Reduction of Cognitive Load, Stress, and Depression: The Effects of a Web-Based Intervention

by

Julie F. Hinkle

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Doctoral Committee:

Professor Emeritus Reg A. Williams, Chair
Clinical Assistant Professor Emerita Judith Lynch-Sauer
Professor Laurel Northouse
Assistant Professor Kai Zheng

DEDICATION

I would like to dedicate this work to my amazing family. Thanks to my patient husband, Dave, who gave me never ending encouragement. To my sons, John and Stanley, who are the light in my life. Thanks specifically to Stanley for giving me lots of encouraging hugs when I needed them. Thanks to my sisters, Angie, Jamie, and the sister of my heart, Cyndi, for listening to me endlessly whenever I needed to talk.

In memory of my Mother, who saw me start this journey, but while not here in the flesh for the end of my journey, is with me in spirit always.

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Chapter I

Problem, Significance, and Research Questions

Patient education is an important mandate of nursing. Nurses are particularly obligated to facilitate efficient assimilation of relevant medical information to promote maximal wellness and optimal patient outcomes in vulnerable populations. One such vulnerable population is depressed patients who must endure the stigma associated with mental illness in addition to the burdens the illness places on them due to its effect on cognitive function. In order to promote effective patient education to depressed patients within a healthcare system that continues to place increasing demands on a nurse's time, new and better methods to efficiently educate those patients with cognitive difficulties are needed.

Problem

New information technologies and modalities developed over the last few decades have resulted in a shift in patient strategies for acquiring information. Patients have become more active consumers of information and have an expectation of receiving the information quickly if not instantaneously. Patients with stigmatizing illnesses are often reluctant to seek information publicly. Depressed patients also face many potential challenges to their ability to learn the information they need in order to better care for themselves. Nurses are often expected to facilitate patient learning taking into account the new information landscape. They need to reach patients that are reluctant to seek out information face to face without having nurses having formal education in teaching modalities other than traditional bedside teaching.

The methods by which patient education is achieved have changed dramatically in a now highly technological and complex information environment. Despite ample research available in

other fields, health education has not been as well studied as it pertains to non-paper based learning. Although there are commonalities with all types and contexts of learning, it is not possible to directly extrapolate studies in other fields to health education. Health education poses certain challenges that are unique as compared to other learning tasks. For example, patients often lack contextual knowledge related to their complex medical issues that is not easily accessible or understandable to a layperson. Patients also experience increased stress and anxiety related to issues of personal health and well being that may not be present with other types and contexts of learning. For example, many patients experience depression and stress that have been clearly associated with learning difficulties, particularly with attention and working memory. Based on the shortcomings of the currently available studies as they pertain to medical education there are multiple avenues of future research that are as yet unexplored.

Purpose and Research Questions

The first step in educating patients is to see if one can reduce stress and perceived cognitive load in subjects who are depressed or have depressive symptoms. Increased stress is seen in depressed individuals (Hammen, 2005). Depression and stress have both been shown to reduce learning. Perceived cognitive load is a fluid concept that is impacted both by the learning task and by the patient's internal state. Perceived cognitive load is correlated with learning. That is, the higher the amount of perceived cognitive load, the decreased effectiveness of learning and the lower the amount of perceived cognitive load, the increased effectiveness of learning. Does reduction in stress correlate with decreased perceived cognitive load in depressed subjects? If reducing stress reduces the amount of perceived cognitive load then reducing stress in depressed subjects should improve learning.

Specific Aims

The overall purpose of the study was to examine the relationship between stress, depressive symptoms, attention, cognitive load and time on task in participants with stress and depressive symptoms.

The specific aims were to:

1. Determine if a relationship exists between depressive symptoms, stress, attention, cognitive load and time on task in participants experiencing stress only and participants experiencing both stress and depression.
2. Examine the effect of the Stress Gym Intervention on depressive symptoms, stress, attention, cognitive load and time on task in participants with stress and in participants who are experiencing both stress and depressive symptoms from pre to post intervention (Williams, Hagerty, Brasington, Clem, & Williams, 2010).

Hypotheses

1. There will be a relationship between depressive symptoms, stress, attention, cognitive load, and time on task for participants experiencing stress only and for participants experiencing both stress and depression.
2. Stress Gym will improve depressive symptoms, stress, attention, and cognitive load for participants experiencing stress only and for participants experiencing both stress and depression.

Significance of the Study

There are significant gaps in the research surrounding how to address learning needs in depressed individuals. Much is known about the difficulties in reaching stigmatized groups such as those with depression, but relatively little is known about the use of the Internet in successfully meeting the learning needs of these groups. There have been successes in using the Internet to provide information to depressed patients specifically about their depression and to use the Internet for behavioral interventions (Clarke, 2002; de Graaf et al., 2009; Mackinnon, Griffiths, & Christensen, 2008). Less is known about the effectiveness of Internet interventions in depressed patients to improve learning more globally.

The effects of stress and depression on learning have been well documented, as has the relationship of cognitive load to learning. The effect of stress on cognitive load has been examined using biometric tools to try to create a way to measure the difference between the two variables (Setz et al., 2010). However, the direct effects of depression on cognitive load has not been examined. In order to understand how to potentially improve patient learning, the relationship between cognitive load, stress, and depression needs to be examined more thoroughly as well as the effectiveness of the Stress Gym to improve cognitive load, stress and depression.

Chapter II

Review of Literature

In order to approach an analysis of the viability and efficacy of an Internet intervention in facilitating the education of patients with depression, it is important to first discuss relevant learning theories that are typically utilized in such analyses. Cognitive Load Theory will be discussed and ultimately will be used in form of an analysis of constructing Internet information delivery that takes into account obstacles to learning unique to the depressed patient population. The Technology Acceptance Model will also be reviewed and is particularly relevant to an Internet-based learning strategy.

Cognitive Load Theory (CLT)

Cognitive Load Theory holds that an improvement in learning outcomes occurs when the structure of instructional activities does not overwhelm the cognitive resources of the learner (Chandler & Sweller, 1991; Sweller, 1988; Sweller, Clark, & Nguyen, 2006). Cognitive load is the amount of burden placed on working memory (i.e., the ability to hold and process information at a given point in time). Cognitive load is broken down into 3 subtypes: intrinsic, germane, and extraneous. Intrinsic cognitive load is the load placed on working memory due to the nature of the learning task itself. An example of a task that would place a high burden on intrinsic cognitive load would be a calculus equation to someone unfamiliar with calculus whereas an addition problem to a person who understands calculus would have low intrinsic load. Germane cognitive load is the load placed on working memory by the relevancy of the

learning task. An example of germane load is the load placed on a learner when being taught how to use a spreadsheet program. A spreadsheet program can be used to perform a variety of different tasks. In order to successfully perform a task in a spreadsheet, learners need to understand the mechanics of setting up the structure and calculations of a spreadsheet that are relevant to their specific task. The load placed during the acquisition of this knowledge constitutes germane load. Instructional activities geared towards the skills needed to perform these spreadsheet functions is germane load (Sweller & Chandler, 1991). The third subtype of cognitive load is extraneous load, which is the load that burdens working memory and detracts from learning. An example of extraneous load is illustrated by the contrast between describing what a square looks like verbally as part of an instruction set as opposed to showing a model or drawing of a square to serve the same purpose. The cognitive load imposed on the learner in comprehending what a square looks like from a verbal description is extraneous load (Clarke, Ayres, & Sweller, 2005). An example of increased extraneous cognitive load relevant to people with depression is the load that the negative and distracting thoughts associated with depression create when someone with depression tries to focus on a task.

Technology Acceptance Model

The Technology Acceptance Model (TAM) is an important theory used to describe the factors influencing how people accept or reject information technology systems. The broad constructs underlying this model are perceived usefulness and ease of use. Perceived usefulness has been defined as the "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Perceived ease of use has been described as "the degree to which a person believes that using a particular system would be

free of effort" (Davis ,1989, p. 320). Many variables have been described that moderate these two constructs (perceived usefulness and perceived ease of use). The moderating constructs from TAM that may have the most relevance to CLT would be the constructs describing learner characteristics. They include voluntariness, relative advantage, self efficacy, computer anxiety, and prior experience (Lee, Plass, & Homer, 2006). Voluntariness is the "the degree to which use of the innovation is perceived as being of free will" (Lee et al., 2006). Relative advantage is "the degree to which an innovation is perceived as being better than its precursor" (Lee et al., 2006) and self efficacy is "the belief that one has the capability to perform a particular behavior" (Lee et al., 2006). Computer anxiety is described as "an individual's apprehension when she/he is faced with the possibility of using computers" (Lee et al., 2006) and prior experience is described as "experience gained" or previous familiarity with the technology and/or the content of the learning task (Lee et al., 2006). Voluntariness, relative advantage, self-efficacy, and computer anxiety potentially impact cognitive load, particularly extraneous load if they are distracting or negatively impact attention. Lack of prior experience with technology can impact extraneous, germane, and cognitive load if the learner is unfamiliar with computers and their use in learning tasks. Therefore, the Technology Acceptance Model in an important component in understanding some variables that impact cognitive load (Lee et al., 2006).

The Use of the Internet in Patient Education

Many investigators have demonstrated that patients have difficulty retaining much of what they are taught during hospital stays and office visits (Sitzia & Wood, 1997; Williams & Gossett, 2001). An important component of quality nursing care is to ensure that patients and families leave with an appropriate understanding of the information they need in order to manage

their own health care. However, patients are frequently discharged from the hospital with a continuing need for information yet have been given limited resources. Typically at discharge, written materials are given to supplement or replicate verbal instructions that patients were given while hospitalized. The utility of paper-based instructions may be diminished by ease of loss, poor legibility, difficulty in searching materials for specific information, and inflexibility of a standard form to adapt to individual needs such as literacy levels or visual problems. Computer-based instructions are sometimes used in an office setting to facilitate learning but are generally unavailable to patients outside the office setting (Jones, Nyhof-Young, Friedman, & Catton, 2001; Keulers, Welters, Spauwen, & Houpt, 2007; Lewis, 2003; Wofford, Smith, & Miller, 2005). Due to the shortcomings of traditional methods of teaching, patient education is often compromised. Given time constraints often placed on the modern nurse, the need to find more effective and efficient ways to provide patient education is imperative to improving patient care and outcomes.

With the advent of low cost, high-speed, and widespread availability of Internet resources, the Internet has become an important source of information. A virtual cornucopia of information is available to many people with Internet access at virtually any time. Seventy-five percent of all adults use the Internet according to the Pew Internet and American Life Project survey (2007) and of those users, 91% and 80% used the Internet to find general information and to find health information, respectively (Horrigan et al., 2007). In 2010, Castleton et al surveyed 500 cancer patients about their Internet use and fond that 80% had access to the Internet and that 63% sought out information about their cancer and cancer treatment on the Internet (Castleton et al., 2011).

The Use of the Internet with Depressed Patients

The Internet is also a promising medium that can be used to reach those suffering from depression. A study by Gould, Munfakh, Lubell, Kleinmand and Parker (2002) suggested that young people with depressive symptoms may already preferentially seek information about health via the Internet over those without depressive symptoms who are seeking health information. This may be attributed to the perceived stigma associated with depression (Gould, Munfakh, Lubell, Kleinman, & Parker, 2002). Individuals who wish to remain anonymous or do not wish to participate in traditional care may also preferentially choose Internet interventions over traditional interventions (Bai, Lin, Chen, & Liu, 2001). In a survey conducted in 2005 patients with mental disorders including depression were more likely than those without mental disorders to use the Internet than other sources of information such as a physician or other healthcare provider (Pohjanoksa-mäntylä et al., 2011). The Internet can also be used to reach those with depression who have traditional access issues such as living in remote areas without local providers, lack of transportation, or lack of financial resources (Ybarra, Alexander, & Mitchell, 2005). Nursing is poised to improve patient education and outcomes if appropriate mechanisms of education can be developed utilizing modern information technologies.

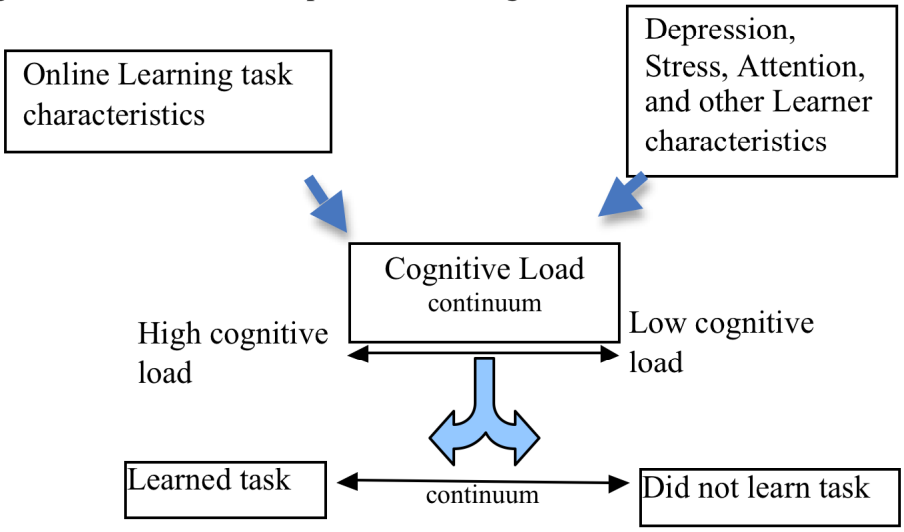
Theoretical Model

Since Cognitive Load Theory and Technology Acceptance Model have been applied to assess failures of information dissemination in other industries, it is reasonable to apply a similar paradigm to evaluate Internet patient education intended for depressed patients. Based on the assumption that increasing cognitive load, particularly extraneous load, decreases learning

outcomes as supported by research in the field of CLT, the proposed model is presented in Figure 1.

Figure 1

The interaction between online learning task characteristics and learner characteristics on cognitive load and their impact on learning:



Online learning task characteristics interact with an individual learner's characteristics producing a task and situation specific cognitive load. These Online Learning task characteristics encompass the structure and delivery of the learning task itself such as visual design, temporal design properties, and multimedia properties of the task and influence germane and extraneous load. For example, a visual design that is cluttered and difficult to read may increase extraneous load of a task. Learner characteristics include the presence or absence of depression, degree of prior knowledge, and level of technology acceptance. Voluntariness, relative advantage, self-efficacy, computer anxiety, and prior experience are all moderators of

technology acceptance. For example, low technology acceptance or the presence of depression may decrease the amount of cognitive resources available for the learning task, thus causing a relative increase in cognitive load. The amount of cognitive load generated varies on a continuum from high to low based on those characteristics. The amount of learning that occurs also varies on a continuum based on the amount of cognitive load generated. Online learning task characteristics are composed of intrinsic load, germane load, and extraneous load.

Effect of Depression and Stress on Learning

Depression and stress have both been shown to consistently have a negative impact on learning, particularly attention, executive function, and working memory. Attention can be described as the ability to focus on the task at hand while being able to ignore extraneous stimuli. Executive function can be described as the capacity of the brain to plan, reason, attend, and make decisions effectively. Working memory is the ability to store and process information in the brain for short amounts of time (Baddeley, 1996). In a classic study by Cohen et al, decreasing attention and poor performance of working memory tasks were shown to be correlated to worsening levels of depression (Cohen, Weingartner, Smallberg, Pickar, & Murphy, 1982). Stress (as measured by biological markers such as cortisol) has been shown to impair multiple cognitive tasks such as episodic memory and working memory both in young and older subjects (Belanoff, Kalehzan, Sund, Fleming Ficek, & Schatzberg, 2001). Current studies described below support these findings that depression and stress impair learning, particularly attention, executive function, and working memory.

Christopher and MacDonald (2005) examined the impact of depression on specific components of working memory. They state that while depression has been consistently shown

to negatively affect working memory, they wanted to examine the relative impact of the three components of working memory (Christopher & MacDonald, 2005). These components are the phonological loop (the part of working memory responsible for processing auditory information), the visuospatial sketchpad (the part of working memory responsible for processing visual and spatial information), and the central executive (the part of working memory responsible for integrating the information form the phonological loop and the visuospatial sketchpad) (Baddeley, 1996). They found that depression significantly affected all three components (at least $p < 0.02$ on all measures of working memory), in other words, people with depression have decreased working memory capacity.

Joorman and Gotlib (2008) also examined the effect of depression and working memory. They hypothesized that difficulties inhibiting irrelevant negative information in depression negatively affects working memory. They studied 63 individual adults aged 18-60 with (n=23) and without depression (n=40). The individuals without depression were divided into 2 control groups. One control group was given a sad mood induction intervention consisting of listening to sad music and being asked to imagine times in their life that make them unhappy while the other control group were not given the sad mood induction intervention. The experiment consisted of a series of trials. Each trial had 3 displays, a learning display, cue display, and probe display. The learning display consisted of 2 word lists with 3 words in each with a target word in blue and the other words in red. The words were also different in whether they were positive or negative words. The second display was a cue display in the color of the target word. The probe display was a word in black presented within the cue display field. The subjects were then asked if the black word was from the initial word list. They found that depressed patients experienced significantly increased interference from negative words, i.e. when the word

displayed in the probe had a negative valence, depressed subjects had significantly slower response times ($p<0.01$) as compared to both control groups (Joormann & Gotlib, 2008).

Stawski, Sliwinski and Smyth (2006) investigated the effects of stress on interference in older adults. They state that stress has been shown to have both a physiological impact and a negative impact on learning and memory in both the old and young adults. They also found that subjective stress as compared to physiologic stress, also has a negative impact on learning and memory in young adults, but has not been examined in older adults. They hypothesize that subjective stress negatively impacts learning in older adults because stress is a burden on attention. They also hypothesized that cognitive interference or the inability to suppress intrusive irrelevant information negatively affects cognition by burdening attentional resources as well. Participants were recruited from the community and senior residence centers in a major metropolitan area aged 66-95 (m=80.01years). They completed measurements of subjective stress, cognitive interference, depression, episodic memory, working memory, and processing speed. The researchers found that their structural model of stress and cognitive interference as negative predictors of working memory, episodic memory, and processing speed was an excellent fit to the data. (CFI=0.997, TLI=0.993 and RMSEA=0.013). Age, cognitive interference, and stress all moderately affected working memory ($p<0.10$) (Stawski, Sliwinski, & Smyth, 2006).

Sliwinski, Smyth, Hofer, and Stawski (2006) also examined the effects of subjective stress on cognition. They examined the effect of impact of changing daily subjective stress on an individual's cognitive ability. The study examined 108 older adults (mean age 80.63) recruited from the community or senior living center in a major metropolitan area and 68 undergraduate psychology students (mean age 20.21) from the local university. The researchers measured daily

subjective stress and examined the effect of intra-individual stress on their cognitive performance. They found that intra-individual variability in daily stress was predictive of intra-individual variability in attention burdening cognitive tasks ($p<0.01$) (Sliwinski, Smyth, Hofer, & Stawski, 2006).

A study by Gohier et al (2009) supported earlier findings that working memory is impaired in depression. They hypothesized that depression leads to cognitive interference and negatively affects working memory regardless of the emotional valence of the stimuli given in the learning task. In this study, 40 patients were assessed for their level of cognitive interference and then given a variety of tasks to perform measuring cognitive functions such as working memory, decision-making, episodic memory, and more. They demonstrate that depressed individuals have difficulties in inhibiting and deleting irrelevant information in working memory, thus slowing down cognitive processing and limiting working memory ($p<0.001$)(Gohier et al., 2009).

In a recent study by Halvorsen et al (2012), adults with current depression, history of depression, and those who never were depressed were examined for differences in cognitive functions, including working memory and attention. 168 participants were divided into these 3 groups based on scores on the Beck Depression Index and trained interviewers. Participants who were currently depressed or had a history of depression scored significantly lower as compared to those who never were depressed on measures of working memory and attention ($p<0.045$) (Halvorsen et al., 2012).

Effect of Perceived Cognitive Load on Learning

Clarke, Ayres and Sweller (2005) described a scaffolding framework based on CLT for online learning tasks. They studied 24 ninth-grade students learning how to use spreadsheets in mathematics. They hypothesized that students with low prior knowledge of spreadsheets would learn more effectively if they were given information necessary for the learning task in a sequential fashion while students with high prior knowledge of spreadsheets would learn more effectively from an integrated approach. They found that students with low prior knowledge did show significant improvement in mathematics test scores when given the information in a sequential fashion. ($p=0.04$). There was significantly lower cognitive load for the high prior knowledge groups when given the information in an integrated/concurrent fashion ($p=0.04$); however, no differences were found in math scores for the high prior knowledge group. No significant differences were found for any groups in spreadsheet ability. No differences were found in cognitive load for the low prior knowledge group when given the information sequentially or concurrently (Clarke et al., 2005).

Seufert and Brünken (2006) examined the effects of providing instructional aids in online learning tasks to reduce cognitive load. They examined 88 college students. They were provided 2 different instructional aids, superficial level help (inter-textual hyperlinks), or deep level help (verbal descriptions displayed below paired representations). They found that deep level help significantly reduced cognitive load ($p<0.005$) (Seufert & Brünken, 2006).

Gerjets and Scheiter (2003) looked at the role of the teacher's goals for the learning task and how that impacts cognitive load. In the first study, they looked at the effect of teacher goals by providing teacher driven structure-emphasizing goals versus. surface-emphasizing goals. The

task consisted of 16 worked out examples of 4 basic math problem types. In the surface-emphasizing goal group, the students were given a cover story that was the same for all 4-problem types and in the structure-emphasizing group, the subjects were given a cover story for each of the 4 problem types. The researchers did not report any statistics for this study but stated that the surface-emphasizing group took less time than the structure-emphasizing group. They stated that this indicated the faster group had lower cognitive load (Gerjets & Scheiter, 2003).

Gerjets and Scheiter (2003) examined the impact of learner goals on cognitive load. They designed a study that all learners were given three word problems to solve. The learner could choose to browse a hypertext environment that contained the information needed to solve the word problems and could also choose to browse irrelevant, but theoretically interesting topics related to the cover stories of the word problems. Learners were divided into two categories, one group given easy word problems and the other given difficult word problems. They were further divided into two groups, one given a second task and the others were not. The group given the second task was informed of this when they started the first task. The authors hypothesized that the information about the second task would increase cognitive load for the group who were given the second task. Again, the authors do not provide statistics but stated that they did find that the group given the second task had impaired problem solving on the first task, theoretically from the increased cognitive load due to the distraction of the impending second task. However, this was only true for easy word problems, not the difficult word problems. The authors hypothesized that this was due to difficulty-related concentration investment by the learner for the more difficult word problems (Gerjets & Scheiter, 2003).

Effect of Online Learning Task Designed Specifically for Depressed Learners

The Stress Gym research (Williams et al, 2010) was a feasibility and usability study of a tool for Navy members. The Stress Gym is an Internet-based intervention designed to help participants experiencing stress and depressive symptoms manage their symptoms. The Stress Gym is based on previous face-to-face behavioral interventions performed by the authors (2007, 2004). The Stress Gym was modified from the face-to-face intervention into a web-enhanced behavioral self-management program (WEB-SM). The Stress Gym consists of nine modules focused on management of stress and depression. They were titled Stress and Emotionality, Reacting to Stress, Sleep, Problem Solving, Changing your Thinking, Belonging, Relationships, Teamwork, and Balance. These modules were designed to help participants become more aware of and how to manage their stress (Williams et al., 2010; Williams et al., 2004).

Participants in the Stress Gym were introduced to the intervention on the home page of the website. They were given the opportunity at this point to complete screening questions in order to provide a more tailored intervention. Participants were informed about which modules may be of most interest to them based on their answers to the screening questions. Participants could then choose to complete the recommended modules in the order suggested or they could complete any or all modules in a chosen order. Navigation to each module was through a simple navigation bar on the home page. Navigation within each module consisted of clicking or scrolling through each web page. Within each module, interactive elements and or animations were included. A record or the participants' responses were recorded and were accessible to the user each time they accessed the program. Participants were asked to fill out an evaluation of the Stress Gym after each module completed and after completing all modules in the Stress Gym.

The evaluation questions were regarding the feasibility and usability of the Stress Gym. The Stress Gym was found to be both a feasible and usable intervention with at least 77% or greater agreeing/strongly agreeing on measures of feasibility and usability. Participants were also asked to rate their perceived stress before and after completing the Stress Gym. Significant reductions in perceived stress were found for both officers ($p = .004$) and enlisted members ($p = .0001$).

Summary

Although the mandate for nurses to educate those most vulnerable such as those with depression has not changed, the methods by which patient education is achieved have changed dramatically in a now highly technological and complex information environment. CLT and the TAM provide a framework on which to analyze the modern challenges of education and the challenge to educate those with depression. While it is known that stress and depression negatively impact working memory, thus causing a relative increase in cognitive load, it is not clear if the reduction of stress reduces cognitive load thereby improving learning in these learners. The first step to understanding if the Stress Gym can improve learning is to examine if Stress Gym can improve stress, depression, and cognitive load. This study will examine the relationship between depressive symptoms, stress, attention, and cognitive load as well as the impact of Stress Gym on these variables.

Chapter III

Methods

Design

A pre-post test correlational comparative design was used to:

1. Determine if a relationship exists between depressive symptoms, stress, attention, cognitive load and time on task in participants experiencing stress only and participants experiencing both stress and depression.
2. Examine the effect of the Stress Gym Intervention on depressive symptoms, stress, attention, cognitive load and time on task in participants with stress and in participants who are experiencing both stress and depressive symptoms from pre to post intervention (Williams et al., 2010).

Sample

Participants were recruited from the students, faculty, and staff of Maryville University, a mid-size mid-western University. There were 195 participants who were screened and gave consent to participate in Stress Gym and answered pre-intervention questions. There were 110 participants who logged into to the Stress Gym Intervention after answering the pre-intervention questions and 95 participants completed all phases of the study. Independent t-tests were performed comparing the means of the PHQ-9 ($p=0.198$), PSS ($p=0.070$), AFI ($p=0.809$), and

PCL (p=0.095) pre intervention measures of participants who went to Stress Gym intervention versus those who did not. No significant differences were found. Independent t-test were also performed comparing the means of the PHQ-9 (p=0.481), PSS (p=0.840), AFI (p=0.589), and PCL (p=0.195) pre intervention measures of those who completed the Stress Gym Intervention versus those who did not. No significant differences were found. All participants were adults (18 years or older) experiencing stress without depressive symptoms (n=49) or stress with depressive symptoms (PHQ-9 ≥5) (n=46). Participants were able to speak and read English, had Internet and email access, and were able to navigate a simple website on a computer. Out of the 76 participants who reported demographic data, over 85% of subjects were female, 83% were never married, 79% stated they were employed, 84% stated they were students, and >96% of participants had some college education or higher with 46% reporting having a college degree or higher.

Table 1

Demographic Characteristics of the Sample Completing Stress Gym

Demographics	Total	Demographics	Total
Age		level of education	
18-24 years	45 (59.2%)	grades 1-8	1 (1.3%)
25-31 years	6 (7.9%)	grade 12 or GED	2 (2.6%)
31-40 years	9 (11.8%)	some college	38 (50.0%)
51-60 years	9 (11.8%)	college graduate	18 (23.7%)
61-70 years	7 (9.2%)	graduate school	17 (22.4%)
total	76	Total	76
gender		marital status	
male	10 (13.3%)	married	23 (30.7%)
female	64 (85.3%)	divorced	1 (1.3%)
declined to designate	1 (1.3%)	separated	2 (2.7%)
Total	75	never married	36 (48.0%)
		unmarried couple	13 (17.3%)
		Total	75
Race			
Native American	1 (1.3%)		
Hawai'ian or Pacific Islander	1 (1.3%)		
Asian or Asian American	2 (2.6%)		
Black or African American	5 (6.6%)		
Hispanic or Latino	2 (2.6%)		
Non-Hispanic white	61 (80.3%)		
Other	4 (5.3%)		
Total	76		

The following formula was used to determine the power of the Stress Gym: $\frac{\mu}{)n-1}$. It was determined that the effect size of the intervention (Stress Gym) is 0.55(Williams et al., 2010). An online sample size calculator (www.danilesoper.com/statcalc) was then used to determine sample size. In order to have adequate power for a two way t-test, it was determined that 53 participants per group and a sample size of 106 participants at minimum are needed to achieve adequate power. In order to have adequate power for a one way t-test, it was determined that 42 participants per group and a sample size of 84 participants at minimum are needed to achieve adequate power. Group and sample sizes were calculated for an alpha level of 0.05, effect size of 0.55, and a desired statistical power of 0.8. This study consisted of 95 total

participants of whom 49 participants had stress and depressive symptoms and 46 participants who had stress only.

Instruments

Table 2
Instruments and when assessed

	PHQ-9	PSS	AFI	PCL	Time	Demographics
Baseline	✔	✔	✔	✔		
Post-Stress Gym	✔	✔	✔	Overall measure and for each individual module	Overall time during Stress Gym Self report for each module after	✔

Personal Health Questions 9 (PHQ-9)

The PHQ-9 is an instrument developed by Kroenke, Spitzer, and Williams (2001) to measure the severity of depression. This instrument uses the 9 DSM-IV criteria for depression and scores each criterion/symptom on a scale of 0-3 (0=none at all and 3=nearly every day). This instrument is easy to administer and to score. This instrument has excellent reliability (Cronbach's $\alpha = 0.89$ and 0.86 in two separate studies) and test-retest reliability if given within two days (Cronbach's $\alpha = 0.84$). Construct validity was assessed by comparison to previously validated measures of depression (20 item Short Form General Health survey, self reported sick days and clinic visits, and symptom related difficulty). Criterion validity was assessed with independently structured mental health professional interviews from a sample of 550 patients. This tool was found to have a sensitivity and specificity of 88% in diagnosing major depression and the ability to distinguish between mild, moderate, moderately severe, and severe depression

(Cohen, Kamarck, & Mermelstein, 1983). PHQ-9 scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depressive symptoms, respectively (Kroenke, Spitzer, and Williams, 2001) (Appendix A).

Attentional Function Index (AFI)

The AFI is an instrument used to measure "perceived" effectiveness in common activities requiring attention and working memory, particularly the ability to formulate plans, carry out tasks, and function effectively in daily life (Cimprich, Visovatti, & Ronis, 2010). This 13-item instrument is easy to administer and score. It is also not significantly affected by years of education or presence of co-morbid conditions, making this an effective tool to measure attention in depressed individuals. The AFI has excellent reliability (Cronbach's $\alpha = 0.92$ for entire instrument and 0.80-0.92 for the 3 subscales; effective attention, attentional lapses, and interpersonal effectiveness). Construct validity was assessed using exploratory principle component factor analysis with varimax rotation (Cimprich et al., 2010) (Appendix A).

Perceived Stress Scale (PSS)

Perceived Stress Scale (PSS) is an instrument used to measure the "degree to which situations in one's life are appraised as stressful" (Cohen et al., 1983). This instrument is a 14-item scale containing 7 negatively rated statements and 7 positively rated statements. The score is reversed for the 7 positively rated items, and the 14 items are then added for a total score. This instrument is easy to administer and has good internal reliability (Coefficient alpha of 0.84, 0.85 and 0.86 in 3 different samples). It also has a test retest reliability after 2 days ($r = 0.85$) and a reduced correlation after 6 weeks ($r = 0.55$) (Cohen et al., 1983). The PSS is not intended as a

diagnostic tool to measure stress, but is a tool to enable comparisons between individuals in a sample and in individuals over time. As such there are no cut-off measures for low, medium, and high stress. Any score above 0 can be considered a self-report of stress (Appendix A).

Perceived Cognitive Load (PCL)

PCL is a subjective measure of cognitive load. Participants are asked to rate the perceived difficulty of a given task on a scale from 1-7, with 1 being "extremely easy and 7 being "extremely difficult." This measure of perceived cognitive load is easy to administer, is reliable and correlates highly with objective measures of cognitive load such as pulse, cortisol levels, and eye movements (.80.99) (Morray, 1982; O'Donnel & Eggemeir,1986). Subjective measures of task difficulty is considered a more reliable estimate of cognitive load as compared to secondary task measures due to the interference that the second task has on cognitive load itself (Marcus, Cooper, and Sweller, 1996). This measure has been found to be a reliable and stable measure when used as a measure at multiple intervals during an intervention if the wording of the scale is the same each time and the learners are not required to expend physical energy in answering the measure (Marcus et al, 1996). PCL has also been found to be highly sensitive to relatively small changes in cognitive load (Pass, 1992) (Appendix A).

Demographics and Self-Tracking Form

The background and demographics questionnaire was an inquiry of age, sex, race/ethnicity, marital status, employment status, and education completed. The self-tracking form was a way for participants to record which modules they have completed and how much

time was spent on each module. There was also a designated section for participants to rate their perceived cognitive load after completing each module (Appendix A).

Procedures

Participants were recruited from the students, faculty, and staff from a midsized mid-western university via paper flyers and the electronic bulletin board postings. All materials contained information about the study, general information about stress and depression, a website address to the study-screening page, and information about the $5 campus coffee shop gift card incentive. Flyers were posted in bathrooms via the "Toilet Papers" (Appendix B) and as separate paper flyers with tear off study website address and password information (Appendix C). The "Toilet Papers" are flyers posted in restrooms used as part of the outreach program from the University Health and Wellness center. These flyers are typically used to provide information on a wide variety of health issues including stress and depression. Electronic bulletin boards are large display monitors located throughout the campus near major entryways and in high traffic areas. These electronic boards have replaced traditional corkboard bulletin boards and are used to advertise a wide variety of university related information to students, faculty, and staff.

Participants who wished to be screened for study eligibility were provided a website address to the study stress and depression screening tools on *Qualtrics*, a research survey design and management website. The front page of this website (Appendix D) contained:

1. Information about the study.

2. Investigator contact information (phone number and email address) to answer any questions from potential participants.

3. General information about stress and depression.

4. Information about anonymity of screening data.

5. Statements that participants may stop participation at any time.

6. Detailed information about university mental health resources, including all names and contact information. A 24-hour emergency contact information link was included on all study WebPages. The link shows emergency contact numbers and is a link to Maryville University's webpage containing all university mental health resource information and appropriate local and national mental health resource information (Appendix E).

7. Link to screening tools.

Screening Tools

The link to the screening tools took participants to a page that contained screening tools for stress (PSS) and depressive symptoms (PHQ-9). Participants were able to answer each question electronically by clicking a radio button located next to each potential answer. At the bottom of the page, there was a link to submit answers. Participants who click on the submit button were routed to a page tailored to the results of their survey question answers, and will also be given information about what they should do if they are thinking of harming themselves or are suicidal. The information included the 24-hour emergency university contact information, local emergency and crisis numbers, and contact information for the national crisis hotline.

All participants who emailed the investigator received an auto-generated email including this information, and all users who called the investigator heard a voice mail message containing

the same information. Participants who spoke to the investigator were given this information verbally. Appropriate emergency services would have been contacted by the investigator (on campus 24 hour hotline/off campus 911). No participants contacted the investigator for emergency services.

All eligible participants received information on confidentiality of consent information as well as confidentiality and anonymity of data collected during study. At the bottom of all tailored pages, a radio button stating "click to go to consent form" and "no thanks" was present. The "click to go to consent form" button took participants to the study consent form and the "no thanks" button linked users to the university mental health resources page. Again, all study web pages had a link containing the 24-hour emergency contact information.

Participants who scored <5 on the PHQ-9 and 0 on PSS did not meet criteria for inclusion (experiencing stress or depressive symptoms) and were given a message stating the results of their survey. They were thanked for their time and informed that they did not meet study eligibility. They were given the website address to the university mental health website for any mental health concerns.

Participants who scored ≥5 and on the PHQ-9 and/or >0 on PSS were given a message stating the results of their survey, thanking them for their time and stating that they meet study eligibility, were given a link to the consent form, and given a link to decline participation. The link to decline participation took participants to the university mental health website for current or future mental health concerns.

Consent

Online consent form was designed using University of Michigan Health Sciences Behavioral Sciences IRB consent form template and Maryville University template (Appendix F). The consent form contained:

1. Introduction, purpose, and content of the study.
2. Benefits and risks of participation in the study
3. Investigator, Maryville, and Michigan IRB contact information and
4. IRB approval information including confidentiality of consent and anonymity of data collected.
5. Information stating that participants can refuse to continue to participate at any time.
6. Link "consent" and link "no thanks." The "no thanks" button will link participants back to university mental health resources webpage, and "consent" button will link participants to main study webpage.

Study Procedure

Participants went to the study after clicking the "consent" button. Participants remained anonymous. Information about *Qualtrics* was provided to the participants, including how user information is never connected to data collected. Each page in the study contained information about how to proceed to the next step in the study. Each step could only be completed in sequential order. They are as follows:

Step 1: Answer pretest questions. This step consisted of 4 different tools, the PHQ-9 (9 questions), the AFI (13 questions), the PSS (14 questions), and the PCL (1 question). PCL was

measured pre-Stress Gym to assess the impact on PCL by participant's depressive symptoms and stress (Appendix A)

Step 2: Print off Self Tracking form (Appendix G)

Step 3: Go to Stress Gym. This was a link at the end of the survey and will open the Stress Gym in a new window. (Appendix H).

Step 4: Return to answer posttest questions. These are same as pretest questions and demographic questions (Appendix A).

Step 5: Get gift card. Participants were able to print a code when they complete post-test questions. They were able to redeem this code in the School of Nursing Department grants office in order to receive a $5 gift card.

The study website also contained investigator contact information, reiteration that participants may refuse to participate at any time, and a 24 hour emergency contact link. The link showed emergency contact numbers and had a link to Maryville University's webpage containing all university mental health resource information and appropriate local and national mental health resource information (Appendix E).

Data Analysis

The following statistical analyses were used to analyze the data gathered to examine the specific aims and hypotheses of this study:

Determine if a relationship exists between depressive symptoms, stress, attention, cognitive load and time on task in participants experiencing stress only and participants experiencing both stress and depression. Correlations were used to examine relationships between variables.

Examine the effect of the Stress Gym Intervention on depressive symptoms, stress, attention, cognitive load and time on task in participants with stress and in participants who are experiencing both stress and depressive symptoms from pre to post intervention (Williams et al., 2010). Paired t-tests and Chi-square were used to examine means before and after the intervention to compare groups.

Ho1. There will be a relationship between depressive symptoms, stress, attention, cognitive load, and time on task for participants experiencing stress only and for participants experiencing both stress and depression. Correlations were used to examine relationships between variables.

Ho2. Stress Gym will improve depressive symptoms, stress, attention, and cognitive load for participants experiencing stress only and for participants experiencing both stress and depression. Paired t-tests and Chi-square were used to examine means before and after the intervention to compare groups.

Human Subjects

Data were collected via Internet-based self-administered measures. Data were obtained for research purposes only, and only from participants who agreed to the online consent form. All information and responses were anonymous and data obtained were secured on the investigator's encrypted and password protected laptop, which was secured in the investigator's locked office.

Potential risks to participants were considered minimal. Participants, however, with stress and depressive symptoms may have been at risk due to the nature of stress and depressive symptoms. A link to information about University community and national mental health resources as describe earlier, was placed at the beginning and end of the pretest measures, with

each module of the intervention, and again before and after post-test measures. If participants had called this investigator with mental health concerns, appropriate referrals to University mental health resources would have been made. No participants called this investigator with mental health concerns. University resources included 24-hour emergency psychiatric evaluation services in conjunction with a local hospital.

Chapter IV

Results

The overall purpose of this study was to examine the relationships between depressive symptoms, stress, attention, cognitive load and learning. Hypothesis 1: There will be a relationship between depressive symptoms, stress, attention, cognitive load, and time on task. Table 3 represents correlations found between depressive symptoms (PHQ-9), stress (PSS), attention (AFI), cognitive load (PCL), and Stress Gym time for all participants. Baseline PHQ-9, PSS, and AFI are all significantly correlated. These baseline measures are also significantly correlated post-Stress Gym (except baseline PHQ-9 with post AFI). Stress Gym time is correlated to post Stress Gym measures (except for post PCL). Hypothesis 1 was supported; there were significant relationships among depressive symptoms, stress, attention, and cognitive load.

Table 3

Correlations between PHQ-9, PSS, AFI, PCL, and Stress Gym time

(Pearson Correlation Coefficients Prob > |r| under H0: Rho=0)

	PHQ-9	PSS	AFI	PCL
PHQ-9	1			
PSS	.776*	1		
AFI	-.442*	-.414*	1	
PCL	.299*	.378*	-.231*	1
Stress gym time	.336*	.083	.141	-.206

*Correlation is significant at 0.01 level (2-tailed).

A specific aim of this study was to examine the effect of the Stress Gym Intervention on depressive symptoms, stress, attention, cognitive load and learning in participants with stress (without depressive symptoms) as compared to participants who are experiencing stress and depressive symptoms. Hypothesis 2: Stress Gym will improve depressive symptoms, stress, attention, and cognitive load for participants experiencing stress only and for participants experiencing both stress and depression. Table 4 was constructed using paired t-tests on the major variables pre and post Stress Gym. Chi square analysis was used for PCL Summary. Mean and standard deviation were compared between pre and posttest groups for each individual variable. There were significant differences found in PHQ-9, PSS, and AFI scores on average for all participants from pre to post Stress Gym ($p< 0.001$). A statistically significant decrease in depressive symptoms and stress was observed. There was also a statistically significant increase in attention. No significant differences were seen in cognitive load after Stress Gym on average for all participants.

Table 4
Paired t-test and Chi-square comparisons of all participants pre and post Stress Gym

Measure	Pre	Post	Difference	P-value
PHQ-9 Summary				
Mean ± SD	6.6 ± 6.0	4.8 ± 5.4	1.8 ± 4.6	**<0.001**
Min	0.0	0.0	-5.0	
Max	24.0	24.0	21.0	
PSS Summary				
Mean ± SD	22.7 ± 10.9	14.3 ± 13.3	8.4 ± 13.2	**<0.001**
Min	4.0	0.0	-9.0	
Max	51.0	38.0	51.0	
AFI Summary				
Mean ± SD	87.1 ± 15.5	58.5 ± 42.5	28.6 ± 41.3	**<0.001**
Min	20.0	0.0	-29.0	
Max	121.0	106.0	109.0	
PCL Summary				
Mean ± SD	2.0 ± 0.8	1.9 ± 0.6	0.0 ± 0.8	0.548
Min	1.0	1.0	-3.0	
Max	4.0	4.0	3.0	

PHQ-9, PSS, AFI compared using paired T-test.

PCL compared using chi-square

Participants were then divided into 2 groups for analysis based on depressive symptoms. Participants with a PHQ-9 score >4 were placed into the "yes" depressive symptoms group (depressive symptoms and stress) and participants with a PHQ-9 score ≤ 4 were places into the "no" depressive symptoms group (stress only). As expected those with depressive symptoms had significantly higher baseline depression scores based on paired t-tests. Those with depressive symptoms had significantly higher stress and cognitive load and significantly lower baseline attention than those with stress only (Table 5).

Table 5

Paired t-test and Chi Square comparisons of baseline measures between depressive symptom (Yes) and stress only (No) groups

	Total	Baseline depressive symptoms		
Baseline Outcomes		Yes	No	
	n=95	n=49	n=46	P-value
PHQ-9 baseline				
Mean ± SD	6.6 ± 6.0	11.1 ± 5.2	1.9 ± 1.4	**< 0.001**
Min	0.0	5.0	0.0	
Max	24.0	24.0	4.0	
PSS baseline				
Mean ± SD	22.7 ± 10.9	29.7 ± 9.0	15.2 ± 7.2	**< 0.001**
Min	4.0	8.0	4.0	
Max	51.0	51.0	33.0	
AFI baseline				
Mean ± SD	87.1 ± 15.5	81.6 ± 14.9	93.0 ± 14.1	**< 0.001**
Min	20.0	49.0	20.0	
Max	121.0	108.0	121.0	
PCL baseline				
very low mental effort	27 (28.4%)	9 (18.4%)	18 (39.1%)	**< 0.001**
low mental effort	47 (49.5%)	21 (42.9%)	26 (56.5%)	
high mental effort	19 (20.0%)	18 (36.7%)	1 (2.2%)	
very high mental effort	2 (2.1%)	1 (2.0%)	1 (2.2%)	

PHQ-9, PSS, AFI compared using paired t-test.
PCL compared using chi-square

Participants in both the stress only and stress with depressive symptoms had significant differences for pre and post measures (PHQ-9, PSS, AFI) after participation in Stress Gym. Both groups had significant decreases in depressive symptoms and stress. Both groups also had significant increases in attention on average (Table 6). No significant differences were found for PCL in either group.

Table 6
Paired t-test Comparison of participants divided into depressive symptom group (Yes) and stress only group (No) pre and post Stress Gym

Depressive symptoms (PHQ-9 >4)	Measure	Baseline	Post Stress Gym	Difference	T-Value	P-value
Yes	PHQ-9 Summary					
	Mean ± std	11.1 ± 5.2	8.0 ± 5.8	3.1 ± 6.0	3.57	**<0.001**
	Min	5.0	0.0	-5.0		
	Max	24.0	24.0	21.0		
No	PHQ-9 Summary					
	Mean ± std	1.9 ± 1.4	1.4 ± 1.5	0.5 ± 1.5	2.40	**0.02**
	Min	0.0	0.0	-3.0		
	Max	4.0	7.0	4.0		
Yes	PSS Summary					
	Mean ± std	29.7 ± 9.0	20.4 ± 14.2	9.3 ± 16.2	4.0	**<0.001**
	Min	8.0	0.0	-9.0		
	Max	51.0	38.0	51.0		
No	PSS Summary					
	Mean ± std	15.2 ± 7.2	7.7 ± 8.3	7.5 ± 9.1	5.57	**<0.001**
	Min	4.0	0.0	-4.0		
	Max	33.0	28.0	33.0		
Yes	AFI Summary					
	Mean ± std	81.6 ± 14.9	55.4 ± 39.0	26.3 ± 39.2	4.69	**<0.001**
	Min	49.0	0.0	-29.0		
	Max	108.0	106.0	104.0		
No	AFI Summary					
	Mean ± std	93.0 ± 14.1	61.9 ± 46.2	31.1 ± 43.7	4.82	**<0.001**
	Min	20.0	0.0	-9.0		
	Max	121.0	104.0	109.0		
Yes	PCL Summary					
	Mean ± std	2.2 ± 0.8	2.1 ± 0.6	0.0 ± 0.9	0.47	0.641
	Min	1.0	1.0	-3.0		
	Max	4.0	4.0	2.0		
No	PCL Summary					
	Mean ± std	1.7 ± 0.6	1.6 ± 0.6	0.0 ± 0.8	0.37	0.710
	Min	1.0	1.0	-1.0		
	Max	4.0	3.0	3.0		

Tables 5 and 6 show that post Stress Gym there was a significant decrease in depressive symptoms and stress for participants with and without depressive symptoms. Furthermore, both groups had increased in attention. However no significant difference was found for cognitive load after Stress Gym for either group. This measure of overall cognitive load post Stress Gym is an average score based on the sums of cognitive load scores given for each individual Stress Gym module participants could choose to explore. Further analysis was performed on each individual Stress Gym module cognitive load scores. There was a significant difference in PCL scores for individual modules between groups. More participants rated their PCL mental effort "high" or "very high" as compared to "low" or "very low" in the group with depressive symptoms (yes) group than with stress only group (No) (Table 7). Participants with depressive symptoms were significantly more likely to rate their cognitive load higher for all 7 Stress Gym modules than those with stress only. Hypothesis 2 was partially supported; Stress Gym improved depressive symptoms, stress, attention, but there was no significant difference in cognitive load after completing Stress Gym.

Table 7

Comparison of Cognitive Load Scores using Chi-Squares for each Stress Gym modules between groups

	Total	Baseline Depression		Chi-Square Value	P Value
	n = 95	Yes n = 49	No n = 46		
PCL-Stress and Emotion				9.7039	**0.008**
very low mental effort	27 (34.2%)	8 (19.0%)	19 (51.4%)		
low mental effort	40 (50.6%)	25 (59.5%)	15 (40.5%)		
high mental effort	12 (15.2%)	9 (21.4%)	3 (8.1%)		
Missing (.)	16	7	9		
PCL-Reacting to Stress				9.6116	**0.008**
very low mental effort	23 (32.9%)	6 (16.7%)	17 (50.0%)		
low mental effort	35 (50.0%)	21 (58.3%)	14 (41.2%)		
high mental effort	12 (17.1%)	9 (25.0%)	3 (8.8%)		
Missing (.)	25	13	12		
PCL-Sleep				10.8953	**0.007**
very low mental effort	21 (33.9%)	6 (18.2%)	15 (51.7%)		
low mental effort	31 (50.0%)	18 (54.5%)	13 (44.8%)		
high mental effort	9 (14.5%)	8 (24.2%)	1 (3.4%)		
very high mental effort	1 (1.6%)	1 (3.0%)	0 (0.0%)		
Missing (.)	33	16	17		
PCL-Problem Solving				5.9882	**0.047**
very low mental effort	22 (39.3%)	7 (24.1%)	15 (55.6%)		
low mental effort	27 (48.2%)	18 (62.1%)	9 (33.3%)		
high mental effort	7 (12.5%)	4 (13.8%)	3 (11.1%)		
Missing (.)	39	20	19		
PCL-Depression				16.8618	**< 0.001**
very low mental effort	18 (33.3%)	5 (14.3%)	13 (68.4%)		
low mental effort	24 (44.4%)	19 (54.3%)	5 (26.3%)		
high mental effort	10 (18.5%)	9 (25.7%)	1 (5.3%)		
very high mental effort	2 (3.7%)	2 (5.7%)	0 (0.0%)		
Missing (.)	41	14	27		
PCL.-Relationships				10.9270	**0.010**
very low mental effort	21 (34.4%)	6 (17.6%)	15 (55.6%)		
low mental effort	25 (41.0%)	16 (47.1%)	9 (33.3%)		
high mental effort	13 (21.3%)	10 (29.4%)	3 (11.1%)		
very high mental effort	2 (3.3%)	2 (5.9%)	0 (0.0%)		
Missing (.)	34	15	19		
PCL-Balance				8.9301	**0.015**
very low mental effort	22 (40.7%)	6 (22.2%)	16 (59.3%)		
low mental effort	26 (48.1%)	16 (59.3%)	10 (37.0%)		
high mental effort	4 (7.4%)	3 (11.1%)	1 (3.7%)		
very high mental effort	2 (3.7%)	2 (7.4%)	0 (0.0%)		
Missing (.)	41	22	19		

Overall task time was measured by total Stress Gym time from login to logoff. Time was obtained for each individual module by self-report. Participants estimated their participation in each individual Stress Gym module. No significant differences were found for overall Stress Gym time across all participants, or for participants divided into groups based on baseline depressive symptoms (Table 4 and Table 7). No significant differences were found between groups for any of the time measures for each Stress Gym module (Table 8). Further analysis was performed to see if there were any other potential relationships with time within individual Stress Gym modules.

Table 8

Comparison of over-all Stress Gym time and time for each Stress Gym module between depressive symptoms groups

	Total	Baseline Depression		Chi-Square	
	n = 95	Yes n = 49	No n = 46	Value	P-Value
time-Stress and Emotion				1.9608	0.398
1-5 minutes	39 (52.0%)	19 (46.3%)	20 (58.8%)		
6-15 minutes	28 (37.3%)	16 (39.0%)	12 (35.3%)		
16-30 minutes	8 (10.7%)	6 (14.6%)	2 (5.9%)		
Missing (.)	20	8	12		
time-Reacting to Stress				2.1759	0.650
1-5 minutes	33 (50.8%)	15 (48.4%)	18 (52.9%)		
6-15 minutes	27 (41.5%)	13 (41.9%)	14 (41.2%)		
16-30 minutes	4 (6.2%)	3 (9.7%)	1 (2.9%)		
31-45 minutes	1 (1.5%)	0 (0.0%)	1 (2.9%)		
Missing (.)	30	18	12		
time-Sleep				0.4114	0.860
1-5 minutes	28 (46.7%)	15 (46.9%)	13 (46.4%)		
6-15 minutes	27 (45.0%)	15 (46.9%)	12 (42.9%)		
16-30 minutes	5 (8.3%)	2 (6.3%)	3 (10.7%)		
Missing (.)	35	17	18		
time-Problem Solving				2.7747	0.660
1-5 minutes	34 (68.0%)	17 (63.0%)	17 (73.9%)		
6-15 minutes	13 (26.0%)	7 (25.9%)	6 (26.1%)		
16-30 minutes	2 (4.0%)	2 (7.4%)	0 (0.0%)		
31-45 minutes	1 (2.0%)	1 (3.7%)	0 (0.0%)		
Missing (.)	45	22	23		
time-Depression				4.0250	0.229
1-5 minutes	28 (57.1%)	17 (48.6%)	11 (78.6%)		
6-15 minutes	16 (32.7%)	14 (40.0%)	2 (14.3%)		
16-30 minutes	4 (8.2%)	3 (8.6%)	1 (7.1%)		
31-45 minutes	1 (2.0%)	1 (2.9%)	0 (0.0%)		
Missing (.)	46	14	32		
time-Relationships				5.4452	0.124
1-5 minutes	31 (54.4%)	15 (46.9%)	16 (64.0%)		
6-15 minutes	21 (36.8%)	13 (40.6%)	8 (32.0%)		
16-30 minutes	4 (7.0%)	4 (12.5%)	0 (0.0%)		
31-45 minutes	1 (1.8%)	0 (0.0%)	1 (4.0%)		
Missing (.)	38	17	21		
time-Balance				2.5140	0.474
1-5 minutes	30 (61.2%)	13 (54.2%)	17 (68.0%)		
6-15 minutes	14 (28.6%)	7 (29.2%)	7 (28.0%)		
16-30 minutes	4 (8.2%)	3 (12.5%)	1 (4.0%)		
31-45 minutes	1 (2.0%)	1 (4.2%)	0 (0.0%)		
Missing (.)	46	25	21		

Significant correlations were found between individual Stress Gym module times and PSS at baseline (Table 9). Significant correlations were found with PSS and the Stress and Emotion, Problem Solving, Depression, Relationships, and Balance Stress Gym Modules. Correlations were also found the Problem Solving Stress Gym Module and baseline PSS and PCL and post Stress Gym PHQ-9 and PSS.

Table 9

Correlations between individual Stress Gym module times with baseline and post Stress Gym PHQ-9, PSS, AFI, and PCL

	Baseline PHQ-9	Baseline PSS	Baseline AFI	Baseline PCL	Post PHQ-9	Post PSS	Post AFI	Post PCL module average
Time-Stress and Emotion	0.096	0.285*	0.045	0.036	0.171	0.347**	0.063	0.260
Time-Reacting to Stress	-0.016	0.138	0.166	0.135	0.057	0.203	0.111	0.081
Time-Sleep	0.052	-0.003	0.070	0.107	0.044	0.077	-0.048	0.046
Time-Problem Solving	0.224	0.346*	-0.046	0.283*	0.300*	0.313*	-0.153	0.242
Time-Depression	0.179	0.313*	-0.317*	0.278	0.250	0.249	-0.102	0.317*
Time-Relationships	0.151	0.285*	-0.149	0.238	0.094	0.116	-0.106	0.330**
Time-Balance	0.145	0.339*	-0.044	0.343*	0.140	0.230	-0.097	0.150

** p<.01

* p<.05.

Participants were asked if they are currently being treated for depression with medication and/or counseling or are seeing a counselor for stress. Eleven participants stated they were being

treated for depression out of the 75 participants who answered question. Eleven stated they take medication for their depression and 3 of them also stated that they see a counselor. An additional 4 participants state that they see a counselor for stress only (Table 10). Only 76 participants answered demographic questions out of 95 participants. More participants (49 out of 95) were found to have some degree of depressive symptoms (Table 4). No significant differences in depressive symptoms were found between groups (p=0.093). Treatment for depression did not seem to affect study results.

Table 10
Depression treatment group vs no depression treatment group

	Diagnosed with depression	
	Yes	No
Total n=75	11	64
Take medications for depression	11	0
See counselor for depression	3	0
See counselor for stress only	0	4
PHQ-9 range	1-20	0-24
PHQ-9 Mean/Std Dev	9.36/6.19	5.78/5.063

Chapter V

Discussion

The results of this study demonstrate that there are relationships between depressive symptoms, stress, attention, and cognitive load. Other studies have shown that higher depressive symptoms are associated with higher stress and lower attention (Cohen et al., 1982; Hammen, 2004; Joormann & Gotlib, 2008). Higher cognitive load is also associated with higher depressive symptoms and stress as well as lower attention. According to Cognitive Load Theory, the higher the cognitive load, the lower the amount of learning (Sweller & Chandler, 1991). Therefore an increase in cognitive load with depressive symptoms, stress and attentional difficulties can indicate a decreased ability to learn. Participants with depressive symptoms experienced higher levels of stress, attentional difficulties and cognitive load. This also lends support to previous research indicating those with depressive symptoms have learning difficulties (Gohier et al., 2009; Halvorsen et al., 2012; Sliwinski et al., 2006).

This study supports the use of Stress Gym as a tool to reduce depressive symptoms, stress, and attentional difficulties. There were significant improvements in participants overall and for participants when they were segregated into 2 groups, those with stress only and those with depressive symptoms and stress. With many patients choosing to explore health concerns online, it is important to have a valid program available online that can help them manage their symptoms.

Stress Gym also can be a useful tool to support learning. The relationship of depression, stress, attention, and cognitive load are well documented as cited earlier. Participants with and without depressive symptoms showed improvement in all of these areas. While this study did not look to see if the effect of Stress Gym was sustained over time on these variables, short-term retention is a prerequisite for long-term retention. Even if the improvements are short lived, the improvement in cognition for patients may be enough to improve the learning of vital information given in concert with Stress Gym. Nurses must be able to provide information to patients that the patient often needs to learn in a time critical fashion. If Stress Gym can improve cognition long enough for this information to be learned, then Stress Gym could be an important tool for nurses.

While participants did not show a reduction in their average overall cognitive load, participants with depressive symptoms showed a greater improvement in cognitive load on average for each Stress Gym module than those participants without depressive symptoms. Cognitive load is a one-item measure and as such, is not sensitive to more subtle changes when the baseline cognitive load is already low. Participants without depressive symptoms rated their average cognitive load as low at baseline. These improvements in cognitive load for participants with depressive symptoms lend support to the use of Stress Gym in improving learning.

Another way to examine the potential effect of Stress Gym on learning is time on task. There are much weaker correlations for time on task. Time on task for some Stress Gym modules were correlated to stress only. Some of the Stress Gym module correlations showed increased time correlated with increased stress while others showed increased time correlated with decreased stress. There also was no significance between increased cognitive load and

stress with time on task. The measurement of time was problematic. Time was measured from login to logout in Stress Gym. Time in each of the seven Stress Gym modules could not be measured quantitatively. Before data collection was begun, the software function created to measure time for each module worked but just before data collection begun, the data collection for time stopped working. Efforts made to correct this error were unsuccessful and this information was unable to be obtained. Time in each of the modules was then measured by self-report. To better understand the relationship with time on task to depressive symptoms, stress, attention, cognitive load, and thus learning, it would be necessary to be able to measure each individual Stress Gym module time quantitatively.

Eleven participants stated that they are currently being treated for depression out of the 76 participants who answered demographic questions. It is unlikely that the questions about depression inhibited participants from responding to demographic questions because the questions about depression were asked at the end of more routine demographic questions such as gender, age, ect. Almost all of the participants who answered demographic questions (75 out of 76) answered the question about current depression treatment. While there is a stigma associated with mental illness, participation in this study would suggest that some participants would be willing to disclose this information.

Limitations

The ability to generalize the findings of this study could be effected by the nature of the participants in this study. As expected with the sample population, participants were mostly students and had some college education at the time of the study. The participants were also

largely female (85%). While a greater number of females experience depression and may seek out help for depression than men, the proportion of females to males was higher than expected. While the recruitment and participation was anonymous to the researcher and was open to all students, faculty, and staff, participants were most likely aware of the researcher name. The researcher has taught for years in the nursing program at the university where recruitment took place and is known by the majority of students in the nursing program. The nursing program is predominately female. This may explain the disproportionately large number of females who enrolled in this study.

Another potential problem with this study was related to technical issues. Participants were asked to go online to answer screening questions. If they qualified for the study and consented to participate in the study, they were rerouted to another website for the intervention. After the intervention, participants were again rerouted to another website to answer post intervention questions. There was some loss of participants to this researcher because some participants were not properly routed to the intervention website. Corrections were made to ensure that participants would be routed correctly to the intervention website. There was a much larger loss in participants from the intervention to post intervention website. Directions had been provided to prevent this loss but were displayed in a more prominent way after the study was started due to this loss. As stated earlier, there were no statistically significant differences found in pre and post intervention variables but this loss of participants could still impact study results.

One study variable, individual module time, was not measured efficiently, which could also impact study results. Overall Stress Gym time was measured quantitatively, but may not accurately reflect time on task. Self-report of time may be inaccurate, skewing results.

Participants could select which Stress Gym modules to participate in, may not have participated in all modules, and may have spend varying time in each module, reducing the usefulness of an overall measure of time in Stress Gym as a measure of time on task.

Future Research

To explore the use of Stress Gym to assist with stressed patients (with and without depressive symptoms), it is important to see if participants had improved learning on a task relevant to patient needs as compared to those who do not use Stress Gym. It is important to this researcher that the learning task be relevant to patient needs in order to translate this research to practice and because learning is more successful in adults if it is relevant to their immediate needs (Knowles, 1970). Stress Gym has been shown to successfully improve depressive symptoms, stress, attention and cognitive load in adults with and without depressive symptoms. It is important to do a study that looks at the potential sustained effect of Stress Gym. It is important to determine how long the effect of Stress Gym lasts to be able to effectively time the intervention with the learning task to increase the chances of successful learning. This could be examined by using a longitudinal study design. Participants with stress with or without depressive symptoms could have the effects of Stress Gym measured immediately after use and again at preset intervals to examine the sustained effect of Stress Gym and at which point, if any, is there a significant drop in effect. Previous studies have shown that effects of online interventions for mental illnesses may not be sustained if not tailored to the user (Bennett & Glasgow, 2009). Stress Gym is tailored to the user by self-selection of Stress Gym module exploration. Stress Gym can potentially be used as a tool to improve learning in patients under

stress to help them better acquire the knowledge they need to successfully take care of their health.

APPENDIX A
Tools

Personal Health Questionnaire 9 (PHQ-9)

Over the *last 2 weeks,* how often have you been bothered by any of the following problems? *(use "√" to indicate your answer)*

	Not at all	**Several days**	**More than half the days**	**Nearly every day**
	0	**1**	**2**	**3**
1. Little interest or pleasure in doing things				
2. Feeling down, depressed, or hopeless				
3. Trouble falling/staying asleep, sleeping too much				
4. Feeling tired or having little energy				
5. Poor appetite or overeating				
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down				
7. Trouble concentrating on things, such as reading the newspaper or watching television				
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual				
9. Thoughts that you would be better off dead, or of hurting yourself in some way.				

Add Columns: _____ + _____ + _____

Perceived Stress Scale (PSS)

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 *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

For each question choose from the following alternatives:
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?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4.° In the last month, how often have you dealt successfully with irritating life hassles?
5.° In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?
6.° In the last month, how often have you felt confident about your ability to handle your personal problems?
7.° In the last month, how often have you felt that things were going your way? .
8. In the last month, how often have you found that you could not cope with all the things that you had to do?
9.° In the last month, how often have you been able to control irritations in your life?
10.°In the last month, how often have you felt that you were on top of things?
11. In the last month, how often have you been angered because of things that happened that were outside of your control?
12. In the last month, how often have you found yourself thinking about things that you have to accomplish?
13.°In the last month, how often have you been able to control the way you spend your time?
14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

° Scored in the reverse direction (Cohen et al, 1983). Permissions: Permission for use of scales is not necessary when use is for nonprofit academic research or nonprofit educational purposes.

Attentional Functional Index (AFI)

I. At this time, how well do you feel you are functioning in each of the areas below? Please rate the answers to the following questions ranging from 0 for not at all to 10 for extremely well.

1. Getting started on activities (tasks, jobs) you intend to do.

Not at all_____ Extremely well
0 5 10

2. Following through on your plans.

Not at all_____ Extremely well

3. Doing things that take time and effort.

Not at all_____ Extremely well

4. Making your mind up about things.

Not at all_____ Extremely well

5. Keeping your mind on what you are doing.

Not at all_____ Extremely well

6. Remembering to do all the things you started out to do.

Not at all_____ Extremely well

7. Keeping your mind on what others are saying.

Not at all_____ Extremely well

8. Keeping yourself from saying or doing things you did not want to say or do.

Not at all_____ Extremely well

9. Being patient with others.

Not at all_____ Extremely well

II. At this time, how would you rate yourself on:

10. How hard you find it to concentrate on details.

Not at all_____ Extremely well

11. How often you make mistakes on what you are doing.

Not at all_____ Extremely well

12. Forgetting to do important things.

Not at all_____ Extremely well

13. Getting easily annoyed or irritated.

Not at all_____ Extremely well

Perceived Cognitive Load (PCL)

Participants will rate their perceived cognitive load during after each module. They were asked: "Please rate the amount of mental effort it took for you to explore each module" Response choices were as follows: "very low mental effort", "very low mental effort", "high mental effort" , "very high mental effort", and "did not explore module"(Chandler & Sweller, 1991).

Demographic Questions

Age
What is your age? _____

Sex
What is your sex?
- Male
- Female

Race/ethnicity
How do you describe yourself? (please check the one option that best describes you)
- American Indian or Alaska Native
- Hawaiian or Other Pacific Islander
- Asian or Asian American
- Black or African American
- Hispanic or Latino
- Non-Hispanic White

Marital status
Are you:
- Married
- Divorced
- Widowed
- Separated
- Never been married
- A member of an unmarried couple

Employment status
Are you currently (mark all that apply):
- Employed for wages
- Self-employed
- Out of work for more than 1 year
- Out of work for less than 1 year
- A homemaker
- A student
- Retired
- Unable to work

Education completed
What is the highest grade or year of school you completed?

- Never attended school or only attended kindergarten
- Grades 1 through 8(Elementary)
- Grades 9 through 11 (Some high school)
- Grade 12 or GED (High school graduate)
- College 1 year to 3 years (Some college of technical school
- College 4 years (College graduate)
- Graduate School(Advance Degree)

Family size

How many children live in your household who are...

- Less than 5 years old?
- 5 through 12 years old?
- 13 through 17 years old?

Current treatment for depressive symptoms or stress

Are you currently being treated for depression? If yes, are you on medication? If on medication, which medications, what dosage and how often you take it and how long have you been taking it?

Are you currently being treated for stress? If yes, are you on medication? If on medication, which medications, what dosage and how often you take it and how long have you been taking it?

Are you currently seeing a counselor for stress or depression? For how long?

APPENDIX B
"Toilet Paper" Flyer

Want to find out if you have stress or symptoms of depression?

Free screening at www.tinyurl.com/HinkleStressGYM

- The Stress Gym is an online tool designed to reduce stress
    - Study will look at how reducing stress effects learning in stressed people and people who have symptoms of depression
- You can earn a $10 University gift card by participating in the anonymous online intervention

To participate in the study log onto
www.tinyurl.com/HinkleStressGym
Password: Saints

All Maryville students and employees over the age of 18 are welcome to participate. The free screening is open to all and does require participation in the study.

APPENDIX C
Paper Flyer

Want to find out if you have stress or symptoms of depression?

Free screening at http://tinyurl.com/HinkleStressGym

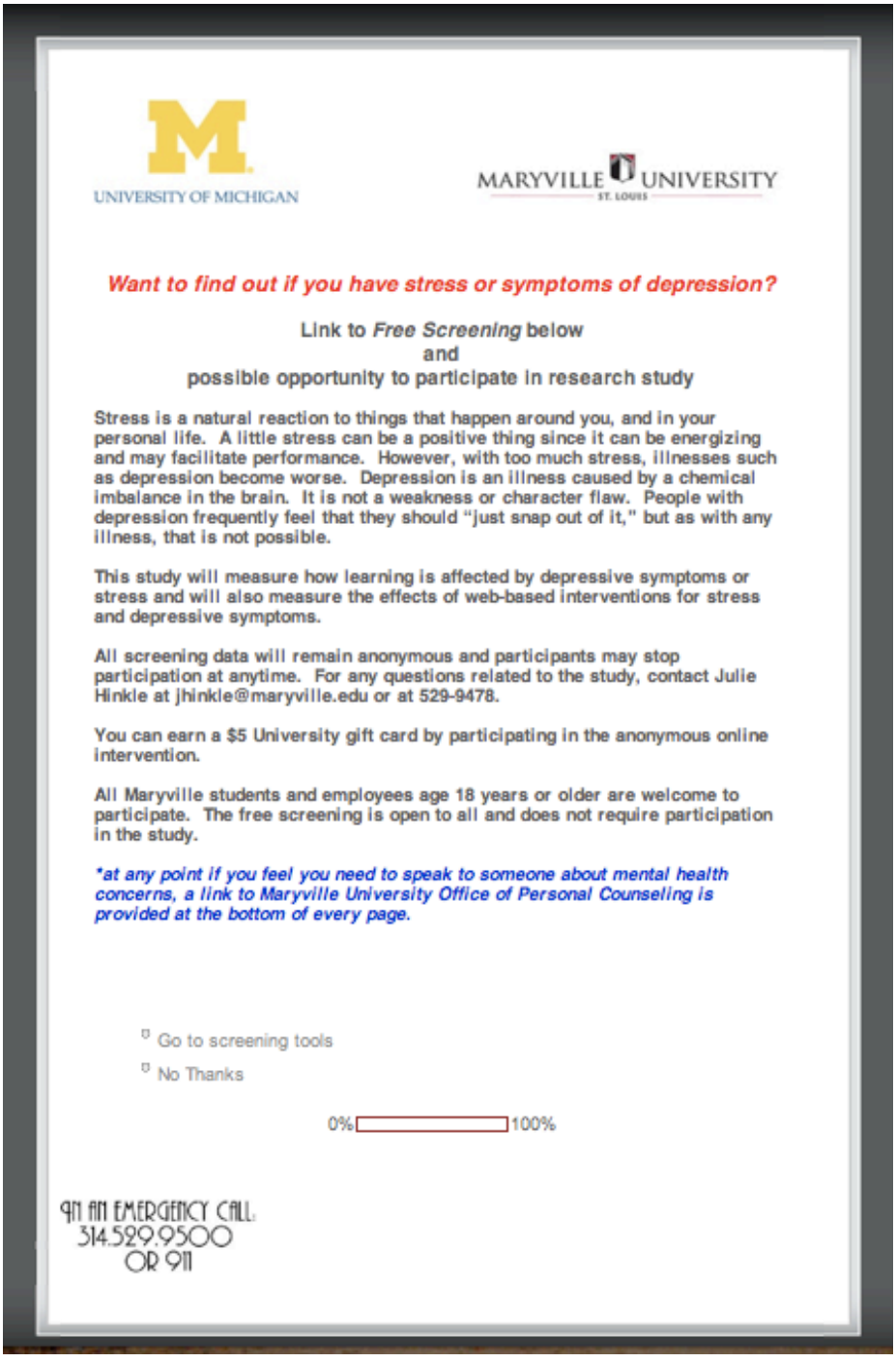
- **The Stress Gym is an online tool designed to reduce stress**
    - **This study will look at how reducing stress affects learning in stressed people and people who have symptoms of depression**
- **You can earn $5 Kaldi's bucks by participating in the anonymous online intervention**

To participate in the study log onto http://tinyurl.com/HinkleStressGym
Password: Saints

All Maryville students and employees age 18 years or older are welcome to participate. The free screening is open to all and does not require participation in the study.

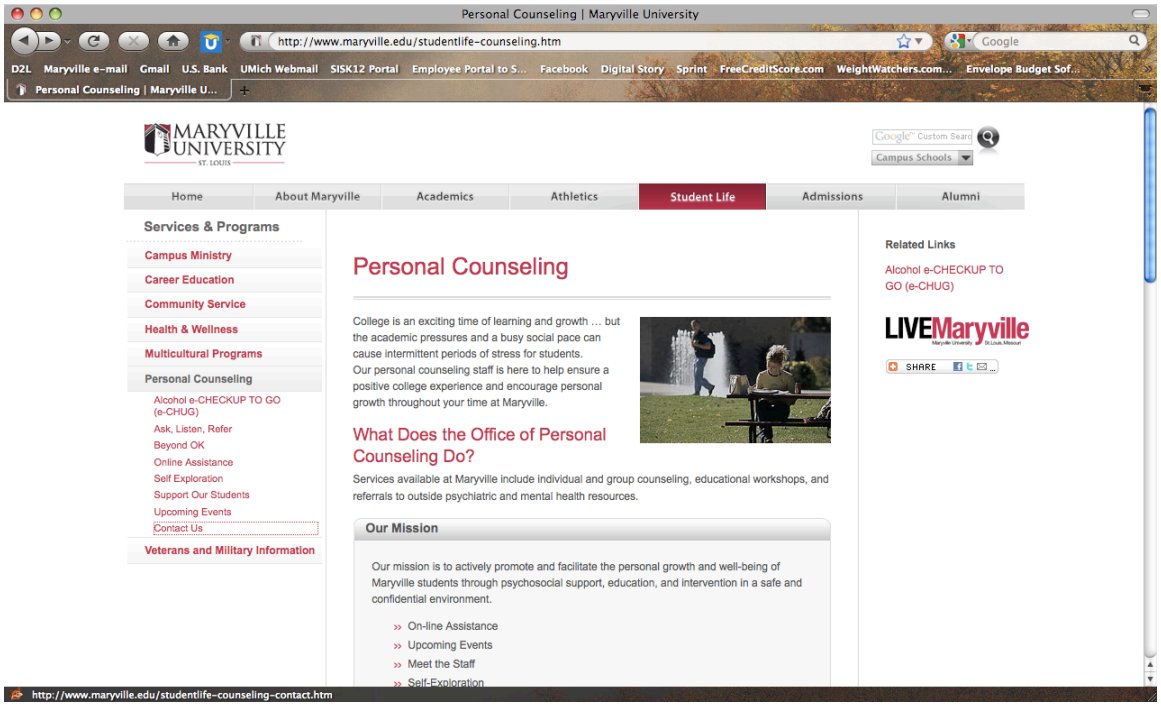
Password: Saints http://tinyurl.com/HinkleStressGym

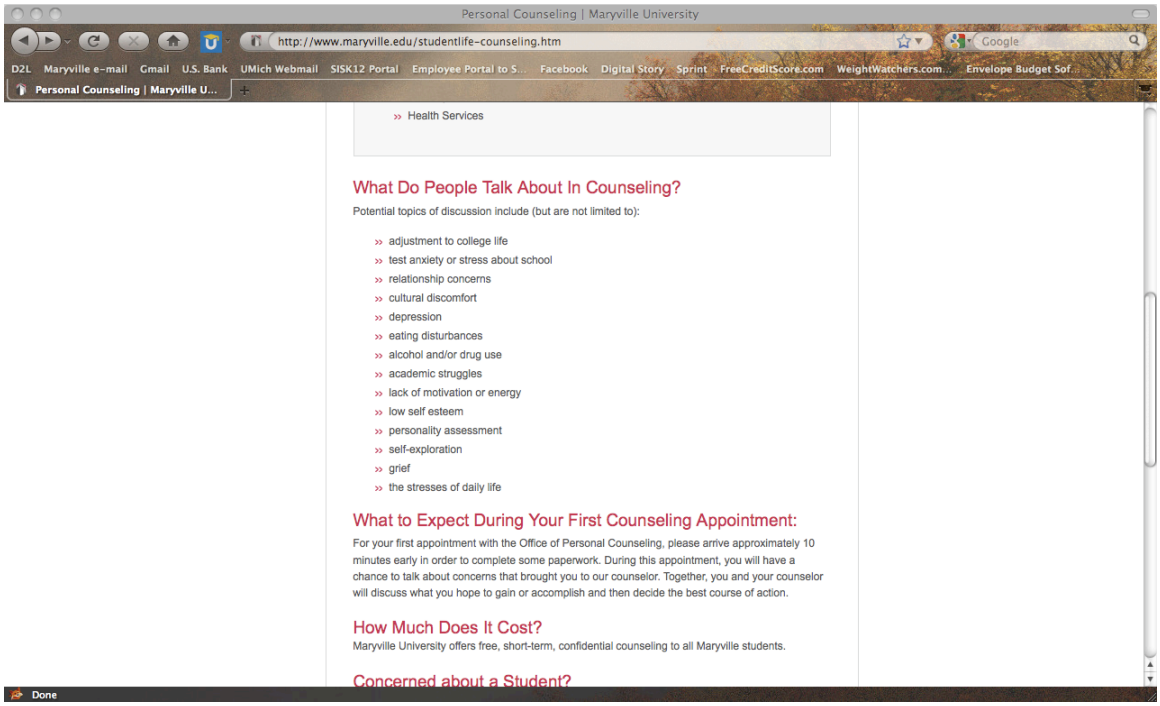
APPENDIX D
Front Page Website

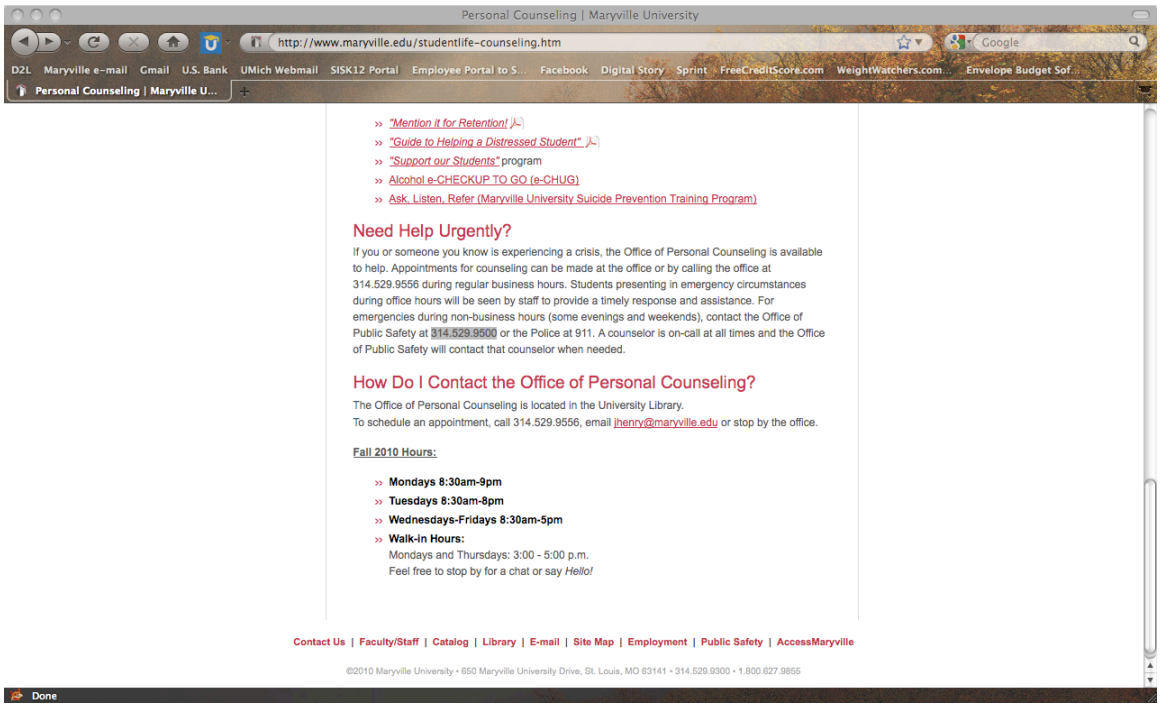


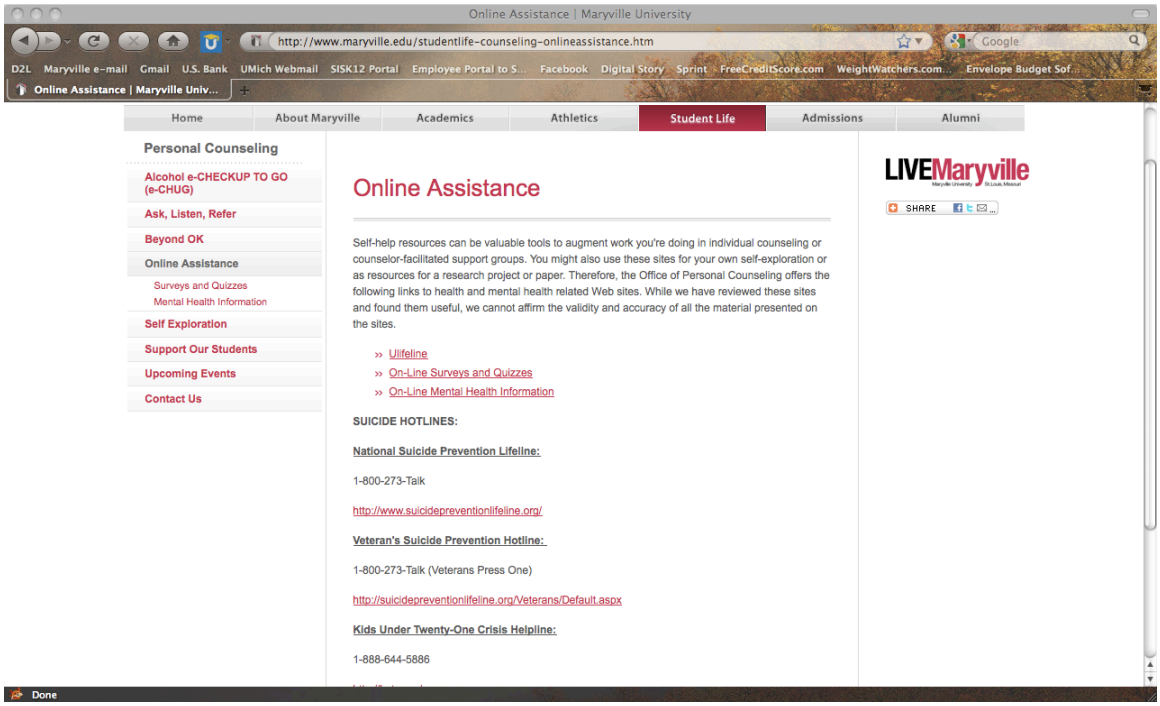
Appendix E

Mental Health Resources




Personal Counseling | Maryville University
http://www.maryville.edu/studentlife-counseling.htm
Google
D2L Maryville e-mail Gmail U.S. Bank UMich Webmail SISK12 Portal Employee Portal to S... Facebook Digital Story Sprint FreeCreditScore.com WeightWatchers.com... Envelope Budget Sof...
Personal Counseling | Maryville U...
» Health Services
What Do People Talk About In Counseling?
Potential topics of discussion include (but are not limited to):
» adjustment to college life
» test anxiety or stress about school
» relationship concerns
» cultural discomfort
» depression
» eating disturbances
» alcohol and/or drug use
» academic struggles
» lack of motivation or energy
» low self esteem
» personality assessment
» self-exploration
» grief
» the stresses of daily life
What to Expect During Your First Counseling Appointment:
For your first appointment with the Office of Personal Counseling, please arrive approximately 10 minutes early in order to complete some paperwork. During this appointment, you will have a chance to talk about concerns that brought you to our counselor. Together, you and your counselor will discuss what you hope to gain or accomplish and then decide the best course of action.
How Much Does It Cost?
Maryville University offers free, short-term, confidential counseling to all Maryville students.
Concerned about a Student?
Done


Personal Counseling | Maryville University
http://www.maryville.edu/studentlife-counseling.htm
Google
D2L Maryville e-mail Gmail U.S. Bank UMich Webmail SISK12 Portal Employee Portal to S... Facebook Digital Story Sprint FreeCreditScore.com WeightWatchers.com... Envelope Budget Sof...
Personal Counseling | Maryville U...
» "Mention it for Retention!"
» "Guide to Helping a Distressed Student"
» "Support our Students" program
» Alcohol e-CHECKUP TO GO (e-CHUG)
» Ask, Listen, Refer (Maryville University Suicide Prevention Training Program)
Need Help Urgently?
If you or someone you know is experiencing a crisis, the Office of Personal Counseling is available to help. Appointments for counseling can be made at the office or by calling the office at 314.529.9556 during regular business hours. Students presenting in emergency circumstances during office hours will be seen by staff to provide a timely response and assistance. For emergencies during non-business hours (some evenings and weekends), contact the Office of Public Safety at 314.529.9500 or the Police at 911. A counselor is on-call at all times and the Office of Public Safety will contact that counselor when needed.
How Do I Contact the Office of Personal Counseling?
The Office of Personal Counseling is located in the University Library.
To schedule an appointment, call 314.529.9556, email jhenry@maryville.edu or stop by the office.
Fall 2010 Hours:
» Mondays 8:30am-9pm
» Tuesdays 8:30am-8pm
» Wednesdays-Fridays 8:30am-5pm
» Walk-in Hours:
Mondays and Thursdays: 3:00 - 5:00 p.m.
Feel free to stop by for a chat or say Hello!
Contact Us | Faculty/Staff | Catalog | Library | E-mail | Site Map | Employment | Public Safety | AccessMaryville
©2010 Maryville University • 650 Maryville University Drive, St. Louis, MO 63141 • 314.529.9300 • 1.800.627.9855
Done


Online Assistance | Maryville University
http://www.maryville.edu/studentlife-counseling-onlineassistance.htm
Google
D2L Maryville e-mail Gmail U.S. Bank UMich Webmail SISK12 Portal Employee Portal to S... Facebook Digital Story Sprint FreeCreditScore.com WeightWatchers.com... Envelope Budget Sof...
Online Assistance | Maryville Univ...
Home
About Maryville
Academics
Athletics
Student Life
Admissions
Alumni
Personal Counseling
Alcohol e-CHECKUP TO GO (e-CHUG)
Ask, Listen, Refer
Beyond OK
Online Assistance
Surveys and Quizzes
Mental Health Information
Self Exploration
Support Our Students
Upcoming Events
Contact Us
Online Assistance
Self-help resources can be valuable tools to augment work you're doing in individual counseling or counselor-facilitated support groups. You might also use these sites for your own self-exploration or as resources for a research project or paper. Therefore, the Office of Personal Counseling offers the following links to health and mental health related Web sites. While we have reviewed these sites and found them useful, we cannot affirm the validity and accuracy of all the material presented on the sites.
» Ulifeline
» On-Line Surveys and Quizzes
» On-Line Mental Health Information
SUICIDE HOTLINES:
National Suicide Prevention Lifeline:
1-800-273-Talk
http://www.suicidepreventionlifeline.org/
Veteran's Suicide Prevention Hotline:
1-800-273-Talk (Veterans Press One)
http://suicidepreventionlifeline.org/Veterans/Default.aspx
Kids Under Twenty-One Crisis Helpline:
1-888-644-5886
LIVEMaryville
SHARE
Done

APPENDIX F
Consent Form

Consent to Participate in a Research Study
COGNITIVE LOAD, STRESS, AND DEPRESSION: THE EFFECTS OF A WEB-BASED INTERVENTION

Principal Investigator: Julie F. Hinkle, MSN, RN, University of Michigan and Maryville University
Faculty Advisor: Reg A. Williams, PhD, RN, BC, FAAN, University of Michigan

Julie Hinkle invites you to participate in a research study about the effects of an intervention to reduce stress. I am looking for participants age 18 years or older who have depressive symptoms or stress that are willing to participate in a web-based intervention designed to reduce stress. The goal of this study is to see if this intervention reduces stress in both stressed individuals and individuals with depressive symptoms and to see if reducing stress can improve learning. This project is being conducted in order to fulfill the requirements of my dissertation for my doctoral program at the University of Michigan School of Nursing.

In order to be eligible for this study, you already answered some questions about stress and depressive symptoms. If you agree to be part of the research study, I will keep those answers you gave about stress and depressive symptoms and will destroy those answers if you choose not to participate. If you agree to participate, you will be asked to answer some questions online about attention, and cognitive load (a measure of learning ability at a given time). This typically takes participants about 10-15 minutes to complete. You will then be able to participate in the web-based intervention (The Stress Gym). This online intervention is self-paced and self-tailored. This means you can take as long as you like exploring the eight modules about stress and depression. Participants in previous studies have taken 30 minutes to an hour to explore Stress Gym. You can choose to explore any and all modules that interest you and may be helpful. The final step of this study involves answering questions again about stress, depressive symptoms, and cognitive load as well as some basic demographic and background questions. A

code will be generated linking your pre and post intervention question automatically. You will not have to remember passwords or give identifying information for this to happen and will be able to return to answer post intervention questions when exiting the Stress Gym after you spend as much time there as you like. You can also create a password in Stress Gym that will allow you to stop and come back another time to finish exploring Stress Gym. You will be able to go back to the post intervention questions when you are finished exploring Stress Gym This step should only take 15-20 minutes if you choose to do this in one sitting.

Participants with stress should directly benefit from being in this study because previous studies have shown this intervention does reduce stress. Those with depressive symptoms may not directly benefit from being in this study, although you may experience a decrease in stress as well. In addition, others may benefit because of an increased understanding of the effects of an intervention designed to reduce stress on the levels of stress in participants with depressive symptoms. Others may also benefit because of an increased understanding of the potential effects of reducing stress on learning in stressed individuals and individuals with depressive symptoms.

I have taken steps to minimize the risks of this study. Even so, you may still experience some risks related to your participation, even when I am careful to avoid them. These risks are related to the nature of stress and depressive symptoms. The study questions are sensitive and may make you feel uncomfortable or embarrassed. You may remember or think about things that bother you. A link to University mental health resources as well as a 24-hour emergency hotline will be provided on all study web pages for those who experience any distress related to stress or depressive symptoms. This hotline will connect callers to a licensed mental health provider with experience in assessing stress and depression related difficulties as well as other mental health disorders.

Participants will be eligible to receive a $5 University gift card after finishing participation in the study.

I plan to publish the results of this study, but will not include any information that would identify you. There are some reasons why people other than me may need to see information you provided as part of the study. This includes organizations responsible for making sure the research is done safely and properly, including the University of Michigan or Maryville University.

To keep your information safe, I will not attach any identifying information to any data, but a study number will be used instead. In addition the data will be kept on a password-protected computer using special software that scrambles the information so that no one can read it.

The data you provide will be stored on laptop as described above in a locked cabinet in a locked office.
I will retain the data for 2 years.

I will dispose of your data by 2014.
The data will be made available to other researchers for other studies following the completion of this research study and will not contain information that could identify you.

Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. If you decide to withdraw early, the information or data you provided will be destroyed.

If you have questions about this research, including questions about computer access to the study website or your compensation for participating, you may contact me, Julie F. Hinkle, at jhinkle@maryville.edu or 314-550-1942. You may also contact my faculty advisor, Reg A. Williams, Ph.D. at rawill@umich.edu for any questions about this research study.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions or discuss any concerns about this study with someone other than the researcher(s), please contact the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board, 540 E Liberty St., Ste 202, Ann Arbor, MI 48104-2210, (734) 936-0933 **[or toll free, (866) 936-0933]**, irbhsbs@umich.edu.You may also ask questions, state concerns regarding your rights as a research subject, or express any feelings of pressure to participate by contacting: Dr. Nancy Williams, Chair of the Institutional Review Board at Maryville University, (314)529-9471

Maryville University recognizes its federally mandated responsibility to ensure that research be conducted in an ethical and scholarly manner, respecting the rights and welfare of all the human participants. Any research misconduct including but not limited to fabrication, falsification, or plagiarism in proposing, performing and reviewing research, or in reporting research results, should be reported to Dr. Tammy Gocial, the Research Integrity Officer at Maryville University at (314) 529-6893.

Maryville University investigators, and their colleagues who are conducting research, recognize the importance of your contribution to the research studies which are designed to improve therapeutic care. Maryville University investigators and their staffs will make every effort to minimize, control, and treat any complication that may arise as a result of this research.

By clicking on "I agree" below, you are agreeing to be in the study and will be linked to the home page of this study. You can print a copy of this document for your records and one copy will be kept with the study records. Be sure that questions you have about the study have been answered and that you understand what you are being asked to do. You may contact the researcher if you think of a question later. You If you do not agree to participate in this study, please click on the link "no thanks" found below.

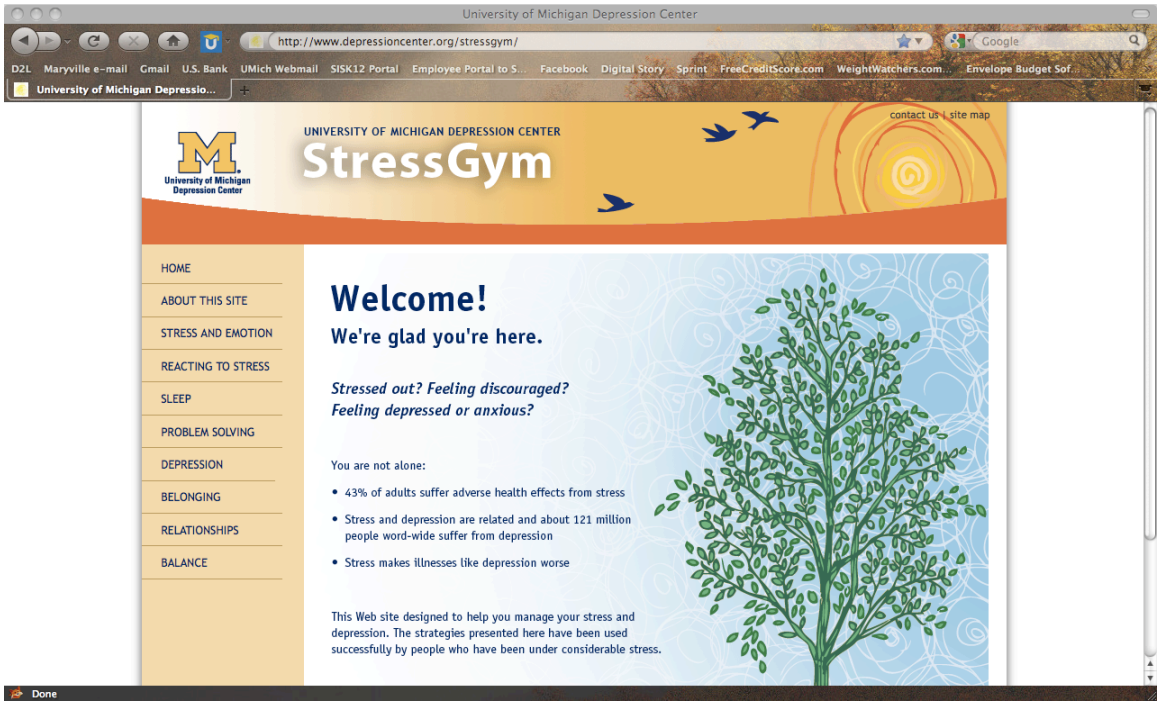
I AGREE **NO THANKS**

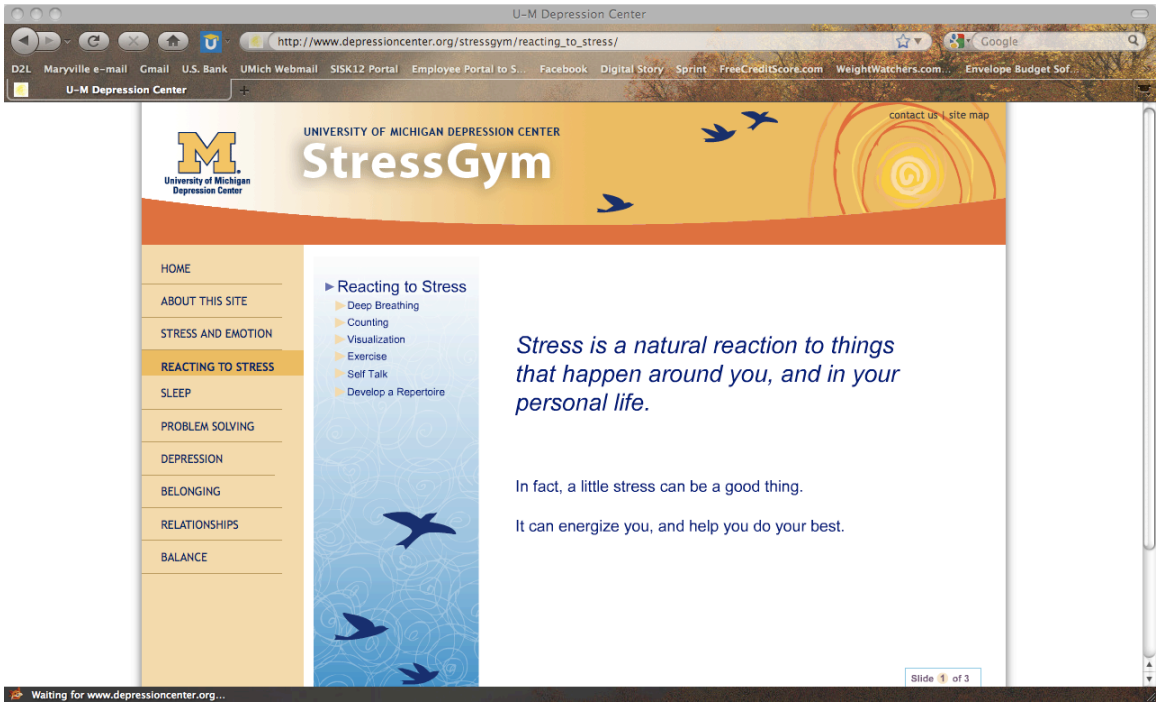
Appendix G
Self-Tracking Form

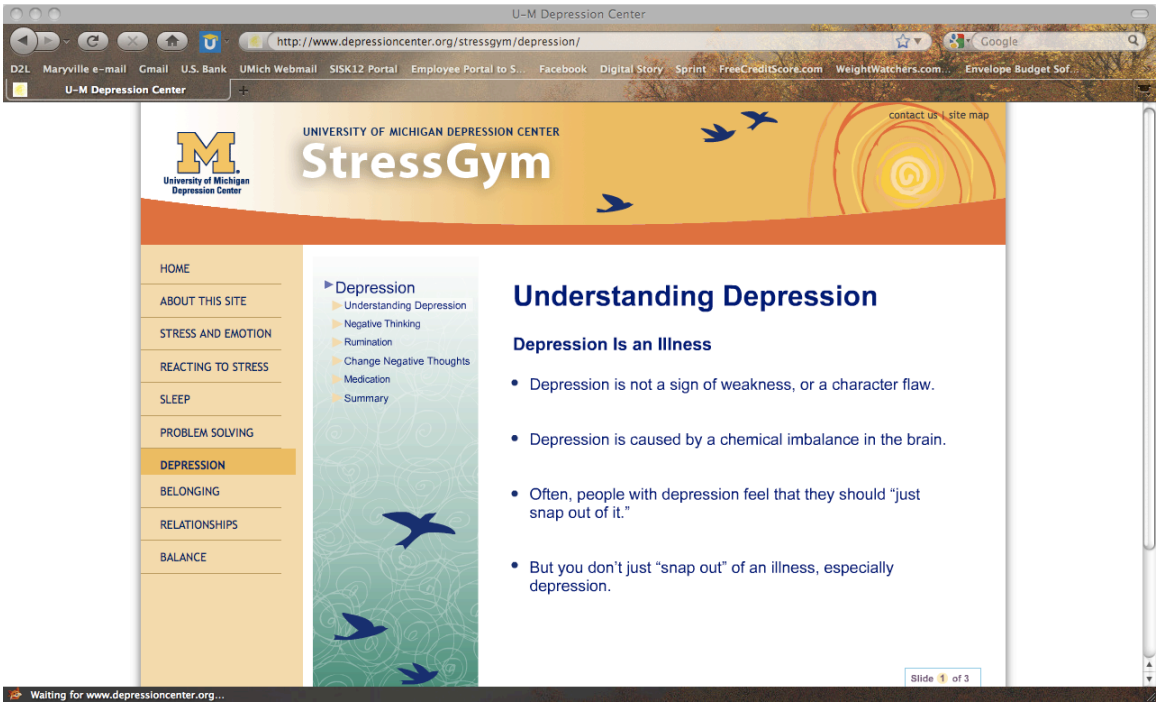
While you are exploring the Stress Gym, please keep track of which modules you explore and how long you spend on each module. Please also rate your Perceived Cognitive Load after each module. This paper can be either printed or marked electronically to assist you in keeping track of these things!

MODULE	**EXPLORED? Y/N**	**TIME SPENT?**	**PERCEIVED COGNITVIE LOAD** check the answer that applies
Stress and Emotion			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____
Reacting to Stress			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____
Sleep			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____
Problem Solving			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____
Depression			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____
Relationships			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____
Balance			Very low mental effort_____ Low mental effort_____ High mental effort_____ Very high mental effort_____

APPENDIX H
Stress Gym Screen Shots




U-M Depression Center
http://www.depressioncenter.org/stressgym/reacting_to_stress/
U-M Depression Center
UNIVERSITY OF MICHIGAN DEPRESSION CENTER
StressGym
contact us | site map
HOME
ABOUT THIS SITE
STRESS AND EMOTION
REACTING TO STRESS
SLEEP
PROBLEM SOLVING
DEPRESSION
BELONGING
RELATIONSHIPS
BALANCE
Reacting to Stress
Deep Breathing
Counting
Visualization
Exercise
Self Talk
Develop a Repertoire
Stress is a natural reaction to things that happen around you, and in your personal life.
In fact, a little stress can be a good thing.
It can energize you, and help you do your best.
Slide 1 of 3
Waiting for www.depressioncenter.org...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Understanding Depression
Depression Is an Illness
Depression is not a sign of weakness, or a character flaw.
Depression is caused by a chemical imbalance in the brain.
Often, people with depression feel that they should "just snap out of it."
But you don't just "snap out" of an illness, especially depression.
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