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**EVALUATING THE SOCIAL ACCEPTABILITY OF AN APPLICATION-  
BLOCKING-BASED CONTINGENCY MANAGEMENT INTERVENTION**

by

Caitlyn R. Upton, M.S.

A Thesis

Submitted to the  
Department of Psychology  
College of Science and Mathematics  
In partial fulfillment of the requirement  
For the degree of  
Master of Arts in Clinical Psychology  
at  
Rowan University  
June 16, 2020

Thesis Chair: Bethany Raiff, PhD., BCBA-D



## Abstract

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EVALUATING THE SOCIAL ACCEPTABILITY OF AN APPLICATION-  
BLOCKING-BASED CONTINGENCY MANAGEMENT INTERVENTION  
2019-2020

Bethany Raiff, PhD., BCBC-D.  
Master of Arts in Clinical Psychology

Many adults and youth in the United States engage in multiple high-risk health behaviors. Research has historically suggested that if these behaviors can be changed, major health conditions could be changed at both the individual and population levels. Contingency Management is a well-validated method of changing health behaviors, however the costs associated with CM prevent it from being widely available. Smartphone applications are becoming increasingly popular in the healthcare sector, and most American have a smartphone with apps they find enjoyable and distracting. A potential avenue for CM dissemination is the development of a smartphone program that utilizes the pre-established reward value of smartphone apps as a tool for change. The following study is exploratory research designed to assess the acceptability of this concept, called Re-Connect. This concept proposes to block apps users spend large amounts of time on, with unlocking access to those apps made contingent upon meeting the user's health goals. Out of the sample surveyed (N = 146) 63.01% reported that they would be likely to use Re-Connect, and 67.81% reported that they would be likely to recommend it. Participants rated their likelihood of use across three pairs of feature variants with more or less control and favored more personal control across all features.

## Table of Contents

Abstract .....	iii
List of Figures .....	v
List of Tables .....	vi
Chapter 1: Introduction .....	1
Chapter 2: Methods .....	5
Participants .....	5
Materials .....	5
Procedure .....	8
Data Analysis .....	9
Chapter 3: Results .....	11
Demographics .....	11
Acceptability Data .....	13
Exploratory Analysis .....	15
Chapter 4: Discussion .....	20
Future Directions .....	24
References .....	26
Appendix A: Re-Connect Video Script and Link .....	29

## List of Figures

Figure	Page
Figure 1. Health Goal Frequencies .....	16

## List of Tables

Table	Page
Table 1. Sample Demographics .....	12
Table 2. Acceptability Statistics .....	14
Table 3. Reported Behavior as Target for Re-Connect.....	17
Table 4. Behavior Targeted by Sex and Age .....	18
Table 5. Acceptability by Sex and Age .....	19

## Chapter 1

### Introduction

In the United States, 17% of adults report engaging in at least three risky health behaviors, such as smoking, alcohol use and physical inactivity, with an average of at least one risky health behavior throughout the population (Fine, Philogene, Gramling, Coups & Sinha, 2004) In teens, 29.8% reported alcohol use, 19.8% reported marijuana use, and 15.4% reported physical activity engagement of under an hour in a 7 day week (Kann, McManus, Harris, Shanklin, Flint, & Queen, et al., 2018). It has long been known that successful interventions on health behavior could have benefits at the individual and population level; however, health behavior is notoriously difficult to change and maintain (Kelly & Barker, 2016).

Contingency management (CM) is a behavior analytic intervention that involves delivering a reward (usually monetary) contingent on objective evidence of desired behavior change. This strategy has been shown to be effective across a range of health behaviors. It is particularly effective for substance use disorders, including cigarette smoking (Dallery, Glenn & Raiff, 2007; Dallery et al., 2017; Higgins et al., 1994; Prendergast, Podus, Finney, Greenwell, & Roll, 2006). It has also been effective in increasing physical activity (Andrade, Barry, Litt, & Petry, 2014; Irons, Pope, Pierce, Patten, & Jarvis, 2013; Strohacker, Galarraga, & Williams, 2014; Washington, Banna, & Gibson, 2014) and aiding in weight loss (Jeffery, Thompson, & Wing, 1978; Thorndike, Riis, & Levy, 2016). However, cost and sustainability of CM treatments remain a challenge due to the standard method of using monetary rewards (Kirby, Benishek, Dugosh, & Kerwin, 2006). Because of this limitation, CM is not readily available to the



public as an intervention. Alternatives have been researched throughout the years, such a voucher-based CM program for smoking cessation that utilized community donations to provide rewards (Amass & Kamien, 2004), and there is evidence for the effectiveness of CM when using other types of rewards, such as material, behavioral or token rewards (Corepal, Tully, Kee, Miller & Hunter, 2018). In one of the first studies to investigate CM interventions, methadone clinic privileges were used as incentives reduce use of benzodiazepines (Stitzer, Bigelow, Liebson, 1979). Consequently, finding innovative and inexpensive rewards could bring the benefits of CM to more people who need it.

Using mobile phones might enable CM to be used with rewards that can be infinitely generated at no cost via tokens, points, or other similar non-monetary currencies. In a 2019 Pew research survey, it was reported that 96% of Americans own a cellular phone in the United States - with 81% being smartphones (Pew Research Center, 2019). Americans check their phone once every 12 minutes on average, and 90% of the time spent on phones is spent in applications (apps; Blair, 2019). People use their phones to access a wide variety of apps, with 81% of people using their phones for games, 96% for messaging apps, 70% for social networking, 47% for retail and 40% for news (Blair, 2019). Because of these usage rates, it is reasonable to assume that people find engagement with apps reinforcing. Given this, a CM intervention using apps that users already enjoy as rewards is not only an innovative new direction for research, but one that has the potential to make a large public health impact.

The proposed concept is an App-Blocking-Based CM intervention called “Re-Connect” that would limit participants’ access to high-valued but non-essential phone apps until specific health behavior conditions have been met. Blocking programs on

mobile phones prevent users from accessing certain applications on their smartphone, such as social media, games, or shopping. These types of programs are already popular; the top four blocking programs in the Google Play store collectively have over 2.6 million downloads with 4.3 to 4.5 star ratings, and Apple has recently unveiled a new feature called Screen Time that performs the same app-blocking functions. Moreover, using mobile phone and mobile phone applications to aid in intervention has also become widely popular in the health sector (Kai & Liebovitz, 2017), establishing a precedent for health-related mobile phone programs and applications. The popularity of blocking programs, combined with the need to access apps that users already find reinforcing, suggests the possible utility of app blocking tools in place of monetary reinforcers for contingency management interventions.

In Re-Connect, the user would receive tokens when they meet their health goals that may then be used to unlock their preferred apps for a specific amount of time. For instance, if a participant uses the app to increase their physical activity, the app could be synced to their Fitbit to verify their steps. This user could have a pre-specified step goal to meet and would earn an amount of time on a blocked app; any steps over the specified goal could earn the user additional tokens, and therefore additional time on the app. Re-Connect would make use of the Premack principle - making a high probability behavior (e.g., social media use) contingent upon engaging in a low probability behavior (e.g., exercise) to increase the likelihood of engaging in that low probability behavior in the future (Klatt & Morris, 2001).

Re-Connect is based upon the well supported method of CM, the Premack principle and the apparent popularity of blocking apps; however, it is important to assess

the social validity of such an intervention prior to developing and testing it (Wolf, 1978). Social validity is composed of three measures: the significance, appropriateness, and meaningfulness of the goals, procedures, and effects being used or achieved through the intervention (Wolf, 1978). The current study sought to design and distribute a survey to assess the social validity of a CM app-blocking intervention that gives access to frequently used smartphone applications contingent on meeting pre-specified health goals. The study is considered exploratory research, and as such many analyses will be performed in order to gain as much information as possible for future development.

## Chapter 2

### Methods

#### Participants

Participants were primarily recruited through the Rowan SONA system and social media sites such as Twitter and Facebook. Any adults over the age of 18 who had a smartphone were able to participate in the study, and the only exclusion criterion was a survey completion below 24%. This criterion was chosen because 24% completion indicated that the acceptability portion of the survey was complete. The study was able to recruit a sample of  $N = 146$ , and a sample of  $N = 140$  that completed the demographic portion of the survey. The sample was 72% white with a mean age of  $M = 26.01$  ( $SD = 10.79$ ). Most of the participants were in the 18 to 25 age bracket (67.57%). The youngest participant was 18 and the oldest was 64. Complete demographics are included in Table 1 below.

#### Materials

The survey began with several questions to assess the dependent variable of acceptability. This section included questions that asked what participants would be interested in using the program for, whether or not they would be more likely to use the program based on certain features, and likelihood that they would recommend to a family member or friend. These questions were asked using a combination of Likert scales, multiple choice, and free response. Likert scale responses were given on a 5-point scale comprised of: 5 = extremely likely, 4 = somewhat likely, 3 = neither likely or unlikely, 2 = somewhat unlikely, and 1 = extremely unlikely. Multiple choice responses included a range of health behaviors that participants might use the app or recommend the app for,

including (1) reducing alcohol use, (2) reducing cannabis use, (3) quitting smoking, (4) quitting vaping, (5) increasing exercise/physical activity, (6) weight loss, (7) improving medication adherence/managing medication (8) managing someone else's behavior (a child, family member, etc), (9) none and (10) 'other' with a textbox for adding additional targets. In total, there were 17 questions used to assess acceptability of the proposed program. These questions are included in Table 2.

All participants completed the International Physical Activity Questionnaire (IPAQ; Hagströmer, Oja, Sjöström, 2006) to assess engagement in physical activity. The survey separates physical activity into subsets of intensity, such as vigorous and moderate. It consists of eight questions, with four indicating the number of days (0 days to 7 days) the participant has engaged in an activity, and four prompting the participants to report the amount of time they engaged in the activity in hours and minutes. Each question defines the level of activity being described. An example description is as follows: "Think about all the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time. An example question is as follows: During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?"

The Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, Fagerstrom, 1991) was used if the participant indicated that they were a smoker. On the FTND, participants rate their answers to questions assessing nicotine dependence using multiple choice questions with a score range from 0 to 10. A score of 0-2 indicates

very low dependence, 3-7 indicates moderate dependence, and 8-10 indicates very high dependence. An example of the questions is as follows: “How soon after you wake up do you smoke your first cigarette?” Response choices: after 60 Minutes (0 points); 31 – 60 minutes (1 point); 6-30 minutes (2 points); within 5 minutes (3 points).

If a participant reported drinking, a brief version of the Alcohol Use Disorders Identification test (AUDIT-C; Babor, de la Fuente, Saunders & Grant, 1992; Bush, Kivlahan, McDonell, Fihn & Bradley, 1998) was used to assess their alcohol consumption. This brief test includes the alcohol consumption test from the full AUDIT questionnaire that has been validated for identifying problematic drinking patterns and is also used as a general metric of alcohol consumption (Bush, Kivlahan, McDonell, Fihn & Bradley, 1998). The questions are answered using a 4-point scale, with a total score range of 0 to 12. A score of 3 or more represents potentially problematic use (Bush, Kivlahan, McDonell, Fihn & Bradley, 1998). These questions include: “How often did you have a drink containing alcohol in the past year? Consider a "drink" to be a can or bottle of beer, a glass of wine, a wine cooler, or one cocktail or a shot of hard liquor (like scotch, gin, or vodka)” with response choices: Never (0 points); monthly or less (1 point); 2 to 4 times a month (2 points); 2 to 3 times a week (3 points); 4 to 5 times a week (4 points); 6 or more times a week (4 points)

Additionally, participants were presented with the 9 question Patient Health Questionnaire (PHQ-9; Kronke, Spitzer & Williams, 2001) in order to assess for symptoms of depression, and the 7 question General Anxiety Disorder questionnaire (GAD-7; Spitzer, Kronke, Williams & Lowe, 2006) in order to assess for symptoms of anxiety. The PHQ-9 asks participants how often they have felt the feelings described in

the questions over the past two week period. These include descriptions such as: “little interest or pleasure in doing things,” “feeling down, depressed, and hopeless,” and “poor appetite or overeating.” Similarly, the GAD-7 also asks participants how often they have felt the feelings described over the last two weeks, with descriptions including: “feeling nervous, anxious or on edge,” “trouble worrying,” and “being so restless it’s hard to sit still.” Both measures are answered using a Likert scale where the options are “not at all,” “several days,” “more than half the days,” and “nearly every day.”

The survey also included questions that assessed demographic characteristics of the population, such as age, gender, socioeconomic status, as well as questions that assessed weight and health conditions. Finally, the survey collected information that would be useful for developing the program, such as what smartphone models people use, their interest in social features, and what behaviors participants might like to target for change.

### **Procedure**

Participants completed a consent form confirming their voluntary involvement and that they were over 18. Then, participants were instructed to watch a 2 minute and 23 sec video that described the concept of Re-Connect (See Appendix A). This video used animated clipart to explain the concept of Re-Connect, using physical activity as an example. A script was also provided for participants who might be visually impaired or preferred written information to visuals. Participants were then instructed to answer questions to evaluate how socially important goals of the concept are, how acceptable they find the procedures being proposed, and their beliefs about the importance of the effects of the concept (Wolf, 1978).

Following the description, participants were first asked to rate how likely they would be to use Re-Connect as it was presented in the video, and how likely they would be to recommend it to a friend or family member. Then participants were presented with three pairs of questions to assess three key features being considered for Re-Connect: how goals are determined, how the apps being blocked are determined, and what duration of time users would prefer to have their apps unlocked. The version presented in the video involved Re-Connect setting the goal for users, picking the apps that would be blocked, and earning a specific amount of time for the app to be unlocked after meeting goals (e.g., 30 min or 2 hours). These choices are representative of Re-Connect having greater control. Participants were asked how likely they were to use Re-Connect based on these features, along with questions to rate the acceptability of the alternative choices, which involved the user having more control. For example, participants were asked how likely they would be to use Re-Connect if they were able to pick their own goals, select which apps would be blocked, and have the apps unblocked for the entire day after meeting their goals. This was done with the intention of comparing the acceptability of the features presented in the video (less personal control) and their alternative (more personal control).

After the acceptability section, the rest of the survey served the function of obtaining information about the sample using the measures outlined in the Materials section.

**Data analysis.** In order to assess the acceptability of the version of Re-Connect presented in the video, a simple linear regression was performed to predict the likelihood of personal use based on three variables: Re-Connect setting goals, Re-Connect randomly



selecting applications to block, and earning specific amounts of time back on the application when health goals are met. An additional linear regression was performed to assess whether or not high scores on the PHQ-9 and GAD-7 were predictive of initial endorsement of likelihood of using Re-Connect above and beyond the variables presented in the video.

Basic descriptive statistics were conducted on all acceptability items in order to determine the likelihood that participants would use the proposed program under various conditions. Independent sample t-tests were conducted to compare each of the Re-Connect scenario variables with its counterpart (e.g., more vs less personal control).

Crosstabs analysis was performed between the selected health goals and the measures included in the latter portion of the survey: AUDIT-C, FTND, and IPAQ. The AUDIT-C was given a sum score across all questions -- females with a sum over 3 and males with a sum over 4 were labeled as having hazardous drinking. The FTND was given a sum and those who earned a score from 8-10 were considered as having high nicotine/cigarette dependence.

The IPAQ was scored by first calculating the minutes per week the participant reported exercising, and then by calculating the metabolic equivalents (MET) minutes (amount of energy expended during an activity), wherein minutes for vigorous activity were multiplied by 8, moderate activity by 4, and walking by 3.3 (Hagströmer, Oja, Sjöström, 2006). These scores were then translated into three categories: High (1500 MET minutes of vigorous activity or 3000 MET minutes when combining all activity types), Moderate (at least 600 MET minutes when combining all activity types), and Low (Below 600 MET minutes) as defined by Hagströmer, Oja, Sjöström, (2006).

## Chapter 3

### Results

This project was considered exploratory research. As such, several analyses were conducted to gain insight on the acceptability of the proposed program, as well as the audience that might be most effectively targeted by such a program.

#### Demographics

Analysis included all participants (N = 146) who completed 24% or more of the survey. Participants who completed below 24% were excluded from the analysis (n = 128; total initiated: N = 274). Survey completion percentages were 24% (n = 6), 51% (n = 7), 89-99% (n = 5), and 100% (n = 128). Demographic characteristics are included in the table below (Table 1).

Table 1

*Sample Demographics*

<b>Age</b>		<b>Race</b>		<b>n</b>
M( $\pm$ SD)	26.01(10.79)	American Indian / Alaskan Native		1
Min	18	Asian		6
Max	64	Black or African American		9
<b>Sex</b>	<b>n(%)</b>	Mixed Race		17
Female	87(62%)	White		107
Male	53(38%)	<b>Ethnicity</b>	<b>n</b>	
<b>Gender</b>	<b>n(%)</b>	Hispanic		17
Female	72(51%)	Not Hispanic		123
Neither male or female	10(7%)	<b>Education</b>	<b>n</b>	
Male	56(40%)	No Schooling Completed		1
Prefer not to answer	1(0.7%)	9th - 11th Grade		1
Transgender	1(0.7%)	High School Graduate		15
<b>Job</b>	<b>n</b>	Some College		68
Employed	56	Associates Degree		11
Out of Work - Looking for Work	11	Bachelor's Degree		32
Out of Work - Not Looking for Work	2	Master's Degree		7
Retired	3	Doctorate Degree		2
Self-Employed	4	Professional Degree		3
Student	63			
Unable to Work	1			

*Note:* Data are from 140 participants who completed the demographics portion of the survey. Values reported are number of participants, unless otherwise noted.

## Acceptability Data

To assess the acceptability of Re-Connect, three pairs of features were compared: control over goals, control over blocked apps, and duration of time apps are unlocked. Therefore, the six variables of interest are Re-Connect setting goals for the user (RC SET GOALS, question 3), the user setting the goals for themselves (CHOOSE GOALS, question 4), Re-Connect choosing which apps are blocked (RC BLOCK, question 5), the user choosing which apps are blocked (CHOOSE BLOCK, question 6), earning a specific and limited amount of time to unlock the app when goals are met (LIMITED TIME, question 7), and unlocking the app for the entire day when goals are met (ALL DAY, question 8). The linear regression taking in to consideration the features of Re-Connect that were presented in the video (RC SET GOALS, CHOOSE GOALS & LIMITED TIME) resulted in a significant model ( $F(3,142) = 34.902, p < .000, R^2 = .424$ ). Of the three variables, RC SET GOALS was most predictive of initial endorsement as it had the highest standardized Beta (.498) and lowest  $p$  value ( $p < .001$ ). The results of a second linear regression to determine if scores on the PHQ-9 and GAD-7 were predictive of endorsement above and beyond the app features did not result in a significant difference from the original model for the PHQ-9 ( $F(3,142) = 34.902, p = .143, R^2 = .433$ ), nor for the GAD-7 ( $F(3,142) = 34.902, p < .769, R^2 = .433$ ) (See Table 2).

Table 2  
Acceptability Statistics

General Acceptability Questions	Likely to Use (%)	Not Likely to Use (%)	Might Use (%)	M ± SD	t(df)= x
1) Based on how we described Re-Connect, how <b>likely</b> would <b>you</b> be to use it to meet your health goals?	63.01	18.49	18.49	3.51 ± 1.097	
2) How likely would you be to <b>recommend</b> it to a <b>friend/family member</b> to meet their health goals?	67.81	8.9	23.29	3.77 ± 0.918	
Re-Connect Feature Questions					
3) How likely would you be to use Re-Connect if <b>Re-Connect set the goals</b> for you?	56.16	23.29	20.55	3.37 ± 1.133	t(145) = 45.97*
4) How likely would you be to use Re-connect if you were able to <b>set your own</b> goals?	68.49	13.01	18.49	3.75 ± 0.987	
5) How likely would you be to use Re-Connect if it <b>randomly blocked the apps</b> so you don't know ahead of time which ones will be blocked (not including essential apps such as the phone or GPS)?	37.67	41.78	20.55	2.86 ± 1.323	t(145) = 45.99*
6) How likely would you be to use Re-Connect if <b>you were able to choose the app(s)</b> that are blocked (not including essential apps such as the phone or GPS)?	67.81	11.64	20.55	3.71 ± 0.975	
7) How likely would you be to use Re-Connect if it unlocked the app for a <b>specific amount of time</b> , but not the entire day, after meeting your health goal?	39.04	33.56	27.4	3.05 ± 1.179	t(145) = 31.30*
8) How likely would you be to use Re-Connect if it unlocked the app for the <b>entire day</b> after meeting your health goal?	63.01	13.01	23.97	3.69 ± 1.111	

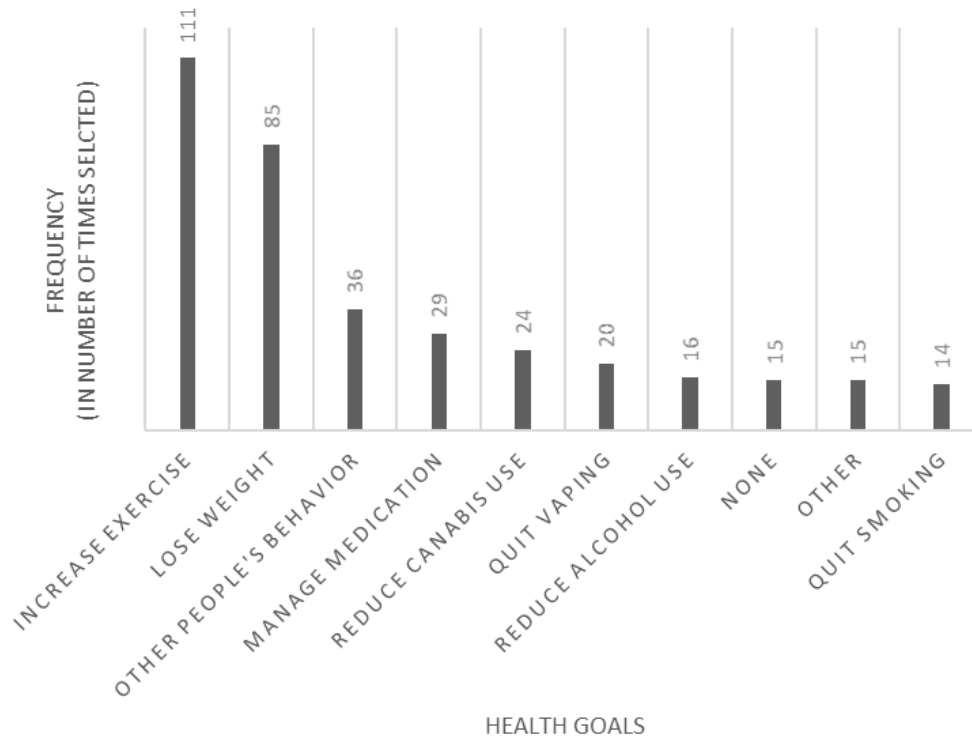
Note. Acceptability data were collected on a five point Likert scale, with 1 being Extremely Unlikely and 5 being Extremely Likely. Data were translated into Likely to Use(4,5), Might Use(3), and Not Likely to Use (1,2). Gray rows represent the variables presented in the video. Data came from all participants who completed the consent form and the acceptability portion of the survey (n = 146). \*Denotes significant difference between scenario acceptability at p < .000.

The independent t-tests consisted of comparing RC SET GOALS to CHOOSE GOALS, RC BLOCK to CHOOSE BLOCK, and LIMITED TIME to ALL DAY.

Participants endorsed greater preference for CHOOSE GOALS ( $M=3.75$ ,  $SD=.987$ ) than for RC SET GOALS ( $M=3.37$ ,  $SD=1.133$ ),  $t(145) = 45.97$ ,  $p < .000$ , greater preference for CHOOSE BLOCK ( $M=3.71$ ,  $SD=.975$ ) than for RC BLOCK ( $M=2.86$ ,  $SD=1.323$ ),  $t(145) = 45.99$ ,  $p < .000$ , and greater preference for ALL DAY ( $M=3.69$ ,  $SD= 1.111$ ) than for LIMITED TIME ( $M=3.05$ ,  $SD=1.179$ ),  $t(145) = 31,307$ ,  $p < .000$ .

### **Exploratory Analysis**

Given that this study was exploratory, additional analyses were conducted to learn more about the features that were of greatest importance. In terms of health goals, 75% of participants endorsed interest in using Re-Connect to increase exercise ( $n = 111$ ) and 57% endorsed an interest in weight loss ( $n = 85$ ), both of which were the only options selected by more than 50 participants. Goals selected by more than 20 participants included managing someone else's behavior ( $n = 36$ ; 24%), improving medication adherence/managing medication ( $n = 29$ ; 19%) and reducing cannabis use ( $n = 24$ ; 16% ; see Figure 1).



*Figure 1.* Data are from 146 participants. Participants were presented with 9 choices plus an “other” category in which they could write their own goals. Participants were directed to select all choices that applied.

Participants were able to select an “other” category and write their own goals (n = 15; 10%). Some of these goals included: “increase water intake,” “...productivity goals for creative endeavors,” “spending less time on social media,” “spending time on hobbies that are not mobile...,” “homework,” and “fulfilling marketing goals.”

Further analyses were conducted to determine if participants who reported engaging in risky health behaviors on the AUDIT-C, FTND, and IPAQ identified these as goals for behavior change using Re-Connect. Participants were also asked if they used electronic cigarettes (vaping). For example, for all participants who reported vaping, (n = 16), 81.25% of them (n = 13) reported that they would like to use Re-Connect to target vaping reduction (see Table 3 for a summary of the other results). Only 4 participants

reported cigarette smoking on the FTND, and of these only 1 indicated interest in using Re-Connect to quit. All 4 smokers who completed the FTND were classified as having high nicotine dependence; this category was labeled ‘Smoking’ for convenience. It should be noted that more participants endorsed “quit smoking” as a health goal than endorsed smoking tobacco/cigarettes on the FTND. It is possible that these participants also considered other smoke substances (such as marijuana or vaping) to fit broadly under “smoking” when choosing this goal. Finally, although 81 participants reported hazardous levels of drinking (60% of which were between the ages of 18 and 25), only 14.81% selected reducing alcohol use as a target goal.

Table 3  
*Reported Behavior as Target for Re-Connect*

<b>Self-Reported Behavior</b>	<b>Total</b>	<b>Identified as target</b>	<b>%</b>
Vaping	16	13	81.25
Moderate Physical Activity	44	35	79.55
Low Physical Activity	27	21	77.78
High Physical Activity	62	43	69.35
Smoking	4	1	25
Hazardous Drinking	81	12	14.81

*Note.* Data are from 133 participants who completed the Acceptability portion, the AUDIT-C, FTND, IPAQ, and demographic section.

The sample was also split by demographic characteristics in order to determine which health goals were popular among different groups (see Table 4). This analysis was conducted for sex (Female and Male) and age (18-25, 26-35, 36-45, 45-55, 56+). Increasing exercise remained the most selected goal across all sub-populations, and losing weight remained the second most selected across all sub-populations.



Due to the high frequency of “Lose Weight” being identified as a goal, Body mass index (BMI) was calculated for all participants who reported height and weight in the demographics section of the survey (N = 139). Participants were sorted into categories based on the BMI score: Underweight was a score below 18.5, Normal was a score from 18.5 to 24.9, Overweight was a score from 25 to 29.9, and Obese was a score of 30 and above. Of the participants who reported an Obese BMI calculation, 82.61% (n = 23) indicated losing weight as a goal, with 72.73% (n = 33) of Overweight, 43.42% (n = 76) of Normal, and 28.57% (n = 7) of Underweight indicating the same.

Table 4  
*Behaviors Targeted by Sex and Age*

	<b>Sex(F)</b> (n = 81) n(%)	<b>Sex(M)</b> (n = 52) n(%)	<b>18-25</b> (n = 94) n(%)	<b>26-35</b> (n = 17) n(%)	<b>36-45</b> (n = 10) n(%)	<b>46-55</b> (n = 9) n(%)	<b>56+</b> (n = 3) n(%)
Exercise	65(80)	34(67)	66(70)	14(82)	9(90)	8(89)	2(67)
Lose Weight	51(63)	23(45)	51(54)	6(35)	8(80)	8(89)	1(33)
Medication	18(22)	8(16)	19(20)	3(18)	3(30)	0	1(33)
Other People...	16(20)	15(29)	23(24)	3(18)	4(40)	1(11)	0
Reduce Cannabis	11(14)	10(19)	20(21)	1(6)	0	0	0
Quit Vaping	9(11)	10(19)	18(19)	1(6)	0	0	0
Reduce Alcohol	7(9)	8(16)	13(14)	0	1(10)	1(11)	0
Quit Smoking	4(5)	8(16)	12(13)	0	0	0	0

*Note.* Data are from 133 participants who completed the Acceptability portion, the AUDIT-C, FTND, IPAQ, and demographic section. Labels for “Medication adherence” and “Other’s people’s behavior” have been shortened to fit in the table. It should be noted that more people reported ‘quit smoking’ as a goal than reported smoking cigarettes.

In addition to identifying health goals by sex and age, acceptability was also split by demographic characteristics. Participants endorsed being likely to use the application over 50% of the time across these populations (Table 5).

Table 5  
*Acceptability by Sex and Age*

	<b>Sex(F)</b> (n = 87) n(%)	<b>Sex(M)</b> (n = 53) n(%)	<b>18-25</b> (n = 95) n(%)	<b>26-35</b> (n = 21) n(%)	<b>36-45</b> (n = 11) n(%)	<b>46-55</b> (n = 10) n(%)	<b>56+</b> (n = 3) n(%)
Likely	55(63)	33(62)	63(66)	11(52)	6(55)	6(60)	2(67)
Maybe	12(14)	13(25)	19(20)	2(10)	1(9)	2(20)	1(33)
Not Likely	20(23)	7(13)	13(14)	8(21)	4(36)	2(20)	0(0)

*Note.* Data are from 133 participants who completed the Acceptability portion and the demographic section.

## Chapter 4

### Discussion

Results of the study indicate that the model of Re-Connect presented in the video featuring health goals set by Re-Connect, blocked apps chosen by Re-Connect, and the ability to earn back time through meeting health goals would be generally acceptable, with 63.01% of participants endorsing likelihood to personally use Re-Connect as it was presented in the video and 67.81% endorsing likelihood to recommend Re-Connect to a friend or family member. The feature most predictive of initial high endorsement was with regard to the health goals being set by Re-Connect, which accounted for 48.2% of the variance in responses. Overall, the data support the Re-Connect concept of a contingency management intervention that utilizes smartphone applications as reinforcement.

There were significant differences in acceptability among feature variations, with participants favoring the versions that allowed them more control over Re-Connect. Participants indicated higher endorsement of Re-Connect when they were told that they would have the ability to set their own goals, the ability to choose which apps would be blocked, and when the blocked apps unlocked for the full day once health goals were met. The largest difference was found between control over which apps would be blocked, where 67.81% of participants were likely to use Re-Connect if they had control over what was blocked, compared to only 37.67% when Re-Connect had control over what was blocked.

These results are consistent with previous health psychology literature on “perceived control” (McEachen, Conner, Taylor & Lawton, 2011, Armitage & Conner,

2001). Perceived control references two facets of the theory, one being the individual's perception of environmental or personal factors that will influence their ability to perform a behavior, and another being their perception of the difficulty of the behavior itself (Ajzen, 2002). Participants favoring more control over the factors influencing their behavior (i.e, which apps are being blocked and how to unlock them) as well as their perception of the difficulty of their target behaviors (i.e., whether Re-Connect sets the goals or the user does) is consistent with these two facets of perceived control.

Although participants in the current study favored more control, research in contingency management has historically been a method where the goals are set for participants, and has gained much empirical support using this strategy for substance use (Dallery, Glenn & Raiff, 2007; Dallery et al., 2017; Higgins et al., 1994; Prendergast, Podus, Finney, Greenwell, & Roll, 2006), physical activity (Andrade, Barry, Litt, & Petry, 2014; Irons, Pope, Pierce, Patten, & Jarvis, 2013; Strohacker, Galarraga, & Williams, 2014; Washington, Banna, & Gibson, 2014), and weight loss (Jeffery, Thompson, & Wing, 1978; Thorndike, Riis, & Levy, 2016). This discrepancy opens the opportunity for future directions in combining the principles of perceived control with what is already known about the science of behavior change.

A 2011 study demonstrated that participants showed increased compliance with behavioral self-management when they were allowed to pick their own goals, versus them being assigned (Olson, Schmidt, Winkler & Wipfli, 2011), which is consistent with the opinions reported in the present study. Additionally, literature on self-reinforcement suggests that individuals base their evaluation of their own performance on the standards of a model first (Bandura, 1976). For instance, a student might look to a teacher for

reference of how to evaluate their own work, or a dieter might look to a nutrition guide to evaluate their own eating habits. Participants were given the opportunity to provide qualitative responses about Re-Connect, where 2 participants expressed concerns that they would not meet their goals and thus would be prevented from using their smartphone, and 3 other specifically noted they would become frustrated. This speaks to a model discrepancy, wherein participants are pre-emptively concerned that the standards will be too high to meet when Re-Connect is setting goals for them. It is possible that an added dialogue about health goals set within a contingency management framework may be appealing to those seeking to change their behaviors. These findings imply that researchers seeking to create a smartphone-based CM intervention should focus on allowing users to have some level of control over elements of the app-blocking program to increase interest and encourage adherence. Finally, it should be noted that users of Re-Connect would always have some level of control over the app in that they could choose to use or delete the app if it does not help them meet their needs. However, the goal of Re-Connect would be to develop an app that is socially acceptable enough to engage users.

In terms of health goals, the majority of participants reported “increasing exercise” (n = 111) and “losing weight” (n = 85) as their target goals, with the combination of the two comprising 53% of the total goals selected across all participants. This trend was consistent across sex and age group. This trend was also consistent across previously reported physical activity levels, with 77.78% of low activity, 79.55% of moderate activity, and 69.35% of high activity participants identifying it as a preferred target behavior. In terms of weight categories, 82.61% (n = 23) of those with BMI scores

in the Obese range indicated a desire to use Re-Connect to lose weight, along with 72.73% (n = 33) of Overweight range and 43.42% (n = 76) of Normal weight range participants indicating the same. These results imply that those interested in a contingency management health app are primarily interested in one that can be used to promote exercise and weight loss. The high interest rate among Obese and Overweight range individuals may be worth pursuing in further research to determine if they have used weight loss apps before and with what success. The relatively high interest rate among Normal range individuals is concerning, and may be worth further study to examine the motivations for weight loss in these individuals. and It should be noted that the video used physical activity as an example, and it is unclear if this may have impacted participant perceptions of the app and what behaviors it could be used to change.

In terms of individuals who were classified as being substance users, participants who reported vaping were more likely than any of the other groups to identify quitting vaping as a target goal at 81.25% (n = 16). Bearing in mind the small sample size of people who reported vaping, this finding could be indicative of larger trend in desire to quit and should be explored further in future research. Of participants who completed the AUDIT-C and demographic portion of the survey, 60% were identified as consuming alcohol in a hazardous manner. Notably, only 14.81% of participants who indicated hazardous levels of alcohol consumption identified reducing alcohol use as a goal (n = 12 out of 81). Given the high number of college students that were in the sample, and the high rates of alcohol use among the college population (National Institute of Health, 2020), it is plausible that hazardous levels of alcohol consumption are viewed as normative, and an expected part of the college experience (Tan, 2012), and therefore it

might not be likely for these students to identify drinking as a behavior they would like to change.

The study faced a number of limitations that are worth noting as well. The majority of data collection was conducted during the COVID-19 pandemic crisis, and this substantially impacted the ability of the author to proceed as originally intended. The study was originally going to be administered via Amazon's Mechanical Turk (mTurk) to gather a diverse sample, however a combination of restrictions due to COVID-19 at the University prevented this resource from being utilized. The most notable limitation was the predominately white, college-aged composition of the sample. Social media was used to facilitate recruitment of a more diverse sample, and this limited part of the data collection to those in the researchers' communities. In order to combat this, the study was distributed through Rowan University's SONA system to achieve a more balanced sample within the constraints of the undergraduate psychology student pool. For this reason, the overall sample size of the study was smaller than the planned 200-500. Additionally, 11% of the 148 participants did not complete the survey at 100%, resulting in a smaller sample for demographic analysis. Survey non-completion is common in survey research, and as such is normative (Visser, Krosnick, & Lavrakas, 2000).

### **Future Directions**

In conclusion, the core concept of Re-Connect was deemed acceptable by the majority of participants, and therefore merits future investigation. Participants in this study favored more personal control in the health behavior regimens they would use with Re-Connect, and research in this area should take this into consideration if CM is to be widely distributed in a self-management format. research in contingency management-

based health applications may consider a focus on physical activity and weight loss to inform the core features of an app.



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## Appendix A

### Re-Connect Video Script and Link

In our lives we have a lot of “I want to’s”. I want to start running I want to stop smoking, I want to, I want to, I want to. But moving from "I want to" to “I am” is a totally different ballgame. There are a lot of things stopping you from meeting those goals, such as work, family, friends, and time you probably spend online using social media, playing games, reading, and so on.

So, what if there was an app that helped you meet your health goals by using those things you already love? We are a team of behavioral scientists who are developing Re-Connect, a smart-app blocker that can help you meet your ‘want to’ goals by allowing you to use the apps on your phone - such as social media, games, music - only if you meet your health goals.

For example, you could choose running as your goal, pair Re-Connect with a Fitbit, and then Re-connect will set goals for you based on your current daily activity. Re-Connect would then keep track of your app usage patterns and learn what apps you might miss the most. Re-Connect would then pick one or more of those apps at random and block them until you met your goals. As you work harder, Re-Connect would allow you to earn back time on your apps and provide you with rewards that get better as you meet your goals.

We would love to hear your feedback on Re-Connect, so please fill out the survey below. Your answers will help us fine-tune the development of Re-Connect and make it even better for you. Thank you, and we're looking forward to helping you Re-Connect with what's important to you. Link: <https://youtu.be/IUNf5SU3JIw>