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ORIGINAL ARTICLE

Baseline motives for eating palatable food: racial differences and preliminary utility in predicting weight loss

Maria D. Sylvester[1] · Emilee E. Burgess[1] · Taraneh Soleymani[2] · Sunil Daniel[2] · Bulent Turan[1] · Mary Katherine Ray[1] · Courtney T. Howard[2] · Mary M. Boggiano[1]

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Abstract
Purpose Behavioral predictors of weight-loss program (WLP) outcomes are needed and important because they can be modified. Eating calorie-dense palatable foods (PFs) outside of hunger contributes to obesity. This study assessed if habitual motives to consume PFs could predict weight-loss outcomes.
Methods $N = 171$ Black and $N = 141$ White adults in a reduced-calorie program completed the Palatable Eating Motives Scale (PEMS). Body weight and body mass index (BMI) lost after 3 and 6 months were analyzed controlling for initial BMI and demographics. Greater PEMS motive scores meant more frequent habitual intake of PFs for that motive.
Results Whites vs. Blacks had higher scores on most of the PEMS motives: Social, Coping, and Reward Enhancement. In Whites at 3 months, greater Reward Enhancement scores and initial BMI predicted more BMI loss ($p < 0.05$). At 6 months, greater Reward Enhancement and lower Conformity scores predicted more weight ($p < 0.05$) and BMI loss (Conformity: $p < 0.05$; Reward Enhancement: $p = 0.05$). PEMS motives did not predict outcomes for Blacks.
Conclusion The results provide preliminary evidence for the PEMS to predict WLP outcomes. White patients who eat PFs primarily for their rewarding properties and less to conform should fare better in Lifestyle programs while group or family-based interventions may be more efficacious when conformity is the main motive. Lower motive scores among Blacks suggest that eating PFs outside of hunger may go unrecognized or underreported and warrants further investigation. The findings highlight the motive-based heterogeneity of obesity and how it may be used to predict outcomes and customize interventions to improve WLP outcomes.
Level of evidence Level IV, multiple time series.

Keywords Obesity treatments · Eating behavior · Lifestyle intervention · Eating in the absence of hunger · BMI · Pretreatment predictors

Introduction

The high prevalence of obesity in adults [1] has increased the need for effective weight-loss strategies. Weight-loss programs (WLP) with lifestyle modifications can assist individuals reach meaningful weight loss; however, not everyone is successful in losing weight [2, 3]. Success in losing weight and maintaining the weight-loss hinges on the ability to change one's behavior with food [2]. Despite this obvious requirement, consistent predictors of WLP outcomes based on eating behavior are lacking [4]. Such predictors are needed and are important because they are modifiable and can be integrated into any individually tailored WLP to improve weight-loss outcomes [5, 6]. This is in contrast to demographic predictors that cannot be changed [6–9].

Various eating patterns are associated with weight gain including disinhibition, greater food liking responsiveness, decreased food satiety, binge-eating, and eating in the absence of hunger [5, 8]. Some of these patterns, namely

Mary M. Boggiano: Published also as M. M. Hagan.

✉ Mary M. Boggiano
boggiano@uab.edu

[1] Department of Psychology, The University of Alabama at Birmingham, 415 Campbell Hall, Birmingham, AL 35294-1170, USA

[2] Department of Nutrition Sciences, The University of Alabama at Birmingham, Birmingham, AL, USA

disinhibition and binge-eating, are also associated with poorer weight-loss maintenance [4]. Decreased social support, psychosocial stress, lower autonomy/passivity, and poor coping skills are also linked to weight regain [4]. These are not behavioral factors per se, but can sabotage weight-loss maintenance by increasing caloric consumption via increased snacking and intake of energy-dense palatable food (PF) which is also linked to poorer weight-loss maintenance [5, 10]. Additionally, how individuals respond physically and emotionally to behavioral recommendations can affect success or failure with weight loss in WLPs [11]. Clearly, there is much variation in eating and cognitive behavior that could help predict success with weight reduction in WLPs.

The Palatable Eating Motives Scale (PEMS) was developed in our lab and is based on a behavioral-change model of obesity treatment. That is, by identifying ones' primary motive for eating PFs that is unrelated to hunger, the motive can be targeted for behavioral change so that consumption of PFs outside of structured meals is reduced or abolished. This is an important behavior to modify given that many WLPs require a reduction in calories for weight loss and maintaining weight-loss hinges on the ability to keep calories reduced [4, 10]. Reducing calories inevitably requires that intake of highly PFs be limited. We posited that different baseline motives for eating PFs might influence patients' abilities to adhere to reduced-calorie programs. Prior studies with the PEMS revealed that individuals with obesity have different primary motives for eating PFs in the absence of hunger [12]. The PEMS identifies Coping, Reward Enhancement, Social, and Conformity motives for eating PFs [13]. The scale has ecological validity; baseline scores in the lab coincide with the participants' real-time and location motives for eating PFs [14]. Importantly, Coping (eating to deal with negative emotions, situations, and stress) is consistently associated with greater body mass index (BMI) and greater weight gain over subsequent years [12, 13, 15, 16]. In WLP patients, higher Coping scores has also been found to be associated with higher current BMI and binge-eating patterns [12].

Given the above findings with the PEMS, the link between PFs and weight control, and the need for modifiable pre-treatment predictors of WLP outcomes, we conducted this preliminary study with the PEMS to predict weight loss over a 3- and 6-month period. A secondary aim was to determine if racial differences exist in baseline PEMS motives and their ability to predict weight loss. Black relative to White patients typically fare worse in weight-loss interventions. They tend to lose less weight, maintain less weight loss, and drop out more frequently [7, 17]. Black Americans consume more fast food, and energy-dense PFs traditionally make up more of their meals compared to White Americans [18–20]. Hence, if baseline PEMS motives predict weight loss in this study, it will be important to know if the same or different motives predict this outcome for both races.

Although the study did not assign participants to different conditions, based on the established contribution of PFs to overweight, it was hypothesized that higher scores on at least one of the PEMS motives would predict weight loss after 3 and 6 months. Also based on poorer WLP outcomes among minorities and different dietary patterns compared to Whites, it was hypothesized that Blacks would lose less weight by 6 months and that baseline differences in dietary patterns would be reflected in lower PEMS scores. The results provide preliminary evidence for use of the PEMS to predict weight-loss success in White patients and highlight racial differences in the reported frequency of eating PFs outside of hunger that are worth exploring further to improve obesity treatments for minorities.

Materials and methods

Participants

A convenience sample of $N = 312$ patients enrolled in the EatRight Lifestyle (ERLS) program at The University of Alabama at Birmingham (UAB) participated. $N = 171$ were Black (88% F) and $N = 141$ non-Hispanic White (70% F). The mean age of Black patients was 46.7 years (SD = 11.2; range 17–71), similar to that of White patients (48.7 years; SD = 13.6; range 20–76). Other ethnicities were excluded from this study. All participants were weight-loss seeking individuals who either independently sought out or were referred to EatRight at UAB, a weight-loss clinic. Not all patients had obesity; however, the mean BMI for Black patients was in the severe obesity range and the mean BMI for White patients was in the obesity range. The mean BMIs and their standard deviations are listed in Table 1. All patients gave informed consent and The UAB Institutional Review Board approved the study.

The EatRight by UAB Lifestyle (ERLS) Program

The ERLS program calculates a daily calorie range based on each patient's resting metabolic rate subtracted by 500–750 kcal. Meal plans include foods higher in bulk but lower in energy density (e.g., vegetables, high grains, fruits). Higher energy foods, such as meats, cheeses, fats, and sugars are suggested in moderation. The composition of the meal plans can vary from low fat to low carbohydrate based on the patient's preference and medical conditions. A follow up visit every 1–2 months after the initial

Table 1 Mean initial BMI, PEMS motive scores, and body weight outcomes by race

Variables	Black patients			White patients		
	Mean	(SD)	*N*	Mean	(SD)	*N*
Initial BMI	41.43	(9.4)***	171	37.43	(8.9)	141
PEMS Coping	1.92	(0.8)	171	2.10	(0.9)*	141
PEMS Reward Enhancement	1.91	(0.8)	171	2.26	(0.9)***	141
PEMS Social	2.17	(0.9)	171	2.41	(1.0)*	141
PEMS Conformity	1.36	(0.5)	171	1.47	(0.6)	141
Weight loss in lbs. at 3 months	12.30	(11.2)	24	12.41	(11.0)	31
BMI loss at 3 months	2.00	(1.9)	24	1.97	(1.6)	31
Weight loss in lbs. at 6 months (0–6)	2.30	(14.3)	13	24.95	(15.1)*	13
BMI loss at 6 months (0–6)	1.73	(2.5)	13	3.82	(2.3)*	13

BMI body mass index, *PEMS* Palatable Eating Motives Scale

* $p < 0.05$, *** $p < 0.001$, difference between Black and White patients

visit was expected. These visits included a weight check and one-on-one time with a physician and dietitian to monitor and help with their meal program and to provide behavioral and physical activity counseling. The program was designed to achieve moderate weight loss [21] but patients were allowed to continue the program until individual weight-loss goals were met.

Demographics, BMI, weight loss, and retention rates

Demographics were obtained retrospectively from medical records. Weight in pounds and height were measured in a private room to calculate BMI (kg/m^2). For patients still visiting the clinic at 3 months ± 3 weeks, loss of weight in pounds and BMI were calculated by subtracting these values at 3 month ± 3 weeks from initial values. For patients still visiting the clinic at 6 months ± 3 weeks, weight and BMI loss were calculated by subtracting these values at 6 month ± 3 weeks from initial values. Retention rates were overall quite low: among Blacks, number of active patients dropped from 171 to 24 by 3 months and to 13 by 6 months, a 14% and 7.6% retention rate, respectively. Among Whites, the number dropped from 141 to 31 by 3 months and to 13 by 6 months, a 22% and 9.2% retention rate, respectively.

Palatable Eating Motives Scale (PEMS)

After the initial BMI was obtained, patients completed the PEMS-revised version [13]. The 20-item scale measures habitual frequency of consuming PFs for Coping, Reward Enhancement, Social, and Conformity motives. Responses can range from 1 (Never/Almost Never) to 5 (Almost Always/Always) and are scored as the mean response for each motive. Coping reflects consuming PFs to deal with aversive moods, worries, and stress; Reward Enhancement to experience the pleasurable properties of the food itself; Social to enjoy parties or celebrations with others; Conformity to fit in or to please friends, peers, and/or family. The PEMS instructions contain culturally sensitive examples of "tasty foods and drinks", e.g., fast foods, desserts, junk food, fried foods, salty snacks, and sugary drinks. The PEMS has good test–retest reliability, ecological validity, and predictive validity [12, 14, 16].

Statistical analysis

Separate linear regressions for the race groups tested the hypothesis that one or more PEMS motives would predict weight loss after 3 and 6 months. These controlled for age, sex, and initial BMI which have been found to influence associations between motives and BMI and WLP outcomes in previous studies [6–9, 12, 13]. Cohen's f^2 determined effect sizes. ANOVAs with race as the fixed factor tested the hypothesis that Blacks would differ from White patients in weight-loss outcomes and a MANOVA determined if baseline PEMS motive scores also differed by race. Initial BMI was entered as a covariate in these analyses due to the large difference in the mean initial BMI between racial groups. These results are presented before the regressions to provide a description table of mean BMI, motive scores, and weight loss and BMI loss for both race groups.

Results

Racial differences in initial BMI, PEMS motive scores, weight loss, and BMI loss

As shown in Table 1, Black patients began the program with a higher mean BMI than Whites. Most of the

PEMS motive scores were significantly higher for White than Black patients indicating greater frequency of eating PFs for reasons other than hunger. Table 1 also reveals the high overall attrition rate with time. By 6 months, Whites lost more body weight. However, all Black patients who continued into month 6 of the program obtained at least moderate weight loss (5% of initial body weight), with 30.8% of these patients losing ≥10% of initial body weight. Among White patients who continued into the 6th month, 92.3% lost at least 5%, and 61.5% lost ≥10% of initial body weight.

Predictors of weight and BMI loss at 3 months

As shown in the regression models in Table 2, baseline consumption of PFs more frequently for Reward Enhancement marginally predicted early (3 month) weight loss for Whites; accounting for 20% of the variance in weight loss (adjusted $R^2 = 0.20$; $f^2 = 0.17$, medium effect size). Similarly, significantly greater Reward Enhancement scores and initial BMI predicted early BMI loss for White patients. This model accounted for 21% of the variance in 3 month BMI loss (adjusted $R^2 = 0.21$; $f^2 = 0.17$, medium effect size). These predictors were independent of age, sex, and scores on the other PEMS motives. Interestingly, there were no significant PEMS predictors of early weight or BMI loss for Black patients.

Predictors of weight and BMI loss at 6 months

At 6 months, male sex, again eating significantly more frequently for Reward Enhancement, but also eating less frequently for Conformity (and Coping at $p < 0.06$) accounted for 64% of the variance in weight loss among White patients (Table 3; adjusted $R^2 = 0.64$; $f^2 = 0.39$, large effect size). Eating less frequently for Conformity and marginally more for Reward Enhancement predicted greater BMI loss at 6 months, accounting for 51% of the variance (adjusted $R^2 = 0.51$; $f^2 = 0.34$, large effect size). Again, no significant PEMS predictors were found for weight outcomes at 6 months in Black patients. For this group, male sex and lower initial BMI accounted for 68% of the variance in weight loss at 6 months (adjusted $R^2 = 0.68$, $f^2 = 0.40$, large effect size), and only lower initial BMI accounted for 64% of the variance in BMI loss (adjusted $R^2 = 0.64$, $f^2 = 0.39$, large effect size). The improved WLP outcomes in males replicate other WLP studies [6–9].

Discussion

This study provided the first preliminary evidence for motives to eat PFs outside of hunger to predict weight-loss outcomes in patients enrolled in a WLP. It also provided the first investigation of racial differences in motives for eating PFs unrelated to hunger. Despite the drop in

Table 2 Regression models of 3-month weight and BMI loss with demographics, initial BMI, and PEMS motive scores as predictor variables

	Black patients			White patients		
	β	*t*	*p*	*β*	*t*	*p*
Weight loss (lbs.)						
Age	−0.17	−0.75	0.46	0.31	1.74	0.10
Sex	0.02	0.09	0.93	0.03	0.17	0.87
Initial BMI	0.39	1.93	0.07	0.31	1.67	0.11
PEMS Coping	−0.25	−0.97	0.35	−0.26	−1.14	0.27
PEMS Reward Enhancement	−0.24	−0.59	0.56	0.56	2.12	0.05#
PEMS Social	−0.09	−0.25	0.81	−0.44	−1.50	0.15
PEMS Conformity	−0.17	−0.77	0.45	−0.15	−0.57	0.58
BMI loss						
Age	−0.21	−0.95	0.36	0.34	1.96	0.06
Sex	−0.10	−0.37	0.72	−0.12	−0.59	0.56
Initial BMI	0.43	2.08	0.05#	0.39	2.12	0.04*
PEMS Coping	−0.23	−0.90	0.38	−0.31	−1.34	0.19
PEMS Reward Enhancement	−0.24	−0.60	0.56	0.57	2.15	0.04*
PEMS Social	−0.10	−0.27	0.80	−0.42	−1.44	0.16
PEMS Conformity	−0.17	−0.74	0.47	−0.18	−0.68	0.50

BMI body mass index, *PEMS* Palatable Eating Motives Scale

* $p < 0.05$; # marginally significant ($p = 0.05$)

Table 3 Regression models of 6-month weight and BMI loss with demographics, initial BMI, and PEMS motive scores as predictor variables

	Black patients			White patients		
	β	*t*	*p*	*β*	*t*	*p*
Weight loss (lbs.)						
Age	0.36	1.77	0.14	-0.20	-0.76	0.48
Sex	0.70	3.54	0.02*	0.48	2.65	0.05#
Initial BMI	−1.27	−4.54	0.01**	−0.43	−1.51	0.19
PEMS Coping	0.81	1.96	0.11	−0.69	−2.43	0.06
PEMS Reward Enhancement	−0.80	−2.26	0.07	0.82	2.77	0.04*
PEMS Social	0.55	1.69	0.15	−0.24	−1.17	0.29
PEMS Conformity	0.55	1.76	0.14	−0.58	−2.73	0.04*
BMI loss						
Age	0.48	2.22	0.08	−0.13	−0.43	0.69
Sex	0.45	2.16	0.08	0.20	0.95	0.39
Initial BMI	−1.31	−4.40	0.01**	−0.44	−1.33	0.24
PEMS Coping	0.57	1.29	0.25	−0.71	−2.12	0.09
PEMS Reward Enhancement	−0.68	−1.79	0.13	0.90	2.58	0.05#
PEMS Social	0.56	1.63	0.16	−0.27	−1.12	0.32
PEMS Conformity	0.76	2.29	0.07	−0.68	−2.75	0.04*

BMI body mass index, *PEMS* Palatable Eating Motives Scale

* $p < 0.05$; ** $p < 0.01$; # marginally significant ($p = 0.05$)

statistical power from the high attrition rate over time, baseline PEMS motive scores were able to significantly predict outcome variables for Whites. Those who reported eating PF most typically for the foods' own rewarding properties, vs. for social, coping, or conformity, incurred greater BMI loss early in the program. Later, by 6 months, eating more for Reward Enhancement also predicted weight-loss outcomes as did lower frequency of eating PFs for Conformity. Although the value of the PEMS to predict these outcomes is preliminary due to the shrinking sample size by 6 months, it is important to consider the robust nature of these statistically significant predictors given loss of statistical power and that demographics, initial BMI, and shared variance among all PEMS motives were controlled in the analyses.

Reward Enhancement was the only motive to associate positively, not negatively, with weight and BMI loss in White patients. Several explanations might account for this: First, apart from the Social motive, Reward Enhancement is the most commonly reported motive for consuming PFs when not hungry [12–16]. Additionally, it has not been linked to disordered eating behavior, clinical eating disorder symptoms, or perceived stress, compared to the Coping and Conformity motives [15]. This suggests that Reward Enhancement may be a less maladaptive motive for habitually eating PFs relative to Coping and Conformity. Secondly, as a motive that is independent of influence from others, patients with this baseline motive style may have been less vulnerable to stray from the reduced-calorie plan due to pressures from family, friends, and co-workers. Such pressures are more influential in those with primary Social and Conformity motive styles. Thirdly, since the ERLS program still allows PFs, the needs of those who ate PFs primarily for reward could still be met. The reduced-calorie program may not have been as challenging for them compared to those with baseline PF eating for Coping, Conformity, or Social motives, as these motives may be more challenging to moderate. Patients who primarily eat to cope would need PFs in various situations they may not be able to escape, and those who eat PFs primarily to conform or be more social would be more influenced by pressures from family and friends to steer away from their prescribed calorie plan.

The significant negative association between eating to Conform, which added to Reward Enhancement scores in predicting weight loss at 6 months in Whites suggests that patients with baseline Conformity motive styles may fare worse in achieving WLP benefits. Additionally, further studies in larger samples may implicate higher baseline Coping scores in poorer outcomes as well because although not a statistically significant independent predictor at $p < 0.06$, it did contribute more to the total variation in weight loss explained by the regression model (Table 3) than did initial BMI, age, and the Social motive scores. As aforementioned, a Conformity motive style would increase the risk of having family and friends intentionally or unintentionally sabotage program compliance. A Coping motive style might render it difficult to adhere to a

reduced-calorie program since the very foods used to deal with negative states, PFs, must now be limited or avoided altogether. To this, previous studies in our lab with WLP patients found that higher Coping scores were significantly associated with increased BMI despite a truncated BMI range [12]. In non-weight-loss seeking adults, higher Coping and Conformity scores were associated with eating-disordered attitudes about eating and body image [15]. Higher Coping scores also predicted more weight gain over 2 years [16] and greater severity of binge-eating [12]. Alternatively, while patients with high Conformity and Coping motives may not do as well in a Lifestyle intervention program, the susceptibility to the influence of family and friends on their eating habits may mean that those with a Conformity (and/or Social) motive style might do better in group- and/or family-based interventions. Those with a Coping motive style would predictable fare better with a reduced-calorie program and adjunct coping and stress-management skills or cognitive-behavioral therapy. In sum, that PEMS motives accounted for large variances in weight loss for White patients is encouraging because the majority of predictors found in other studies account for up to only 30% of variance in weight loss and other WLP outcomes [22].

There were several limitations in this study. The high attrition rate may have precluded additional significant effects in Whites and significant PEMS predictors for Blacks due to decreased statistical power. However, this limitation testifies to the pressing problem of patient retention in WLPs [7, 9, 23]. That a co-payment was expected at each visit may have influenced the attrition rate in this sample [6]. Another limitation was the low number of expected visits in the ERLS program, once every 1–2 months. This forced us to use a wide time range for collection of weight and BMI data (±3 weeks of a 3 and 6 month period). The limitation is the risk of confounding effects on body weight inherent of disproportionate time comparisons and uncontrolled factors that are more likely to occur with a longer time range. Also, that meal plans in the ERLS program varied from low fat to low carbohydrate could have introduced a moderating effect of diet that should be controlled in future studies.

Despite limitations in this preliminary study with the PEMS to predict WLP outcomes, there emerged important and novel contributions. The PEMS was able to characterize motive styles associated with successful weight loss in Whites who continued the program into the 6th month. Nearly all patients retained at this time lost at least 5% of their initial body weight, and 61.5% of White and 30.8% of Black patients lost ≥10% of their initial body weight. Weight loss of 10% is clinically significant [24] as it can substantially reduce the risk and severity of associated comorbidities, including type 2 diabetes which ranks higher among Black relative to White Americans and among those living in southern states [25, 26]. This was also the first study to find racial differences in motives for consuming PFs outside of hunger.

Report of lower frequency to eat PFs for reasons other than hunger in Black patients may be due to the culturally greater presence and consumption of PFs for energy needs [19, 20]. It may also be that because of the ubiquity of PFs in their environment, Blacks are less likely to recognize that they may be using these foods for other motives including those identified by the PEMS. A study with the Kids-PEMS in low income, urban Black adolescents, found that poor emotion regulation predicted greater eating of PFs for Coping and Conformity motives 16 months later [27] and scores on these motives correlated positively with higher BMI. In congruence with the present study, lower scores on these two motives predicted more weight loss in White adults. If maladaptive eating is going unrecognized or underreported in Black adults with obesity, future motives-based research must be aimed at this population. Another strength of the study was the convenience sample and lack of strict inclusion and exclusion criteria, which can complicate comparisons across studies and limit generalization [6]. Still randomized control trials are needed to validate the PEMS's utility in WLPs.

In conclusion, the results of this study offer promise for PEMS motives to predict WLP outcomes in Whites and suggest reasons to specifically conduct more testing with the PEMS in Black patients. The study highlights the motive-based heterogeneity of eating PFs in the absence of hunger that exists among those seeking treatment for obesity. If patient and practitioner are aware of the primary motive for engaging in this obesogenic behavior, the information can be used to customize lifestyle change interventions which should facilitate adherence to new eating habits both during and long after treatment. In this way, it is hoped that the PEMS will serve to predict as well as improve WLP outcomes.

Compliance with ethical standards

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Conflict of interest Maria Sylvester declares no conflict of interest. Emilee Burgess declares no conflict of interest. Taraneh Soleymani declares no conflict of interest. Sunil Daniel declares no conflict of interest. Bulent Turan declares no conflict of interest. Mary Katherine Ray declares no conflict of interest. Courtney Howard declares no conflict of interest. Mary Boggiano declares no conflict of interest.

Ethical approval All procedures performed were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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