Predictors of Completion and Response to a Text Message Intervention to Promote Well-Being and Cardiac Health Behaviors

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BACKGROUND

- Despite the known benefits of adherence to healthy behaviors (e.g., physical activity, diet), many individuals with cardiac risk conditions (e.g., type 2 diabetes [T2D]) struggle to adhere to these behaviors.
- Text message interventions (TMIs) have the potential to improve health behavior adherence. However, they may not be equally effective for all individuals.
- Identifying characteristics associated with engagement in and response to a TMI may provide important information on how to implement a TMI in clinical settings most effectively.

OBJECTIVES

In this secondary analysis of data from a two-arm, controlled trial, we aimed to identify sociodemographic, clinical, and intervention characteristics that were significantly associated with engagement in and response to a 12-week TMI among 60 individuals with two or more cardiac risk conditions.

METHODS

Inclusion Criteria:
- Cardiac risk conditions: Two or more of hypertension, T2D, and hyperlipidemia, diagnosed by consensus criteria.
- Low moderate to vigorous physical activity (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 (assessed via the BRFSS) or elevated fat/cholesterol intake (assessed via the 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.

TEXT4HEALTH INTERVENTION

Adaptive Text Messages
Encourage engagement in activities to promote well-being and health.
Daily utility ratings influence future messages.
Adapt over time to provide ongoing, customized support.

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Interactive Text Messages
Facilitate creation of individualized health behavior goals.
Assess progress towards goals.
Identify barriers and facilitators to health behavior completion.

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Phone Check-Ins
Orient participants to the program.
Review progress towards overall goals.
Provide customized guidance regarding barriers and facilitators.

Participants in the enhanced usual care (eUC) group received Omron step counters with specific instructions regarding their use, as well as information about the importance of health behaviors in cardiac health.

STUDY ASSESSMENTS

Predictors
Age
Medical comorbidity (age-adjusted Charlson score)
Gender
Race/ethnicity (non-Hispanic White vs. other)
Marital status (married vs. other)
Positive affect (PANAS)
Optimism (LOT-R)
Depression (HADS-D)
Anxiety (HADS-A)
Self-Efficacy (GSES)
Engagement with text messages (as a predictor of adherence)

Outcomes
Engagement with intervention text messages (number of responses to daily adaptive text messages)
Overall health behavior adherence (composite of MVPA [minutes/day, measured by accelerometer], sedentary time [minutes/day, measured by accelerometer], fruit/vegetable intake [BRFSS], and saturated fat intake [MEDFICTS])

Key: BRFSS = Behavioral Risk Factor Surveillance System; GSES = General Self-Efficacy Scale; HADS-A = Hospital Anxiety and Depression Scale – Anxiety Subscale; HADS-D = Hospital Anxiety and Depression Scale – Depression Subscale; LOT-R = Life Orientation Test – Revised; MEDFICTS = Meats, Eggs, Dairy, Fried foods, fat In baked goods, Convenience foods, fats added at the Table, and Snacks; MVPA = moderate to vigorous physical activity; PANAS = Positive and Negative Affect Schedule
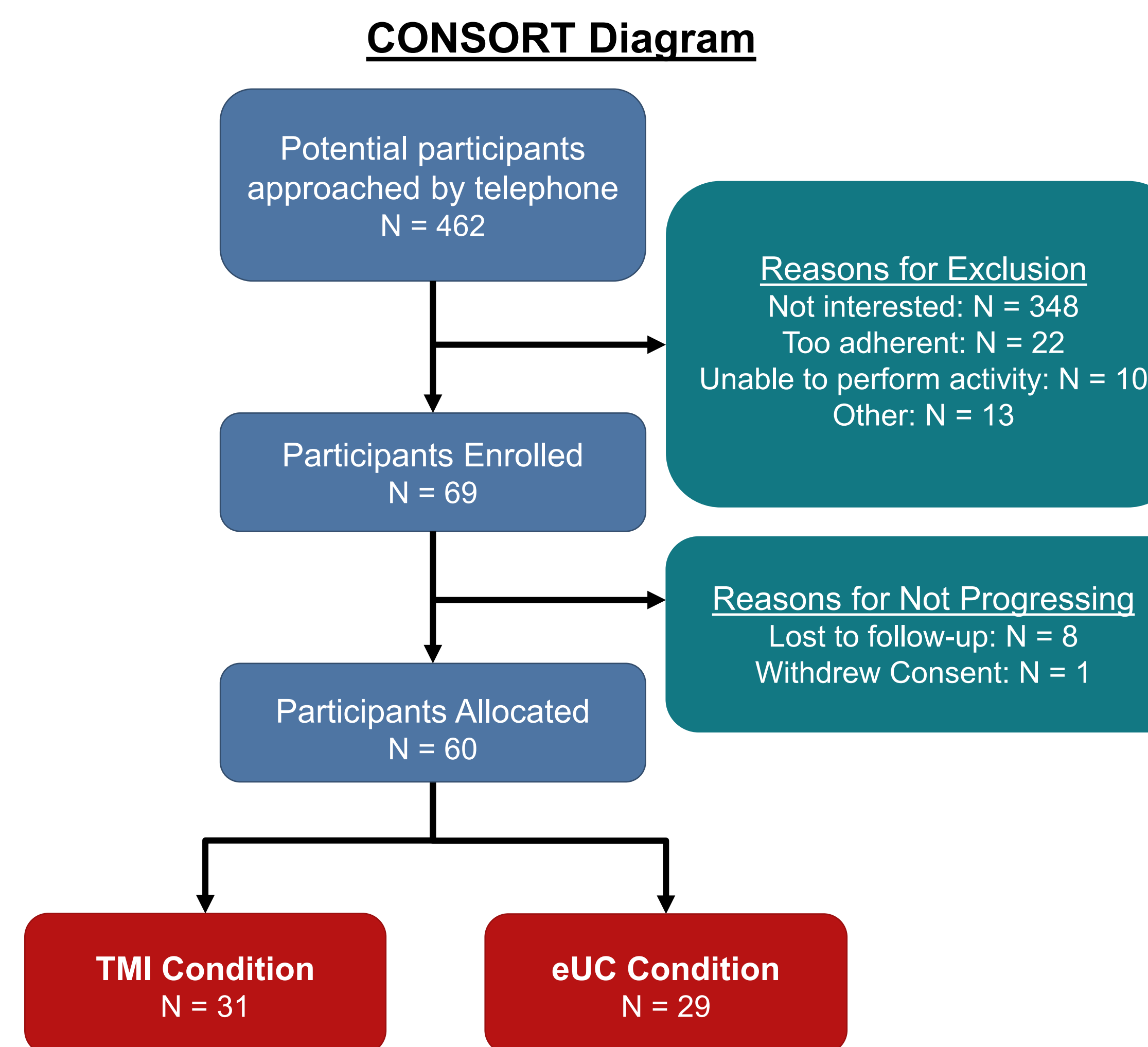
STATISTICAL ANALYSES

Engagement in the intervention:
We performed linear regression analyses to examine the relationships between predictor variables and the number of responses to daily, adaptive text messages.

Efficacy of the intervention:
We performed mixed effects regression analyses, with a categorical effect of time and an unstructured covariance matrix, to examine the relationships between predictor variables and the impact of the intervention on adherence. In each analysis, we adjusted for allocation variables (gender and dichotomized age, medical comorbidity, and baseline MVPA), time, treatment group and its interaction with time, the predictor variable and its interactions with intervention group and time, and the predictor variable's interaction with the intervention effect (treatment group*time*predictor variable). The treatment group*time*predictor variable reflects the moderating effect of the predictor variable on the intervention's effect.

BASELINE CHARACTERISTICS

CONSORT Diagram

Potential participants approached by telephone N = 462

Reasons for Exclusion
Not interested: N = 348
Too adherent: N = 22
Unable to perform activity: N = 10
Other: N = 13

Participants Enrolled N = 69

Reasons for Not Progressing
Lost to follow-up: N = 8
Withdrew Consent: N = 1

Participants Allocated N = 60

TMI Condition N = 31 | eUC Condition N = 29

Baseline Characteristics

Characteristic	Group	
	TMI (N=31)	eUC (N=29)
Sociodemographic characteristics		
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)
Married (N[%])	13 (42)	15 (52)
Medical characteristics		
Age-adjusted Charlson Score (M [SD])	3.6 (1.7)	3.3 (2.0)
Baseline Outcome Measures (M [SD])		
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)
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)
Self-efficacy (GSES)	33.8 (4.2)	34.1 (3.1)

RESULTS

Intervention Engagement

Predictor	B	95% CI	p
Age	0.06	-0.34, 0.45	.78
Medical comorbidity	-2.05	-4.51, 0.40	.099
Female gender	-7.47	-16.20, 1.26	.092
non-Hispanic White	6.87	-4.71, 18.45	.24
Married	-7.52	-16.02, 0.97	.082
Positive affect (PANAS)	-0.01	-0.68, 0.65	.97
Optimism (LOT-R)	-0.18	-0.99, 0.63	.66
Anxiety (HADS-A)	0.03	-1.42, 1.47	.97
Depression (HADS-D)	-0.04	-1.68, 1.60	.96
Self-Efficacy (GSES)	0.40	-0.76, 1.56	.49

Results were similar when using engagement in weekly goal-focused messages as the outcome of this analysis.

Overall Adherence

Predictor	12 weeks			24 weeks		
	B	95% CI	p	B	95% CI	p
Age	-0.09	-0.19, 0.01	.063	0.03	-0.12, 0.06	.54
Medical comorbidity	0.12	-0.49, 0.73	.70	0.11	-0.41, 0.63	.68
Female gender	1.42	-0.81, 3.65	.21	-0.27	-2.25, 1.72	.79
non-Hispanic White	-2.59	-5.65, 0.47	.098	-0.90	-4.54, 2.73	.63
Married	0.30	-2.03, 2.64	.80	0.15	-1.92, 2.21	.89
Positive affect (PANAS)	0.15	-0.04, 0.33	.12	0.08	-0.08, 0.24	.32
Optimism (LOT-R)	0.09	-0.14, 0.32	.44	0.17	-0.03, 0.37	.099
Anxiety (HADS-A)	0.00	-0.43, 0.43	.99	-0.13	-0.49, 0.24	.50
Depression (HADS-D)	-0.06	-0.51, 0.38	.77	-0.22	-0.62, 0.19	.29
Self-Efficacy (GSES)	0.05	-0.28, 0.38	.78	0.01	-0.31, 0.33	.93
Text Responses	-0.05	-0.14, 0.05	.32	-0.03	-0.09, 0.04	.41

DISCUSSION

- Though not statistically significant, several trends were identified: Married individuals, women, and those with greater medical comorbidities tended to be less likely to engage with the daily text messages in the Text4Health intervention. Additionally, individuals with older age, those from non-Hispanic White backgrounds, and those with higher levels of optimism at baseline tended to experience greater improvements in adherence in response to the intervention at different time points. Additional research is needed explore these relationships in larger study populations.
- Limitations of the study include its sample size and limited racial/ethnic diversity.
- Ultimately, identification of predictors of intervention engagement and response will help us to determine which individuals are most likely to respond to text message-based health behavior programs and who may benefit from additional intervention components to increase adherence.

MGH Cardiac Psychiatry Research Program