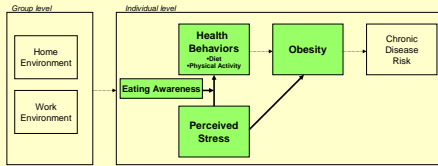




## Background

- Obesity continues to threaten public health (i.e. associated with CHD, type II diabetes, and some cancers).
- Additional obesity-related group-level factors beyond individual behaviors need to be explored.
- Stress provides mechanism for embodiment of external factors to influence obesity via changes in physiologic functioning and health behaviors (Figure 1).
- Higher stress can result in consumption of foods high in calories, sugar, and fat as well as fewer main meals and vegetable servings, particularly among females and those who may lack awareness of their dietary intake (e.g. emotional- and restrained-eaters).

Figure 1. Overall conceptual model



## Aims

- Aim 1: To determine whether perceived stress is associated with dietary behaviors.
- Aim 2: To evaluate whether perceived stress is associated with physical activity.
- Aim 3 (exploratory): To assess if lack of eating awareness (i.e. "task-eating") is an effect modifier between perceived stress and dietary intake.
- Aim 4 (exploratory): To explore whether perceived stress influences obesity.

## Measures

- Perceived Stress Scale (PSS-10): global stress measure (range: 0-40)
- PACE baseline predictors: # fruit and vegetable servings, # fast-food meals, # soft drinks consumed, frequency of eating while doing other activities (i.e. task-eating), frequency of free-time physical activity, body-mass index (BMI)

## Data

- Promoting Activity and Changes in Eating (PACE), a worksite randomized intervention to prevent weight-gain
- Random subsample of total group [N=34 (worksites); n=627 (employees)]

## Analysis

- Linear mixed models for each behavior
  - Fixed effects: age, sex, race, education
  - Random effects: worksite
  - Dietary intake x eating behavior interaction term included

## Results

- Mean PSS-10 score = 12.6 (SD=2.3)
- Higher stress associated with (Table 2):
  - Higher frequency of eating while doing other activities (p=0.002)
  - Lower self-efficacy to monitor eating choices (p=0.010)
  - Lower self-efficacy to participate in physical activity (p=0.034)
  - Lower frequency of free-time physical activity (p=0.016)
- Perceived stress not associated with soft-drink consumption
- Perceived stress not associated with BMI
- Task-eating behavior is a significant effect modifier between perceived stress and intake of fruit and vegetables as well as fast-food (Table 3)

Table 1. Baseline demographic characteristics of PACE random subsample

	Total <sup>a</sup> (n=627)		Men (n=267)		Women (n=360)	
	mean	SD	mean	SD	mean	SD
Age	44.2	5.1	45.1	5.3	43.2	4.7
	n	%	n	%	n	%
Race						
White	507	84.9	221	88.7	286	82.5
African American	36	6.0	10	4.0	26	7.5
Hispanic/Latino	27	4.6	10	4.1	17	4.9
Asian	27	4.5	9	3.2	18	5.2
Education						
<HS, HS graduate or GED	69	11	30	11.2	39	10.8
Some college or technical college	255	40.8	97	36.5	158	43.9
College graduate	214	34.2	92	34.6	122	33.9
Post-graduate or professional degree	88	14.1	47	17.7	41	11.4
Household income						
<\$50,000	152	27.5	45	19.0	107	32.3
\$50,000 to \$74,999	132	23.6	58	26.4	74	21.9
\$75,000 to \$100,000	106	18.9	43	18.8	63	19.3
>\$100,000	166	30.0	81	35.8	85	26.5

<sup>a</sup>N=34, n=627

Table 2. Predicted overall mean difference in baseline reported eating, dietary, and physical behaviors and BMI by perceived stress

	Coefficient <sup>a</sup>	95% CI	P Value for Trend <sup>b</sup>
Eating Behavior			
Eating while doing other activities	0.02	(0.01, 0.03)	0.002
Dietary Behavior			
Servings of fruits and vegetables per day <sup>c</sup>	0.02	(-0.01, 0.04)	0.135
Fast food meals per month <sup>d</sup>	-0.02	(-0.04, 0.001)	0.064
Soft drink consumption	-0.04	(-0.09, 0.02)	0.161
Self-efficacy			
Doing free-time physical activity	-0.01	(-0.03, -0.001)	0.034
Monitoring eating choices	-0.02	(-0.03, -0.004)	0.010
Physical Activity Behavior			
Free-time physical activity score	-0.34	(-0.62, -0.06)	0.016
Free-time sweat-inducing exercise	-0.01	(-0.02, -0.001)	0.037
Daily TV viewing	0.003	(-0.01, 0.01)	0.569
Physical Attributes			
Body Mass Index (kg/m <sup>2</sup> )	1.001	(0.997, 1.002)	0.681

<sup>a</sup>Slope between groups differing in one unit perceived stress estimated by linear mixed model adjusted for age (continuous), sex, race (collapsed into 4 categories), and education (collapsed into 4 categories) <sup>b</sup>Trend tested with Wald Test <sup>c</sup>Log transformed <sup>d</sup>Transformed via taking cube root <sup>e</sup>Ratio of median BMI between groups differing in one unit perceived stress estimated by general linear mixed model adjusted for age (continuous), sex, race (4 categories), and education (4 categories)

Table 3. Predicted mean difference in baseline reported dietary behaviors by perceived stress depending on eating behavior

	Fruit and vegetables <sup>a</sup>			Fast Food <sup>b</sup>		
	Coefficient	95% CI	P Value for Trend <sup>c</sup>	Coefficient	95% CI	P Value for Trend <sup>c</sup>
Frequency of eating while doing other activities						
Seldom or never	0.09	(0.03, 0.16)	0.005	-0.03	(-0.07, 0.01)	0.180
Sometimes	-0.02	(-0.07, 0.02)	0.262	-0.07	(-0.14, -0.002)	0.044
Always or most of the time	-0.06	(-0.10, -0.02)	0.006	0.09	(0.03, 0.15)	0.006

<sup>a</sup>P value for interaction=0.003, variable log transformed <sup>b</sup>P value for interaction=0.025, variable cube root transformed

<sup>c</sup>Slope between groups differing in one unit perceived stress estimated by linear mixed model adjusted for age (continuous), sex, race (collapsed into 4 categories), and education (collapsed into 4 categories) <sup>d</sup>Trend tested with Wald Test

## Limitations

- Cross-sectional study
- Possible difficulty generalizing to lower income or other ethnic populations

## Conclusions

- Men and women reported mean perceived stress scores consistent with values reported in the literature. Range of scores reflects lower-stressed population.
- Higher perceived stress associated with higher frequency of "task-eating", lower frequency of physical activity and lower self-efficacy.
- Higher perceived stress associated with lower fruit and vegetable consumption and higher frequency of fast-food meals among frequent task-eaters.
- Perceived stress not associated with BMI in these data.
- These results provide some insight into the potential role of low-levels of stress in dietary, eating, and physical activity behaviors.

## Implications

- If replicated longitudinally, inclusion of stress management and/or mindfulness techniques targeting dietary intake may be needed within obesity-related behavior change interventions to improve effectiveness.