

Rowan University

Rowan Digital Works

Theses and Dissertations

8-10-2023

**TAILORING DIGITAL PHYSICAL ACTIVITY SUPPORT MESSAGES
FOR WOMEN IN MIDLIFE WITH ELEVATED RISK FOR
CARDIOVASCULAR DISEASE: A MULTICOMPONENT STUDY**

Kiri Baga

Rowan University

Follow this and additional works at: <https://rdw.rowan.edu/etd>



Part of the [Medicine and Health Sciences Commons](#), and the [Psychology Commons](#)

Recommended Citation

Baga, Kiri, "TAILORING DIGITAL PHYSICAL ACTIVITY SUPPORT MESSAGES FOR WOMEN IN MIDLIFE WITH ELEVATED RISK FOR CARDIOVASCULAR DISEASE: A MULTICOMPONENT STUDY" (2023). *Theses and Dissertations*. 3149.

<https://rdw.rowan.edu/etd/3149>

This Thesis is brought to you for free and open access by Rowan Digital Works. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of Rowan Digital Works. For more information, please contact graduateresearch@rowan.edu.

**TAILORING DIGITAL PHYSICAL ACTIVITY SUPPORT MESSAGES FOR
WOMEN IN MIDLIFE WITH ELEVATED RISK FOR CARDIOVASCULAR
DISEASE: A MULTICOMPONENT STUDY**

by
Kiri Baga

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 13, 2023

Thesis Chair: Danielle Arigo, Ph.D., Associate Professor, Department of Psychology

Committee Members:

Bethany Raiff, Ph.D., Professor, Department of Psychology
Katherine Gotham, Ph.D., Professor, Department of Psychology

Acknowledgments

This project would not have been possible without the support of many people. Thank you to the study participants, who donated their time and energy to supporting this work. I am particularly grateful for the advice and mentorship from my advisor, Dr. Danielle Arigo. I would not have designed and executed this study without her thoughtful and careful guidance and encouragement. Thank you to Drs. Gotham and Raiff, whose ideas and recommendations during my proposal substantially improved the design of my study and informed the interpretation of the findings. I have also been fortunate to work with outstanding graduate students and research assistants who supported this work.

Abstract

Kiri Baga

TAILORING DIGITAL PHYSICAL ACTIVITY SUPPORT MESSAGES FOR WOMEN IN MIDLIFE WITH ELEVATED RISK FOR CARDIOVASCULAR DISEASE: A MULTICOMPONENT STUDY

2022-2023

Danielle Arigo, Ph.D.

Master of Arts in Clinical Psychology

Women in midlife (ages 40-60) are at heightened risk for cardiovascular disease (CVD). Although physical activity (PA) engagement can reduce CVD risk, few women engage in sufficient PA to receive this benefit. They cite lack of social support as a key barrier, but existing interventions that employ social support show limited effectiveness. Digital PA support messages (i.e., brief, text-based messages delivered via smartphone or other device) may be a powerful method to meet social support needs in daily life. However, women's preferences for and responses to distinct types of messages are not well understood. The aim of this study was to examine selections of and responses to digital social support messages among women with CVD risk conditions (e.g., hypertension; $N = 27$, $M_{Age} = 53.3$ years, $M_{BMI} = 32.6$ kg/m²). Our findings indicate that women in this group may experience both elevated physical health risks and psychological distress (perceived stress, anxiety, depressive symptoms) that influence perceptions of support resources. Digital PA support for this population needs to account for these barriers to effectively increase PA and reduce health risk among this overburdened and at-risk group.

Table of Contents

Abstract	iii
List of Figures	vii
List of Tables	viii
Chapter 1: Literature Review	1
Introduction	1
Physical Activity	2
Social Influences on Physical Activity	3
Social Cognitive Theory of Health Behavior	3
Social Support	4
Digital PA Support Messages	7
Project WHADE: A New Physical Activity Support Tool for Women in Midlife	8
Aims of the Present Study	9
Chapter 2: Methods	11
Study Overview: Design and Data Collection	11
Recruitment and Participants	12
Procedures	16
Measures	17
Demographics	17
Individual Difference Measures (Baseline Survey)	17
Web Application Use (Daily)	19
Exit Interviews	21
Data Analysis	22

Table of Contents (Continued)

Chapter 3: Results	26
Descriptives for Individual Differences in Psychological Distress	26
Daily Website Use	26
Research Question 1: Consistency Versus Variability in Message Selections and Perceptions of Helpfulness	26
Message Selections	27
Message Helpfulness	28
Research Question 2: Participants' Narrative Perceptions of Support Messages.....	30
Message Selections	31
Message Helpfulness	32
Research Question 3: Associations Between Individual Difference Characteristics and Message Perceptions	36
Individual Differences in Helpfulness Ratings	37
Individual Differences in Baseline Psychological Distress and Message Helpfulness	37
Individual Differences in Selection Stability and Message Helpfulness	38
Chapter 4: Discussion	40
Message Selections	40
Message Helpfulness	42
Implications for Digital PA Promotion Among Women in Midlife	45
Strengths, Limitations, and Future Directions	46
Conclusions.....	51
References.....	53

Table of Contents (Continued)

Appendix A: Relevant Exit Interview Questions.....62

Appendix B: Perceived Stress Scale63

Appendix C: Beck Anxiety Inventory64

Appendix D: Center for Epidemiologic Studies Depression Scale65

List of Figures

Figure	Page
Figure 1. Outline of Study Procedures.....	17
Figure 2. Web Application Selection Options for Digital PA Support.....	19
Figure 3. Mean Helpfulness Rating by Message Selection and Message Used	30

List of Tables

Table	Page
Table 1. Participant Demographics.....	14
Table 2. Participant Health Characteristics.....	15
Table 3. Example Message by Category.....	20
Table 4. Data Collection and Analysis by Research Question	25
Table 5. Frequency of Message Category Selection and Exposure.....	27
Table 6. Number of Participants by Stability Category	28
Table 7. Representative Quotations for Helpfulness Ratings From Website Use	34
Table 8. Illustrative Quotations From Participant Exit Interviews	36
Table 9. Individual Differences Characteristics and Model Fit of Full Models (with added predictors) Versus Reduced Models.....	38
Table 10. Individual Differences in Stability and Model Fit of Full Model (with stability category) Versus Reduced Model.....	39

Chapter 1

Literature Review

Introduction

Cardiovascular disease (CVD) is responsible for more than 800,000 deaths per year in the United States, accounting for one in three deaths overall (NHLBI, 2021). These conditions and their associated risk factors (e.g., hypertension) affect nearly half of American adults (AHA, 2019; NHLBI, 2021). CVD and related risk conditions also cost \$216 billion per year in U.S. healthcare expenditures and another \$147 in productivity losses (Benjamin et al., 2018). Thus, efforts to reduce the burden of CVD in the United States would have a considerable public health impact. Secondary prevention efforts that focus on groups with CVD risk conditions may be particularly effective to reduce healthcare costs and premature deaths in the United States.

For example, CVD women in midlife (40-60 years old; Brim, Ryff, & Kessler, 2019) are at uniquely elevated risk for CVD, as both age- and sex-related risk factors influence the development of CVD for this group. For example, as there is a gradual deterioration of the cardiovascular system across the lifespan, CVD risk increases with age (Dhingra & Vasan, 2012). Women's risk uniquely increases because of the menopause transition and associated hormonal changes, as estrogen is protective for heart health (and decreases during this transition; Rodgers et al., 2019). There is also public misconception that CVD is more commonly a "male disease," leading some healthcare providers to miss the identification and management of CVD risk factors among women (Hyun et al., 2017), and women are often not aware of their level of risk (Bailey Merz et al., 2017). In addition, women experience elevated psychological distress during this life

stage, including stress, anxiety, and depression, and these factors are independently associated with CVD risk (Sassarini, 2016; Reeves et al, 2011; Silverman et al., 2019). Finally, there is a unique confluence of psychosocial factors that influence this population's health, including balancing multiple competing priorities during daily life (e.g., caregiving for children/elders, professional work) and expectations that women will prioritize other's needs ahead of their own (Infurna et al., 2020). Thus, inadequate healthcare attention combined with the unique biological changes and psychosocial challenges that occur during midlife heighten the risk of mortality from CVD for women during this period.

Physical Activity

Fortunately, risk for CVD can be attenuated by engagement in healthy behaviors such as physical activity. Physical activity (PA) is a primary method of reducing the risk of premature death from CVD for women in midlife (Myers et al., 2015). Moderate-to-vigorous PA improves cardiovascular health by lowering blood pressure and cholesterol (Barone Gibbs et al., 2021). Physical activity also supports healthy weight control and metabolic functioning (Strasser, 2013). Although PA guidelines recommend 150 minutes of moderate to vigorous PA per week, even small bouts of PA (e.g., 15 minutes of daily walking) or any increase in lower-intensity activity (Aggio et al., 2020; Murtagh et al., 2010) can improve cardiovascular functioning for women in midlife (Hupin et al., 2015; Piercy et al., 2018). Therefore, PA behavior is crucial to cardiovascular health for this group.

However, few women in this age group meet recommended guidelines for PA (DHHS, 2018). Women are less physically active than men throughout the lifespan and

this disparity becomes even more pronounced for women ages 40-60 (Finkel et al., 2018; Infurna et al., 2020). This may be due to many competing personal and professional responsibilities that women manage during daily life. For example, women often balance caretaking for children and/or elderly parents with professional work (Infurna et al., 2020; Thomas et al., 2018). The midlife stage is also marked by personal and professional transitions related to caregiving, professional responsibilities, and social roles that may be prioritized ahead of personal health (Infurna et al., 2020). As noted, women in midlife also report greater psychological distress (e.g., stress, anxiety, depression) than men and women in other age groups, which has been associated with reduced PA engagement (Sassarini, 2016; Reeves et al, 2011; Vancampfort et al., 2015; Puccinelli et al., 2021). As a result, insufficiently active women face a myriad of barriers to engaging in sufficient PA. A better understanding of what *facilitates* PA for insufficiently active women during midlife could improve the effectiveness of existing PA interventions.

Social Influences on Physical Activity

Social Cognitive Theory of Health Behavior

Perceptions of the social environment are known to influence PA in many populations and warrant particular attention among women in midlife. For example, Social Cognitive Theory of health behavior (Bandura, 1998) suggests that perceptions of the social environment, including normative influences and social support, can facilitate or create barriers to engaging in health behavior such as PA. Specifically, women report that perceived norms such as expectations that they will prioritize family and caregiving responsibilities ahead of PA often serve as a barrier to their participation (Hendry et al.,

2010). However, social norms can also increase PA engagement, if women perceive PA as important to their responsibilities (e.g. caregiving; Hendry et al., 2010). Women also engage in more PA if they have physically active role models or see women exercise more often in their community (Fleury & Lee, 2006), as this sets a positive social norm for maintaining PA.

Social Support

Support from others in the social environment also shows a powerful influence on women's PA. In general, social support research is focused on understanding the provision of support through social relationships (Berkman et al., 2000). Whereas social networks and social integration describe connections between individuals and engagement in relationships, respectively, social support focuses on the specific functions of social relationships and examines both provided and perceived support (Holt-Lunstad & Uchino, 2015). Functions of social relationships might include the provision of emotional, informational, or accountability support, among others (Holt-Lunstad & Uchino, 2015). Emotional support (i.e., encouragement) involves comforting or caring for others (Yoo et al., 2014). Informational support is providing relevant tips or advice (Holt-Lunstad & Uchino, 2015). Finally, accountability involves setting expectations for others' behavior in a way that supports adherence (Mohr et al., 2011).

Adequate social support in these three domains is associated with greater PA engagement (Ayotte et al., 2010). Also, behavioral interventions that increase social support in these areas have shown some efficacy for increasing PA behavior (Keller et al., 2014; Rote et al., 2015). However, women typically do not receive enough social support for health behaviors from their relationships (Kiernan et al., 2012). For this

reason, interventions increasing these three types of social support for PA are expected to improve health for women in midlife (cf. Arigo, et al., 2022a). This may be particularly important for the target population, as they are often expected to put other's needs ahead of their own and they indicate that their relationships are important sources of encouragement and accountability (Hendry et al., 2010).

It is also important to consider individual perceptions of supportive behaviors by others. The value of social support for a particular person may vary depending on whether the support provided meets their needs. For this reason, measures of social support distinguish between ostensibly "objective" measures of support (e.g., the number of supportive behaviors by others in a given time frame, the number of available support resources) and *perceived support* (i.e., subjective perceptions of the availability of and/or satisfactions with support; Haber et al., 2007). Notably, these measures of support are often only weakly correlated (Haber et al., 2007), and perceived support is more strongly associated with better health outcomes (relative to "objective" measures of support; Uchino et al., 2012). Thus, effective PA interventions must account for women's perceptions of support, rather than assume that any and all available support will help to promote PA. To date, however, few studies have examined this group's perceptions of intervention components that purport to increase their social support for their PA.

One specific opportunity to account for women's perceptions of support may be tailoring based on women's responses to support in different categories (i.e., emotional, informational, and accountability support). Initial studies with this population suggest that women may differ in their selections and responses to distinct types of support for PA (Arigo et al., 2022a; Wallbank et al., 2022). Individual differences such as

psychological distress may influence the types of support women desire and perceive as helpful. For example, emotional support (rather than accountability or informational support) may be perceived as particularly helpful for women experiencing psychological distress, as it may buffer against the effects of stress and enhance coping abilities (Pilkington et al., 2015; Jeong et al., 2013). However, there is a limited understanding in terms of this population's responses to emotional, informational, and accountability support for PA, and whether (or which) individual difference characteristics (e.g., stress, anxiety, depressive symptoms) may influence perceptions of support.

Of note, a theory of health behavior focused on the target population (Midlife Attitudes toward Physical Activity [MAPA] theory) also suggests that *context* is important to understanding women's participation in PA (Im et al., 2010). Multiple factors are thought to influence women's decisions to engage in PA. Personal factors may include PA self-efficacy, perceived health status, background characteristics (e.g., age), and perceived barriers (e.g., lack of motivation). The social environment, including personal relationships and society more broadly, is incorporated as the key environmental determinant of PA behavior in this model (Im et al., 2010). Perhaps most importantly, this theory contextualizes PA in daily life, acknowledging that there is a combined influence of factors that determine PA behavior on a particular day. For example, expectations from others (e.g., that caregiving is the top priority for women) are incorporated into this model and influence daily PA behavior differently depending on personal and environmental factors (Im et al., 2010). Thus, women's PA-specific social support needs may vary based on their context or changing needs, day to day. PA

interventions typically do not account for the possibility of daily variation in women's support needs.

Digital PA Support Messages

One method to increase emotional, informational, and accountability support for PA and address daily variation in support needs is through digital messages, or brief, text-based messages accessed through digital means (e.g., smartphone, computer). The PA Messaging Framework describes an optimal process to develop messages, and suggests that the target audience's evaluation of message should guide decision making (Williamson, 2021). In line with this recommendation, user-centered design approaches can be used to create messages that are engaging and effective for the target population: these approaches aim to maximize the usability of products and effectively address the needs and interest of end users by involving them in the development process (Abrams et al., 2004). Personalization strategies can also account for individual or target group characteristics when delivering messages (e.g., age, gender, baseline PA level), which may increase the likelihood that content is perceived as relevant (Monteiro-Guerra et al., 2020). Furthermore, digital modalities can enable users to self-select the types of support that addresses their needs at the moment, increasing the likelihood that social support is perceived as helpful. This may also be useful if individual differences influence the types of categories of support women are interested in viewing. Initial research by our group suggests that digital messages to support PA are acceptable to women in midlife with elevated CVD risk and are convenient to access for this population (Arigo et al., 2022a).

However, existing studies have not adequately examined this population's selection(s) of digital PA support messages or their perceptions of messages, either in the

moment or retrospectively. For example, there is limited understanding in terms of the consistency (versus fluctuation) in women's support preferences across categories of support, both within and between persons. To our knowledge, few studies have employed qualitative methods to provide a nuanced understanding of this population's perceptions of digital support messages and potential factors that are critical to their helpfulness in supporting daily PA behavior. Predictors of category selection, including individual differences (e.g., stress, anxiety, depressive symptoms) have also not been considered. Finally, factors that influence women's perceptions of support (i.e., specific content of messages, individual support needs) are not well understood. The current limited understanding of women's daily PA support needs may limit the effectiveness of digital support messages for this group.

Project WHADE: A New Physical Activity Support Tool for Women in Midlife

As an initial step toward better understanding and addressing the PA support needs of women in midlife, our research team developed a proprietary website tailored for this population and conducted a series of studies to iteratively refine and test it with members of the population of interest (as part of Project WHADE, for Women's Health And Daily Experiences; see Arigo et al., 2022a, for full background). The research team, including clinical health psychology professionals and trainees, individually developed digital PA messages in the three support categories (i.e., emotional, informational, and accountability support). Three categories were chosen (rather than listing all possible support types) to streamline the experience for participants. Although there are many possible types of social support, these categories are conceptually distinct forms of

support and primary categories cited in the literature (Michie et al., 2013; Holt-Lunstad & Uchino, 2015; Wallbank et al., 2022).

The investigators selected the primary support categories for messages on the web application and confirmed or disconfirmed these designations during participant interviews. During this phase, content feedback was elicited from small groups of women in the target population through qualitative interviews ($n = 5$) and surveys ($n = 5$) for messages in the three categories. Participants viewed messages and ranked them in terms of how much they liked each message and found it helpful in terms of supporting their PA (rated 1 = *not at all*, 10 = *extremely*, separately for liking and helpfulness). The lowest-rated messages were removed from the website or revised to address feedback. For example, certain messages were edited to address feedback that shorter messages are preferred, or were changed to accommodate formatting preferences (e.g., changes to bulleting and numbering). Naturalistic functionality testing was also completed in which women used the web application, including viewing and rating the digital messages, for a 4-day period. Results from naturalistic testing suggested that the revised digital PA message content was acceptable to women in the target population (Arigo et al., 2022a). In the present study, we used data gathered in a subsequent test of this web tool to better understand women's preferences for and responses to digital social support messages.

Aims of the Present Study

In sum, digital PA support messages may offer an efficient and powerful method for promoting PA among women in midlife with elevated CVD risk, though little is known about how these women select or perceive such messages in daily life. To address this gap, this study used a multi-component approach. Women's selections and responses

to support messages were studied in the context of a web application that provides a daily opportunity to self-select digital PA support messages in the three categories described (i.e., emotional, informational, and accountability support) and rate their helpfulness. A sample of 27 women completed 7 days of web application use and a subsequent 1-hour qualitative interview to share their experiences with the web application ($M_{Age} = 53.2$ years, $M_{BMI} = 32.7$ kg/m²). Their daily message selections and ratings, as well as their immediate explanations for ratings and their overall perceptions of the messages (described in post-use interviews), were used to elucidate possible reasons for their responses to different messages. Quantitative and qualitative data were considered separately and via integration to generate overarching conclusions. Findings can be used to improve the tailoring of PA interventions for women in midlife.

This study was guided by three main research questions, focused on understanding overall and specific perceptions of the helpfulness of digital social support messages:

- (1) How consistent (versus variable) are the target population's daily selections and perceptions of helpfulness of social support content in the digital environment?
- (2) What are participants' narrative perceptions of support messages, which may inform further tailoring of digital PA support messages?
- (3) What are the possible individual difference characteristics that might influence women's perceptions of messages?

Chapter 2

Methods

Study Overview: Design and Data Collection

The present study used secondary analyses of data from the Women's Health And Daily Experience research program (Project WHADE). Project WHADE focuses on determining the best methods to support PA among women in midlife and to inform the development of more effective interventions and reduce CVD risk among women in this group. Recruitment for the current study began with outreach to past Project WHADE participants, who participated in either a single cross-sectional survey assessing psychosocial experiences and health behaviors ($N = 28$) or an ecological momentary assessment (EMA) study ($N = 75$). Participants in the EMA study were asked to wear a research-grade physical activity monitor and complete surveys reporting their naturally occurring social and health experiences 5 times per day for 10 consecutive days (see Arigo et al., 2020b; Arigo et al., 2021b; Arigo et al., 2022a). Following the initial EMA study, women who previously participated in Project WHADE were recruited for two additional phases of data collection to assess changes in psychosocial and health experiences following the onset of the COVID-19 pandemic (5 days of EMA surveys 5 times per day; see Arigo et al., 2022c; Brown & Arigo, 2022).

Data for the proposed study were collected between January and June 2022, in the context of a research study evaluating the use of a web application supporting PA with various behavior change components. Study activities included using a website with PA support content, tailored based on previous work with the population of interest (Arigo et al., 2022a), each morning for 7 days; wearing a PA monitor for the same 7 days; and

completing a 1-hour, semi-structured exit interview about their experience participating. During website use, participants selected a PA support message in one of three categories (i.e., emotional, informational, or accountability support), viewed one of these messages, self-reported how helpful the message was to them, and provided a text-based explanation for their rating. Exit interviews conducted after 7 days of website use were transcribed and analyzed to understand possible reasons for variation in support preferences, and to generate inferences regarding support preferences and needs for this population. Further details about participants, measures, and procedures are presented below.

Recruitment and Participants

Participants were recruited based on their previous participation in Project WHADE or through social media (i.e., advertisements posted on Facebook, Twitter, and Craigslist). Previous WHADE participants were contacted via email because they were known to meet eligibility criteria. Previous experience with Project WHADE was anticipated to have a minimal impact on participants' experience in the current study. The current study involved using a web application supporting PA each morning and only one participant had engaged with the web application previously (during initial website development and testing); the website was subsequently expanded and new content was added. Any overlap for the remaining participants was purely conceptual, in that past participants may have been more familiar with the social and psychological experiences (e.g., social support) assessed during daily surveys. However, all participants were introduced to the relevant concepts during the initial orientation sessions so that they were familiar with the survey content. Additionally, data analyses for the current study

were focused on data collected during web application use rather than daily survey data. Consequently, their previous experience with the research team was unlikely to affect their behavior during the study, though it may have predisposed them to trust the team to build a useful digital PA support tool. We attended to this possibility in our consideration of women's perceptions of website content (Discussion, below).

Eligible participants were women in midlife (40-60 years old) who resided in the United States and reported having at least one health condition elevating their risk for CVD. Possible health conditions included hypertension or prehypertension, type 2 diabetes or prediabetes, high cholesterol (hypercholesterolemia or hyperlipidemia), and metabolic syndrome, as well as smoking (current or quit in the past 3 months). A total of 76 women were contacted or expressed interest, of which 27 proceeded to enroll in the study. The remaining contacts did not respond to recruitment emails or indicated they were unable to participate at the time of the study. The final sample had a mean age of 53.3 years ($SD = 5.20$) and BMI of 32.7 kg/m² ($SD = 6.87$). One-third of participants ($n = 9$) identified as Black/African American, 3.7% ($n = 1$) identified as Asian, and 3.7% ($n = 1$) identified as Latina. A further 3.7% ($n = 1$) indicated she identified with another race or ethnicity that was not listed and specified that she was half White, half Native American. The remaining 59% ($n = 16$) of participants identified as White. The majority of the sample (59%; $n = 16$) identified as post-menopausal. The remaining sample included three women (11%) who identified as pre-menopausal, 2 women (7%) who identified as peri-menopausal, and 6 women (22%) who reported another menopause status (e.g., cessation of menstruation due to hysterectomy or other surgery). Tables 1 and 2 describe participant demographics and health characteristics, respectively.

Table 1*Participant Demographics*

	M	SD
Age	53.3	5.2
	n	%
Racial Identification		
Caucasian/White	16	59.3
African American/Black	9	33.3
East Asian	1	3.7
American Indian	1	3.7
Ethnic Identity		
Non-Hispanic	26	96.3
Hispanic	1	3.7
Marital Status		
Never Married	8	29.6
Married	10	37
Divorced	6	22.2
Separated	1	3.7
Widowed	2	7.4
Highest Educational Level		
Associates' degree, partial college, or technical degree	5	18.5
Bachelor's degree	13	48.2
Graduate degree	9	33.3
Household Income		
<\$25,000	4	14.8
\$25,000-\$50,000	5	18.5
\$50,000-\$75,000	5	18.5
>\$75,000	13	48.2
Children		
Yes	19	70.4
No	8	29.6
Provide Childcare		
Yes	12	44.4
No	15	55.6
Provide Other Care		
Yes	5	18.5
No	22	81.5

Table 2*Participant Health Characteristics*

	M	SD
BMI	32.6	6.7
	n	%
BMI Category		
Healthy Weight	4	14.8
Overweight	6	22.2
Obese	17	63
Menopause Status		
Pre-menopause	3	11.1
Peri-menopause	2	7.4
Post-menopause	16	59.3
Other	6	22.2
CVD Risk Conditions		
Hypertension	17	63
High cholesterol	14	52
Type 2 Diabetes	10	37
Metabolic Syndrome	2	7
Current Smoker	1	4
Other Risk Conditions		
Yes	13	51.9
No	14	48.1

Procedures

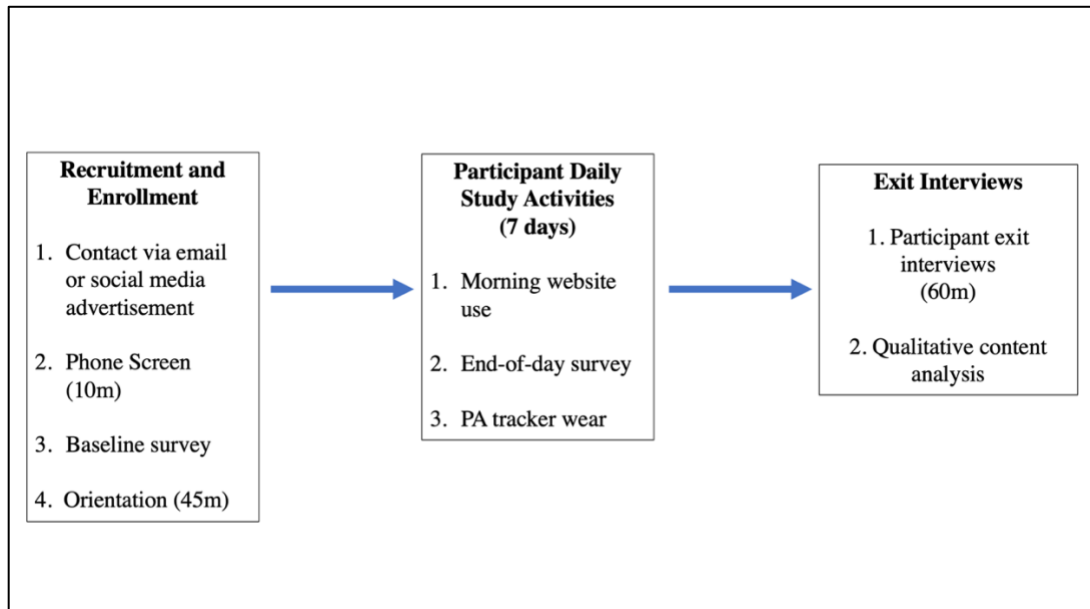
A purposive sampling approach was used to maximize diversity across the sample. Contacts from Project WHADE who were known to be eligible based on previous study participation were offered an optional phone screening to ask questions and prompted to schedule an orientation session with the author, who served as the study coordinator. The coordinator and project director (thesis mentor) prioritized contacting past participants if they previously self-identified as a woman of color or lower socioeconomic status (i.e., household income below \$50,000 and/or not having attended college) ahead of women who did not meet these criteria. Contacts from social media who indicated interest in participating first completed a brief online questionnaire about their eligibility and were contacted to schedule a 15-minute phone screen with the study coordinator prior to orientation. Contacts from social media who self-identified as a woman of color or lower SES were prioritized ahead of women who did not meet these criteria, as well.

Women who were eligible and interested in participating were asked to complete a baseline questionnaire and either confirm they owned a device that tracks PA (e.g., Fitbit, Apple Watch) or provide their mailing address so they could be sent a study-issued pedometer. During the orientation session, contacts were given in-depth information about the study activities. As illustrated in Figure 1, the study included wearing a pedometer or personal PA tracker, viewing the website, and completing an end-of-day survey each day for 7 days. Following participation, participants were asked to complete a 1-hour exit interview to provide feedback on their experience with the study and their

perceptions of various web application content. Interview transcripts were analyzed using qualitative content analysis, as described below.

Figure 1

Outline of Study Procedures



Measures

Demographics

Participants reported their demographic information at baseline, including age, gender, education level, menopause status, CVD risk conditions, height, weight, total household income, and racial/ethnic identification.

Individual Difference Measures (Baseline Survey)

Subjective Stress Level. This characteristic was measured using the Perceived Stress Scale (Cohen et al., 1983; Appendix B). The Perceived Stress Scale (PSS-10)

items ask about stress-related feelings and thoughts. Items focus on respondents' perception of how unpredictable and uncontrollable their experiences are. For example, they are asked, "*In the last month, how often have you felt that you were unable to control the important things in your life?*" and "*In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?*" Items are rated on a scale from 0 'Never' to 4 'Very often.' The PSS-10 has high internal consistency ($\alpha = 0.78$). Higher scores indicate greater levels of perceived stress.

Anxiety Symptoms. These were measured using the Beck Anxiety Inventory (Appendix C; Beck et al., 1993). The Beck Anxiety Inventory (BAI) is a 21-item inventory that asks how bothersome anxiety symptoms have been on a scale from 0 'Not At All' to 3 'Severely'. The items capture different aspects of anxiety, including (1) neurophysiologic (e.g., "*numbness or tingling*"), (2) subjective (e.g., "*unable to relax*"), (3) panic-related (e.g., "*fear of losing control*"), and (4) autonomic (e.g., "*feeling hot*"). The BAI has high internal consistency ($\alpha = 0.92$). A score of 0-7 indicates minimal anxiety, 8-15 indicates mild anxiety, 16-25 indicates moderate anxiety, and 26 and above indicates potentially concerning anxiety.

Depressive Symptoms. The Center for Epidemiologic Studies Depression Scale (CES-D) was used for depression (Radloff, 1977; see Appendix D). The CES-D was developed to measure current depressive symptomology and focuses on the affective experience of depression. This scale includes 20 items and asks respondents to rate how often they have experienced symptoms of depression (e.g., "*I felt depressed*", "*I could not get going*"). Respondents rate items on a scale from 0 'Rarely or None of the Time (less than 1 day per week)' to 3 'Most or all of the time (5-7 days per week).' The scale

was found to have high reliability ($\alpha = 0.84$; Radloff, 1991). A score of 16 or higher indicates a clinically significant level of depression.

Web Application Use (Daily)

Flow of website use included multiple components meant to initiate behavior change for PA related to goal setting and intention formation, social comparison, and social support (see Arigo et al., 2022a). Specific to the proposed study, participants were prompted to self-select and view PA support messages in one of the three categories mentioned previously (i.e., emotional, informational, or accountability support), or they could indicate “no preference” (see Figure 2) Users are presented with the same categories, presented in the same order, during each use. Participants were introduced to message options during orientation and given a demonstration of the website, in which they were shown two example messages in different categories.

Figure 2

Web Application Selection Options for Digital PA Support

Choose a Message (#1)

Which type of physical activity message would you like to see today?

- Encouragement to help me stay on track
- Tips for being more active
- Holding myself accountable
- No preference - choose for me

Participants received a randomly generated message in one of the three categories if they indicated no preference (see Table 3 for examples in each category). After viewing a message, they were asked to rate their immediate perception of how helpful the message was in terms of supporting their PA on a 5-point scale from 1 (*not at all*) to 5 (*very much*) and provide a brief, text-based explanation for their rating.

Table 3

Example Messages by Category

Message Category	Example Message
Encouragement to help me stay on track	<p>Are you on track with your physical activity goal this week?</p> <p>IF NO: Sometimes life gets in the way of our goals, but we can recommit and get back on track. Name two small steps you can take that will help you get back on track right away, and then incorporate them this week!</p> <p>IF YES: That's great! Think about what you've done this that's helped keep you on track, and plan to keep doing this. Stick with what works!</p>
Tips for being more active	<p>With so much going on in your busy schedule, it can be hard to find time to exercise. Here are some ways to be more active during your normal activities:</p> <ol style="list-style-type: none"> 1. <i>Walk up and down the stairs 3 times in a row while at home</i> 2. <i>Walk in place while talking on the phone or scrolling through social media</i> 3. <i>Take 2-minute walking or standing breaks for each hour of sitting/screen time</i>

Message Category	Example Message
Holding myself accountable	<p>It's common to tell ourselves that we'll exercise, but then push it off because we get busy or tired. Want to make sure it happens? Make it a point today to write down:</p> <ol style="list-style-type: none"> 1. How many times you'll exercise this week, 2. For how long you'll exercise, and 3. When and how you'll exercise.

Exit Interviews

Following 7 days of participation, participants attended 1-hour semi-structured exit interviews to provide feedback about their experience participating and the web application content (see Appendix A). Each participant was asked about which of the three support categories (if any) they selected most often and their reactions to the messages. Interviews were conducted by the project director (thesis mentor, a Ph.D.-level clinical health psychologist) and the study coordinator (the author, a Ph.D. student in clinical psychology). Following exit interviews, trained research assistants cleaned transcripts of each interview while watching video recordings, to ensure accuracy. Transcripts were analyzed using content analysis (Mayring, 2014), which involved examining participant's reflections on the different message types and constructing categories that described participant's explanations for their selections and responses to messages. Categories were developed based on the frequency in which participant explanations occurred within transcripts, and they were influenced by both the researcher's understanding of the population of interest and newly identified patterns relevant to digital PA support. In this way, the construction of categories was influenced by Braun and Clark's (2022) approach to thematic analysis, which was used for the larger

research project. Categories were constructed to describe participant's selections and perceptions of messages based on patterns in participant responses during interviews, and included (1) interest in actionable PA support messages, (2) expression of no preference for message category, (3) trust in an external source (research team, web application, universe) to deliver helpful messages, (4) description of competing responsibilities (e.g., professional, caregiving) influencing PA behavior, (5) interest in variety in PA support categories, (6) negative responses to accountability support, and (7) use of specific PA support categories to meet daily PA needs.

Data Analysis

To address Research Question 1, descriptive statistics were used to examine the extent to which women were consistent (versus variable) in their message category selections and perceptions of helpfulness across 7 days of study participation. We first calculated totals across each message selection category (emotional, informational, and accountability support, and no preference), to identify the proportion of women who have stable category selections across 7 days of participation and the proportion who choose to view messages from multiple categories. Full stability was defined as choosing the same category on every day of selection; moderate stability was defined as choosing the same category on 4-6 days of selection, and low stability was defined as only choosing the same category on 2-3 days of selection.

Next, estimates were calculated for message helpfulness ratings (mean, median, mode, standard deviation, standard error, and range) overall (across all women and days) and for each message category. This allowed for description of overall perceptions and the sample's overall responses to each type of message, respectively. Intraclass

correlation coefficients (ICCs) were used to examine the proportions of variance resulting from between-person differences and within-person variation. This test assumes the dependent variable (i.e., helpfulness ratings) uses interval data, is homoscedastic, has a normal distribution, and has no multicollinearity. Relevant assumptions were tested prior to analyses. Multilevel models were then used to examine whether there are meaningful differences in ratings of helpfulness between message categories. A 2-level multilevel model was used, with day of selection/rating nested within persons.

We used two different multilevel models – one including perceptions of all messages viewed (including those shown when participants selected no preference) and one including perceptions only of specific selections (i.e., emotional, informational, and accountability support) – to determine whether perceptions of helpfulness differed when women made deliberate selections versus received a message randomly. This was used to understand whether purposefully selecting a support category may increase perceived helpfulness, as participants may choose specific categories depending on their support needs in the moment. Effect size was examined with the equivalent of $\eta^2 = 0.01$ or greater to indicate a meaningful effect (Fritz et al., 2012). (As there is little agreement regarding the appropriate effect size estimate for multilevel models, we calculated eta-squared for ease of interpretation.)

To address Research Question 2, immediate explanations for message helpfulness ratings and exit interview transcripts were analyzed using content analysis (e.g., Mayring, 2014; Brown & Arigo, 2022), to identify possible explanations for quantitative findings. As noted under Measures, semi-structured interviews included questions about the category of social support message selected most often and responses to messages in each

category. Participants were also asked about their motivations and reasoning for selecting “no preference”. Categories were created that represented participants’ aggregated reasons for support message selections and perceptions of these messages. Interview transcripts were analyzed for any messages that participants spontaneously recalled during exit interviews and possible factors contributing to their salience. Research questions and data analysis methods are summarized in Table 4.

To address Research Question 3, we calculated mean helpfulness scores for individual participants and examined narrative explanations for scores for participants with the highest and lowest average helpfulness scores, respectively. Multilevel models were used to examine whether perceptions of helpfulness across the three support categories differed based on self-reported perceived stress, anxiety, and depressive symptoms at baseline. We used separate models to test the interaction between message category and each psychological symptom (predictor) on message helpfulness ratings (outcome). We hypothesized that encouragement messages would be perceived as more helpful than accountability and informational messages for individuals reporting greater (vs. lesser) psychological distress (i.e., stress, anxiety, and depressive symptoms). We also conducted exploratory models to test for differences in perceptions of message helpfulness by the extent of stability each woman exhibited, and whether the category of message received moderated this association.

Table 4*Data Collection and Analysis by Research Question*

Research Question	Data Collection Method	Data Type	Data	Analysis
What is the stability (versus variability) in selections and perceptions of helpfulness of social support content?	Web application	Quantitative	Category selection, helpfulness ratings	<ol style="list-style-type: none"> 1. Descriptive statistics (totals for category selection) 2. Estimates (overall perceptions and responses to messages) 3. Multilevel models (differences in ratings across message categories)
What are participants' narrative perceptions of support messages?	Web application and exit interviews	Qualitative	Explanations for helpfulness ratings, semi-structured exit interviews	<ol style="list-style-type: none"> 1. Content analysis of explanations for helpfulness ratings 2. Content analysis of daily explanations and interview transcripts to identify possible explanations of quantitative findings
What are the associations between individual difference characteristics and message perceptions?	Baseline survey and web application	Quantitative & Qualitative	Baseline measures of psychological distress, category selection, helpfulness ratings, explanations for helpfulness ratings, semi-structured exit interviews	<ol style="list-style-type: none"> 1. Estimates (mean helpfulness by participant) 2. Explanations for perceptions (by participant) 2. Multilevel models (differences in helpfulness ratings based on selection stability and baseline distress)

Chapter 3

Results

Descriptives for Individual Differences in Psychological Distress

Most participants indicated moderate or high perceived stress at baseline. The average score for perceived stress (PSS; $M = 20.07$; $SD = 7.70$) indicated moderate levels of stress. Scores ranged from low perceived stress (1) to high perceived stress (36). However, the majority of women (70.37%; $n = 19$) met criteria for moderate perceived stress on the PSS (i.e., scored 14-26) and six participants (22.22%) met criteria for high perceived stress (scored 27 or higher). Average scores for anxiety (BAI; $M = 10.85$; $SD = 10.20$) were below the clinical threshold of 16 and indicated mild anxiety. Scores ranged from 1 (minimal anxiety) to 39 (severe anxiety). Approximately 29.63% ($n = 8$) of participants met criteria for clinically significant anxiety; 11.11% ($n = 3$) of the sample met criteria for severe anxiety. With respect to depressive symptoms, participants indicated mild clinically significant depression on average (i.e., scored 16 or higher on the CES-D; $M = 17.93$; $SD = 12.4$). Scores ranged from few symptoms of depression to clinically significant depression (CES-D; range = 4-48). Approximately 40.74% ($n = 11$) of participants met criteria for clinically significant depressive symptoms. Overall, participants indicated moderate stress, mild but clinically significant depressive symptoms, and mild anxiety.

Daily Website Use

Of the expected 189 website uses (27 participants x 7 days), there were 175 observed and completed uses (96.8%). Missed website uses were caused by technical difficulties (5 of 14 misses) and competing commitments and priorities during daily life

(9 of 14 misses). Technical difficulties included attempting to access the website link, which was designed to be accessed only once daily, more than one time prior to completing their use. Thus, participants completed the vast majority of expected website uses and experienced few difficulties.

Research Question 1: Consistency Versus Variability in Message Selections and Perceptions of Helpfulness

Message Selections

Participants selected no preference, encouragement, tips, and accountability messages on 41%, 23%, 21%, and 15% of days with completed website uses, respectively (72, 40, 36, and 27 occasions; see Table 5). When no preference was selected, participants were assigned to view encouragement messages most frequently (51% of the time; $n = 90$), compared to tips and accountability messages, which were viewed 31% ($n = 54$) and 18% ($n = 31$) of times, respectively (see Table 5).

Table 5
Frequency of Message Category Selections

Message Category	Frequency of Selections
No preference	72 (41%)
Encouragement	40 (23%)
Tips	36 (21%)
Accountability	27 (15%)

Frequency of Message Category Use When “no preference” Was Selected

Message Category	Frequency of Message Category Use
Encouragement	90 (51%)

Message category	Frequency of Message Category Use
Tips	54 (31%)
Accountability	31 (18%)

Almost half (48.15%; $n = 13$) of women demonstrated low stability in their message category selections: they selected the same category on 2-3 out of 7 days. The remaining participants demonstrated either moderate stability (i.e., selected the same category on 4-6 days; 40.74%, $n = 11$) or full stability (i.e., selected the same category every day; 11.11%, $n = 3$; see Table 6).

Table 6

Number of Participants by Stability Category

Stability category	Number of participants
Low	13 (48.15%)
Moderate	11 (40.74%)
Full	3 (11.11%)

Message Helpfulness

As noted, participants' perceptions of message helpfulness were rated on a scale of 1 (*not at all*) to 5 (*very much*). Message helpfulness ratings met relevant assumptions of normality and homoscedasticity; at the participant level, mean helpfulness scores ranged from 1.57 to 5.00. The average score for helpfulness across women, days, and message categories was 3.15 (*somewhat helpful*; $SD = 1.25$) and messages were rated

across the full range of helpfulness options. The mode rating was 4 (*quite a bit helpful*) and the median rating was 3 (*somewhat helpful*). Less than 40% of the variability in helpfulness ratings was attributable to between-person stability (ICC = 0.38), indicating that the majority of variability (62%) was attributable to within-person variation between days (plus error). Thus, women in this sample showed more day-to-day variability than stability in their ratings of helpfulness.

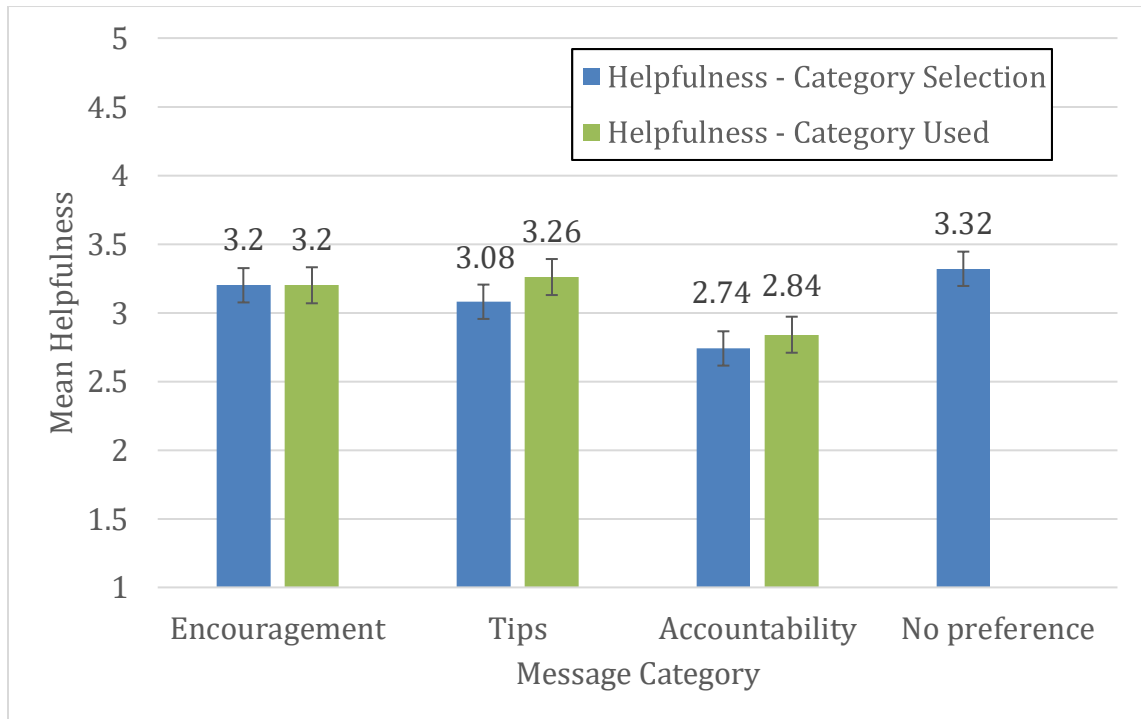
We examined message category selections and exposure as potential predictors of this variability. A 2-level multilevel model showed a significant omnibus difference between selection categories ($F[3,45] = 3.10, p = 0.04, \eta^2 = 0.17$; see Figure 3). A follow-up direct contrast showed that participants perceived messages as more helpful when they let the system choose for them (i.e., no preference), compared to when they selected a specific message category ($F[3,45] = 7.02, p = 0.01$). This difference was associated with a large effect size ($\eta^2 = 0.32$).

With respect to the three categories of messages viewed, tips messages were rated most helpful on average ($M = 3.26, SE = 0.16$; see Figure 3). The median and mode scores for tips messages were 3.5 (between *somewhat helpful* and *quite a bit helpful*) and 4 (*quite a bit helpful*), respectively. The average score for tips messages was followed closely by the average score for encouragement messages ($M = 3.20, SE = 0.13$). For this category, the median and mode scores were both 3 (*somewhat helpful*). On average, the lowest rated category in terms of helpfulness was accountability ($M = 2.84, SE = 0.26$). The median and mode scores were both 2 (*a little bit helpful*). Differences in mean helpfulness did not follow the order of presentation (i.e., encouragement, tips, accountability, no preference). Although the omnibus difference across categories (for

messages exposures) was not statistically significant ($F[2, 43] = 2.81, p = 0.07$), the associated effect size was moderate ($\eta^2 = 0.12$).

Figure 3

Mean Helpfulness Rating by Message Selection and Message Used



Research Question 2: Participants’ Narrative Perceptions of Support Messages

As noted, we used two sources of qualitative data to understand participants’ selections and ratings of support messages. For message selections, we used participants’ recollections of category selection and the reasons for their selections as described during 60-minute interviews (after completing 7 days of website use). For message helpfulness, we used text explanations for ratings during website use (in the moment) and the content of 60-minute interviews (after completing 7 days of website use). We were particularly

interested in understanding why most participants demonstrated low or moderate stability, while three demonstrated full stability, and differences in women's perceptions across message categories.

Message Selections

Content of 60-Minute Interviews. As expected, participants demonstrated interest in support across the three support categories during exit interviews. For example, one participant (50 years old, identified as White) said, *"...if you made me pick one, I would say the tips for being more active, but I did really like all three of them."* Another participant (54 years old, identified as White) said, *"Holding myself accountable – I probably needed to use that one more and would like to get copies of those also. Encouragement's good ... and definitely the tips for being more active was great."*

In line with our rationale for the website design, participants may also have varied in their selections due to changing needs across days. For example, one participant (45 years old, identified as White) described purposefully selecting encouragement messages one day. She said, *"...because you know when I had the migraine or when I didn't get done as much as I would have liked ... just having that "you know tomorrow's a new day," ... those things are really helpful."* Another participant (50 years old, identified as White) described typically selecting tips messages when she wanted actionable advice, *"... I would pick that message (category), because I wanted to see something that was going to maybe make me do more activity."*

Interestingly, the three participants who demonstrated full stability in message category selection indicated no preference for message category every day. Participants reported choosing no preference for various reasons, including beliefs that: (1) the

research team would deliver appropriate messages no matter the category, (2) having “faith” in getting an appropriate message, and (3) an assumption that this option would maximize variability in message content. For example, a participant (57 years old, identified as White) said, *“Because I figured that it was already zoned for me, for my age group, so I figured anything you could offer would be good.”* Another participant (51 years old, White) said, *“I figured let faith tell me what I need to know for today so,”* and a third (59 years old, identified as Black) said, *“... because if I do it on my own choice I may just keep choosing the same thing. I wanted to leave it up to the computer to choose for me.”* Across levels of stability, however, participants endorsed a preference for variety with respect to message category and were disappointed if they noticed repeated content. For example, a participant (51 years old, identified as Black) said, *“I think it's disappointing and not motivating me to want to ... keep using it. It's like oh it's all the same thing.”*

Message Helpfulness

Text Explanations for Ratings. In referencing immediate explanations for helpfulness ratings, there were a range of ratings and positive and negative feedback to messages from each category (see Table 7). Highly rated messages were perceived as relevant and offering reasonable, actionable suggestions to increase PA, whereas messages with lower ratings were described as irrelevant to the participant’s circumstances or difficult to implement. Tips and encouragement messages, which were rated higher on average than accountability messages, may have been perceived as more actionable and affirming. Participants who responded positively to messages in these

categories appreciated the idea of “taking small steps toward a major goal” and tips for getting activity in at work (see Table 7).

Participants' lower ratings of helpfulness for accountability messages may partially be explained by perceived added stress and difficulty implementing suggestions without additional support. One participant (52 years old, identified as White) said, “*I tried to get my family and friends to help support me in having a healthier lifestyle. That didn't work out well.*” Another participant (52 years old, identified as Black) cited a preference for external accountability (compared to holding oneself accountable) and said, “*I can write goals as much as I want... I do not hold myself accountable to my own goals.*”

Overall, messages that were helpful were often endorsed as “good reminders,” reasonable to fit in during daily life, and relevant to the individual’s needs and priorities. For example, a participant (57 years old, identified as Black) said, “*It gave me some easy suggestions. Kind of reminded me of what I knew but don't always do.*” Women commonly mentioned that actionable advice, including ideas to fit in PA during the day, or messages supporting short bursts of activity (e.g., getting even 5 minutes of PA is good for health) were well received. Messages incorporating caregiving or reasons to engage in PA for family or loved ones were often endorsed as helpful and good reasons to commit to PA behavior. During website use, one participant (53 years old, identified as Black; see Table 7) explained her message rating and said, “*I like the idea of why it's important to ME which is because my kids and husband and family need me to be healthy and be around and I want to be healthy and be around.*”

Table 7*Representative Quotations for Helpfulness Ratings From Website Use*

Message category	Helpfulness rating	Text-based explanation
Encouragement	1	<i>"I'm not a caregiver so this really doesn't feel like it applies to me."</i>
	3	<i>"I like the idea of why it's important to ME which is because my kids and husband and family need me to be healthy and be around and I want to be healthy and be around."</i>
	5	<i>"It told me to be patient with myself. I should just take it day by day, making small steps towards my major goal."</i>
Tips	1	<i>"I already knew this and feel like I may have seen this message already this week ... it doesn't really fit with my lifestyle."</i>
	3	<i>"It gave me some easy suggestions. Kind of reminded me of what I knew but don't always do."</i>
	5	<i>"I sit a lot on my job so it is important to be intentional about standing up and moving."</i>
Accountability	1	<i>"The message was too general and didn't have any examples to help me understand/apply it to my own life better."</i>
	3	<i>"My family is not close to me in the area to keep accountable. The phone/text is nice but not the same."</i>
	5	<i>"...setting goals to paper help me to stay focused. I'm more likely to do it when I know I've made a commitment."</i>

Content of 60-Minute Interviews. Participant explanations for category selections and responses during exit interviews helped explain possible reasons why accountability messages were perceived as less helpful, compared to other categories (see Table 8). A participant (51 years old, identified as White) said, “*Part of the thing about the accountability for me is I equate it to more stress ... I get more and more stressed about not hitting whatever I said I was doing. So for me I don't know that it has a positive impact.*” Another participant (62 years old, identified as White) described accountability support as unhelpful and said, “*For me, my day feels overscheduled as it is.*”

Recollections of messages during interviews also indicated that actionable advice and support that centers caregiving as a reason for activity were appreciated. One participant (54 years old, White) said, “*Exercise three times for 10 minutes, short walks in front of the TV, this really stuck out with me – I highlighted this – be patient with yourself but stick to it.*” Another participant (52 years old, identified as Black) said, “*I did like the stuff ... in terms of your family, doing something with them.*” Thus, messages that centered women’s priorities and suited daily needs and busy schedules were endorsed during interviews.

Table 8*Illustrative Quotations From Participant Exit Interviews*

Category	Mean helpfulness (SD)	Illustrative quotations from exit interviews
Encouragement	3.20 (SD=1.21)	<i>“And then I appreciated the messages that said hey, you know, basically, something is better than nothing, don't beat yourself up. You know, take one step at a time, I appreciated that, I thought that was really good.”</i>
Tips	3.26 (SD=1.20)	<i>“I like that it was concrete information to you know really help me. It wasn't something that was abstract.”</i>
Accountability	2.84 (SD=1.44)	<i>“Part of the thing about the accountability for me ... I equate it to more stress.”</i>

Research Question 3: Associations Between Individual Difference Characteristics and Message Perceptions

We used both idiographic and nomothetic approaches to examine the influence of individual differences on the helpfulness of messages. To examine individual differences in helpfulness ratings, we first examined participants' narrative explanations for ratings and responses for the two women who gave the highest and lowest average helpfulness ratings for messages, respectively. Using a nomothetic approach, we then examined whether psychological distress at baseline or stability category (in terms of category selection) helped predict perceptions of messages.

Individual Differences in Helpfulness Ratings

Using an idiographic approach, we highlight a participant with an average rating of 1.57 (low; 44 years old, identified as White); she rated the majority of messages (5/7) as not at all helpful. In her qualitative interview, she indicated that messages often focused on balancing competing priorities, such as caretaking and full-time work. She found this alienating and unrelatable. For example, she said, *“I’m not caring for anybody, I’m only caring for myself, so it felt like completely irrelevant and useless to me, which felt, I guess I would say, annoying.”* In contrast, a participant (54 years old, identified as Black) who rated messages as a 5/5 on average commented that messages were motivating and encouraged her to set goals and be kind to herself through setbacks and barriers, like experiencing health-related stress. Positive comments during website use included, *“It motivated me to learn more about setting goals,”* and *“It motivated me to keep going because I had a stroke six years ago.”*

Individual Differences in Baseline Psychological Distress and Message Helpfulness

We examined whether individual differences in psychological distress (assessed at baseline) predicted helpfulness ratings across 7 days of website use. In separate models, adding scores for measures of perceived stress, anxiety, and depression did not substantially improve model fit (see fit statistics in Table 9). Anxiety (measured using the BAI) was not found to be a moderator and the effect size suggested differences between models were negligible ($F[2,144] = 0.12, p = 0.91, \eta^2 = 0.001$). However, we found conflicting results in terms of adding perceived stress (using the PSS) and depressive symptoms (using the CES-D). There were not significant differences in terms of mean differences, yet interactions were associated with small but meaningful effect sizes when

adding predictors for perceived stress: ($F[2,144] = 2.81, p = 0.49, \eta^2 = 0.02$) and depressive symptoms ($F[2,144] = 0.49, p = 0.79, \eta^2 = 0.01$). Thus, analyses of predictor variables (i.e., perceived stress, depressive symptoms, anxiety) provided mixed results in terms of our hypothesis that distress may be associated with the helpfulness of encouragement messages.

Table 9

Individual Difference Characteristics and Model Fit of Full Models (with added predictors) Versus Reduced Models

Predictor variable	Model	AIC	BIC	Bayes factor
Perceived stress (PSS)	Full model	564.61	589.93	0
	Reduced model	544.97	560.79	2122480
Anxiety (BAI)	Full model	568.84	594.16	0
	Reduced model	544.97	560.79	17589109
Depression (CES-D)	Full model	569.37	594.70	0
	Reduced model	544.97	560.79	23130033

Individual Differences in Selection Stability and Message Helpfulness

Finally, we examined message helpfulness ratings by participant stability in selections. Given that only 3 participants demonstrated full stability, the full and moderate stability categories were collapsed into one to examine whether higher (versus

lower) stability moderated perceived message helpfulness. A model comparison was conducted to explore whether adding a binary variable for higher versus lower category stability would improve model fit. The reduced model (i.e., without stability category) was favored relative to the full model, indicating that stability did not meaningfully add to the prediction of helpfulness ratings, above and beyond the inclusion of category selection (see Table 10). However, as the associated effect size was small but meaningful ($F[3, 42] = 1.54, p = 0.29, \eta^2 = 0.03$), our results were mixed in terms of the possible effects of selection stability on the perceived helpfulness of support messages.

Table 10

Individual Differences in Stability and Model Fit of Full Model (with stability category) Versus Reduced Model

Predictor variable	Model	AIC	BIC	Bayes factor	<i>p</i>
Stability category (higher versus lower)	Full model	546.80	578.45	0.00	0.29
	Reduced model	544.16	563.14	2108.73	

Chapter 4

Discussion

Digital social support messages that are tailored for women in midlife with elevated CVD risk may help to increase PA engagement in this group, and thereby, reduce risk of premature mortality from CVD. The present study was designed to offer an improved understanding of women's perceptions of digital PA support messages, including potential reasons for their preferences and responses. Women's selections and perceptions of messages were examined to determine the extent of stability (versus variability) in women's support needs in daily life and possible factors contributing to their perceptions of message helpfulness, including the support category (i.e., encouragement, tips, accountability) as well as "no preference" selections, stability versus variability in participants' selections, and individual differences in potentially relevant psychological constructs (i.e., perceived stress, anxiety, and depressive symptoms). Narrative explanations for helpfulness ratings immediately after viewing each message and participant reflections during exit interviews supported the identification of factors that influenced selections and ratings.

Message Selections

In this study, the majority of women (89%) demonstrated low or moderate stability in message category selection across days. This is consistent with previous findings documenting that women show interest in multiple types of social support for physical activity (PA), and an individual's support needs may vary during daily life (Holt-Lunstad & Uchino, 2015; Arigo et al., 2022a). Women may also have sought messages from multiple categories to maximize variety, as previous work has also found

that users of digital health tools seek and appreciate novelty in digital content (Wittmann et al., 2007; Wittmann et al., 2008). Women selected encouragement, tips, and accountability messages with similar frequencies. However, they indicated “no preference” for the message category most often. During exit interviews, women reported using the “no preference” option to maximize variety or because they believed that the website or the universe would provide optimal support.

It was noteworthy that participants reported using “no preference” because they trusted the web application or the universe to give appropriate content. Women are accustomed to seeking health information both online and from professionals, and often respond positively to recommendations from both sources (Tan & Goonawardene, 2017). They may also have believed a randomly generated message would be helpful because of trust in the research team; during orientation sessions, participants were advised that the web application was specifically designed to support PA for women and tailored to suit this population’s needs. Further, 17 (out of 27) women had previous experience working with the research team. Thus, increased trust between participants and the researchers may have influenced their decisions to receive randomly generated content, as greater trust in digital health tools is associated with measures of engagement (Hether et al., 2014). Women also mentioned using “no preference” because they “had faith” in the universe to deliver helpful information. Faith or trust in the universe may reflect participant’s religion or spirituality, as existing evidence suggests women may find strength in these areas, particularly to support coping and self-management of health-related issues (Unantenne et al., 2013).

Previous work also suggests that this option may have been appealing because it carried the lowest cognitive load, and because women may not always be aware of their support needs. Women in midlife lead extremely busy lives that often – though not always – include balancing caregiving for others, professional responsibilities, and their own self-care (Infurna et al., 2020). The “no preference” option may have carried the lowest cognitive load, and thereby alleviated choice pressure during website use (Plass et al., 2010). Alternatively, it may have been a helpful choice when women’s support needs were not particularly salient to them, which may occur when women are unable to assess their stressors and support needs in the moment (Cohen & McKay, 2020). Women’s interest in the “no preference” option warrants further inquiry, as these messages were also rated as significantly more helpful than messages shown when a specific category was selected.

Message Helpfulness

All categories received positive ratings overall, providing further evidence that support across the three categories is useful for this group (Keller et al., 2014; Rote et al., 2015). Ratings were influenced by multiple factors, including the support category, specific content of messages, and fit with the individual’s personal or daily support needs. There are a number of possible reasons that message generated by “no preference” were perceived as more helpful, including (1) women having higher expectations for messages generated by the web application (compared to self-selected messages), (2) possible misalignment between women’s self-assessment of their support needs in the moment versus what was actually helpful for them, and (3) the frequency in which messages of different categories were generated when “no preference” was selected.

Women's beliefs about the web application and their support needs may have influenced how they rated message generated by "no preference". Participants may have had higher expectations for messages generated by the web application (rather than themselves) because of their perception that the web application (or research team) was selecting an appropriate message. Positive expectations of support have been associated with better evaluations of support after-the-fact (Pierce et al., 1992). Women who trusted the researchers or web application more may also have used this option more frequently and given higher ratings for messages overall. It is also possible that there is a misalignment in women's preferences for PA support and what may be actually helpful in the moment. Previous work has identified discrepancies in immediate reactions and preferences for digital support for PA during daily life and more global evaluations of one's needs (Smith et al., 2014). In the present study, women responded negatively to accountability support in the moment while also stating they needed accountability during exit interviews. Participants also stated a preference and demonstrated interest (through selections) in novel content, while also stating during exit interviews that repeated messages or messages with known information served as "good reminders." Thus, women's preferences for support may not always indicate what is most helpful to them. A final reason that "no preference" received higher ratings may be that encouragement and tips messages were generated at greater frequencies when "no preference" was used (relative to accountability messages), and those categories received higher ratings on average.

Although there were not significant differences in helpfulness ratings among the three message categories, findings that accountability support may be perceived as less

helpful or causes more stress (relative to encouragement or tips) warrants further consideration. Women frequently seek accountability support from digital health tools and it is associated with greater PA behavior (Holt-Lunstad & Uchino, 2015; Mohr et al., 2011). Perceptions of accountability support as stressful may undermine efforts to increase PA and increase distress for women in this group, who are often overburdened by competing priorities (Infurna et al., 2020). Women's immediate responses and global reflections on website use suggested that encouragement and tips were preferred in part due to their actionability and perceived relevance during daily life. Support perceived as actionable is often sought after by digital health users and is associated with improved behavior change outcomes in intervention studies (Rabbi et al., 2015; Schembre et al., 2018). Our findings are in line with previous work suggesting making commitments to PA may be perceived as inconsistent with this population's needs and competing priorities (Im et al., 2013). Future studies with larger samples and additional days of message exposure are needed to determine the optimal methods to provide accountability support for this population without increasing stress.

Additional work is also needed to understand the possible effects of psychological distress on the perceptions of different times of messages. Our hypothesis that encouragement messages would be perceived as more helpful than other types of messages for individuals indicating higher levels of perceived stress, anxiety, and depressive symptoms was not clearly supported. Findings did not support adding anxiety as a predictor. However, our results were mixed in terms of the possible benefits of adding perceived stress and depressive symptoms as predictors; there were not significant differences (in terms of mean differences) between models, but interactions were

associated with small but meaningful effect sizes. Additional work with larger samples could help to determine whether psychological distress influences perceptions of messages in different categories.

In the present study, a small sample size and range in scores for stress, anxiety, and depressive symptoms may have precluded the identification of associations. For example, the vast majority (92.59%) of participants indicated moderate or high perceived stress. Our sample also included subsets who indicated clinically significant anxiety (29.63%) and clinically significant depressive symptoms (40.74%); mood and anxiety symptoms have been shown to impact perceptions of support (Pilkington et al., 2015; Jeong et al., 2013). Thus, the combined effects of the sample size, small range in perceived stress symptoms, and possible differences in perceptions of support among individuals with clinically significant mental health symptoms may explain our results. It is also possible that a “no preference” option may be optimal for women experiencing higher levels of distress to reduce choice pressure and the need to assess one’s support needs in the moment, which would be contrary to our hypothesis that an encouragement option would be preferred for these women.

Implications for Digital PA Promotion Among Women in Midlife

Together, the present findings support the utility of digital PA messages during daily life for this population and suggest that the development of messages should be guided by this population’s needs – notably, preferences for variety and actionability during daily life for women balancing competing demands. Other important takeaways include substantial within-person variability in selections across days, which support the use of digital tools to meet women’s changing needs and preferences, and heterogeneity

in women's preferences and needs in terms of the content of messages. Psychosocial experiences, including participating in caregiving or professional work, may influence the specific content that is perceived as relevant and is therefore helpful for women. Thus, digital PA support messages for this population must account for differences in women's individual needs, as research suggests women are more likely to use and benefit from personalized digital health tools (Abrams et al., 2004; Monteiro-Guerra et al., 2020).

Future work may also focus on the utility of a "no preference" option to reduce cognitive load and potentially increase the perceived helpfulness of digital PA support, as well as determine the optimal methods to provide accountability support. Our findings suggest that a "no preference" option may be preferred by this group and a possible mechanism to increase perceived helpfulness if users have increased trust in digital tools and experts to deliver support (compared to themselves). Finally, we suggest that accountability support for this population needs to account for this group's barriers to engaging in PA, notably competing priorities and a lack of social support for PA in their daily lives (Kiernan et al., 2012; Infurna et al., 2020). Given the documented benefits of accountability and overall desire for this type of support, there is a clear need to determine how to more effectively develop accountability supports that are perceived as maximally helpful for this overburdened group.

Strengths, Limitations, and Future Directions

This study had a number of strengths. For instance, we utilized a proprietary website developed by behavioral scientists with experience working with the population of interest (Arigo et al., 2023; Arigo et al., 2021a; Arigo et al., 2020a), and the website was tested for usability and acceptability prior to data collection for the present study

(Arigo et al., 2022a). This may have facilitated perceptions that website content was relevant to this group's particular needs, and encouraged high engagement and compliance. The use of a digital platform to deliver social support provided the ability for participants to both select and view a variety of types of social support while reflecting on the usefulness of messages in real time, as well as in aggregate after the fact. More broadly, the use of both quantitative and qualitative data collection helped determine nuanced reasons for women's perceptions of messages in the moment and retrospectively, and can guide the development of more effective PA support for this population. Finally, the purposive sampling approach was effective to increase the racial and ethnic diversity of the sample; approximately 41% identified as women of color.

Limitations of this study are also noteworthy and point to opportunities for future work in this area. Women who previously participated in studies with this research group may have been predisposed to liking the web application more or provide positive reviews, since insights from past works were used to inform development and participants may have wanted to please research staff. However, 10 women (37%) had never been in contact with the research team previously, and we saw little distinction in perceptions between these groups. Additionally, all participants were encouraged to share critical feedback with the research team to support improvements to the web application, and our findings regarding negative perceptions of certain website content indicate comfort sharing this type of feedback. It is also possible that differences in clinical expertise and social desirability bias may have influenced participant feedback during interviews. Qualitative interviews were conducted by the author (a Ph.D. student in clinical psychology) or the principal investigator (thesis mentor, a Ph.D.-level clinical

health psychologist), and it is possible that level of disclosure and feedback may have varied across participants due to these factors.

In terms of the website experience, the categories of support offered and user interface are possible limitations. As noted, we selected encouragement, tips, and accountability to represent distinct types of social support that are known to affect PA behavior (Michie et al., 2013; Holt-Lunstad & Uchino, 2015; Ayotte et al., 2010). However, additional categories of support, for example belonging (sense of connection with others) and esteem (promoting one's skills or abilities), have been identified as important sources of social support and were not included in the current version of the web application (Lahey & Cohen, 2000). The research team provided three sources of support for various reasons, including increasing efficiency in developing the web application and minimizing the cognitive load (and choice pressure) for users. Future studies may examine the utility of adding categories of support and determining the cost (versus benefit) of offering women support in additional categories. Finally, the order of support categories on the website was static and may have influenced selections. Of note, "no preference" was the last option listed and selected most often. However, future work may add a feature that randomizes categories on the web application to minimize any bias related to category order.

As noted, the sample size of 27 was also extremely modest for conducting relevant between-person tests, and this likely impacted tests of associations between baseline psychological distress and perceived message helpfulness. Future research should continue to work toward identifying individual difference characteristics that can help to target support messages appropriately, as emotional support may be particularly

helpful for individuals experience high distress (Pilkington et al., 2015; Jeong et al., 2013). However, it is important to note that the sample size was adequate for reaching saturation with qualitative methods (Hennick et al., 2017; Hennick & Kaiser, 2022) and that there were 7 daily website use observations for each participant, which is sufficient for the multilevel analyses conducted (Maas & Hox, 2005; Murayama et al., 2022).

Additionally, although efforts were made to increase the representation of diverse racial and identities and a variety of educational and economic backgrounds, the sample was still primarily White and highly educated. Therefore, findings may not be applicable to women in midlife at elevated CVD risk from all backgrounds, as studies suggest there may be racial and socioeconomic differences in perceptions of professional support for PA (over more informal support networks) as well as the extent to which women's might prioritize their family's needs over their own health needs (Wippold et al., 2021; Sokol & Fisher, 2016; Im et al., 2013). However, our findings regarding these topics are in line with previous work with women from diverse backgrounds within this population (Im et al., 2013). We emphasize that the use of qualitative methods (as well as intensive assessment) decreases the importance of the person-level sample size. However, future work with larger samples would be needed to determine more nuanced individual differences in women's needs depending on factors such as racial and ethnic identity or socioeconomic background.

These limitations notwithstanding, the present study offers a rich set of insights that can inform both improvements to our website and to the development of digital PA support tools more broadly. Future work on our website will focus on the development of additional content that is perceived as helpful for this population, particularly social

support that is perceived as relevant to their unique needs (e.g., little time for PA, difficulty committing to large bouts of activity, balancing PA and caregiving) and increasing content variety. Messages with low ratings, including certain accountability messages, may be edited to increase the perceived actionability of messages without adding additional stress. We also recommend future work examining effects of exposure to digital PA support messages on objectively assessed PA behavior in the subsequent hours and days, which can determine how perceptions of support affect behavior on different time scales. This study focused on perceived helpfulness of messages as a potential mediator of their influence on objective PA behavior. Although perceived helpfulness is an important factor in women's willingness to use digital PA messages and respond to suggestions, as previously mentioned, women's preferences for support in the moment may be misaligned with what is helpful longer term and ultimately influences behavior (Smith et al., 2014).

In terms of message categories, additional studies that use mixed methods and daily assessment with larger samples may also support the identification of relevant predictors on the helpfulness of support of various types. Qualitative methods, including thematic analysis (Braun & Clarke, 2022), may be used to extract deeper meaning units from women's narrative explanations for why they might use (and prefer) a randomly generated message. These methods would also be useful to determine specific aspects of accountability support that are perceived as stressful and possible opportunities to develop preferred accountability support for this population. Finally, daily assessment studies with larger samples (with greater variability in levels of psychological distress) might be used to identify associations between mood, anxiety, and stress symptoms and

the perceived helpfulness of messages (and subsequent changes in PA behavior) during daily life.

Conclusions

Findings suggest that digital PA support messages are acceptable, and may be helpful, to support PA among this population with elevated health risks. In addition to experiencing elevated CVD risk, almost all participants (92.59%) indicated moderate or high perceived stress, and many participants endorsed clinically significant levels of anxiety (29.63%) and depression (40.74%), which further increase health risks and contribute to low quality of life for this population (Vancampfort et al., 2015; Puccinelli et al., 2021). It is possible that our participants may not be representative of the larger population of women in this age group with elevated CVD risks, due to self-selection or other biases. This was not advertised as a study to support mental health, however, and there is a substantial body of literature suggesting women in this group suffer disproportionately from both physical and mental health problems relative to men and women of other age groups (Sassarini, 2016; Reeves et al, 2011; Brown & Arigo, 2022). Thus, support for this at-risk group must account for the substantial societal and health barriers that preclude women's ability to increase PA during daily life, and focus on promoting both physical and mental health toward the reduction of CVD risk.

In sum, digital support messages offer a flexible and useful option to support PA that can be tailored to meet this population's unique needs. Our findings indicate that multiple categories of support, and tailored options that are designed to meet the needs of this population, may be maximally beneficial to support PA and reduce risk for CVD. Social support that minimizes stress and choice pressures, and thereby cognitive load, and

is perceived to be developed by experts for the population of interest, may be particularly useful. Our findings suggest that women in midlife often (but not always) experience high stress, busy schedules, and societal pressures to prioritize other's needs ahead of their own, and accounting for women's life experiences and individual barriers can support the development of more effective digital PA support resources.

References

- Abras, C., Maloney-Krichmar, D., & Preece, J. (2004). User-centered design. In Bainbridge, W. *Encyclopedia of Human-Computer Interaction*. Thousand Oaks: Sage Publications, 37(4), 445-456. doi: 10.1.1.94.381
- Aggio, D., Papachristou, E., Papacosta, O., Lennon, L. T., Ash, S., Whincup, P., ... & Jefferis, B. J. (2020). Trajectories of physical activity from midlife to old age and associations with subsequent cardiovascular disease and all-cause mortality. *J Epidemiol Community Health, 74*(2), 130-136. doi:10.1136/jech-2019-212706
- American Heart Association. (2019, January 31). *Cardiovascular diseases affect nearly half of American adults, statistics show*. <https://www.heart.org/en/news/2019/01/31/cardiovascular-diseases-affect-nearly-half-of-american-adults-statistics-show>
- Arigo, D., Brown, M. M., Shank, F., & Young, C. M. (2023). Ecological Momentary Assessment of Associations Between Social Interactions and Physical Activity Outcomes Among Women in Midlife With CVD Risk Conditions. *Annals of Behavioral Medicine, 57*(1), 50-60. doi: 10.1093/abm/kaac031
- Arigo, D., Brown, M.M., Pasko, K. Ainsworth, M.C., Travers, L., Gupta, A.A., Symons Downs, D., & Smyth, J.M (2020a). Rationale and design of the Women's Health And Daily Experiences project: Protocol for an ecological momentary assessment study to identify real-time predictors of midlife women's physical activity. *JMIR Research Protocols, 9*(10), e19044. doi:10.2196/19044
- Arigo, D., Lobo, A. F., Ainsworth, M. C., Baga, K., & Pasko, K. (2022a). Development and initial testing of a personalized, adaptive, and socially focused web tool to support physical activity among women in midlife: Multidisciplinary and user-centered design approach. *JMIR Formative Research, 6*(7). doi:10.2196/36280
- Arigo, D., Mogle, J. A., Brown, M. M., & Gupta, A. (2021a). A multi-study approach to refining ecological momentary assessment measures for use among midlife women with elevated risk for cardiovascular disease. *mHealth, 7*. doi:10.21037/mhealth-20-143
- Arigo, D., Mogle, J. A., Brown, M. M., Pasko, K., Travers, L., Sweeder, L., & Smyth, J. M. (2020b). Methods to assess social comparison processes within persons in daily life: A scoping review. *Frontiers in Psychology, 10*. doi:10.3389/fpsyg.2019.02909
- Arigo, D., Mogle, J.A., & Smyth, J.M. (2021b). Relations between social comparisons and physical activity among women in midlife with elevated risk for cardiovascular disease: An ecological momentary assessment study. *Journal of Behavioral Medicine, 44*(5), 579-590. doi: 10.1007/s10865-021-00229-7

- Arigo, D., Romano, K.A., Pasko, K., Travers, L., Ainsworth, M.C., Jackson, D. A., & Brown, M.M. (2022b). A scoping review of behavior change techniques used to promote physical activity among women in midlife. *Frontiers in Psychology, 13*, 855749.
- Arigo, D., Travers, L., & König, L. M. (2022c). Pain experiences among women in midlife with existing health conditions: changes across pre-COVID-19, stay-at-home orders, and initial reopening. *Psychology & Health, 1*(17). doi: 10.1080/08870446.2022.2027421
- Ayotte, B. J., Margrett, J. A., & Hicks-Patrick, J. (2010). Physical activity in middle-aged and young-old adults: The roles of self-efficacy, barriers, outcome expectancies, self-regulatory behaviors and social support. *Journal of Health Psychology, 15*(2), 173-185. doi:10.1177/1359105309342283
- Bairey Merz, C. N., Andersen, H., Sprague, E., Burns, A., Keida, M., Walsh, M. N., ... & Robinson, B. (2017). Knowledge, attitudes, and beliefs regarding cardiovascular disease in women: the Women's Heart Alliance. *Journal of the American College of Cardiology, 70*(2), 123-132. doi:10.1016/j.jacc.2017.05.024
- Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health, 13*(4), 623–649. doi:10.1080/08870449808407422
- Barone Gibbs, B., Hivert, M. F., Jerome, G. J., Kraus, W. E., Rosenkranz, S. K., Schorr, E. N., ... & American Heart Association Council on Lifestyle and Cardiometabolic Health; Council on Cardiovascular and Stroke Nursing; and Council on Clinical Cardiology. (2021). Physical activity as a critical component of first-line treatment for elevated blood pressure or cholesterol: Who, what, and how?: A scientific statement from the American Heart Association. *Hypertension, 78*(2). doi:10.1161/HYP.000000000000196
- Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., Martin, B. W., & Lancet Physical Activity Series Working Group. (2012). Correlates of physical activity: Why are some people physically active and others not?. *The Lancet, 380*, 258-271. doi:10.1016/S0140-6736(12)60735-1
- Benjamin, E. J., Virani, S. S., Callaway, C. W., Chamberlain, A. M., Chang, A. R., Cheng, S., ... & Muntner, P. (2018). Heart disease and stroke statistics—2018 update: A report from the American Heart Association. *Circulation, 137*(12), e67-e492. doi:10.1161/CIR.0000000000000558
- Beck, A. T., Epstein, N., Brown, G., & Steer, R. (1993). Beck anxiety inventory. *Journal of Consulting and Clinical Psychology*. doi:10.1037/t02025-000

- Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine*, *51*(6), 843-857. doi:10.1016/S0277-9536(00)00065-4
- Braun, V., & Clarke, V. (2022). *Thematic Analysis: A Practical Guide*. American Psychological Association.
- Brim, O. G., Ryff, C. D., & Kessler, R. C. (Eds.). (2019). *How healthy are we?: A national study of well-being at midlife*. University of Chicago Press.
- Brown, M.M., & Arigo, D. (2022). Changes in life circumstances and mental health symptoms during the COVID-19 pandemic among midlife women with elevated risk for cardiovascular disease. *Journal of Women and Aging*, *34*(5), 637-648. doi: 10.1080/08952841.2021.1967654
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). *Perceived Stress Scale*. APA PsycTests. doi:10.1037/t02889-000
- Cohen, S., & McKay, G. (2020). Social support, stress and the buffering hypothesis: A theoretical analysis. In *Handbook of Psychology and Health (Volume IV)* (pp. 253-267). Routledge.
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, *39*(3), 124-130. doi: 10.1207/s15430421tip3903_2
- Dhingra, R., & Vasan, R. S. (2012). Age As a Risk Factor. *Medical Clinics of North America*, *96*(1), 87-91. doi: 10.1016/j.mcna.2011.11.003
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*(2), 117-140. doi: 10.1177/001872675400700202
- Finkel, D., Andel, R., & Pedersen, N. L. (2018). Gender differences in longitudinal trajectories of change in physical, social, and cognitive/sedentary leisure activities. *The Journals of Gerontology: Series B*, *73*(8), 1491-1500. doi:10.1093/geronb/gbw116
- Fleury, J., & Lee, S. M. (2006). The social ecological model and physical activity in African American women. *American Journal of Community Psychology*, *37*(1), 129-140. doi: 10.1007/s10464-005-9002-7
- Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: current use, calculations, and interpretation. *Journal of Experimental Psychology: General*, *141*(1), 2.

- Guimond, S., & Chatard, A. (2014). Basic principles of social comparison: Does gender matter? In Z. Krizan & F.X. Gibbons (Eds.), *Communal Functions of Social Comparison* (pp. 205-229). Cambridge University Press.
- Haber, M. G., Cohen, J. L., Lucas, T., & Baltes, B. B. (2007). *The relationship between self-reported received and perceived social support: A meta-analytic review. American Journal of Community Psychology, 39*(1), 133-144. doi: 10.1007/s10464-007-9100-9
- Hendry, P., Solmon, M., Choate, L. H., Autrey, P., & Landry, J. B. (2010). Midlife women's negotiations of barriers to and facilitators of physical activity: implications for counselors. *Adultspan Journal, 9*(1), 50-64. doi: 10.1002/j.2161-0029.2010.tb00071.x
- Hennink, M. M., Kaiser, B. N., & Marconi, V. C. (2017). Code saturation versus meaning saturation: how many interviews are enough?. *Qualitative health research, 27*(4), 591-608.
- Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine, 292*, 114523.
- Hether, H. J., Murphy, S. T., & Valente, T. W. (2014). It's better to give than to receive: The role of social support, trust, and participation on health-related social networking sites. *Journal of Health Communication, 19*(12), 1424-1439.
- Holt-Lunstad, J., & Uchino, B. N. (2015). Social support and health. In K. Glanz, B.K. Rimer & K Viswanath (Eds.) *Health behavior: Theory, Research and Practice*. (pp. 183-204).
- Hupin, D., Roche, F., Gremeaux, V., Chatard, J. C., Oriol, M., Gaspoz, J. M., ... & Edouard, P. (2015). Even a low-dose of moderate-to-vigorous physical activity reduces mortality by 22% in adults aged ≥ 60 years: a systematic review and meta-analysis. *British Journal of Sports Medicine, 49*(19), 1262-1267. doi:10.1136/bjsports-2014-094306
- Hwang, K. O., Ottenbacher, A. J., Green, A. P., Cannon-Diehl, M. R., Richardson, O., Bernstam, E. V., & Thomas, E. J. (2010). Social support in an Internet weight loss community. *International Journal of Medical Informatics, 79*(1), 5-13. Doi:10.1016/j.ijmedinf.2009.10.003
- Hyun, K. K., Redfern, J., Patel, A., Peiris, D., Brieger, D., Sullivan, D., ... & Woodward, M. (2017). Gender inequalities in cardiovascular risk factor assessment and management in primary healthcare. *Heart, 103*(7), 492-498. doi:10.1136/heartjnl-2016-310216

- Im, E.-O., Stuifbergen, A. K., & Walker, L. (2010). A situation-specific theory of Midlife Women's Attitudes toward Physical Activity (MAPA). *Nursing Outlook*, 58(1), 52–58. doi: 10.1016/j.outlook.2009.07.001
- Im, E. O., Ko, Y., Hwang, H., Chee, W., Stuifbergen, A., Walker, L., & Brown, A. (2013). Racial/ethnic differences in midlife women's attitudes toward physical activity. *Journal of Midwifery & Women's Health*, 58(4), 440-450.
- Infurna, F. J., Gerstorf, D., & Lachman, M. E. (2020). Midlife in the 2020s: Opportunities and challenges. *American Psychologist*, 75(4). doi: 10.1037/amp0000591
- Jeong, H. G., Lim, J. S., Lee, M. S., Kim, S. H., Jung, I. K., & Joe, S. H. (2013). The association of psychosocial factors and obstetric history with depression in pregnant women: focus on the role of emotional support. *General Hospital Psychiatry*, 35(4), 354-358. doi:10.1016/j.genhosppsych.2013.02.009
- Keller, C., Ainsworth, B., Records, K., Todd, M., Belyea, M., Vega-López, S., ... & Nagle-Williams, A. (2014). A comparison of a social support physical activity intervention in weight management among post-partum Latinas. *BMC Public Health*, 14(1), 1-15. doi:10.1186/1471-2458-14-971
- Kiernan, M., Moore, S. D., Schoffman, D. E., Lee, K., King, A. C., Taylor, C. B., ... & Perri, M. G. (2012). Social support for healthy behaviors: Scale psychometrics and prediction of weight loss among women in a behavioral program. *Obesity*, 20(4), 756-764. doi:10.1038/oby.2011.293
- Lakey, B., & Cohen, S. (2000). Social support theory and measurement. In *Social Support Measurement and Intervention: A guide for health and social scientists*. Oxford University Press. doi: 10.1093/med:psych/9780195126709.003.0002
- Lindsay Smith, G., Banting, L., Eime, R., O'Sullivan, G., & Van Uffelen, J. G. (2017). The association between social support and physical activity in older adults: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 1-21. doi: 10.1186/s12966-017-0509-8
- Maher, J. P., Rhodes, R. E., Dzibur, E., Huh, J., Intille, S., & Dunton, G. F. (2017). Momentary assessment of physical activity intention-behavior coupling in adults. *Translational Behavioral Medicine*, 7(4), 709-718.
- Maas, C. J., & Hox, J. J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology*, 1(3), 86-92.
- Mayring, P. (2014). Qualitative content analysis: theoretical foundation, basic procedures and software solution. 2014. *GESIS–Leibniz Institute for the Social Sciences*.

- McArthur, D., Dumas, A., Woodend, K., Beach, S., & Stacey, D. (2014). Factors influencing adherence to regular exercise in middle-aged women: A qualitative study to inform clinical practice. *BMC Women's Health, 14*(1). doi:10.1186/1472-6874-14-49
- Melrose, K. L., Brown, G. D., & Wood, A. M. (2015). When is received social support related to perceived support and well-being? When it is needed. *Personality and Individual Differences, 77*, 97-105. doi:10.1016/j.paid.2014.12.047
- Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., ... & Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine, 46*(1), 81-95. doi: 10.1007/s12160-013-9486-6
- Mohr, D., Cuijpers, P., & Lehman, K. (2011). Supportive accountability: A model for providing human support to enhance adherence to eHealth interventions. *Journal of Medical Internet Research, 13*(1), doi:10.2196/jmir.1602
- Monteiro-Guerra, F., Rivera-Romero, O., Fernandez-Luque, L., & Caulfield, B. (2019). Personalization in real-time physical activity coaching using mobile applications: A scoping review. *IEEE journal of Biomedical and Health Informatics, 24*(6), 1738-1751. doi: 10.1109/JBHI.2019.2947243.
- Murayama, K., Usami, S., & Sakaki, M. (2022). Summary-statistics-based power analysis: A new and practical method to determine sample size for mixed-effects modeling. *Psychological Methods, 27*(6), 1014–1038.
- Murtagh, E. M., Murphy, M. H., & Boone-Heinonen, J. (2010). Walking—the first steps in cardiovascular disease prevention. *Current Opinion in Cardiology, 25*(5), 490.
- Myers, J., McAuley, P., Lavie, C. J., Despres, J. P., Arena, R., & Kokkinos, P. (2015). Physical activity and cardiorespiratory fitness as major markers of cardiovascular risk: their independent and interwoven importance to health status. *Progress in Cardiovascular Diseases, 57*(4), 306-314. doi:10.1016/j.pcad.2014.09.011
- National Heart, Lung, and Blood Institute (NHLBI). (2021, October). Know the Differences: Cardiovascular Disease, Heart Disease, Coronary Heart Disease. U.S. Department of Health and Human Services, National Institutes of Health. <https://www.nlm.nih.gov/health/topics/anxiety-disorders/index.shtml>
- Pierce, G. R., Sarason, B. R., & Sarason, I. G. (1992). General and specific support expectations and stress as predictors of perceived supportiveness: an experimental study. *Journal of Personality and Social Psychology, 63*(2), 297. doi: 10.1037/0022-3514.63.2.297

- Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., ... & Olson, R. D. (2018). The physical activity guidelines for Americans. *JAMA*, *320*(19), 2020-2028. doi:10.1001/jama.2018.14854
- Pilkington, P. D., Milne, L. C., Cairns, K. E., Lewis, J., & Whelan, T. A. (2015). Modifiable partner factors associated with perinatal depression and anxiety: a systematic review and meta-analysis. *Journal of Affective Disorders*, *178*, 165-180. doi: 10.1016/j.jad.2015.02.023
- Plass, J. L., Moreno, R., & Brünken, R. (Eds.). (2010). *Cognitive Load Theory*.
- Puccinelli, P. J., da Costa, T. S., Seffrin, A., de Lira, C. A. B., Vancini, R. L., Nikolaidis, P. T., ... & Andrade, M. S. (2021). Reduced level of physical activity during COVID-19 pandemic is associated with depression and anxiety levels: an internet-based survey. *BMC Public Health*, *21*(1). doi:10.1186/s12889-021-10470-z
- Rabbi, M., Pfammatter, A., Zhang, M., Spring, B., & Choudhury, T. (2015). Automated personalized feedback for physical activity and dietary behavior change with mobile phones: a randomized controlled trial on adults. *JMIR mHealth and uHealth*, *3*(2), e4160.
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385-401.
- Reeves, W. C., Pratt, L. A., Thompson, W., Ahluwalia, I. B., Dhingra, S. S., McKnight-Eily, L. R., Harrison, L., D'Angelo, D. V., Williams, L., Morrow, B., Gould, D., & Safran, M. A. (2011). Mental illness surveillance among adults in the United States. *Centers for Disease Control and Prevention*, *60*, 1-32.
- Rodgers, J. L., Jones, J., Bolleddu, S. I., Vanthenapalli, S., Rodgers, L. E., Shah, K., ... & Panguluri, S. K. (2019). Cardiovascular risks associated with gender and aging. *Journal of Cardiovascular Development and Disease*, *6*(2), 19. doi:10.3390/jcdd6020019
- Rote, A. E., Klos, L. A., Brondino, M. J., Harley, A. E., & Swartz, A. M. (2015). The efficacy of a walking intervention using social media to increase physical activity: A randomized trial. *Journal of Physical Activity & Health*, *12*. doi:10.1123/jpah.2014-0279
- Sassarini, J. (2016). Depression in midlife women. *Maturitas*, *94*, 149-154. doi: 10.1016/j.maturitas.2016.09.004

- Schembre, S. M., Liao, Y., Robertson, M. C., Dunton, G. F., Kerr, J., Haffey, M. E., ... & Hicklen, R. S. (2018). Just-in-time feedback in diet and physical activity interventions: systematic review and practical design framework. *Journal of Medical Internet Research*, *20*(3), e106. doi: 10.2196/jmir.8701
- Silverman, A. L., Herzog, A. A., & Silverman, D. I. (2019). Hearts and minds: stress, anxiety, and depression: unsung risk factors for cardiovascular disease. *Cardiology in Review*, *27*(4), 202-207. doi: 10.1097/CRD.0000000000000228
- Smith, K. L., Kerr, D. A., Fenner, A. A., & Straker, L. M. (2014). Adolescents just do not know what they want: a qualitative study to describe obese adolescents' experiences of text messaging to support behavior change maintenance post intervention. *Journal of Medical Internet Research*, *16*(4), e103.
- Sokol, R., & Fisher, E. (2016). Peer support for the hardly reached: a systematic review. *American Journal of Public Health*, *106*(7), e1-e8. doi: 10.2105/AJPH.2016.303180
- Strasser, B. (2013). Physical activity in obesity and metabolic syndrome. *Annals of the New York Academy of Sciences*, *1281*(1), 141-159. doi:10.1111/j.1749-6632.2012.06785.x
- Tan, S. S. L., & Goonawardene, N. (2017). Internet health information seeking and the patient-physician relationship: a systematic review. *Journal of Medical Internet Research*, *19*(1), e9.
- Thomas, A. J., Mitchell, E. S., & Woods, N. F. (2018). The challenges of midlife women: themes from the Seattle midlife women's health study. *Women's Midlife Health*, *4*(1), 1-10. doi:10.1186/s40695-018-0039-9
- Uchino, B. N., Bowen, K., Carlisle, M., & Birmingham, W. (2012). Psychological pathways linking social support to health outcomes: A visit with the "ghosts" of research past, present, and future. *Social Science & Medicine*, *74*(7), 949-957. doi:10.1016/j.socscimed.2011.11.023
- Unantenne, N., Warren, N., Canaway, R., & Manderson, L. (2013). The strength to cope: Spirituality and faith in chronic disease. *Journal of Religion and Health*, *52*, 1147-1161.
- U.S. Department of Health and Human Services. (2018). 2018 Physical activity guidelines advisory committee scientific report. Washington, D.C.

- Vancampfort, D., Stubbs, B., Sienaert, P., Wyckaert, S., De Hert, M., Rosenbaum, S., & Probst, M. (2015). What are the factors that influence physical activity participation in individuals with depression? A review of physical activity correlates from 59 studies. *Psychiatria Danubina*, 27(3), 0-224.
- Wallbank, G., Haynes, A., Tiedemann, A., Sherrington, C., & Grunseit, A. C. (2022). Designing physical activity interventions for women aged 50+: A qualitative study of participant perspectives. *BMC Public Health*, 22(1), 1-14. doi:10.1186/s12889-022-14237-y
- Wippold, G. M., Frary, S. G., Abshire, D., & Wilson, D. K. (2021). Peer-to-peer health promotion interventions among African American men: a scoping review protocol. *Systematic Reviews*, 10(1), 1-6.
- Wittmann, B. C., Bunzeck, N., Dolan, R. J., & Düzel, E. (2007). Anticipation of novelty recruits reward system and hippocampus while promoting recollection. *Neuroimage*, 38(1), 194-202. doi: 10.1016/j.neuroimage.2007.06.038
- Wittmann, B. C., Daw, N. D., Seymour, B., & Dolan, R. J. (2008). Striatal activity underlies novelty-based choice in humans. *Neuron*, 58(6), 967-973. doi:10.1016/j.neuron.2008.04.027
- Yoo, W., Namkoong, K., Choi, M., Shah, D. V., Tsang, S., Hong, Y., ... & Gustafson, D. H. (2014). Giving and receiving emotional support online: Communication competence as a moderator of psychosocial benefits for women with breast cancer. *Computers in Human Behavior*, 30, 13-22. doi:10.1016/j.chb.2013.07.024

Appendix A

Relevant Exit Interview Questions

Which messages did you select most often?

What did you like about the messages?

What didn't you like about the messages?

What did you think of each message category (i.e., encouragement, accountability, tips, no preference)?

If someone were to use these approaches to support you (in text messages, verbally, etc.), what do you think would be most helpful?

- What about these things makes them helpful?

What would be least helpful?

- What about these things makes them unhelpful?

Appendix B

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Name _____ Date _____

Age _____ Gender (Circle): **M** **F** Other _____

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

- | | | | | | |
|--|---|---|---|---|---|
| 1. In the last month, how often have you been upset because of something that happened unexpectedly? | 0 | 1 | 2 | 3 | 4 |
| 2. In the last month, how often have you felt that you were unable to control the important things in your life? | 0 | 1 | 2 | 3 | 4 |
| 3. In the last month, how often have you felt nervous and "stressed"? | 0 | 1 | 2 | 3 | 4 |
| 4. In the last month, how often have you felt confident about your ability to handle your personal problems? | 0 | 1 | 2 | 3 | 4 |
| 5. In the last month, how often have you felt that things were going your way? | 0 | 1 | 2 | 3 | 4 |
| 6. In the last month, how often have you found that you could not cope with all the things that you had to do? | 0 | 1 | 2 | 3 | 4 |
| 7. In the last month, how often have you been able to control irritations in your life? | 0 | 1 | 2 | 3 | 4 |
| 8. In the last month, how often have you felt that you were on top of things? | 0 | 1 | 2 | 3 | 4 |
| 9. In the last month, how often have you been angered because of things that were outside of your control? | 0 | 1 | 2 | 3 | 4 |
| 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? | 0 | 1 | 2 | 3 | 4 |

Appendix C

Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much	Moderately - it wasn't pleasant at times	Severely – it bothered me a lot
Numbness or tingling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling hot	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wobbliness in legs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unable to relax	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear of worst happening	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dizzy or lightheaded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heart pounding/racing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unsteady	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Terrified or afraid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nervous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling of choking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hands trembling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shaky / unsteady	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear of losing control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Difficulty in breathing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fear of dying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scared	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indigestion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Faint / lightheaded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Face flushed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hot/cold sweats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix D

Center for Epidemiologic Studies Depression Scale

Week	During the Past			
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I talked less than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. People were unfriendly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I had crying spells.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I felt that people dislike me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I could not get "going."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>