera & Muench). Studies have explored the use of the Dialectical Behavior Therapy (DBT) coach, Handheld Assisted Network Diary (HAND), and a mood reporting application. DBT coach has been shown to reduce substance use urges and decreased emotional intensity (Rizi, Dimeff, Skutch, Carroll, & Linehan, 2011). In addition, HAND has shown similar results to paper and pencil monitoring systems of daily alcohol consumption (Bernhardt et al., 2009) suggesting the use of an electronic system is more efficient and less tedious. Lastly, the mood reporting application increase participants' self-awareness and helped them cope with stress (Morris, Kathawala, Leen, Gorenstein, Labhard, & Deleeuw, 2010). This awareness helped decrease scores for anger, anxiety, and sadness scales. However, this research examines only few of the many applications that exist for mental health. More research needs to be conducted to determine if these applications are effective and efficacious.

Using mobile phone applications for mental health treatment is in the developmental stage, so global standards for testing these applications do not exist. However, Whittaker, Merry, Dorey, and Maddison (2012) established a process for developing and testing mobile health interventions. These researchers developed a six-step evaluation to determine if the intervention is effective. The evaluation includes formative research, pretesting, pilot study, randomized control trial, qualitative research, and evaluation of implementation impact. Even though this evaluation procedure is thorough, it is time and labor intensive. It can take from three to four years to determine if an application is efficacious.

Even though some studies have attempted to determine the efficacy of these applications, high attrition rates have limited the generalization of the results. Researchers have hypothesized why attrition occurs. The first hypothesis is that many of the participants become bored and lose interest in the application. Studies have suggested providing reinforcement might improve the continued usage of the application (Dimeff, Rizvi, Contreras, Skutch, & Carroll, 2011). Another hypothesis is the usability of the application influences attrition. Research has shown if individuals find the application annoying they often get angry and stop using it (Watson et al., 2012). The last hypothesis is that many applications that are downloaded are not used to their full potential. Aguilera and Muench (2012) found that after apps, especially those dealing with mental health, are downloaded they are not frequently accessed.

Before studies try to determine the efficacy of applications on mobile devices as a mental health intervention, research needs to be conducted to determine who uses these

applications. By understanding the population who frequently accesses such applications, mental health interventions through applications can be targeted. In addition, by understanding the population, applications and research procedures can be adjusted to decrease attrition rates.

The intended population for this study is college students. Two common issues for college students are depression and alcohol abuse. Rates of college students seeking help for depression have been increasing over the past several years. A study conducted examining problem areas for college students found that 40.67% of college students have sought help for depression at a university-counseling center during 1996-2001 (Benton, Robertson, Tseng, Newton, & Benton, 2003). This percentage has significantly increased compared to earlier years (Benton et al.). In addition, alcohol use in a college population is extremely common. Drinking alcohol is a common aspect of the college environment in which many individuals are drinking at social events. College students have higher rates of consuming alcohol compared to their peers who have chosen to pursue an occupation and not further their education (Johnston, O'Malley, Bachman, & Schulenberg, 2009). Furthermore, college students have higher rates of binge drinking compared to their peers who did not attend college.

Treatment compliance is a major concern for many individuals with alcohol abuse issues. Many individuals are resistant to attend and complete treatment because they do not view their drinking habits as harmful. Individuals who do attend treatment programs have high rates of attrition. The individuals who drop out of programs will continue

abuse alcohol and have similar outcomes to those individuals who have never enrolled in treatment (Stark, 1992).

Motivation to change is a significant factor that influences treatment compliance. Motivation predicts whether a client will seek services and adhere to the treatment procedures for alcohol abuse (Miller, 1999). If an individual is unwilling to change habits, treatment will not be successful for this individual. It is important to determine an individual's motivation by conducting a motivation to change questionnaire or to complete motivational interviewing (Heffner, Tran, Johnson, Barrett, Blom, Thompson, & Anthenelli, 2010; Miller). This will help give a clinician an overview of the client's motivation to change.

Furthermore, culture influences motivation to change drinking habits. If a culture views excessive and binge drinking as acceptable behavior, this routine will continue (Miller, 1999). Excessive and binge drinking occurs frequently amongst college students due to it being viewed as an acceptable activity and as a means to socialize. Furthermore, alcohol consumption is high amongst the American Indian population (O'Connell, Novins, Beals, & Spicer, 2005). Excessive consumption of alcohol and illegal substances is viewed as tolerable behavior. Often, parents drink and use other substances with their children. Both of these examples illustrate how culture can influence an individual's drinking pattern and motivation to change that behavior.

Also, resistance and treatment compliance is a barrier for the treatment of depression. Depression is one of the most common mental health disorders, affecting at least 5% of the population during a given year (Cooper-Patrick, Powe, Jenckes, Gonzales,

Levine, & Ford, 1997). However, individuals are more willing to seek help for depressive symptoms. 29-52% of the individuals experiencing depressive symptoms seek professional help (Schomerus, Matschinger, & Angermeyer, 2009). Furthermore, individuals severely influenced by depression, women, young individuals, and single people are more willing to seek help for their depressive symptoms (Schomerus et al., 2009). These individuals have insight to their mental health issues and are motivated to seek professional assistance.

Individual taking antidepressants or attending therapy sessions for depression do not have high rates of treatment compliance. Keller, Hirschfeld, Demyttenaere, and Baldwin (2002) found that treatment compliance for antidepressants is extremely poor. However, treatment compliance increases when the client is educated about the disorder and the prescribed medication (Keller et al., 2002). Even poor compliance and high attrition rates exist for individuals attending psychotherapy sessions for depression. Many clients do not complete homework outside of the therapy sessions (Neimeyer, Kazantzis, Kessler, Baker, & Fletcher, 2008). This hinders the treatment progress for the client. Furthermore, Mohr, Ho, Duffecy, Reifler, Sokol, Burns, Jin, and Siddique (2012) found that individuals receiving a cognitive behavioral therapy intervention via telephone were more likely to continue treatment compared to individuals who were receiving an intervention face to face. Individuals are more willing to meet with a clinician if it is convenient for them.

For these reasons, this study investigated how symptoms of depression and alcohol consumption can influence an individual's willingness to use applications on a

mobile device. It is hypothesized that scores on the Alcohol Use Disorder Identification Test and Patient Health Questionnaire- 8 will independently predict willingness to use applications on mobile devices as an adjunct to psychological treatment.

Methods

Participants

Study participants were recruited from a university in Midwest metropolitan area. Individuals were recruited by investigators via the SONA system and by campus email. Individuals contacted by email were provided a description of the study and information on the compensation for completing the survey. Even if a participant did not own a mobile device, the individual was asked to answer the questions as if he or she did own a device. There were 972 college students responded to this survey. However, data from 130 participants were omitted from the study due to not selecting a box stating he or she accepted the terms in the informed consent or did not answer any of the survey questions. Another 6 participants were omitted due to being under the age of 18 years old. 836 participants were included in the data analysis. The participants ages ranged from 18 to 68 with an average age of 24.74 ($SD= 7.63$). The majority of the participants were White, non-Hispanic (88.6%) and the rest of the participants were White, Hispanic (2.2%), Black or African American (3.1%), Asian-Pacific Islander (3.0%), Hispanic or Latino (0.8%), Native American or American Indian (0.2%), and other non-listed race (1.6%). Three participants declined to specify their race (0.3%). Furthermore, 599 of the participants were female (71.7%) and 236 were male (28.2%). One participant declined to specify his or her sex.

Materials

The participants completed an online survey administered through Survey Monkey. The survey consisted of demographic questions, questions referencing mobile device usage, and questions referring to seeking mental health treatment. Some examples of the questions referencing the mobile device usage were as followed: on the average day, how much time do you spend using your mobile device or would you be willing to download applications to monitor your mood or alcohol consumption. Furthermore, the survey was comprised of two measures: the Alcohol Use Disorders Identification Test (AUDIT) and the Patient Health Questionnaire -8 (PHQ-8). The survey can be seen in Appendix A.

Alcohol. The AUDIT is a self-report measure that consists of ten multiple choice questions using a 5-point scale, 0-4 (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). This scale was designed to determine if a participant meets criteria for an alcohol use disorder. The AUDIT contains questions examining the frequency of drinking alcoholic beverages, the quantity of consumption on a typical day, information on binge drinking episodes, and negative consequences due to drinking. The AUDIT is highly correlated with other measures assessing alcohol use. In addition, the AUDIT scale has been recognized internationally as a valid and reliable screening test for alcohol use disorders (Babor et al.). A cut off score of 8, is generally used when determining drinking issues (Conigrave, Hall, & Saunders, 1995).

Depression. The PHQ-8 is a self-report measure that consists of eight multiple-choice questions using a four-point scale, 0-3. The scale assess depressive symptom

severity and whether an individual meets diagnostic criteria for major depressive disorder based on the *Diagnostic and Statistical Manual of Mental Health Disorders- Fourth Edition* (DSM-IV; Spitzer, Williams, & Kroenke, 2010). The PHQ-8 total score ranges from 0-24. The total scores are broken down into depression classifications based on cut off scores. The classification categories are defined as mild (5-9), moderate (10-14), moderately severe (15-19), and severe depression (20-24; Spitzer et al.). A cut off value of ≥ 10 can be used to diagnose current depression in diverse populations (Kroenke, Strine, Spitzer, Williams, Berry, & Mokdad, 2009; Spitzer et al.). Kroenke, Spitzer, Williams, and Löwe (2010) reported this assessment tool has high sensitivity (.88), specificity (.88), internal reliability (Cronbach's $\alpha = .86-.89$) and test-retest reliability (.84) when using a cut off value ≥ 10 . The PHQ-8 also is a valid severity measure of depression in diverse populations (Corson, Gerrity, Dobscha, 2004; Kroenke, & Spitzer, 2002; Kroenke et al., 2009). The PHQ-8 omits the ninth item when on the PHQ-9, which asks about self-harm or death. This item is not highly endorsed surveying a non-hospitalized sample (Kroenke et al., 2010). Studies have shown high correlations between the scores on the PHQ-8 and PHQ-9 ($r = .998, .997$; Corson et al., 2004; Kroenke et al., 2010). Many studies have validated the scales together due to the high correlation.

Procedure

Potential participants were recruited by investigators via the SONA system and by campus email. Individuals contacted by email were provided a description of the study and information on the survey (See Appendix B). Students completing the survey via

SONA system were provided with extra credit for compensation while, students completing the survey through the online survey system were not compensated.

A link to the online survey was provided in the email. Before completing the survey, the participants were provided with an informed consent document (See Appendix C). The participants were required to check a box stating they read the form, were 18 years of age or older, understood what they were asked to do, and agreed participate in the study. When participants completed the survey, they were informed that the study was complete and was thanked for participating in the study. Contact information for the researchers was provided to the participants in case any questions would arise.

Results

Data was collected for a two-week period. A correlational analysis was conducted to determine if the variables willingness to use an application to stay connected with a mental health professional, to help remember things discussed in meetings, and to record behavior and emotions outside of meetings were significantly correlated. Since these three variables were significantly correlated (see Table 1), the variables were combined to make a new variable of overall willingness to use an application as an adjunct to psychological treatment. The new variable has high internal reliability (Cronbach's $\alpha = .82$).

On average, the participants were highly willing to use an application as an adjunct to psychological treatment ($M = 10.85$, $SD = 2.66$; see Figure 1). Scores around nine shows the client is neutral to using an application for mental health assistance.

Scores around twelve shows the client agrees he or she would be willing to use an application for assistance. 49.9% of the participants ($N = 417$) had total willing scores between 12 and 15. If individuals with scores of 11 are included, 62.6% of the participants ($N = 523$) agree they are willing to use an application as an adjunct to mental health treatment.

In addition, the total scores from the AUDIT and PHQ-8 were derived by using the scoring system found in the scales' manual. Using established cut off scores, 27.8% of sample screened positive for an alcohol use disorder and 15.2% screened positive for depression. A correlational analysis was conducted to determine if the two independent variables, AUDIT and PHQ-8 scores, were significantly correlated. The analysis showed the two variables are significantly correlated ($r = .112, p < .01$). Even though this correlation is significant the relationship is weak. Hence, both independent variables were used in the regression analysis.

A multiple regression was used to determine if PHQ-8 and AUDIT scores significantly predicted total willingness cores. The results of the regression indicated that scores on the PHQ-8 and AUDIT indicated that the model is not significant ($F(2,712) = 2.287, p = .102$). Multicollinearity did not influence this analysis (Tolerance = .988, VIF = 1.012).

Furthermore, a multiple regression analysis was used to determine if PHQ-8 and AUDIT scores significantly predicted interest in using an application to monitor mood. The results of the regression indicated that PHQ-8 and AUDIT scores accounted for 7% of the variance ($R^2 = .070, F(2,709) = 26.687, p < .001$). PHQ scores significantly

predicted an individual's interest in using an application to monitor mood but AUDIT scores did not (See Table 2). As PHQ-8 scores increase, an individual's interest in using an application to monitor mood increases ($r = .268, p < .001$).

Lastly, a multiple regression was used to determine if PHQ-8 and AUDIT scores significantly predicted an individual's interest in using an application to monitor alcohol consumption. A multiple regression indicated that PHQ-8 and AUDIT scores account for 14.8% of the variance ($R^2 = .148, F(2, 714) = 62.216, p < .001$). AUDIT scores significantly predicted an individual's interest in using an application to monitor alcohol consumption but PHQ-8 did not. A positive relationship exists between AUDIT scores and interest in using an application to monitor alcohol consumption ($r = .378, p < .001$).

Discussion

The results partially supported the study's hypothesis. PHQ-8 and AUDIT scores did not significantly predict an individual's total willingness to use an application for mental health assistance. However, PHQ-8 scores did significantly predict an individual's interest in using an application to monitor mood. This is consistent with the research stating individuals with depressive symptoms are willing to seek help for their mental health needs (Schomerus et al., 2009). Hence, using an application for a resource tool can help decrease the stigmatization of mental health issues, increase mental health awareness, and increase service seeking behavior.

Additionally, as AUDIT scores increase, an individual's interest in monitoring alcohol consumption increases. This is not consistent with the current literature. According to the literature individuals with high risk drinking habits are less likely to

seek services to decrease consumption (Stark, 1992). Many individuals with high risk drinking do not feel their behavior is detrimental and will not seek services. Even the high risk individuals who attend mandatory chemical dependency treatment may not be successful because they do not view their behavior as harmful (Heffner et al., 2010). The significant results might be related to the sample predominately being people who did not endorse problematic alcohol use on the AUDIT and thus not consistent with samples consisting solely of individuals with high risk alcohol use.

Furthermore, 27.8% of the sample screened positive for an alcohol use disorder. This is not surprising due to excessive alcohol consumption commonly occurs in a young college population (Johnston et al., 2009). Furthermore, the college culture supports excessive drinking around socialization events. In addition, 15.2% of the sample screened positive for depression. In a college population, depression is a common diagnosed mental health disorder (Benton et al., 2003). Of course, self-report measures raise concerns regarding whether the participants accurately portrayed their alcohol consumption and depressive symptoms.

This is the first study that examines the effects of alcohol consumption and depressive symptoms on willingness to use an application as an adjunct to mental health assistance. Hence, it is impossible to determine if these results are consistent with other studies. However, the results did show that many individuals are willing to use an application specific to their areas of concern for mental health assistance. Although these results are preliminary, they are encouraging and suggest more research in this domain,

including potentially piloting such applications with individuals experiencing depression and alcohol abuse.

Using an application for mental health assistance is a novel approach to providing intervention and prevention techniques to large quantities of individuals. This type of approach shows similar potential to help individuals similar to that of tele-conferencing, websites, and text messaging. Similar approaches can be applied to application usage to produce similar positive results.

Even though very few studies have conducted experiments using applications for mental health assistance, the current literature supports using these applications (Bernhardt et al., 2009; Morris et al., 2010; Rizi et al., 2011). However, more research needs to be conducted exploring the effectiveness and efficaciousness of these applications.

This study has served as a stepping-stone for future studies examining application usage on mobile devices. More research needs to be conducted to determine the characteristics of the population who are willing to use applications for mental health assistance. By understanding the characteristics of this population, studies can efficiently recruit individuals and decrease attrition rates for examining the efficacy and effectiveness of these applications.

There are several limitations in this study. The participants were not a diverse sample. Most of the participants were female (71.7%), White, Non-Hispanic (88.6%) individuals. Furthermore, the participants were college students mostly between the ages of 18-27 (81.5%), suggesting the generalizability of the results may be limited to college

students. This population demographic is not diverse limiting the generalizability of the results. In addition, information on socioeconomic status was not gathered.

Socioeconomic status could possibly be an important predictor of help seeking behavior. If individuals do not have money, they would be unable to afford mental health services and would not seek assistance for these issues.

Furthermore, data was only collected for two weeks. A longer data collection could yield different results due to having people who would have waited to fill out the survey. In addition, all of the questions on the survey were self-report. More objective measurements of alcohol and depressive symptoms could yield different results.

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Table 1

Correlation Coefficients for Willingness Variables

| Willingness | Willingness | |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------------|
| | Remember information discussed in meetings | Record behavior and emotions outside of meetings |
| Stay connected with a therapist | .575** | .610** |
| Remember information discussed in meetings | | .623** |

Note. ** denotes the correlation is significant at $p < .01$.

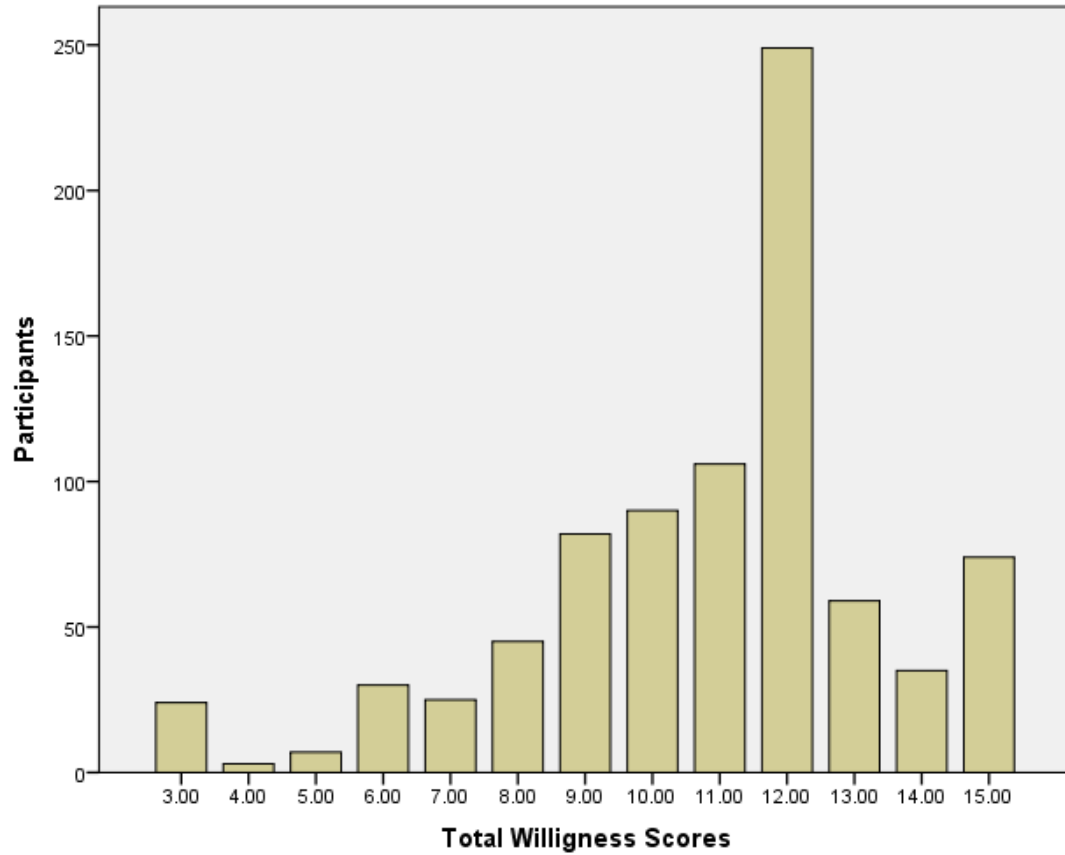


Figure 1. Total willingness scores for the entire sample on a 0-15 point scale (N = 836).

Table 2

Summary of Multiple Regression Analyses

| Variable | Total Willingness | | | Willingness to Monitor Mood | | | Willingness to Monitor Alcohol Consumption | | |
|----------|-------------------|-------------|---------|-----------------------------|-------------|---------|--------------------------------------------|-------------|---------|
| | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | β | <i>B</i> | <i>SE B</i> | β |
| AUDIT | -.001 | .022 | -.001 | .014 | .011 | .047 | .120 | .011 | .375*** |
| PHQ-8 | .046 | .022 | .080* | .079 | .011 | .255*** | .018 | .011 | .055 |
| R^2 | | .006 | | | .070 | | | .148 | |

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

Appendix A

Application Survey

What is your sex?

- Male
- Female
- Other

What is your age?

What is your race?

- White, non-Hispanic
- White, Hispanic
- Black or African American
- Asian-Pacific Islander
- Hispanic or Latino
- Native American or American Indian
- Other:

On the average day, how much time do you spend using your mobile device?

How interested would you be use an application for the following tasks?

How interested would you be in using an application for the following tasks

| | Not interested | Somewhat not interested | Neutral | Somewhat interested | Very interested |
|--------------------------------|-----------------------|-------------------------|-----------------------|-----------------------|-----------------------|
| Monitoring mood | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Monitoring alcohol consumption | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Quite often, individuals having a hard time dealing with life stressors meet with a counselor, therapist, or psychologist.

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| If this occurred, I would be willing to use a mobile phone application to help keep connected with the mental health professional. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If this occurred, I would be willing to use a mobile phone application to help remember things discussed in the meetings. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If this occurred, I would be willing to use a mobile phone application to help record your behavior or emotions outside of the meetings. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Please select one option that best describes your answer to each question.

How often do you have a drink containing alcohol?

- Never
- Monthly or less
- 2-4 times a month
- 2-3 times a week
- 4 or more times a week

How many drinks containing alcohol do you have a typical day when you are drinking?

- 1 or 2
- 3 or 4
- 5 or 6
- 7 to 9
- 10 or more

How often do you have six or more drinks on one occasion?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

How often during the last year have you found that you were not able to stop drinking once you had started?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

How often during the last year have you failed to do what was normally expected of you because of drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

How often during the last year have you had a feeling of guilt or remorse after drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

How often during the last year have you been unable to remember what happened the night before because of your drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

Have you or someone else been injured because of your drinking?

- No
- Yes, but not in the last year
- Yes, during the last year

Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?

- No
- Yes, but not in the last year
- Yes, during the last year

Over the last 2 weeks, how often have you been bothered by any of the following problems?

| | Not at all | Several days | More than half the days | Nearly every day |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|-------------------------|-----------------------|
| Little interest or pleasure in doing things | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Feeling down, depressed, or hopeless | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Trouble falling or staying asleep, or sleeping too much | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Feeling tired or having little energy | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Poor appetite or overeating | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Feeling bad about yourself — or that you are a failure or have let yourself or your family down | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Trouble concentrating on things, such as reading the newspaper or watching television | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult

Survey completed. Please click submit.

Thank you for your participation in this survey. If you have any questions or concerns about this survey, please do not hesitate to contact the principal investigators Daniel Houlihan, Ph.D. at (507) 389-6308, daniel.houlihan@mnsu.edu, or the student investigator(s), Sherry Werkmeister, B.S. at sherry.werkmeister@mnsu.edu, Jeff Beeman at jeff.beeman@mnsu.edu or Tessa Weber at tessa.weber@mnsu.edu. Also, if you need additional assistance with mental health issues, provided below is a listing of a few of the mental services providers. It is not an endorsement of any service providers. Neither Minnesota State University, Mankato nor any of its staff will be financially responsible for providing services at any of these clinics.

Minnesota State University, Mankato Counseling Center (for MSU students only)
389-1455
245 Centennial Student Union
Minnesota State University, Mankato
Mankato, MN 56001

Adult Child and Family Services
387-3777
103 N Broad St.
Mankato, MN 56001

Blue Earth County Human Services
389-8319
410 S. 5th
Mankato, MN 56001

Mankato Psychology Clinic (for Neuropsychology Testing)
387-1350
209 S. 2nd St. Suite 306
Mankato, MN 56001

Appendix B

Dear Minnesota State University Student,

My name is Sherry Werkmeister and I am a graduate student in the Clinical Psychology graduate program at Minnesota State University, Mankato. I am conducting a study examining the use of applications on mobile devices in a Midwest metropolitan area.

The goal of this project is to determine which types of applications individuals owning a smart phone, iPad, iPod, Kindle, tablets, etc, are frequently utilizing. Even if you do not own one of these mobile devices I strongly ask for your participation in this study as I will ask about hypothetical usage. This study will serve as a foundation to determine who would benefit from using mental health applications and how to efficiently provide mental health treatment in isolated areas where mental health services are not available.

The study can be completed in two ways. If you are a student with a SONA system account, the survey can be accessed through that site. Extra credit will be awarded to the students completing the survey through SONA. If you do not have a SONA system's account, the link for the survey can be found below. The survey will take up to five minutes to complete. I greatly appreciate your participation in this study. If you have any questions about this study please do not hesitate to contact the Principle Investigator Daniel Houlihan, Ph.D. at (507) 389-6308, daniel.houlihan@mnsu.edu, or the student investigator(s), Sherry Werkmeister, B.S. at sherry.werkmeister@mnsu.edu, Jeff Beeman at jeff.beeman@mnsu.edu or Tessa Weber at tessa.weber@mnsu.edu. For concerns regarding the treatment of human subjects I may contact the Interim Dean of Graduate Studies and Research Dr. Barry Ries at (507) 389-2321.

Thank you for your time.

Sincerely,

Sherry Werkmeister, B.S.
Minnesota State University, Mankato
23 Armstrong Hall
sherry.werkmeister@mnsu.edu

<https://www.surveymonkey.com/s.aspx?sm=d1I%2fIfUAkT8wQexk2P46Ow%3d%3d>

Appendix C

Informed Consent for Participation in the Research

Purpose

You are being asked to participate in a research study. I understand that the purpose of the study is to determine the use of applications on mobile devices in a Midwestern metropolitan area.

Participants

I understand that I have been asked to participate because I am a student at Minnesota State University in Mankato, MN.

Procedure

I will participate in the survey via Survey Monkey. I understand that I cannot take the survey twice. I understand I can either access the survey through the SONA system or on the web link provided to me in the recruitment email. I acknowledge the survey can take five minutes to complete. I acknowledge the survey will ask me questions about my mobile device usage and questions pertaining to my willingness to use applications to improve my mental health. I understand my responses will be anonymous. I understand after I answer the last question on the survey, this study is complete and no future contact will only occur.

Risks

I understand that there are minimal risks associated with participation in this study. It is possible I may become agitated or upset while filling out the survey. If I feel distressed and do not want to continue, I have the choice to withdraw from the study. I will not be penalized if I chose to withdraw from the study. I understand if I feel I need additional assistance with mental health issues that provided below is a listing of mental services providers. I understand it is not an endorsement of any service providers. I understand neither Minnesota State University, Mankato nor any of its staff will be financially responsible for providing services at these clinics.

Minnesota State University, Mankato Counseling Center (for MSU students only)
389-1455
245 Centennial Student Union
Minnesota State University, Mankato
Mankato, MN 56001

Adult Child and Family Services
387-3777
103 N Broad St.
Mankato, MN 56001

Blue Earth County Human Services
389-8319
410 S. 5th
Mankato, MN 56001

Mankato Psychology Clinic (for Neuropsychology Testing)
387-1350
209 S. 2nd St. Suite 306
Mankato, MN 56001

Benefits

I understand there are no direct benefits from participating in this study. I understand that society can benefit from this study by determining who should be targeted for the use of mobile device applications for mental health interventions. Also, I understand society can benefit from this study due to this research serving as a foundation for future studies examining how to efficiently provide mental health treatment in areas where mental health services are not available.

Compensation

I understand I can be compensated for participating in this study. If I am a student using the SONA system, I will receive extra credit for my participation. However, if I do not have an account with the SONA system and cannot access the survey through that system, I will not receive compensation for participating in this study.

Confidentiality

I understand that my confidentiality will be protected. All the information gathered from the survey will be kept in a locked electronic folder and is only accessible by the researchers on this study. I understand all the information from this study will be held in this secure location for at least 3 years.

Right to Refuse or Withdraw

I understand that participation in this study is voluntary. I may refuse to participate or withdraw from the study at any time without penalty or loss of benefits. I understand that my decision to participate will not affect my relationship with Minnesota State University, Mankato.

Questions

I have been informed that if I have any questions, I am free to ask them. Contact information can be found at the end of the survey.

Closing Statement

By checking the box below indicates that I have read this form, I am 18 years of age or older, I understand what I will be asked to do, and I agree to participate in this study.

I **agree** to participate in this study

Please print this form for your records.