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RUNNING HEAD: THE ROLE OF MOTIVATION TO EAT

The Role of Motivation to Eat in the Prediction of Weight Control Behaviors in Female and Male Adolescents

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Abstract

Objective: To examine how motivation to eat variables predict changes in dieting and weight control behaviors over five months.

Method: Greek adolescents (n= 248), aged 12-16 years, completed questionnaires measuring different dimensions of motivation to eat, dieting, healthy and unhealthy weight control behaviors. Dieting and weight control behaviors were measured five months later.

Results: Compliance motivation positively predicted changes in dieting in males and a number of unhealthy weight control behaviors in females. Coping motivation negatively predicted meal skipping in both genders and was associated with a lower risk of vomiting in females. Social motivation positively predicted eating less high fat food in males while pleasure motivation was associated with a reduced likelihood of eating more fruits and vegetables in females and a reduced risk of fasting in males.

Conclusion: Intervention programs designed to facilitate healthy and circumvent unhealthy weight control practices in adolescents may need to be gender-specific. For females it may be important to minimize compliance motivation whereas for males, programs that foster social motivation to eat might be appropriate.

Keywords: dieting, longitudinal, social, coping, compliance, pleasure

The Role of Motivation to Eat in the Prediction of Weight Control Behaviors in Female and Male Adolescents

1. Introduction

The increase in body weight during puberty coupled with a societal emphasis, in particular in the Western world, on an increasingly stick-thin ideal as a standard of beauty often leads to a "normative discontent" about body appearance among adolescent girls (Levine & Smolak, 2002). In turn, body dissatisfaction is associated with a range of maladaptive consequences including engagement in unhealthy weight control behaviors (Crocker, Sabiston, Kowalski, McDonough, & Kowalski, 2006; Neumark-Sztainer, Wall, Story, & Perry, 2003; Thompson & Chad, 2002) the onset of eating pathology (Keel, Fulkerson, & Leon, 1997), and depression (Stice & Bearman, 2001). While a relatively small proportion of adolescents develop full-blown eating disorders (up to 2.7% of adolescent Australian girls; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999), many adolescents engage in unhealthy weight control practices that vary in severity (e.g., skipping meals, purging). In fact, more than fifty percent of females and nearly one third of males in the US report to occasionally engaging in disordered weight control behaviors (Croll, Neumark-Sztainer, Story, & Ireland, 2002). This is disconcerting, as unhealthy weight control behaviors are not only a risk factor for disordered eating, but also result in dietary inadequacy (e.g., lower intakes of calcium and iron; Neumark-Sztainer, Hannan, Story, & Perry, 2004) and obesity (through a reduced basal metabolic rate; Neumark-Sztainer et al., 2006), thus compromising the health status of a significant number of adolescents. Although some weight control behaviors are healthy (e.g., physical activity, avoiding high fat foods) and should be encouraged, others are unhealthy (e.g., skipping meals), and some of them extreme (e.g., using laxatives), and should be avoided. Previous research has reported that 57.2% of girls and 31.6% of adolescent boys in North America engage in a combination of both healthy and

unhealthy weight control behaviors (Neumark-Sztainer et al., 2004). However, empirical evidence on this issue outside North America and Western Europe is scarce. The purpose of this paper is to examine psychological predictors of healthy and unhealthy weight control behaviors in a sample of Greek male and female adolescents. Further, we aimed to examine such predictions using a longitudinal design.

The psychological motivation underpinning eating behaviors appears to be important in order to understand the initiation of unhealthy eating behaviors. Jackson, Cooper, Mintz and Albino (2003) developed the Motivation to Eat Scale (MES), the first measure to examine four different types of motivation underlying the initiation of eating behavior. The measure was derived from Cox and Klinger's (1988, 1990) four-category framework designed to understand motivation for alcohol use. Specifically, Cox and Klinger suggested and found support for the contention that people's psychological motivation for drinking alcohol could generally be categorized into four dimensions: coping with negative emotions, complying with social expectations, attempting to be sociable, and enhancing pleasure. Jackson et al.'s (2003) work showed that coping and compliance motivation positively predicted, whilst social motivation negatively predicted occurrence of restrictive eating (a composite measure of fasting, appetite control pill use and going on a strict diet), bingeing, and purging (a composite measure of vomiting, laxative use and diuretic use). With regard to social motivation, this conceptualization is in accord with social facilitation research showing that people tend to eat more in groups than when alone (Herman, Roth, & Polivy, 2003). Pleasure motivation was the only significant (positive) predictor of the extent to which someone had ever engaged in bingeing behavior and it also negatively predicted restrictive eating. The motivation to eat variables predicted 12.7% of the variance in binge eating, 6.4% of the variance in restrictive eating and 3.1% of the variance in purging behavior. It is currently unknown how motivation to eat, as measured by the MES, predicts *distinct* unhealthy *and*

healthy weight control behaviors. Further, Jackson et al.'s (2003) research was cross-sectional in nature and could not therefore examine changes in eating behaviors as a function of different types of motivation to eat. Longitudinal studies are needed to identify predictors of changes in eating behavioral patterns. Finally, Jackson et al.'s research was conducted with North American college students, thus the extent to which the relationships between the individual motivations to eat and eating behavior extends to younger and culturally different population groups is unknown.

Although largely seen as a Western problem, the preoccupation with image, appearance and dietary restriction is not limited to adolescents living in highly Westernized nations. In fact, disordered eating attitudes are becoming increasingly prevalent in countries which are not as yet fully Westernized (Riddoch et al., 2004). Yannakoulia et al. (2004) suggested that in some of these societies (such as the Greek one), which have been going through a transition from traditional to more Westernized living patterns in the past few decades, adolescents' eating and weight control behaviors may be influenced by both traditional and Western values. For example, in these societies food consumption plays a central role in highly valued social interactions. At the same time, adolescents in these societies are being exposed to the standard beauty ideals of the Western world which necessitate a strict control over the type and quantity of food consumed. The extent to which motivation to eat predict healthy and unhealthy weight control behaviors over time in societies that are becoming increasingly Westernized in their cultural standards and practices is currently unknown. Such information is important in order that culturally sensitive interventions are developed to facilitate healthy and prevent unhealthy weight control practices in adolescents.

In brief, the main purpose of the present study was to examine the contribution of motivation to eat variables in predicting engagement in both healthy and unhealthy food-related weight control behaviors in Greek adolescents. In particular, we aimed to examine

whether our predictor variables predicted dichotomously measured (i.e. presence or absence thereof) general dieting behavior as well as distinct healthy and unhealthy weight control practices. We also aimed to investigate whether the same set of predictors could predict the total number of healthy and unhealthy weight control behaviors engaged in by these adolescents.

First, based on previous findings (Jackson et al., 2003), we hypothesized that compliance and coping motivation to eat would positively, while social and pleasure motivation would negatively predict general dieting in both females and males. Second, we expected higher levels of compliance and coping motivation to eat to be positively associated, and social and pleasure motivation to eat to be negatively associated with the distinct unhealthy weight control behaviors. Third, total number of unhealthy weight control behaviors would be positively predicted by compliance and coping motivation and negatively predicted by social and pleasure motivation to eat. We did not offer any a priori hypotheses with regard to the prediction of distinct, or number of, healthy weight control behaviors due to lack of research in this area. Due to the lack of studies within this area using adolescent males, we examined females and males separately, but we did not make any hypotheses regarding differences between the gender groups. In all analyses we controlled for the effects of age and BMI because these are known to influence the eating behaviors of adolescents (Fraser, Welch, Luben, Bingham, & Day, 2000; Lien, Jacobs, & Klepp, 2002; Lytle, Seifert, Greenstein, & McGovern, 2000; Triandis, 1995).

2. Method

2.1. Participants

The participants of the study were two hundred and forty-eight adolescents (99 males and 148 females, 1 participant did not report his/her gender; *M* age = 14.75 years, *SD* = .76; age ranged from 14 to 18 years) from three high schools in Northern Greece.

2.2. Measures

2.2.1. Body Mass Index (BMI).

Based on self-reported height and weight, BMI was calculated using the formula kg/m^2.

2.2.2. General dieting, healthy and unhealthy weight control behaviors.

General dieting was measured with a single item (i.e., "Have you gone on a diet in the past five months?"). The response options were "yes" and "no". Healthy and unhealthy weight control behaviors were measured in a dichotomous fashion (i.e., *yes* or *no*) with questions asking the participants to report whether they had 'done any of the following things in order to lose weight or avoid gaining weight during the past five months. Healthy weight control behaviors constituted eating more fruits and vegetables, eating less high fat food, and eating fewer sweets. Unhealthy weight control behaviors included fasting, eating very little food, using a food substitute (powder of special drink), skipping meals, taking diet pills and making oneself vomit. This assessment of general dieting and distinct weight control behaviors has previously been used by Neumark-Sztainer et al. (2003).

2.2.3.Motivation to Eat.

The Motivation to Eat Scale (MES; Jackson et al., 2003) was used to assess four dimensions (each tapped by five items) of psychological reasons for the initiation of eating behavior. The scale consists of twenty items with the question stem reading "How often do you eat…". The items tap compliance (e.g., "because someone pressures you to eat"), coping (e.g., "as a way to help you cope"), social (e.g., "to be sociable"), and pleasure motivation (e.g., "because you like to eat"). Responses are given on a scale ranging from 1 (*never*) to 4

(*always*). The authors of the MES have provided evidence as to the convergent, discriminant and incremental validity of the measure (Jackson et al., 2003).

2.3. Procedure

The design of the study was approved by the ethics committee of a large University in Northern Greece. Informed consent was obtained from the school principal, the children, and their parents two weeks prior to the data collection. The questionnaire was administered at the beginning and towards the end of the second term in a quiet place under the supervision of trained personnel. General dieting, healthy and unhealthy weight control behaviors were measured at both time points. The participants were reassured that their responses would be confidential, that there were no right or wrong answers and they could withdraw from the study at any time without any negative consequences. None of the students withdrew from the study. The questionnaire completion lasted approximately twenty minutes. The two measurements were matched by school, class, gender, and birth date.

2.4. Data analyses

Our main analyses comprised of binary logistic regressions aimed to test the hypotheses that the motivation to eat variables would significantly predict changes in the reporting of the dichotomously measured dieting and distinct healthy and unhealthy weight control behaviors. Linear multiple regression analyses were conducted to test whether the motivation to eat dimensions could predict the continuous measure of total numbers of healthy and unhealthy weight control behaviors.. Neumark-Sztainer et al. (2003) have also treated the total number of such behaviors as a continuous variable.

3. Results

3.1. Preliminary analyses

All scales demonstrated adequate internal reliability (range α = .80 - .90). Correlations between predictor variables did not exceed r = .64. Thus, there was no evidence of multicollinearity within the data. The majority (86.21%) of the participants responding at time 1 completed the questionnaire again at time 2. Non-completion at time 2 was due to sickness-related absence. There were no significant differences in gender (χ^2 (1) = .001; p = .97) and age (t (263) = 1.10; p = .27) between those who responded at time 1 only and those who responded at both time points. Means and standard deviations for the predictor variables and number of healthy and unhealthy weight control behaviors for females and males are provided in Table 1. Paired samples t-tests showed that there were significant differences between time 1 and time 2 variables for number of healthy weight control behaviors in females (t (146) = 2.07; p = .04). At time 1, males reported higher levels of social motivation to eat compared to females (t (242) = 2.53; p = .02), while at time 2, females reported significantly greater numbers of both healthy (t (245) = -3.42; p = .001) and unhealthy (t (244) = -2.04; p = .04) weight control behaviors compared to males.

Table 2 illustrates frequency analyses for dieting, healthy and unhealthy weight control behaviors by gender group at each time point. Females reported greater levels of dieting at time 1 (Pearson χ^2 (1) = 8.46; p = .004) and time 2 (Pearson χ^2 (1) = 10.84; p = .001) than males. Overall, females engaged in significantly more healthy weight control behaviors than males. Thus, females ate more fruits and vegetables at both time points (Time 1: Pearson χ^2 (1) = 7.27; p = .007; Time 2: Pearson χ^2 (1) = 5.80; p = .016) and reported eating less high fat foods at time 2 (Time 1; Pearson χ^2 (1) = 3.55; p = .06; Time 2: Pearson χ^2 (1) = 7.60; p = .006). Further, females ate less sweets to lose or control weight compared to males at both time 1 (Pearson χ^2 (1) = 12.56; p = .000) and time 2 (Pearson χ^2 (1) = 6.81; p = .009). With regard to the unhealthy weight control behaviors, females reported to eat very little food significantly more so than males at time 2 (Pearson χ^2 (1) = 8.93; p = .003), and reported

skipping meals significantly more than males at both time 1 (Pearson χ^2 (1) = 5.16; p = .02) and time 2 (Pearson χ^2 (1) = 5.63; p = .02). In contrast, males reported significantly higher frequency of using food substitutes at both time 1 (Pearson χ^2 (1) = 4.18; p = .04) and time 2 (Pearson χ^2 (1) = 5.56; p = .02). Finally, males reported a significantly higher BMI than females (t (232= 3.80; p = .000). Due to the very low proportion of participants, particularly females, using diet pills as a means of weight control at both time points, this behavior was excluded from further analyses.

3.2. Motivation to eat variables as predictors of dieting, healthy and unhealthy weight control behaviors

Initially we controlled for the effects of age and BMI. However, in all analyses predicting changes in dieting, healthy and unhealthy weight control behaviors, neither of the variables proved to be significant predictors (p > .05). Thus, we excluded age and BMI as control variables and decided to merely control for the relevant time 1 weight control behavior, entering the time 1 behavior at step 1 and the set of motivational predictors at step 2. The results revealed that for females the motivation variables did not predict changes in general dieting (*Step 2* χ^2(4) = 4.71; p = .32; Nagelkerke R^2 = .33). In contrast, for males, compliance motivation positively predicted changes in dieting (B = 1.61; p = .027; *Exp(B)* = 5.02; *95%CI* = 1.20 – 20.96).

Table 3 demonstrates the results of binary logistic regression analyses, separate for each gender group, predicting distinct healthy weight control behaviors at time 2. As expected, in females the set of motivation variables predicted eating more fruits and vegetables as weight control strategies. Specifically, high levels of pleasure motivation to eat were associated with a decreased likelihood of eating more fruits and vegetables to lose or maintain weight. In females, for the remaining healthy behaviors, the respective time 1 behavior was the only

significant predictor of the same behavior at time 2. The pattern for males differed somewhat. While only the respective time 1 behaviors predicted eating more fruits and vegetables, and eating less sweets, the set of motivational predictor variables predicted changes in eating less high fat foods. Specifically, social motivation to eat was associated with an increased likelihood of eating less high fat foods.

Table 4 demonstrates the results for changes in unhealthy weight control behaviors. For females, the more pertinent results related to eating very little food and skipping meals. The set of motivational variables significantly predicted changes in eating very little food. However, the individual motivational variables failed to reach significance. With regard to meal skipping, motivation to eat did predict changes in this behavior. Specifically, low levels of coping motivation were associated with higher levels of meal skipping, overall explaining 33% of the variance in this behavior. Further, vomiting at time 1 was a fairly strong positive predictor of this behavior at time 2. Interestingly, neither the respective time 1 behaviors nor the motivational variables predicted fasting and using food substitutes as weight control behaviors in females.

Again, the pattern for males differed from that of females. The only behavior to be significantly predicted by the motivational variables was the use of food substitutes. Although the set of the motivational variables was a significant predictor of changes in the use of food substitutes, none of the individual motivations were significant predictors. The respective time 1 behaviors significantly predicted fasting and meal skipping at time 2. This was not the case for the time 1 and 2 measures for eating very little food or vomiting.

In addition to predicting the occurrence of each behavior, we predicted the total number of food-related healthy and unhealthy behaviors engaged in by the participants. Among females healthy behaviors at time 1 significantly predicted changes in the number of healthy weight control behaviors ($\beta = .40$; $F\ (1, 143) = 27.74$; $p = .000$; *Adj.* $R^2 = .16$), but the

motivational variables did not add significantly to the prediction (sig F_{change} = .07). The same pattern of results was evident for the males (β = .48; F (1, 94) = 28.29; p = .000; *Adj.* R^2 = .22 and step 2 sig F_{change} = .36).

In contrast, with regard to the number of unhealthy weight control behaviors, compliance motivation to eat was a significant predictor (β = .19; p = .03) of changes in such behaviors in females, explaining 16% of the variance. In males, it was only the time 1 behavior that significantly predicted time 2 unhealthy behaviors (β = .45; p = .000; *Adj.* R^2 = .19).

4. Discussion

In the present study we sought to examine the role of different types of motivation to eat in predicting changes in healthy and unhealthy weight control behaviors in a sample of Greek adolescents over a period of five months. In doing so, we extended previous research in several ways. First, motivational antecedents of both unhealthy and healthy distinct weight control behaviors were examined. Second, we employed a longitudinal design to examine whether the motivation variables predicted changes in the weight control behaviors by controlling for the initial levels of these variables. Third, we used an understudied cultural group. Finally, we included adolescent males who have often been overlooked by research within this area of work.

Compared to results reported by Yannakoulia et al. (2004; 19.5% for females and 9.7% for males) who also studied a sample of female and male Greek adolescents, the estimates of dieting prevalence in the present study were higher among both gender groups at both time points. Differences in the measurement time frame between the two studies may be responsible for this discrepancy. Specifically, Yannakoulia et al. asked the participants

whether they were 'currently' on a diet to lose weight, and not whether they had dieted to lose weight at any time within the past five months (which was the measure used in our study).

Our findings revealed that fasting, eating very little food and skipping meals were fairly common practices, in particular among females, but also among males. In the latter group, food substitutes (such as a powder or a special drink) were used by one in five. Unhealthy weight control practices cannot be considered rare in female or male Greek adolescents. Previous findings reported by Yannakoulia et al. (2004) also showed that 20.30% of girls and 7.30% of adolescent boys in Greece could be classified as at risk of disordered eating attitudes, as assessed by the Eating Attitudes Test (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982). The results of our study extend such research by illustrating the distinct types of unhealthy weight control behaviors Greek adolescents are more likely to engage in. In view of this, the identification of factors that might predict engagement in specific unhealthy (as well as healthy) weight control practices should be a concern for public health promotion specialists in Greece (and by extension of similar types of research, in other countries) in order to enhance the effectiveness of programmes designed to prevent disordered eating, and perhaps ultimately eating disorders.

Our findings showed that while different motivations to eat were important to understand some weight control practices, they did not predict all behaviors. Therefore, our hypotheses were only partly supported. For example, with regard to compliance coping, this variable significantly and positively predicted changes in the total number of unhealthy behaviors engaged in among females and dieting in males, but none of the distinct unhealthy or healthy weight control behaviors for either gender. It would therefore appear that having high levels of compliance motivation has negative repercussions for the *extent* to which Greek adolescent females engage in unhealthy behaviors to lose weight and whether males generally engage in dieting or not. While it has been argued that a "norm for minimal eating" is

particularly salient in young female adults (Roth et al., 2001), the present research extends such findings with adolescent females from a different culture, and shows that social norms dictating general food inhibition may be equally pertinent for male adolescents. In fact, in examining the role of social norms in determining eating behavior, Roth et al. showed that social norms dictating food restriction are more powerful than norms denoting expectations to match the food intake of others in a social context.

With regard to coping motivation, this variable negatively predicted changes in meal skipping in both females and males. Further, eating to cope with negative emotions positively predicted changes in vomiting in females. Thus, emotions seem to play a role in the regulation of eating behaviors in both males and females, a finding which supports previous research (Geliebter & Aversa, 2003). With regard to vomiting, the present findings provide some support for the prediction that eating to cope with negative emotions may have detrimental effects on more extreme weight control behaviors, at least in females.

The only behavior to be significantly predicted by social motivation to eat was eating less high fat foods. Specifically, males with high levels of such motivation were more likely to eat less high fat foods. Clearly social motivation to eat is only relevant to eating behavior where eating takes place in an interpersonal context (Herman et al., 2003). While some previous research conducted by Castro and colleagues (Bellisle et al., 1999; de Castro & Brewer, 1992; de Castro, Brewer, Elmore, & Orozco, 1990; Redd & de Castro, 1992) indicates that the presence of others generally facilitates eating, there is a paucity of research examining the impact of social facilitation on healthy versus unhealthy foods consumed. Our results suggest that adolescent males may make healthier eating choices in social situations by eating foods with relatively low fat intake. Social motivation to eat was not a significant predictor in the female sample. It is possible that the principle of social facilitation of eating

does not apply in determining eating behaviors among Greek adolescent females. Future research could examine this possibility.

With regard to pleasure motivation, Jackson et al. (2003) argued and found support for the hypothesis that this variable positively predicted binge eating. However, we did not assess binge eating in the present study, as we were mainly interested to examine antecedents of food restriction. We hypothesized that pleasure motivation would be a negative predictor of unhealthy weight control behaviors. This hypothesis was partly supported as pleasure motivation negatively predicted fasting in males. It does make intuitive sense to suggest that if pleasure motivation is likely to stimulate excess food intake, it would be likely to also deter food restriction practices such as fasting. However, this process does not seem to operate for females. Perhaps the societal pressure on women and girls in particular to conform to a lean toned physique, which dictates a modest energy intake, overrides the impact of pleasure motivation on eating behavior. While we did not forward any hypotheses with regard to healthy weight control behaviors due to the lack of research in this area, our results also showed that females with high levels of pleasure motivation to eat were significantly less likely to eat more fruits and vegetables as a means of weight control. It would be useful if future qualitative follow-up work examined reasons for this association.

Some limitations should be borne in mind when interpreting the results of the present study. First, socio-environmental influences were not considered. Although previous research has documented parents, peers and the media as influencing the extent to which adolescents engage in unhealthy weight control behaviors (Eisenberg, Neumark-Sztainer, Story, & Perry, 2005; Field et al., 2001; Neumark-Sztainer et al., 2003), we were interested to investigate the role of less commonly examined individual-level predictors. Second, we did not assess the personal weight control histories of the participants. Clearly, from a public health perspective, it would be important to understand predictors of behaviors that have taken place over longer

time spans or which have become chronic. Third, it would have been useful if more objective measures of behavior could have been incorporated. However, such measures are not without their own limitations. Finally, including samples of a different cultural origin would have allowed for direct comparisons in terms of the roles of each predictor.

In conclusion, our results indicate that motivation to eat variables may be useful predictors of some healthy and unhealthy weight control behaviors in Greek adolescents. With regard to future intervention efforts designed to circumvent unhealthy and induce healthy weight control practices, it would seem particularly pertinent that programs are designed to minimize compliance motivation in female and facilitating social motivation in Greek adolescent males.

References

Bellisle, F., Dalix, A.-M., & de Castro, J. M. (1999). Eating patterns in French subjects studied by the "weekly food diary" method. Appetite, 32, 46–52.

Cox, M., & Klinger, E. (1988) A motivational model of alcohol use. Journal of Abnormal Psychology, 97, 168-180.

Cox, M., & Klinger, E. (1990). Incentive motivation, affective change, and alcohol use: a model. In M. Cox (Ed.), Why people drink (pp. 291-314). New York: Gardner Press.

Crocker P. R. E,, Sabiston, C. M., Kowalski, K. C., McDonough, M. H., & Kowalski, N. (2006). Longitudinal assessment of the relationship between physical self-concept and health-related behavior and emotion in adolescent girls. Journal of Applied Sport Psychology, 18, 185-200.

Croll, J., Neumark-Sztainer, D., Story, M., & Ireland, M. (2002). Prevalence and risk and protective factors related to disordered eating behaviors among adolescents: Relationship to gender and ethnicity. Journal of Adolescent Health, 31, 166-175.

de Castro, J. M., & Brewer, E. M. (1992). The amount eaten in meals by humans is a power function of the number of people present. Physiology and Behavior, 51, 121–125.

de Castro, J. M., Bellisle, F., Feunekes, G. L. J., Dalix, A.-M., & de Graaf, C. (1997). Culture and meal patterns: A comparison of the food intake of free-living Americans, Dutch, and French students. Nutrition Research, 17, 807–829.

de Castro, J. M., Brewer, E. M., Elmore, D. K., & Orozco, S. (1990). Social facilitation of the spontaneous meal size of humans occurs regardless of time, place, alcohol or snacks. Appetite, 15, 89–101.

Eisenberg, M. E., Neumark-Sztainer, D., Story, M., & Perry, C. (2005). The role of social norms and friends' influences on unhealthy weight control behaviors among adolescent girls. Social Science & Medicine, 60, 1165-1173.

Field, A. E., Camargo, C. A., Jr., Taylor, C. B., Berkey, C. S., Roberts, S. B., & Colditz, G. A. (2001). Peer, parent and media influences on the development of weight concerns and frequent dieting among preadolescent and adolescent girls and boys. Pediatrics, 107, 54-60.

Fraser, G. E., Welch, A., Luben, R., Bingham, S. A., & Day, N. E. (2000). The effect of age, sex, and education on food consumption of a middle-aged English cohort-EPIC in East Anglia. Preventive Medicine, 30, 26–34.

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. Psychological Medicine, 12, 871-878.

Geliebter A., & Aversa, A. (2003). Emotional eating in overweight, normal weight and underweight individuals. Eating Behaviors, 3, 341-347.

Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on food intake: A normative interpretation. Psychological Bulletin, 129, 873-886.

Jackson, B., Cooper, M. L., Mintz, L., & Albino, A. (2003). Motivations to eat: Scale development and validation. Journal of Research in Personality, 37, 297-318.

Keel, P. K., & Fulkerson, J. A., & Leon, G. R. (1997). Disordered eating precursors in pre- and early adolescent girls and boys. Journal of Youth & Adolescence, 26, 203–216.

Levine, M. P., & Smolak, L. (2002). Body image development in adolescence. In T. F. Cash & T. Pruzinsky (Eds.), Body image: A handbook of theory, research, and clinical practice (pp. 74-82). New York: The Guilford Press.

Lien, N., Jacobs, D.R., Jr., & Klepp, K. I. (2002). Exploring predictors of eating behavior among adolescents by gender and socio-economic status. Public Health Nutrition, 5, 671–681.

Lytle, L. A., Seifert, S., Greenstein, J., & McGovern, P. (2000). How do children's eating patterns and food choices change over time? Results from a cohort study. American Journal of Health Promotion, 14, 222–228.

Neumark-Sztainer, D., Hannan, P. J., Story, M., & Perry, C. L. (2004). Weight-control behaviors among adolescent girls and boys: Implications for dietary intake. Journal of the American Dietetic Association, 104, 913-920.

Neumark-Sztainer, D., Wall, M., Guo, J., Story, M., Haines, J., & Eisenberg, M. (2006). Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: How do dieters fare 5 years later? Journal of the American Dietetic Association, 106, 559-568.

Neumark-Sztainer, D., Wall, M. M., Story, M., & Perry, C. L. (2003). Correlates of unhealthy weight control behaviors among adolescents: Implications for prevention programs. Health Psychology, 22, 88-98.

Patton, G. C., Selzer, R., Coffey, C., Carlin, J. B., & Wolfe, R. (1999). Onset of adolescent eating disorders: Population based cohort study over 3 years. British Medical Journal, 7186, 765-768.

Redd, M., & de Castro, J. M. (1992). Social facilitation of eating: Effects of social instruction on food intake. Physiology and Behavior, 52, 749–754.

Riddoch, C. J., Andersen, L. B., Wedderkopp, N., Harro, M., Klasson-Hegebo, L., Sardinha, L. B., Cooper, A. R., & Ekelund, U. (2004). Physical activity levels and patterns of 9- and 15- year old European children. Medicine and Science in Sports and Exercise, 36, 86-92.

Roth, D. A., Herman, C. P., Polivy, J., & Pliner, P. (2001). Self-presentational conflict in social eating situations: A normative perspective. Appetite, 36, 165–171.

Stice, E., & Bearman, S. K. (2001). Body image and eating disturbances prospectively predict increases in depressive symptoms in adolescent girls: A growth curve analysis. Developmental Psychology, 37, 597–607.

Thompson, A. M., & Chad, K. E. (2002) The relationship of social physique anxiety to risk for developing an eating disorder in young females. Journal of Adolescent Health, 31, 183-189.

Triandis, H. C. (1995). Individualism and collectivism. Oxford: Westview Press.

Yannakoulia, M., Karayiannis, D., Terzidou, M., Kokkevi, A., & Sidossis, L. S. (2004). Nutrition-related habits of Greek adolescents. European Journal of Clinical Nutrition, 58, 580-586.

Yannakoulia, M., Matalas, A. L., Yiannakouris, N., Papoutsakis, C., Passos, M., & Klimis-Zacas, D. (2004). Disordered eating attitudes: An emerging health problem among Mediterranean adolescents. Eating and Weight Disorders, 9, 126-133.

Table 1

Means (M) and Standard Deviations (SD) of Motivation to Eat and Number of Healthy and Unhealthy Weight Control Behaviors for Females and Males

	Time 1			
Variables (range of scale)	Females		Males	
	M	*SD*	*M*	*SD*
Compliance (1-4)	1.57	.56	1.64	.63
Coping (1-4)	1.49	.60	1.44	.64
Social (1-4)	1.95	.54	2.14	.64
Pleasure (1-4)	1.98	.54	2.10	.62
Number of healthy weight control behaviors (0-3)	2.03 (1.83)	1.02 (1.03)	1.55 (1.35)	1.08 (1.11)
Number of unhealthy weight control behaviors (0-6)	1.18 (1.32)	.98 (1.22)	1.28 (1.06)	1.44 (1.28)

Note. Means and standard deviations in brackets represent descriptive statistics at time 2.

Table 2

Percentages of Dieting, Healthy and Unhealthy Weight Control Behaviors at Both Time Points for Females and Males

	Time 1		Time 2	
	Females	Males	Females	Males
Dieting	66.90	48.50	67.83	46.15
Eating more fruits and vegetables	73.60	57.60	69.60	54.50
Eating less high fat foods	56.80	43.40	47.30	30.30
Eating fewer sweets	70.90	49.50	66.20	50.50
Fasting	14.20	18.20	28.77	24.24
Eating very little food	39.20	29.30	36.99	19.19
Using food substitutes	10.80	20.20	9.59	20.20
Skipping meals	45.90	31.30	42.47	27.55
Taking diet pills	.07	5.10	.07	3.00
Vomiting	4.70	4.00	6.80	4.04

Table 3

Binary Logistic Regression Analyses Predicting Distinct Healthy Weight Control Behaviors (0 =lack of behavior; 1= presence of behavior) at Time 2 from the Respective Weight Control Behavior and Motivation to Eat Variables at Time 1.

	Females			Males		
	Unstandardised coefficients	Odds Ratios	95% CI for Odds Ratios	Unstandardised coefficients	Odds Ratios	95% CI for Odds Ratios
Eating more fruits and vegetables T2						
Step 1 $\chi^2(3) = 3.89$; $p = .049$; Nagelkerke $R^2 = .04$				*Step 1* $\chi^2(1) = 8.79$; $p = .003$; Nagelkerke $R^2 = .12$		
Eating more fruits and vegetables T1	.81*	2.25	1.01 – 5.00	1.26**	3.52	1.50 – 8.24
Step2 $\chi^2(4) = 11.50$; $p = .02$; Nagelkerke $R^2 = .15$				*Step2* $\chi^2(4) = 1.35$; $p = .85$; Nagelkerke $R^2 = .13$		
Compliance	-.60	.55	.24 - 1.25	-.16	.85	.33 – 2.21
Coping	.56	1.75	.87 – 3.53	-.20	.82	.27 – 2.51
Social	-.09	.91	.40 – 2.07	-.30	.74	.28 – 1.99
Pleasure	-1.06*	.35	.15 - .81	.43	1.54	.56 – 4.20

Eating less high fat foods T2						
Step 1 $\chi^2(1) = 14.09$; $p = .000$; Nagelkerke $R^2 = .13$				*Step 1* $\chi^2(1) = 3.85$; $p = .05$; Nagelkerke $R^2 = .06$		
Eating less	1.31**	3.72	1.83 – 7.54	.88*	2.40	.99 – 5.82
high fat foods T1						
Step2 $\chi^2(4) = 5.61$; $p = .23$; Nagelkerke $R^2 = .17$				*Step2* $\chi^2(4) = 12.64$; $p = .01$; Nagelkerke $R^2 = .22$		
Compliance	.61	1.84	.86 – 3.90	.59	1.80	.61 – 5.29
Coping	-.67	.51	.26 - 1.01	-.91	.40	.11 – 1.42
Social	.08	1.08	.52 – 2.26	1.86**	6.39	1.83 – 22.35
Pleasure	-.20	.82	.39 – 1.72	-.85	.43	.14 – 1.32
Eating less sweets T2						
Step 1 $\chi^2(1) = 9.58$; $p = .002$; Nagelkerke $R^2 = .09$				*Step 1* $\chi^2(1) = 22.19$; $p = .000$; Nagelkerke $R^2 = .28$		
Eating less	1.25**	3.49	1.58 – 7.72	2.06**	7.85	3.15 – 19.57
sweets T1						
Step2 $\chi^2(4) = 8.18$; $p = .09$; Nagelkerke $R^2 = .17$				*Step2* $\chi^2(4) = 2.86$; $p = .58$; Nagelkerke $R^2 = .31$		
Compliance	.32	1.37	.63 – 2.99	.59	1.81	.60 – 5.40
Coping	-.72	.49	.22 – 1.05	-.57	.56	.17 – 1.89

Social	-.81	.45	.19 – 1.02	.12	1.13	.39 – 3.25
Pleasure	.17	1.19	.53 – 2.67	.37	1.44	.48 – 4.31

Note. * = $p < .05$; ** = $p < .01$.

Table 4

Binary Logistic Regression Analyses Predicting Distinct Unhealthy Weight Control Behaviors (0 =lack of behavior; 1= presence of behavior) at Time 2 from the Respective Weight Control Behavior and Motivation to Eat Variables at Time 1.

	Females			Males		
	Unstandardised coefficients	Odds Ratios	95% CI for Odds Ratios	Unstandardised coefficients	Odds Ratios	95% CI for Odds Ratios
Fasting T2						
Step 1 $\chi^2(1) = .02$; $p = .90$; Nagelkerke $R^2 = .00$				*Step 1* $\chi^2(1) = 3.96$; $p = .047$; Nagelkerke $R^2 = .06$		
Fasting T1	-.07	.93	.34 – 2.60	1.12*	3.05	1.04 – 8.99
Step2 $\chi^2(4) = 3.69$; $p = .45$; Nagelkerke $R^2 = .04$				*Step2* $\chi^2(4) = 8.55$; $p = .07$; Nagelkerke $R^2 = .18$		
Compliance	.23	1.26	.60 – 2.66	.99	2.70	.81 – 8.99
Coping	.07	1.08	.54 – 2.13	.88	2.42	.66 – 8.91
Social	-.71	.49	.22 – 1.08	.09	1.09	.34 – 3.49
Pleasure	-.05	.95	.45 – 2.01	-1.44*	.24	.07 - .81
Eating very little food T2						
Step 1 $\chi^2(1) = 5.64$; $p = .02$; Nagelkerke $R^2 = .05$				*Step 1* $\chi^2(1) = 3.01$; $p = .08$; Nagelkerke $R^2 = .05$		

Eating very little food T1	.84*	2.32	1.15 – 4.66	.92	2.52	.90 – 7.10
Step2 $\chi^2(4) = 14.68$; $p = .005$; Nagelkerke $R^2 = .18$				*Step2* $\chi^2(4) = 7.60$; $p = .11$; Nagelkerke $R^2 = .17$		
Compliance	-.69	.50	.24 – 1.05	1.30	3.68	.91 – 14.88
Coping	-1.43	.65	.33 – 1.31	-1.39	.25	.06 – 1.07
Social	-.61	.55	.25 – 1.19	1.00	2.72	.73 – 10.17
Pleasure	-.08	.92	.43 – 2.00	-.14	.87	.23 – 3.21
Using a food substitute T2						
Step 1 $\chi^2(1) = 1.58$; $p = .21$; Nagelkerke $R^2 = .02$				*Step 1* $\chi^2(1) = 7.88$; $p = .005$; Nagelkerke $R^2 = .12$		
Using a food substitute T1	.97	2.63	.64 – 10.80	1.58**	4.84	1.63 – 14.35
Step2 $\chi^2(4) = 4.36$; $p = .36$; Nagelkerke $R^2 = .09$				*Step2* $\chi^2(4) = 10.77$; $p = .029$; Nagelkerke $R^2 = .28$		
Compliance	-.77	.46	.16 – 1.33	-.76	.47	.16 – 1.40
Coping	.04	1.04	.38 – 2.83	-.06	.94	.26 – 3.38
Social	-.26	.77	.23 – 2.62	.10	1.10	.27 – 4.50
Pleasure	-.14	.87	.27 – 2.81	-.78	.46	.13 – 1.58

Skipping meals T2						
Step 1 $\chi^2(1) = 28.17$; $p = .000$; Nagelkerke $R^2 = .24$				*Step 1* $\chi^2(1) = 16.54$; $p = .000$; Nagelkerke $R^2 = .23$		
Skipping	1.89**	6.64	3.17 – 13.90	1.97**	7.19	2.68 – 19.31
meals T1						
Step2 $\chi^2(4) = 11.44$; $p = .02$; Nagelkerke $R^2 = .33$				*Step2* $\chi^2(4) = 6.59$; $p = .16$; Nagelkerke $R^2 = .31$		
Compliance	-.45	.64	.30 – 1.37	.90	2.47	.70 – 8.74
Coping	-.76*	.47	.23 - .95	-1.52*	.22	.05 – .91
Social	-.04	.96	.43 – 2.14	.81	2.26	.64 – 7.98
Pleasure	-.25	.78	.35 – 1.74	.42	1.52	.46 – 4.99
Vomiting T2						
Step 1 $\chi^2(1) = 13.75$; $p = .000$; Nagelkerke $R^2 = .23$				*Step 1* $\chi^2(1) = 2.32$; $p = .13$; Nagelkerke $R^2 = .08$		
Vomiting T1	3.36**	28.89	5.25 – 159.10	2.29	9.89	.78 – 125.24
Step2 $\chi^2(4) = 7.38$; $p = .12$; Nagelkerke $R^2 = .35$				*Step2* $\chi^2(4) = 5.13$; $p = .27$; Nagelkerke $R^2 = .26$		
Compliance	-1.27	.28	.08 – 1.01	-.25	.78	.12 – 4.87
Coping	1.90*	6.71	1.17 – 38.48	-.72	.49	.04 – 6.27
Social	-.08	.92	.20 – 4.17	.86	2.37	.10 - 55.78

Pleasure	-.69	.50	.09 – 2.75	-1.42	.24	.02 – 3.82

Note. * = $p < .05$; ** = $p < .01$.