

## BACKGROUND

- Nonadherence to key health behaviors is a major public health problem among patients with cardiac risk conditions (e.g., type 2 diabetes [T2D]).
- Positive psychology (PP) interventions, which utilize short tasks (e.g., using personal strengths, recalling positive events) to cultivate well-being, have previously promoted cardiac health behaviors in combination with traditional approaches.
- Mobile health (mHealth) programs may hold substantial promise as an intervention delivery modality. Text message interventions (TMI) in particular may represent a novel, accessible means to deliver a PP-based health behavior intervention, and personalization of such messaging may optimize patient engagement.
- Accordingly, we developed a 12-week, adaptive, PP-based TMI ("Text4Health") that aims to provide a more personalized approach to promoting well-being and cardiac health behaviors.
- In this project we compared the Text4Health intervention (plus step counter provision) to enhanced usual care (including step counter provision) among persons at elevated cardiac risk.

## OBJECTIVES

### Primary Aim:

- To examine the feasibility and acceptability of the Text4Health TMI, as measured by rates of text message transmission, rates of participant response to text messages, and participant ratings of message utility, among 60 persons at elevated cardiac risk.

### Secondary Aims:

- To explore group differences between the Text4Health TMI and eUC on psychological well-being and health behavior adherence (composite of moderate to vigorous physical activity [MVPA], sedentary time, fruit/vegetable intake, and cholesterol/saturated fat intake) at 12 and 24 weeks.

## METHODS

### Participants:

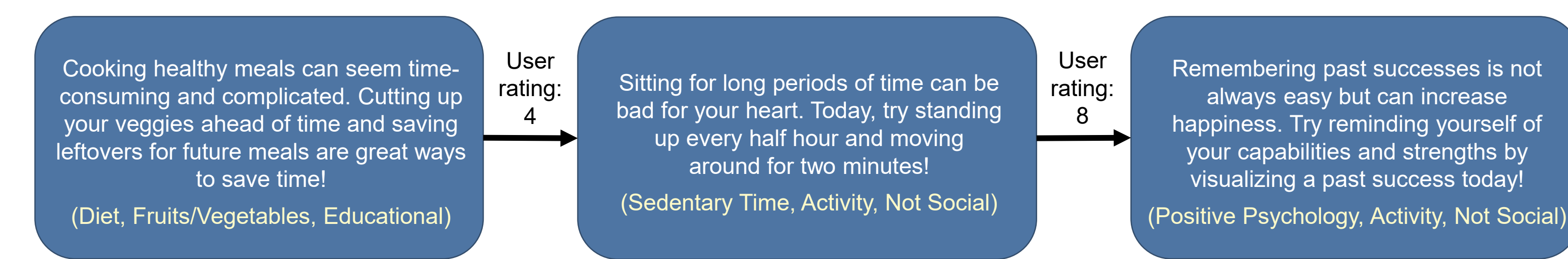
Patients eligible for this pilot study were adults who met the following criteria:

- Cardiac risk conditions: Two or more of hypertension, T2D, and hyperlipidemia, diagnosed by consensus criteria.
- Low MVPA or high sedentary leisure time (SLT): <150 mins/week of MVPA or >120 mins/day of SLT, assessed via accelerometer
- Suboptimal diet: Fewer than 5 daily servings of fruit/vegetables or elevated fat/cholesterol intake assessed via MEDFICTS scale
- Exclusion criteria: Existing coronary artery disease, cognitive impairment, inability to be active, language/literacy barriers, inability to receive text messages, or current participation in a physical activity/health behavior program.
- Participants were allocated to receive the Text4Health TMI (plus a step counter) or eUC (step counter provision alone).

### Text4Health Intervention:

- Adaptive text messages: Participants received daily text messages focused on well-being or health behaviors, and they rated each message from 0-10 based on how helpful it was to them.
- Goal-focused text messages: Participants also received twice-weekly text messaging focused on a health behavior goal.
- Phone check-ins: At enrollment, 4 weeks, and 8 weeks, participants had brief (5-minute) calls with a trained study team member to discuss the goals of the program, problem-solve any barriers to health behavior change, and provide support.
- Participants in this group (and eUC) also received Omron step counters with educational information and specific instructions regarding their use and regarding the importance of health behaviors in cardiac health.

## TEXT MESSAGES



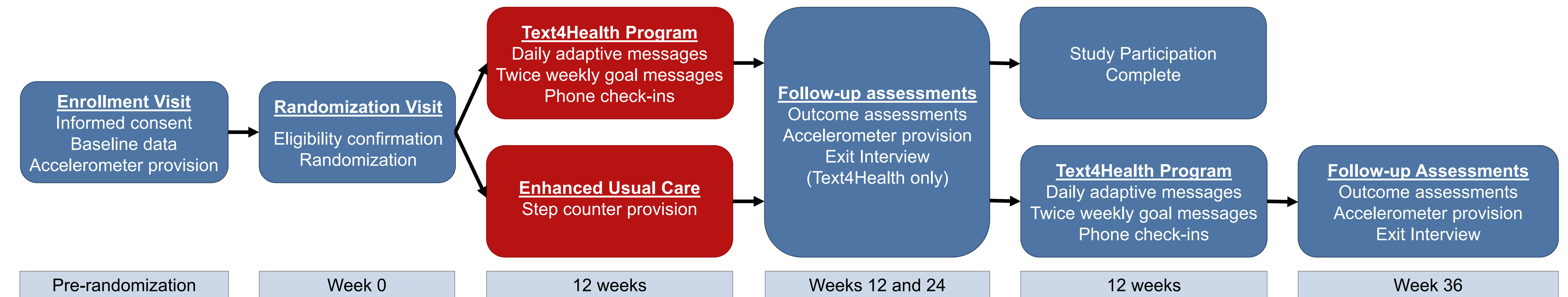
The algorithm integrates ratings from previous messages to choose increasingly tailored text messages.

## STUDY OUTCOMES

Type of Outcome	Outcomes
<b>Aim #1 Outcomes (Primary Aim)</b>	
Feasibility	Rates of text message delivery (goal: 95%+), rates of text message response (goal 70%+)
Acceptability	Ratings (0-10) of text message utility (goal: >7/10)
<b>Aim #2 Outcomes (Secondary Aim)*</b>	
Psychological Outcomes	Positive affect (PANAS), optimism (LOT-R), depression (HADS-D), anxiety (HADS-A), self-efficacy (GSES), locus of control (MHLC), social support (MSPSS)
Health Behaviors	MVPA (minutes/day), sedentary time (minutes/day), overall physical activity (steps/day), saturated fat (MEDFICTS), fruits/vegetables (BRFSS)
<b>Aim #3 Outcomes (Exploratory Aim)</b>	
Markers of Cardiac Health	Blood pressure, body mass index, LDL and HDL cholesterol, triglycerides, fasting glucose, A1C 6-minute walk test, AHA Life's Simple 7
Functional Outcomes	6-minute walk test, physical function (PROMIS PF-20)

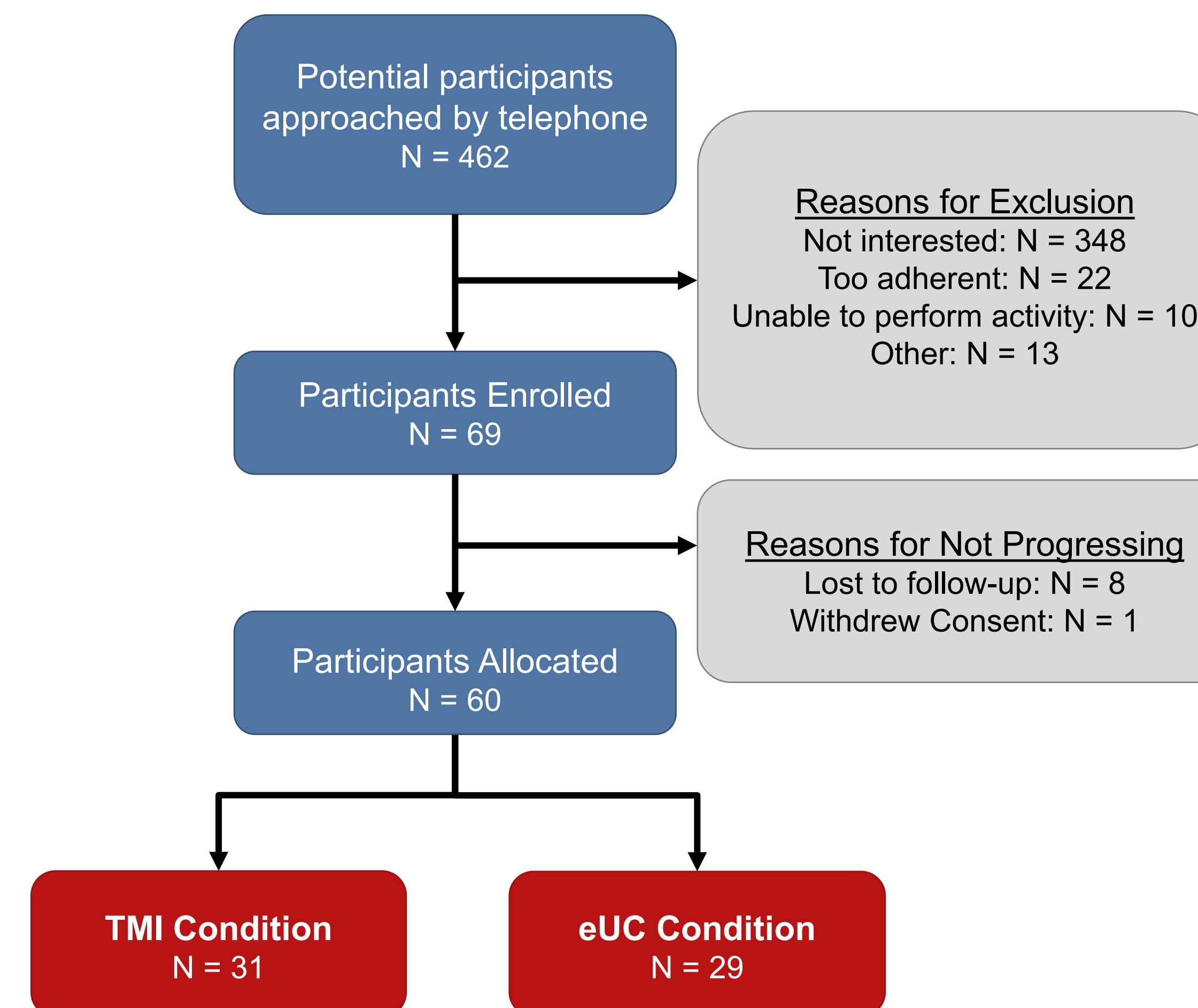
\* Main outcomes for Aim #2 are positive affect (PANAS) and a composite measure of health behaviors (dietary measures, sedentary time, MVPA) created by combining the component z-scores for each measure. These will be compared between the two groups at 12 weeks (primary time point) and 24 weeks, using mixed effects models.

## STUDY PROCEDURES



## BASELINE CHARACTERISTICS

### CONSORT Diagram



### Baseline Characteristics

Characteristic	Group	
	TMI (N=31)	eUC (N=29)
<b>Sociodemographic characteristics</b>		
Age in years (M [SD])	65.5 (9.6)	66.1 (12.7)
Female gender (N[%])	19 (61)	18 (62)
Non-Hispanic White (N[%])	23 (74)	26 (90)
<b>Medical characteristics</b>		
Cardiac Risk Conditions (N[%])		
Hypertension	30 (97)	29 (100)
Hyperlipidemia	31 (100)	29 (100)
Type 2 diabetes	12 (39)	5 (17)
Age-adjusted Charlson Score (M [SD])	3.6 (1.7)	3.3 (2.0)
<b>Baseline Outcome Measures (M [SD])</b>		
Health Behavior Adherence (composite)	0.04 (2.14)	-0.06 (1.78)
Fruit/Vegetables (per day; BRFSS)	3.9 (1.9)	2.8 (1.1)
Saturated Fat (MEDFICTS)	77.4 (25.1)	66.6 (24.4)
MVPA (mins/day)	18.8 (20.5)	19.6 (15.0)
Sedentary time (mins/day)	617.6 (123.8)	615.1 (158.7)
Overall activity (steps/day)	5,356 (3,390)	5,157 (2,199)
Positive affect (PANAS)	34.4 (7.1)	35.1 (6.1)
Optimism (LOT-R)	16.6 (5.8)	19.3 (4.5)
Anxiety (HADS-A)	6.3 (3.3)	4.7 (2.6)
Depression (HADS-D)	3.5 (2.9)	2.9 (2.3)
Physical Function (PROMIS PF-20)	92.5 (7.7)	92.4 (7.7)
Cardiac Risk Score (AHA Life's Simple 7)	6.6 (1.7)	7.0 (1.6)

## RESULTS

### Preliminary Efficacy

Outcome	B	95% Confidence Interval	p-value	Effect Size
Health behavior adherence (composite)	0.2	-0.8, 1.3	.68	0.12
Fruit and vegetable intake (BRFSS)	-0.1	-1.0, 0.8	.84	-0.06
Saturated fat/cholesterol (MEDFICTS)	-4.1	-19.8, 11.7	.61	-0.16
MVPA (minutes/day)	5.6	-2.8, 14.1	.19	0.33
Sedentary Time (minutes/day)	10.1	-69.7, 89.9	.80	0.07
Overall activity (steps/day)	300.3	-972.0, 1,572.5	.64	0.14
Positive affect (PANAS)	0.2	-2.8, 3.1	.90	0.03
Optimism (LOT-R)	1.4	-0.7, 3.5	.20	0.26
Anxiety (HADS-A)	-1.1	-2.5, 0.2	.10	-0.37
Depressive symptoms (HADS-D)	-0.3	-1.4, 0.7	.53	-0.12
Physical function (PROMIS PF-20)	1.4	-0.6, 3.4	.16	0.21
Cardiac Risk (AHA Life's Simple 7)	0.1	-1.0, 1.2	.88	0.05

### Feasibility and Acceptability

Overall, 98.8% (2,491/2,520) of messages were successfully transmitted, and 84.0% (2,099/2,491) of messages received a response. Participants rated the utility of the messages as 7.5 (SD 2.7) out of 10.

## CONCLUSION

- An adaptive, personalized TMI was feasible and well-accepted among 60 participants at elevated cardiac risk, surpassing all thresholds for these metrics in this study's Primary Aim.
- The intervention led to modest improvements in MVPA, anxiety levels, and physical function, but it did not significantly impact other psychological and health behavior outcomes.
- Additional work should be done to understand how this intervention should be modified to have greater effect.