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## **The Effect of Food and Sleep Tracking on Quality of Life**

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## **Abstract**

*Background:* Various factors such as sleep quality and amount and food intake can have an impact on quality of life in terms of the amount of stress or fatigue that an individual experiences as an outcome. Food tracking has been commonly used as a tool for weight loss. Yet, current research has been looking at other possible advantages related to food tracking.

*Objective:* To examine the effects of food and sleep tracking on health-related quality of life with respects to sleep quality and quantity, stress, and fatigue, in adults aged 18 years or older.

*Methods:* Participants completed the Perceived Stress Scale and Fatigue Symptom Inventory questionnaires before and after a 7-day food and sleep tracking period, via the HealthWatch 360 application. An optional interview was conducted with 20 participants and summarized into four themes.

*Results:* There was a nonsignificant improvement in overall sleep amount ( $p=0.073$ ) over 7 days, when compared to day 1 as baseline. When stratified by gender, there was a significant improvement in overall sleep amount for females (0.012) but not for males ( $p=0.321$ ). Results also found that there were significant changes in sleep quality ( $p=0.582$ ) for males and females. Moreover, there was a slight, nonsignificant, decrease in fatigue and stress over 7 days, ( $p=0.067$ ) and ( $p=0.039$ ), respectively.

*Conclusion:* Food and sleep tracking using the HealthWatch 360 application does not have a significant effect on quality of life in terms of stress, fatigue and sleep. Nevertheless, tracking food intake and sleep may lead to increased accountability.

## **Introduction**

Quality of life is a concept that subjectively describes both positive and negative aspects of an individual's wellbeing. Mind, body, and spirit are factors that impact one's quality of life. The mind refers to a person's intellect and provides the capability of consciousness and thought.<sup>2</sup> A study by Oztasan et al. concluded that there was a medium level correlation between quality of life and mental symptoms, such as depression and anxiety, in that mental symptoms increased as quality of life decreased.<sup>3</sup> The body is the physical structure which carries duties dictated by the mind and the spirit, synonymous with the soul, and is a person's nonphysical entity that conveys character and emotions.<sup>2</sup> Although it is challenging to find the perfect balance between the three entities, making the effort to improve certain aspects will increase quality of life.<sup>1</sup>

Health-related quality of life (HRQOL) includes physical and mental health perceptions such as energy level, mood, sleep, and stress.<sup>1</sup> Diseases such as diabetes, hypertension and arthritis and their risk factors which include high body mass indices and sedentary lifestyles are related to HRQOL.<sup>1</sup> Therefore, assessing and improving HRQOL is important since it helps avoid the risk of preventable diseases.<sup>1</sup> Health related quality of life also aides in the achievement of the nation's health objectives, which center around creating longer lives of higher quality, that are free of preventable diseases.<sup>4</sup>

Much research has been done to study the effects of different aspects of quality of life such as exercise, yoga, and diet.<sup>5,6,7,8</sup> Passos et al. stated that exercise has antidepressant and anti-anxiety effects.<sup>5</sup> Additionally, exercise has been shown to be effective in improving sleep quality and treating insomnia.<sup>5</sup> In a meta-analysis, which aimed to rank and compare music interventions to controls in primary insomnia patients, Feng et al. concluded that listening to music is an effective intervention for improving symptoms of primary insomnia in adults.<sup>6</sup> Yoga has been suggested

to have positive effects on psychophysiological levels, which decreases stress levels in college students.<sup>7</sup> With respect to dietary intake, a systematic review conducted by Carson et al. on dietary interventions and quality of life (QOL) reported that most studies found QOL to improve with healthful dietary interventions.<sup>8</sup> However, evidence to fully understand this concept is insufficient.<sup>8</sup>

Food intake is known to influence quality of life, though there is little evidence that tracking food intake has an impact on HRQOL.<sup>1</sup> In a cross-sectional study, Sarcona et al. found that using a health application to track food intake made people feel healthier and improved self-monitoring of food intake and exercise.<sup>10</sup> Similarly, Ingels et al. conducted a study on individuals with type 2 diabetes and found that dietary tracking was a significant factor for successful weight loss.<sup>11</sup>

A variety of websites and applications have been developed to track foods.<sup>8</sup> For a long time, food tracking has been typically completed using a food diary. Nowadays, digital food diaries are often used, via mobile or web applications, to track different variables such as food and water intake as well as exercise activity. This includes recording all foods and beverages consumed during the day, along with the quantity and approximate time each food item was consumed. Food diaries can help people identify habits that require improvement, and may result in controlling portion sizes and caloric intake or making dietary changes.<sup>9</sup> Some food logs even provide recommendations based on a person's specific needs.<sup>8</sup>

Multiple studies suggest that food tracking tools, such as digital food logs, are becoming widely used, mainly for weight loss purposes.<sup>11,12</sup> Moreover, current research is geared toward using food tracking<sup>13</sup> and several studied in the literature have looked at food intake in terms of a dietary intervention, and its effect on various outcomes.<sup>14,15</sup>

There is a lack of evidence which reveals the possible impact that food tracking has on health-related quality of life. Therefore, the purpose of this graduate student research study was to determine the effects of food and sleep tracking on quality of life with respects to stress and fatigue levels, and sleep quality and quantity, in adults aged 18 years or older.

## **Methods**

Thirty-six males and females aged 18 years and older were recruited via email, social media, word of mouth, and the distribution of flyers. Each subject participated in both the control and intervention group. Participants were required own a smartphone and regularly exercise at moderate intensity for a minimum of 150 minutes per week. Participants were not eligible if they worked night shifts, were diagnosed with clinical depression, were breastfeeding at the time of recruitment, had insomnia or any other sleep disorder, were tracking food at the time of recruitment, or were taking sleeping aids such as melatonin. Approval for this study was obtained from the Institutional Review Board of Loma Linda University. All participants signed a statement of informed consent prior to entering the study.

## **Instruments**

A demographics questionnaire was completed by each participant at the start of the study to further analyze the outcomes of the study based on specified categories. In order to assess participants' current state of quality of life, Cohen's Perceived Stress Scale and the Fatigue Symptom Inventory were used. The demographics questionnaire, Cohen's Perceived Stress Scale, and the Fatigue Symptom Inventory were completed by participants the day before the seven-day period of food and sleep tracking. After the seven-day food and sleep tracking period, Cohen's Perceived Stress Scale and the Fatigue Symptom Inventory were completed by participants once more. Food intake, sleep amount and sleep quality were tracked by participants

using the HealthWatch 360 application which was previously downloaded by each participant. To further improve liability, a compliance log sheet was also completed by participants every day during the tracking period and was collected at the end of the study.

### 1. Demographics Questionnaire

A general demographics questionnaire, developed by the graduate student investigators, was used to separate participants into categories in order to further analyze data based on groups such as gender. Other categories included education level, age, and employment status.

Sample questions in the demographics questionnaire included:

- € What is your gender?
- € What is your age?
- € Have you ever tracked your food intake in the past?

### 2. Cohen's Perceived Stress Scale

The Perceived Stress Scale (PSS) was developed by Dr. Sheldon Cohen as a tool for measuring psychological stress.<sup>16</sup> In this questionnaire, individuals reported the degree in which they perceived certain situations in their lives to be stressful. Originally a 14-item questionnaire, it was shortened to 10 questions that measure the degree in which individuals view their lives to be unpredictable, uncontrollable or overloaded. Overall, the PSS is an easy-to-use questionnaire with established acceptable psychometric properties. Perceived Stress Scale scores were obtained by reversing responses (e.g., 0=4, 1=3, 2=2, 3=1, & 4=0) to the four positively stated items (items 4,5,7, & 8) and then summing the scores across all scale items.<sup>16</sup> This questionnaire took participants approximately 5-10 minutes to complete. Questions included:

- In the last month, how often have you been upset because of something that happened unexpectedly?

- In the last month, how often have you felt that you were unable to control the important things in your life?
- In the last month, how often have you felt nervous or “stressed”?
- In the last month, how often have you felt confident about your ability to handle your personal problems?

### 3. Fatigue Symptom Inventory

The Fatigue Symptom Inventory (FSI) is a 14-item survey, validated and used to assess the severity, frequency, and daily pattern of fatigue as well as its perceived interference with quality of life.<sup>17</sup> In this survey, severity is measured using individual 11-point scales that assess most, least, and average fatigue in the past week as well as current fatigue. This questionnaire also took participants approximately 5-10 minutes to complete. Sample questions included:

- Rate your level of fatigue on the day you felt most fatigued during the past week
- Rate your level of fatigue on the average during the past week
- Rate your level of fatigue right now
- Rate how much, in the past week, fatigue interfered with your mood

### 4. HealthWatch 360 Application (GB Health Watch, San Diego, CA)

This application was created to strengthen connections between health, nutrition, and lifestyle as part of the nutritional genomics mission of the GB HealthWatch company. It was designed to help individuals understand how their health outcomes might be a result of the composition of their genes. Participants used this application for a duration of seven days to track their food intake and sleep amount and quality. Each participant was trained to properly use the application and entered all food items consumed over the seven days.

### 5. Compliance Log Sheet



A compliance log sheet was used to increase accountability among participants when logging all of their data for each day during the seven days of tracking. Participants simply had to “check off” whether or not they completed their food and/or sleep tracking each day.

## **Procedures**

An introductory meeting was held with each participant who volunteered to join the study. During this meeting, procedures were explained and participant expectations were discussed in order to promote understanding. At the start of the meeting, participants were asked to sign an informed consent document. A tutorial session was conducted by the researchers on using the HealthWatch 360 application. Participants who could not attend the group tutorial were given a private session with the researchers.

Once volunteers were prepared to participate, they were asked to fill out the required three questionnaires and were given a compliance log sheet. The following day, participants began tracking food intake, sleep amount, and sleep quality for seven consecutive days via the HealthWatch 360 application. All participants began tracking on the same week day. After the seven-day period, participants were asked to complete the PSS and FSI questionnaires once more and submitted them, along with their compliance log sheets.

An optional interview was conducted at the end of the study with twenty participants, each lasting for approximately 15 minutes. The purpose of the interviews was to learn about each participant’s experience. The interviews were recorded and transcribed. After transcription and analysis, the recordings and transcripts were destroyed.

## **Statistical Analysis**

Quantitative data were entered into Excel 2016 (Microsoft Corporation, Redmond, WA, USA) and was analyzed using SAS 9.4 (SAS Institute, Cary, NC, USA). The statistical analyses

included descriptive statistics, two sample t-tests, paired t-test, mixed model and non-parametric statistical testing:  $\chi^2$  tests for contingency table and Wilcoxon signed – rank test. Mean  $\pm$  SD was computed for quantitative variables, frequency (percentage) for categorical variables, and median for ordinal data. All statistical analyses were performed at an alpha level of .05.

### Covariates

Dependent variables included scores from sleep quality and sleep amount data, and independent variables included several categorical variables. Independent variables included gender, age, marital status (single, married, divorced, widowed, separated, other), and number of children, if any. Other independent variables were their level of education (high school, GED, associates, undergraduate degree, graduate degree, other), employment status (full time, part time, per diem, self-employed, homemaker, unemployed, retired, other), presence of medical problems, history of food tracking (using applications such as MyFitnessPal or HealthWatch 360), and current or past experience with CrossFit activities.

### Results

Table 1 shows demographic data for 34 participants. The majority of participants were female, and between the ages of 22 and 56 years.

**Table 1.** Frequency (%) of selected characteristics of participants at baseline (N=34)

Characteristics	Frequency(%)
Age (years)	31 $\pm$ 8.6*
Gender	
Female	21 (61.8)
Male	13 (38.2)
Marital status	
Single	18 (52.9)
Married	16 (47.1)
Children	
Yes	10 (29.4)
Education	
High School	6 (17.6)

Undergraduate	6 (17.6)
Associates	10 (29.4)
Graduate	7 (20.6)
Other	7 (20.6)
	4 (11.8)
Employment	
Full time	15 (44.1)
Part time	6 (17.6)
Homemaker	3 (8.8)
Self employed	3 (8.8)
Retired	0 (0)
Unemployed	1 (2.9)
Other	6 (17.6)
Medical Conditions	
Absent	28 (82.4)
Past Food Tracking	
Never tracked	17 (50)
Method of Food Tracking	
Not Applicable	17 (50)
MyFitnessPal	11 (32.4)
Other	6 (17.6)
Cross-Fit	
Yes	25 (73.5)

\*Mean(Standard Deviation)

Table 2 reveals descriptive analyses for sleep amount, stratified by time and gender. Sleep amount was logged into the Healthwatch 360 mobile application, daily, over a period of 7 days as number of hours slept. Overall, between males and females, there was no significant difference in sleep amount over 7 days ( $p=0.073$ ), when compared to baseline. However, there was a significant improvement in sleep amount for day 2 ( $p=0.043$ ) and day 5 ( $p=0.046$ ). When stratifying by gender, there was an overall significant improvement in sleep amount for females ( $p=0.012$ ). Moreover, there was a significant improvement in sleep amount for females for day 2 ( $p=0.015$ ) and day 5 ( $p=0.021$ ). However, there was no significant improvement in overall sleep amount among males ( $p=0.321$ ).

**Table 2.** Mean(SD) of sleep amount (hours), stratified by gender over time

Day	Females				Males				Overall P value
	n	Mean (SD)	Min-Max	P value	n	Mean (SD)	Min-Max	P value	

				†				†	†
1	18	6.5(1.0)	4.5-9.0		8	6.4(1.2)	4.0-8.0		
2	16	7.4(1.1)	5.5-10.0	<b>0.015</b>	8	6.4(1.3)	4.5-8.0	0.904	<b>0.043</b>
3	15	6.5(1.4)	4.0-8.0	0.988	10	7.0(1.1)	5.5-9.0	0.272	0.510
4	15	6.6(0.9)	5.0-8.0	0.913	10	6.8(0.9)	5.0-8.0	0.651	0.738
5	17	7.4(1.2)	5.5-10.0	<b>0.021</b>	9	6.6(1.5)	4.0-8.5	0.642	<b>0.046</b>
6	17	6.6(1.7)	4.0-11.0	0.799	9	6.5(1.4)	4.0-9.0	0.659	0.770
7	18	6.8(1.0)	4.5-9.0	0.410	11	5.9(1.3)	3.0-7.5	0.406	0.994
Overall		6.8(0.8)	5.2-8.3	<b>0.012</b>		6.6(0.9)	4.6-7.8	0.321	0.073

All days are compared to Day 1.

Results shown in Table 3 indicate descriptive analyses for sleep quality, stratified by time and gender. Sleep quality was also logged into the Healthwatch 360 mobile application, over a period of 7 days, using a Likert-type scale from 1 to 5; 1 indicating the poorest sleep quality and 5 reflecting the highest sleep quality. Results from the mixed model analysis indicated that there was no overall significant improvement in sleep quality over time ( $p=0.582$ ). When stratifying by gender, results showed that there was no significant improvement in sleep quality for females ( $p=0.482$ ) or males ( $p=0.207$ ). Results also indicated that there was a significant correlation between the two dependent variables, sleep quality and sleep amount ( $r=0.42$  and  $p= <.0001$ ).

**Table 3.** Mean (SD) of sleep quality (Likert-type scale), stratified by gender

Day	Females				Males				Overall P value †
	n	Median	Min-Max	P-value †	n	Median	Min-Max	P value †	
1	6	3.5	2.0-4.0		6	3.0	2.0-4.0		
2	9	4.0	2.0-4.0	0.959	6	3.0	3.0-4.0	0.286	0.560
3	9	3.0	1.0-5.0	0.943	6	3.5	3.0-4.0	0.157	0.433
4	10	3.5	2.0-5.0	0.484	7	4.0	3.0-4.0	0.053	0.102
5	11	4.0	2.0-5.0	0.163	7	4.0	2.0-4.0	0.242	0.056
6	12	3.0	2.0-5.0	0.865	6	4.0	3.0-4.0	0.071	0.297
7	12	4.0	2.0-5.0	0.365	6	3.0	2.0-4.0	0.984	0.301
Overall		3.4	2.0-5.0	0.482		3.4	2.9-4.0	0.207	0.582

All days are compared to Day 1.

Using Wilcoxon signed rank test for paired samples, results showed that there was no significant decrease for overall stress ( $p=0.329$ ) with means(standard deviation), from pre to post of, 17.24(6.04) and 16.5(4.86), respectively. Results using Wilcoxon signed rank test for paired samples also showed that there was no significant decrease in the mean over time for fatigue ( $p=0.067$ ) with means(standard deviation), from pre to post, 16.85(12.86) and 13.12(11.77), respectively. Although the total score for fatigue variables was not significant from pre to post, there were statistically significant changes in some individual questions (Q1, Q3, Q9, Q10, Q11, Q13), (Table 4).

**Table 4.** Significant questions of Fatigue Symptom Inventory showing improvements pre to post

	Pre-score (n=34)			Post-score (n=34)			P value
	Q1	Median	Q3	Q1	Median	Q3	
Question 1. Rate your level of fatigue on the day you felt <b>most</b> fatigued during the past week	4.0	6.5	8.0	3.0	4.5	6.0	<.001
Question 3. Rate your level of fatigue on the <b>average</b> during the past week	2.0	4.0	5.0	2.0	3.0	4.0	<.001
Question 9. Rate how much, in the past week, fatigue interfered with your <b>relations with other people</b>	0.0	2.0	4.5	0.0	1.0	3.0	0.004
Question 10. Rate how much, in the past week, fatigue interfered with your <b>enjoyment of life</b>	0.5	2.0	4.5	0.0	1.0	3.3	0.045
Question 11. Rate how much, in the past week, fatigue interfered with your <b>mood</b>	1.0	3.0	4.5	1.0	2.0	4.0	0.018
Question 13. Rate <b>how much of the day</b> , on average, you felt fatigued in the past week	1.0	3.0	4.5	1.0	3.0	3.0	0.017

Q1 indicates first tertile  
Q3 indicates third tertile

### *Qualitative Analysis*

The interviews conducted allowed the research investigators the opportunity to learn about the impact of food and sleep tracking on those who participated. The results of the qualitative analysis complimented and supported the results of the quantitative analysis. Out of the 34 volunteers who participated in the study, 20 participated in the interviews. Each interview was recorded, transcribed, and coded in order to find the most common themes throughout all 20 interviews. This qualitative data was analyzed using a coding system which broke down each interview, word for word, to find recurring thoughts and experiences from participating subjects. Four major themes that defined the overall experience of the study were concluded. The most recurring theme found throughout the interviews was accountability and increased awareness (Table 6).

**Table 6.** Major Themes of Overall Experience (n=20)

<b>Theme</b>	<b>Illustrative Examples</b>
1. Accountability & Awareness	<i>Participant 1: “It really gave me accountability”. Participant 3: “It was something new to me and gave me some awareness of food and sleep”. Participant 6: “I think it’s nice and convenient because of the awareness it gives us about our food intake and making sure we are not eating too much, which is always something I’m worried about”.</i>
2. Impact of Food Logging	<i>Participant 2: “Usually, I have a hard time sleeping and while tracking my food it made me focus on eating well all day which helped my sleep quality, I think, immensely improve”. Participant 5: “I think it may have elevated my stress a little only because I needed to make sure I remembered to track and if I didn’t track the whole day then I would have to enter it all in at night”.</i>
3. Difficulty Tracking	<i>Participant 3: “It was hard to keep track when going out because I would almost forget to track or have trouble knowing what to track... like how detailed to be”. Participant 7: “I cook most of my own meals so trying to figure out how to add something in the app (was challenging)”. Participant 12: “...since this particular app was confusing to me, I don’t know if I’ll stick with it”.</i>
4. Comparing to Other Apps	<i>Participant 14 “...I would find it tedious to look for foods that I would normally find in (other app). So, I either chose something similar or entered it all in manually... if I had the time at least”. Participant 4: “...I like the style of it. Better than the other one”.</i>

## **Discussion**

The purpose of this study was to determine if tracking food and sleep had an effect on quality of life in terms of stress, fatigue, and amount and quality of sleep. The results of this study showed that the overall number of hours slept by participants did not improve significantly as a result of food and sleep tracking. Yet, an overall significant improvement in sleep amount was observed for day 2 and day 5, when compared to baseline. However, this observation may have been due to chance as it is not consistent with the rest of the data in this study. Another reason for this observation is that, since tracking food and sleep began on day 1, which was a Monday, participants may have been able to get more sleep on day 5, because it was a Friday,

which allowed them to sleep more on the weekend. A study by Goel et al. compared sleep patterns in young men and women and found that sleep was better among women than men.<sup>19</sup> Similarly, findings in this study showed that females had a better overall improvement in sleep hours than males.

We also observed that stress and fatigue were not significantly impacted by sleep and food tracking. One reasoning for this finding is that food and sleep tracking may not have been the variables needed to significantly improve or outweigh other stressors in the participants' lives.

A recurring theme from this study's qualitative findings was the increased sense of accountability and awareness reported by participants. The reasons for desiring accountability differed according to individual needs, which included being accountable for eating consistently throughout the day or sticking to certain health and fitness goals. Becoming more aware and knowledgeable about food and its nutritional components can make people realize how much, or how little, they were eating. Participants claimed to have increased awareness of their food and sleep habits, which could be a reason why their accountability increased.

*"I think the most beneficial part was seeing where I could make changes in my diet because all my food that I ate was right in front of me".*

The qualitative analysis resulted in a mixture of responses on how food tracking impacted a participants HRQOL. For example, the perceptions about how tracking impacted stress levels differed among participants. According to some of the participants, having an extra task to do meant that they had to remember about tracking at certain times throughout the day, which may have contributed to an increase in stress levels. Other participants reported that they did not believe that tracking had an impact on their stress levels.



While the food tracking application could be conveniently found on one's smartphone, some participants reported facing some difficulties when using the application to log their food intake.

*“It was hard to keep track when going out because I would almost forget to track or have trouble knowing what to track... like how detailed to be”.*

Being unfamiliar with measuring food accurately before or after cooking was also an issue for some participants, which may have caused them to log an incorrect amount of what they consumed.

*“I cook most of my own meals so trying to figure out how to add something in the app (was challenging). So, for example, a hamburger has a ton of different ingredients: the weight of the meat, a slice of cheese, one teaspoon of mayo...”.*

Those who were new to using the HealthWatch 360 application thought that it was difficult to understand how use it, even after being given a tutorial. As a result, some decided that they would not continue tracking using this application.

*“I wouldn't (continue using) because I found that it was difficult to put in custom foods, and that there wasn't a lot of pre-listed items that I eat in the app for tracking”.*

Food tracking applications are far from new to the health and fitness world of mobile applications. Therefore, participants who have previously tracked food before using other mobile applications found it hard not to compare them to the HealthWatch 360 mobile application. There were difficulties reported about having to manually enter in all the nutritional information about certain foods that could not be found on the application's database.

*“...I would find it tedious to look for foods that I would normally find in (other app). So, I either chose something similar or entered it all in manually... if I had the time at least”.*

Participants were also asked if they would continue using the HealthWatch 360 application or use another one. Mixed responses were noted with those who have tracked in the past stating that they would most likely use other mobile tracking applications. Those who had never used a food tracking application prior to the study stated that they would continue to use the HealthWatch 360 application. Therefore, it seemed that the application was a better fit for the general population than those with certain fitness goals.

### **Strengths and Limitations**

This study's strength is that it, to the best of our knowledge, is the first study to look at food and sleep tracking and how it affects health-related quality of life. The study's limitations include having a small sample size and budget constraints. Also, tracking food and sleep for a short duration of time may have hindered the possibility of observing potentially significant changes in the outcomes, over the long term.

### **Conclusion**

Although our findings showed that food and sleep tracking did not have an effect on health-related quality of life, we were able to determine that it increased participants' awareness and accountability. This suggests that, with an increased sense of awareness related to one's food and sleep habits, participants may eventually be triggered to make improvements, however, it would likely need a longer period of time to observe.

The qualitative themes regarding accountability, impact of food logging, difficulty tracking, and comparisons to other application gave researchers a more personable representation of the overall results of the study. Our analysis revealed that the interviewees did indeed perceive an impact from tracking their food, whether positive or negative. Most of the negative experiences were related to the type of mobile health application used, instead of the food

tracking experience itself. Additional research with a longer study period and a larger sample size is needed to further examine the effect of food and sleep tracking on HRQOL outcomes.

## **Appendices**

## Appendix A

### Cohen's Perceived Stress Scale

#### PERCEIVED STRESS SCALE

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

Name \_\_\_\_\_ Date \_\_\_\_\_

Age \_\_\_\_\_ Gender (Circle): **M** **F** Other \_\_\_\_\_

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

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



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#### References

The PSS Scale is reprinted with permission of the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386-396.  
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## Appendix B

### Fatigue Symptom Inventory

#### FSI

For each of the following, circle the one number that best indicates how that item applies to you.

1. Rate your level of fatigue on the day you felt **most** fatigued during the past week:

0 1 2 3 4 5 6 7 8 9 10  
Not at all As fatigued  
fatigued as I could be

2. Rate your level of fatigue on the day you felt **least** fatigued during the past week:

0 1 2 3 4 5 6 7 8 9 10  
Not at all As fatigued  
fatigued as I could be

3. Rate your level of fatigue on the **average** during the past week:

0 1 2 3 4 5 6 7 8 9 10  
Not at all As fatigued  
fatigued as I could be

4. Rate your level of fatigue **right now**:

0 1 2 3 4 5 6 7 8 9 10  
Not at all As fatigued  
fatigued as I could be

5. Rate how much, in the past week, fatigue interfered with your **general level of activity**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

6. Rate how much, in the past week, fatigue interfered with your **ability to bathe and dress yourself**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

7. Rate how much, in the past week, fatigue interfered with your **normal work activity (includes both work outside the home and housework)**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

## FSI

For each of the following, circle the one number that best indicates how that item applies to you.

8. Rate how much, in the past week, fatigue interfered with your **ability to concentrate**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

9. Rate how much, in the past week, fatigue interfered with your **relations with other people**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

10. Rate how much, in the past week, fatigue interfered with your **enjoyment of life**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

11. Rate how much, in the past week, fatigue interfered with your **mood**:

0 1 2 3 4 5 6 7 8 9 10  
No Extreme  
interference interference

12. Indicate **how many days**, in the past week, you felt fatigued for any part of the day:

0 1 2 3 4 5 6 7  
Days Days

13. Rate **how much of the day**, on average, you felt fatigued in the past week:

0 1 2 3 4 5 6 7 8 9 10  
None of The entire  
the day day

14. Indicate which of the following best describes the **daily pattern** of your fatigue in the past week:

0 1 2 3 4  
Not at all Worse in Worse in Worse in No consistent daily  
fatigued the morning the afternoon the evening pattern of fatigue

**Appendix C**  
Compliance Log Sheet

Participant # \_\_\_\_\_  
Date \_\_\_\_\_

**Compliance Log Sheet**

*Did you log in your food intake and sleep quality? Please circle Yes or No*

<b>Day #</b>	<b>Did you log your food intake?</b>	<b>Did you log your amount and quality of sleep?</b>	<b>Comments (optional)</b>
1	Yes   No	Yes   No	
2	Yes   No	Yes   No	
3	Yes   No	Yes   No	
4	Yes   No	Yes   No	
5	Yes   No	Yes   No	
6	Yes   No	Yes   No	
7	Yes   No	Yes   No	





## Appendix E Interview Questions

### Interview Questions

1. How did your experience food tracking affect stress?
2. How did you experience with sleep tracking affect stress?
3. What are your perceptions and thoughts of using a mobile app to track your food and sleep?
4. What were your biggest challenges with tracking food and sleep?
  - a. Which did you find more difficult and why?
5. What was the most beneficial part about your experience?
6. Would you continue to use this app? If not, please share your reasons.
7. If you used another food tracking app in the past, how would you compare your experience using this app versus your previous app?
8. What would you tell a friend about using HealthWatch360 app?

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