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Psychological Health and Overweight and Obesity Among High Stressed Work Environments

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Abstract

Correctional employees are recognized to underreport stress and stress symptoms and are known to have a culture that discourages appearing “weak” and seeking psychiatric help. This study assesses underreporting of stress and emotions. Additionally, it evaluates the relationships between stress and emotions on health behaviors. Correctional employees (n=317) completed physical assessments to measure body mass index (BMI), and surveys to assess perceived stress, emotions, and health behavior (diet, exercise, and sleep quality). Stress and emotion survey items were evaluated for under-reporting via skewness, kurtosis, and visual assessment of histograms. Structural equation modeling evaluated relationships between stress/emotion and health behaviors. Responses to stress and negatively worded emotions were non-normally distributed whereas responses to positively-worded emotions were normally distributed. Emotion predicted diet, exercise, and sleep quality whereas stress predicted only sleep quality. As stress was a poor predictor of health behaviors and responses to stress and negatively worded emotions were non-normally distributed it may suggests correctional employees are under-reporting stress and negative emotions.

Keywords

Stress; Emotion; Health behavior; Correctional employees; Structural equation modeling

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Introduction

Almost 69% of U.S. adults are considered overweight or obese [1]. Obesity predicts increased risks of morbidity and mortality [2-5] and elevated medical costs [6]. Health behaviors have been identified as key determinants of bodyweight (e.g. diet and exercise) [5,7-9]. Stress and poor psychological health such as negative emotions, depression, and anxiety may also be risk factors for obesity by promoting poor health behaviors. Emotional characteristics have been related to both body weight and health behaviors. Multiple studies also suggest that negative emotions (e.g. negative mood) may negatively affect eating patterns [10-12]. In addition, elevated stress is related to poor sleep quality and duration [13]. Furthermore, poor sleep quality has been related to psychosocial health including negative mood state, depression [14], anger, hostility, and aggression [15-17].

Work stress also has been associated with unhealthy lifestyle behaviors such as poor dietary practices [18] and low levels of physical activity [19,20], thus contributing to weight gain, abdominal obesity [21,22], and metabolic syndrome [23]. Chronic work stress has serious adverse implications on employee health and well-being [24-27] and has been significantly associated with rises in plasma cortisol level, coronary heart disease [25], high blood pressure, high blood sugar [28], and psychological issues such as anxiety and depression [29-32]. Furthermore, occupations characterized with high job strain (high work demands and low decision control) have been associated with increased risk of depressive symptoms, and those characterized with high job strain coupled with low social support are associated with psychological distress, job dissatisfaction, and negative emotions [31,33]. Additionally, chronic psychological distress and negative work experiences may negatively impact an individual's personality, resulting in a persistently negative outlook [34].

Law enforcement personnel are an occupational group with higher health risks compared to working adults in other occupations [35]. Correctional employees have elevated rates of overweight and obesity when compared to national U.S. averages (86.6% and 55.8%, respectively), vs. (69% and 32%, respectively) [36]. Likewise, correctional employees report poor health behaviors including poor diet, snacking on low nutrient foods [37], low physical activity, sedentary behaviors, and poor sleep patterns [29]. Correctional employees are also recognized for high rates of occupational stress and depression [34]. Unfortunately, the poor psychological health profiles of correctional employees appear to perpetuate poor health behaviors and ultimately contribute to overweight/obesity. For example, in a focus group study correctional employees reported that job related stress was a major contributor to poor dietary practices [29].

The contributing effect of work stress on health in correctional employees rests on the presence of multiple sources of daily stress including the hierarchical structure, work environment (poor staff to inmate ratios, required overtime, and shift work), contact with incarcerated inmates, low social support, negative public image, work overload, role ambiguity, low skill discretion, job-demands-control imbalance and effort-to-reward imbalance [34,37,38-42]. The constant sense of personal endangerment effects correctional employees health behavior [24,43]. Correctional work is associated with high levels of adverse emotions and elevated prevalence of mental health issues [44] that include

perception of a short life expectancy, high suicide rates [45], and high rates of depression [46,47].

The term emotional labor describes the management or modification of emotions when one's occupation requires expression of certain feelings while concealing other emotions [48.49] This may take the form of faking, enhancing, or suppressing certain expression to achieve the desired emotional anterior [50]. Emotional labor has been associated with adverse psychosocial states and measures, including burnout [51,52], job stress and self-alienation [49,52], depression, cynicism, role alienation [53], emotional numbness [54], and job tensions [51,55]. When emotional labor results in a conflict between required emotions and true emotions, the result has been termed as ‘emotional dissonance’. The larger the gap between required emotions and true emotions, the more likely an employee is to experience stress, job burnout, and psychological separation from one's self [56,57].

Although law enforcement, including work in corrections, is noted to be a high-stress occupation, law enforcement personnel commonly under-report stress levels and stress symptoms [35,58-60]. This reported phenomenon provides a basis for testing the emotional labor construct and hypothesis [35,60]. The resulting emotional detachment from both self and other is associated with poor family relationships (e.g. marital disruption and divorce) [35,61,62] and has been observed in police officers [63], military personnel [64] and correctional officers [24,65]. These occupations all require the display of a detached attitude during emotionally challenging situations (e.g. conflict, aggression, manipulation) while refraining from displaying actual feelings [63]. For example, military personnel are characterized as “macho” and being immune to the challenges and traumas that are “just part of the job”. Individuals who do not keep up this “macho” description are identified as “lacking in moral fiber”. Seeking psychiatric help is viewed with a negative stigma and therefore, military members generally do not seek such help for fear of appearing weak [64]. Furthermore, exposure to life-threatening events, a common experience for law enforcement personnel, can also result in feelings of detachment, emotional numbness, and interfere with an individual's ability to function as they used to [66].

Correctional officers need to display various emotional fronts in specific situations (e.g. friendly/supporting, anger/toughness, and/or concealing distress and weakness) [67]. In corrections work, expression of emotions and feelings has been characterized as an occupational hazard and low-status “women's work” [68]. Although confronted with many stressful situations, correctional officers have are limited in coping by the primacy of security and procedures. Therefore, correctional employees have few tools to decompress when faced with stressful situations and must internally cope with intense and negative emotions while requiring to appear calm and emotionally detached [69]. Among correctional officers, this emotional dissonance has been noted as a source of stress [63]. Denial of occupational stress and its consequences have been cited as sources of feelings of helplessness and alienation [70].

Due to emotional detachment, correctional officers may not realize detrimental consequences (e.g. negative behavioral patterns and emotional instability) traumatic events.

Alarmingly, this inability to express negative emotions and inhibition of emotions are strong predictors of poor physical health and illness (e.g. high blood pressure & cancer) [50,63].

Overall, occupational stress in law enforcement personnel is seen as a problem for employers by adversely affecting the psychological, emotional, and behavioral health of employees [43,71-72]. Emotional dissonance has many detrimental effects on employee health including increased stress. Therefore, both emotional dissonance and the acute and chronic stressors of these high stress occupations must be effectively understood and addressed. Many studies note these populations to underreport stress and stress related symptoms [24,31,60]. Therefore, addressing stress and emotions within corrections may enhance health-promoting efforts. Hence, the purpose of this study was to examine the prevalence of reported stress, negatively worded emotions (e.g. feeling blue or worthless), and positively-worded emotions (e.g. feeling calm or happy) amongst a group of correctional employees and compare responses to assess for under-reporting and possible evidence of emotional labor and emotional dissonance. Further, researchers examined if reported stress and overall emotion had an effect on reported health behaviors (diet, exercise, and sleep quality). Drawing attention to emotional labor and dissonance experienced by correctional employees and the effects of employee stress and emotions on health behaviors will bring better awareness to understanding the determinants of health among employees.

Materials and Methods

Design

This was a cross-sectional observational study.

Participants

Data collection was conducted at two correctional institutions in the same Northeastern state. Prior to data collection, members of the research team met with Wardens and Union representatives on multiple occasions to discuss best practices and procedures for encouraging participation. All employees of these facilities were invited for voluntary participation. Volunteers were recruited with flyers posted in the facilities and roll call announcements conducted by research staff and supervisory lieutenants. After being informed about study requirements and having time to discuss questions with research staff, participants signed a consent form approved by the Institutional Review Board. Health Risk Assessment (HRA) survey and physical assessments were conducted in secure locations within each facility. Participants were financially compensated for each portion of the assessment they participated in (survey and physical assessment) for a maximum of $50. Research staff spent approximately two months at each site. Administration was fully informed of all study procedures and gave their support and encouragement to employees for participation. Three hundred and seventeen employees completed the Health Risk Assessment (HRA) and the physical assessment.

Measurements

Data from the Health Risk Assessment (HRA) survey and a physical assessment were utilized (variables further discussed below). The HRA tool is commonly used in workplace

wellness programs and has been certified by the National Committee for Quality Assurance [73]. All survey items used are listed in Table 1.

Physical assessment—Trained research staff measured height and weight with a calibrated Seca 700 physician balance beam scale, measuring weight to the nearest 0.1 kilogram and height to the nearest millimeter. Height and weight measures were used to calculate body mass index (BMI) (weight in kilograms divided by height in meters squared) and classified based on Centers for Disease Control and Prevention (CDC) recommendations [74,75].

Health risk assessment—This study used the Wellsource® HRA- The Personal Wellness Profile™, a survey utilizing 39 questions in Likert scale form to assess multiple dimensions of participant's self-reported health. For this study, responses to nutrition, physical activity, stress, and emotions were assessed. Survey items were used to create an overall latent variable score for each health behavior, stress, and overall emotion.

Health behaviors—Three health behaviors were assessed based on self-reported answers to HRA questions (diet, exercise, and sleep quality).

Diet quality score was calculated from 6 survey items assessing how often the participant ate from each food groupparentheses (snacks, high salt foods whole grains), and frequency of eating breakfast. Because survey roots used either 4- or 5-point Likert scale, all questions were normalized to a 4-point scale prior to analysis. Answers ranged from (1) ‘almost never eat the healthier options’ to (4) ‘almost always eat the healthier options’. Higher latent diet quality scores represent better overall diet.

Exercise quality score was based on 3 survey items assessing frequency of aerobic, strength building, and stretching exercise on 4- or 7-point Likert scales, with all items normalized to a 4-point scale. Answers ranged from (1) ‘never’ to (4) ‘three or more days/week’, with higher latent exercise quality scores indicating better exercise habits.

Sleep quality was based on a single question asking, “how often do you get 7 to 8 hours of sleep”. Answers on a 4-point Likert scale ranged from (1) ‘always’ to (4) ‘seldom or never’. This item was reverse coded so a higher latent score represented better sleep quality.

Stress—A perceived stress latent variable was created from 6 survey items with “yes” or “no” responses. Higher latent scores indicate higher stress levels.

Overall emotion—Overall emotion latent variable was created from 6 survey items. Two questions were considered negatively worded emotions (feeling blue and feeling worthless) and four were considered positively-worded emotions (feeling energy, calm, happy, and relaxed). Answers were on a 6-point Likert scale and ranged from (1) ‘none of the time’ to (6) ‘all of the time’. Responses were reverse coded as needed so that a higher latent overall emotion score represented more positive overall emotion.

Data Analyses

Data from HRAs and physical assessments were transferred to Microsoft Excel and IBM SPSS™ version 21.0 software [76]. Frequencies and histograms were used to assess the prevalence of each stress signal and emotion. To assess under-reporting of stress and emotions each was evaluated for non-normality in responses. Determination of non-normality was based on recommendations by Kim et al. who states that for samples of n>300 histograms and the absolute value of skewness and kurtosis should be utilized. An absolute skew of >2 or an absolute kurtosis >7 is a reference value to determine substantial non-normality [77]. Analyses were conducted on dependent variables with and without outliers evaluated as +3 standard deviations from the mean [78]. To create latent variable (explained below) all binary variables were coded as 0 and 1, variables on Likert scales were reverse coded if needed, and categories of variable survey items were normalized. Variables were assessed for missing values. All variables had 100% response rate besides 3 emotions questions, which had 3 missing responses. Therefore, these individuals were not used in analyses involving emotions.

Latent variables and structural equation models—Next, we used Structural Equation Modeling (SEM) [79-81] to make latent variables (stress, overall emotion, diet quality, and exercise quality) and test for relationships between these variables. Latent variable indicators are listed in Table 2. All analyses for latent variables and structural models were conducted using Mplus version 7.11 [82]. The SEM procedure used was based on recommendations by Buhi 2007 [83]. Latent constructs that could not be directly measured were represented by directly measured survey items (indicators), by assessing the shared variance between correlations/covariances of the indicators. Measurement models used to create these latent constructs increased statistical accuracy by capturing measurement error [84]. After creating latent constructs, structural models were created to assess the relationships between the various latent constructs (stress, overall emotion, diet quality, and exercise quality) and directly reported or observed constructs (sleep quality and BMI). All measurements and structural models were assessed based on model fit to the data (how well the data fits the hypothesized relationships) as represented by the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker Lewis Index (TLI). Rejection criteria was: >0.06 for RMSEA, <0.95 for CFI, <0.90, and <0.95 for TLI [85]. In cases of inadequate model fit, latent variables were altered by either co-varying indicators or removing non-meaningful indicators (determined by factor loads and p-value), see Table 3.

Results

Participant characteristics

Descriptive analyses indicated that a majority of corrections employees reported no/few stress signals, with the percent reporting no stress signals ranging from 81.4 - 91.2% depending on the signal. Of the 6 stress signals, percentage of participants who reported not having the signal were; 81.4%, 85.8%, 88.3%, 87.1%, 87.1%, and 91.2% (Table 4). All 6 stress signals had a large skewness (1.621 to 2.915), with 5 of the 6 survey items being

above the reference value for non-normality. Please refer to the histogram in Figure 1 for the distribution of all stress signals.

The 6 responses to emotion survey items, as listed in Table 5, were coalesced from 6 responses to 3 (all or most of the time, some of the time, little or none of the time). When comparing responses to negatively worded emotions (worthless, blue) vs. positively-worded emotions (happy, calm, energetic, taking time to relax) a smaller percentage of participants reported having a negative feeling. Both negative emotions had a large skew (skewness of −0.924 to −2.060) indicating a non-normal distribution with a majority of participants reporting rarely having the negative emotion. In contrast, reporting of the 4 positive emotions was more evenly distributed with a more proportionate distribution of participants responding to having the given emotion all of the time, some of the time and little or none of the time, skewness of 0.169 to −0.556 (Figure 2). For the negatively worded emotion of feeling downhearted/blue only 2.8% of individuals reported feeling the negative emotion a majority of the time. In comparison, for the positively-worded emotion of feeling happy, 10.4% of individuals report not feeling happy a majority of the time. The implication is that responses to positively-worded questions differ from negatively worded questions, even when the construct is similar.

SEM analysis results are depicted in Table 6. These show that higher self-reported stress had no effect on diet or exercise quality, but negatively effected sleep quality ($\beta=-0.23$, $p=0.001$). Overall emotion directly effected all three health behaviors; diet ($\beta=0.163$, $p=0.006$), exercise ($\beta=0.163$, $p=0.006$), and sleep quality ($\beta=0.318$, $p<0.001$), with positive emotion resulting in better health behaviors. These results suggest that reported overall emotion might be more meaningful in predicting health behaviors than reported stress.

Discussion

The use of SEM assessed if stress and/or overall emotion were predictive of health behaviors. Results suggest a relationship between emotions and health behaviors, with a more positive mood or better overall emotion related to better diet, exercise, and sleep quality. On the other hand, stress was related only to sleep quality but not diet and exercise quality. These results indicate that overall emotion was a more meaningful predictor of health behaviors than stress in this population. One inference is that rather than relying on self-reported stress alone as a predictive variable, it may be useful to assess multiple stress and emotion related variables since the suitability for a particular population cannot be assumed. The importance of understanding the study population before administering surveys is implicit. Previous studies also have found a positive relationship between emotions and health behaviors [10,11,86]. Gibson (2006) [87] found mood can alter food choices and suggested that eating may calm stressed “nerves” through hedonic sensory qualities that elicit pleasure. In human laboratory research, negative mood states have been related to altered preferences for highly-palatable foods [88] and to a disinhibiting effect on eating [89,90]. Udo found non-obese participants had less resistance to eating during negative mood induction than positive mood induction [12]. A meta-analysis by Knottinen examined relationships between depression/depressive symptoms and obesity [91]. Higher levels of depression were related to a tendency to eat during negative- emotions lower self-

efficacy for physical activity when facing barriers, lower reported physical activity, and higher levels of adiposity [91]. Finally, the link between emotions and sleep quality has been noted in previous research. Stewart (2011) found adults with higher reported negative affect had poorer sleep quality [92]. Furthermore, poor sleep quality has been associated with depression [14], anger, hostility, and aggression [15-17].

The relationship between stress and health behaviors is controversial [93,94]. Some studies have found certain types of stress including work stress to be associated with obesity-related behaviors among adults (e.g. diet and exercise quality) [95-98]. However, other studies have failed to show a relationship between stress and dietary changes, similar to our own study [99-101]. This may be due in part to the differences in responses to stress. A meta-analysis captured this ambiguity with approximately 40% of individuals increasing their intake, 40% decreasing their intake, and 20% reporting no change their intake and eating behaviors in response to perceived stress [102]. Interestingly, individuals who were in the higher range of normal weight or who were overweight generally increased their intake with stress, whereas those who are underweight or in the lower end of normal weight typically did not increase their intake or decreased their intake [103]. Additionally, those individuals who were "emotional eaters" tended to have cravings for and increase their intake of high-fat/sweet and rewarding/comfort foods in response to stress. There is evidence that individuals who use food as a reward in stressful times or negative mood states tend to decrease awareness of calorie intake and food restriction in the presence of stress [98]. Women's dietary practices may be more influenced by stress than men [87,98]. As our study population was largely male, this may be a reason for not finding a significant relationship. Our study failed to find an association between the effect of stress and exercise. Similarly, Conroy (2007) found only a modest association between leisure physical activity and stress levels [104].

Another reason for not finding a significant relationship between stress, diet and exercise quality in our study may be the small range of the responses to perceived stress. In one worksite obesity prevention study it was hypothesized that stress would affect risk for obesity through bio-behavioral processes. The authors found a relationship between higher stress levels and lower levels of eating awareness, physical activity, and walking, but no relationship between stress levels and BMI or diet quality were seen. The authors suggested that this might be because the range of reported stress scores in the sample was too small to detect associations. The average stress scores were not consistent with the expected highly stressed population [98]. Future studies should address possible moderators of the perceived stress-health behavior relationship (e.g. overweight and obesity, sex, eating behavior domains) [98,105].

Our study did find a relationship between stress and sleep quality. The link between stress and sleep quality was also seen in a study by Kashani (2012) who found that higher levels of stress were correlated with significant disturbances in sleep duration and quality [106]. Hemmingsson (2014) stated that sleep patterns are adversely affected by chronic exposure to stress [107].

Although correctional work is recognized as a high stress occupation, in our study self-reports of stress and negatively worded emotions were very low. These findings would imply

that this is a population that is rather unstressed. However, this conflicts with the well-supported idea that corrections are a high stress occupation [34, 35,65]. Previous studies also reported such conflicts [29,108], suggesting that correctional employees under-report stress and emotions (particularly negatively worded emotions). In contrast, in our study, responses to positively-worded emotions had a more uniform distribution, possibly signifying more accurate reporting. Although they are asking very similar questions more participants admit to not feeling happy (possibly because it is a positively-worded emotion) whereas a much smaller percentage of participants admit to feeling downhearted hearted/blue (possibly because it is a negatively worded emotion). Interestingly, correctional employees may more accurately report positively-worded emotions, but are less likely to report negatively worded emotions.

These results suggest that correctional employees may be underreporting stress and negatively worded emotions. This may conceivably be the result of job prescribed emotional labor in which employees are expected to refrain from displaying stress and emotions to prevent the appearance of weakness. Correctional employees are often expected to display certain emotions while on the job such as appearing strong and tough in stressful situations, even if these emotions are at odds with their true emotions [67]. This may be a reason why correctional employees, and law enforcement employees in general, have been noted to underreport signs of weakness of stress and stress-related symptoms.

Under-reporting has been reported in other studies as discrepancies between reported levels of stress and physiological levels of stress. Given the reliance of many investigators on surveys and psychosocial assessment, the discrepancy is a potential serious barrier to valid results. Cheek (1983) found that objective stress measures (e.g. physical illness and high divorce rates) in correctional officers suggest high job stress. In contrast, correctional officers reported they were not especially stressed or tense. Although corrections officers denied their stress and its consequences (physical, emotional, interpersonal, and occupational), they readily reported stress-related problems in their colleagues, noting that correctional work is indeed stressful yet reporting that they themselves did not feel the effects of this stress. The authors concluded that correctional officers attempt to hold in their emotions and deny their weaknesses [108]. Morse et al. (2011) found that correctional officers' surveys indicated high levels of stress-related symptoms (hypertension, alcohol consumption) and that a majority of employees were concerned about their personal safety (almost 66%). However, these same employees reported confidence in managing the demands of the job. The authors concluded that the conflict between stress-related symptoms and reported stress may have resulted from a false perception of adequately managing stress [29]. McCarty (2009) found similar discrepancies between physiological and self-reported levels of stress, and suggested that when assessing correctional employee stress, physiological measures should be utilized if possible (e.g. cortisol, dehydroepiandrosterone (DHEA), cholesterol, triglycerides, fasting glucose levels, 10-min resting electrocardiogram, heart rate variability, and blood pressure) [24,109].

Conclusion

Law enforcement personnel face difficult situations in which they experience negative emotions and may have little training on stress reduction skills to regain psychological and physiological equilibrium [35], and may refrain from expressing true emotions. Seeking psychiatric assistance can be seen as a weakness [64]. Due to the negative physical affects, behavioral outcomes, and mental health implications, it is important to address occupational stress and negative emotions in law enforcement personnel. Particularly, efforts to educate law enforcement employees on the risks of stress and withheld emotions and on effective ways to cope may be helpful in alleviating emotional turmoil. Training employees in managing their emotions has been recommended [63]. Lourel advised that high stress occupations such as law enforcement should have counseling and psychological support, and that employees should be provided with regular debriefing support to prevent psychological disturbances and promote overall health and well-being [110]. Moreover, health care professionals should pay extra attention to the physiological and physical health of patients who work in high stress occupations. Finally, emotions have been noted as central to decision making [111] and can be highly predictive of health behaviors [112,113], however, they are rarely addressed in social-cognitive interventions [114]. Future interventions would benefit from considering the influence of stress and emotions on participant health behaviors, and understanding the unique stressors that may be inhibiting healthy behaviors. Incorporating occupational health psychology in health promotion effort should be considered to help achieve sustainable outcomes in employee health behavior change.

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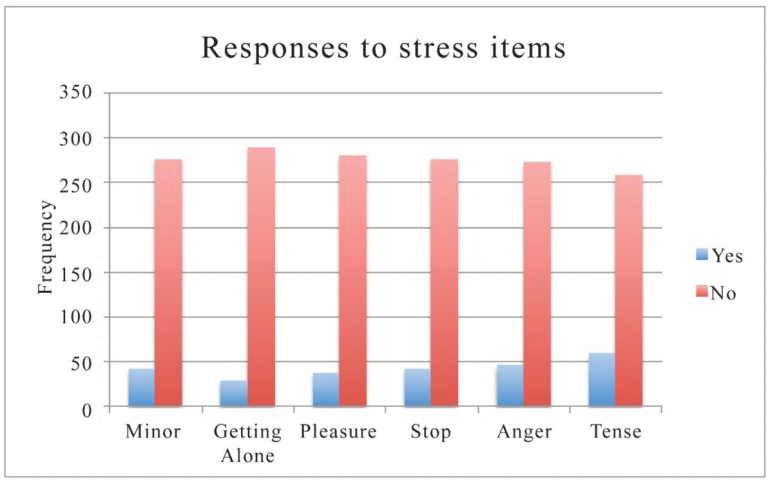

Figure 1.
Distribution of responses to stress survey items

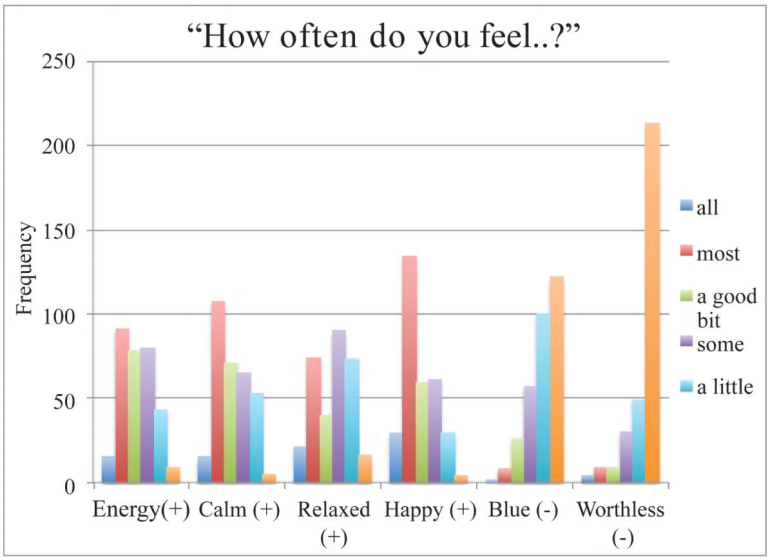

Figure 2.
Distribution of responses to positively and negatively worded emotions

Table 1

Survey Items from Self-Report Health Risk Assessment Survey (n=317)

Construct	Survey Item	Response Coding
Diet Quality		
Breakfast	How often do you eat breakfast, more than just a roll and a cup of coffee?	1 = every day 4 = seldom or never *Reverse coded*
Snacks	How often do you eat snack foods between meals (chips, pastries, soft drinks, candy, ice cream, cookies)?	1 = three or more times/day 4 = seldom or never
Salt	How often do you add salt to your foods or eat salty foods (chips, pickles, soy sauce)?	1 = seldom or never 4 = nearly every meal *Reverse coded*
Fat Intake	Indicate the kinds of foods you usually eat (high fat and low fat examples)	1 = nearly always eat high fat 4 = eat mostly low fat *Collapsed numbers 4 and 5*
Breads and Grains	Indicate the kinds of breads and grains you usually eat (refined and whole grain examples)	1 = nearly always eat refined 4 = eat primarily whole *Collapsed numbers 4 and 5*
Fruits and Vegetables	How many servings of fruits and vegetables do you eat daily?	1 = 1 or less 4 = 4 or more *Collapsed numbers 4 and 5*
Exercise Quality		
Exercise	How many days per week do you engage in aerobic exercise of at least 20 to 30 minutes duration (fitness walking, cycling, jogging, swimming, aerobic dance, active sports)?	1 = none 7 = seven *Collapsed into 4 categories: (None, 1-2, 3-4, 5+)*
Strength Exercise	How many times per week do you do strength-building exercises such as situps, pushups, or use weight training equipment?	1 = none 4 = 3 or more
Stretching Exercise	How many times per week do you do stretching exercises to improve flexibility of your back, neck, shoulders and legs?	1 = none 4 = 3 or more
Overall Emotion		
Overall Emotion	*How much of the time during the past four weeks...*	1 = none of the time 6 = all of the time
	Have you felt calm and peaceful? (Calm)	
	Did you have a lot of energy? (Energy)	
	Have you felt downhearted/blue? (Blue)	*Reverse coded*
	Have you been a happy person? (Happy)	
	Have you felt worthless, inadequate, or unimportant? (Worthless)	*Reverse coded*
	Did you take the time to relax and have fun daily? (Relaxed)	
Stress		
Stress	Minor problems throw you for a loop (Minor)	
	You find it difficult to get along with people you used to enjoy (Getting Along)	0 = no
	Nothing seems to give you pleasure anymore (Pleasure)	1 = yes
	Unable to stop thinking about my problems (Stop)	
	Feel frustrated, impatient, or angry much of the time (Anger)	
	Feel tense or anxious much of the time (Tense)	

Table 2

Latent variables and survey item indicators

Latent Variable	Indicator	Standard Estimate	p-value
Diet Quality	Snacks	0.332	0.000**
	Breads/grains	0.606	0.000**
	Fruits/Vegetables	0.428	0.000**
	Fat intake	0.782	0.000**
Exercise Quality	Stretching	0.784	0.000**
	Strength Exercise	0.907	0.000**
	Aerobic Exercise	0.753	0.000**
Stress	Getting Along	0.121	0.000**
	Pleasure	0.138	0.000**
	Stop	0.153	0.000**
	Anger	0.190	0.000**
	Tense	0.223	0.000**
Emotion	Energy	0.853	0.000**
	Relaxed	1.002	0.000**
	Calm	0.986	0.000**
	Happy	0.984	0.000**
	Blue	0.687	0.000**
	Worthless	0.384	0.000**

*p<0.05.

** p<0.01; Please refer to Table 1 for more detailed description of response answers.

Table 3

Latent Variable Model Fit with comparison of model fit before and after improvements were made

	Number of Indicators	X^2 P-value	RMSEA	CFI	TLI	Changes to improve model fit
Diet Quality	6	0.007	0.069	0.950	0.917	
Diet Quality (final)	4	0.280	0.029	0.997	0.992	Remove indicators
Exercise Quality (final)*	3	0.000	0.000	1.000	1.000	
Stress	6	0.042	0.055	0.940	0.900	
Stress (final)	5	0.361	0.017	0.996	0.993	Remove indicator
Overall Emotion	6	0.000	0.137	0.926	0.877	
Overall Emotion (final)	6	0.173	0.038	0.995	0.990	Covary indicators

*Identified models do not have accurate model fit information and modifications were not possible

Table 4

Participant Report of Stress Signals

Stress Signal	No		Yes		Normality	
	n	%	n	%	Skew	Kurtosis
Minor	276	87.1	41	12.9	2.22*	0.945
Getting Along	289	91.2	28	8.8	2.915*	6.54
Pleasure	280	88.3	37	11.7	2.399*	3.778
Stop	276	87.1	41	12.9	2.22*	2.945
Anger	272	85.8	45	14.2	2.062*	2.264
Tense	258	81.4	59	18.6	1.621	0.63

* Non-normality base on: absolute skew >2 or absolute Kurtosis >7; Please refer to Table 1 for more detailed description of response answers.

Table 5

Participant Report of Emotions

Emotion	*Normality*				*% Reporting (Frequency of emotion)*		
	Mean	**SD**	**Skewness**	**Kurtosis**	**Infrequent**[1]	**Moderate**[2]	**Frequent**[3]
Energy[a]	3.77	1.218	−0.234	−0.737	16.5	50	33.5
Calm[a]	3.84	1.236	−0.291	−0.966	18.4	43.1	38.6
Blue	4.95	1.088	−0.924	0.283	70.7	26.5	2.8
Happy[a]	4.19	1.197	−0.556	−0.543	10.4	38	51.6
Worthless	5.39	1.097	−2.06[*]	3.957	83.4	12.5	4.1
Relaxed[a]	3.46	1.378	0.169	−1.029	28.3	41.4	30.3

Please refer to Table 1 for more detailed description of response answers.

[*] Non-normality base on: absolute skew >2 or absolute Kurtosis >7;

[a] Reverse coded so that higher values represent better overall emotion for data analyses

[1] Little or none of the time (1-2)

[2] Some of the time (3-4)

[3] All or most of the time (5-6).

Table 6

Stress & Overall Emotion's Effects on Health Behaviors

	Standardized Estimate	S.E.	P-value
Stress			
Diet	−0.112	0.077	0.144
Exercise	−0.119	0.083	0.152
Sleep	−0.230	0.069	0.001**
Overall Emotion			
Diet	0.163	0.059	0.006**
Exercise	0.322	0.065	0.000**
Sleep	0.318	0.068	0.000**

* p>0.05.

** p>0.01.