The Effects of Restraint and Gender on Frequency of Consumption of High-Glycemic Load and High-Fat Foods

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Arts with Honors in Psychology from the University of Michigan 2015

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Abstract

Nutritional characteristics, like fat and carbohydrates, may influence how frequently individuals consume various foods. Further, food consumption may vary by gender or by whether an individual exhibits restrained eating. Men and women may prefer different foods, and high dietary restraint may increase avoidance of foods that are believed to cause weight gain like foods high in fat and rapidly absorbed refined carbohydrates (indicated by glycemic load [GL]). This study analyzed the influence of individual characteristics on reported consumption of foods with varying nutrition. Participants (n = 120) were asked how frequently they consumed 35 foods with different nutritional compositions, and completed the EDE-Q. Hierarchical linear modeling was used to assess the impact of fat and GL on reported consumption, and how restraint and gender altered these associations. Fat and GL both emerged as large, negative predictors, meaning that as fat or GL increased in a food, reported consumption decreased. Gender was a large predictor of consumption of high-fat foods, that is, males indicated consuming high-fat foods more frequently than females. Restraint was a moderate, negative predictor of consumption of high-GL foods, that is, as individuals scored higher on the restraint scale, their reported consumption of high-GL foods decreased. An increased societal pressure on women to be thin may explain the gender difference found in this study. Restrained eaters may be particularly susceptible to messages in the environment encouraging or discouraging consumption of foods with certain nutritional profiles. More research is needed to explore restrained eaters' reaction to environmental food messages.

Keywords: food, nutrition, fat, glycemic load, individual characteristics, gender, restraint

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Obesity is a significant problem in America, currently impacting over one-third of American adults and almost 17% of American children (Ogden, Carroll, Kit, & Flegal, 2014). Simultaneously, the national perception of beauty and health are contingent on low body weight, particularly in women (Broom & Dixon, 2008; Garner, Garfinkel, Schwartz, & Thompson, 1980; Hesse-Biber, Leavy, Quinn, & Zoino, 2006). As a result, it has been observed that 70% of Americans may be trying to lose weight at any given moment (Cogan & Ernsberger, 1999); due to this thin ideal, many individuals may be utilizing dietary restraint to reduce their size and weight. Dietary restraint is functionally defined as the intentional, volitional restriction of food and/or caloric intake in order control body weight (Stice, Marti, Shaw, & Jaconis, 2009; Lowe & Kral, 2006). However, considering the increasing rates of obesity, restraint does not seem like an effective weight loss strategy.

Empirical investigation of restraint is in its nascent stages, and the construct is still evolving. Herman and Mack (1975) conceptualized restraint as a biological set point (Nisbett, 1972), which predetermined the amount of food intake necessary for an individual to feel satiated. They hypothesized that restrained individuals would eat less than this biologically determined amount, creating a calorie deficit in order to maintain a desired weight (Herman & Mack, 1975). However, level of restraint does not seem to differ significantly between overweight and normal weight individuals (Herman & Mack, 1975), though they expected overweight and obese individuals to exhibit more restraint according to this set point hypothesis. Herman and Polivy (1983) recognized that intake might depend more on cognitive factors than physiological set point deviations. In response to these findings, Lowe and Butryn (2007)

developed the terms "homeostatic hunger," or physiological hunger caused by a physical need for energy, and "hedonic hunger," referring to hunger not triggered by a calorie deficit, but rather by a desire for pleasure derived from eating. Thus, individuals who consume past the "biological set point" may be consuming highly palatable food for pleasure, rather than to satisfy a biological need. Restraint in reference to hedonic hunger would refer to an individual's effort to restrict such eating for pleasure outside of homeostatic hunger.

This construct of "cognitive restraint" has implications for eating behavior. Even during the first conceptualizations, Herman and Mack (1975) acknowledged that there were significant differences in the behavior of restrained and unrestrained eaters. For example, individuals high in cognitive restraint may be particularly susceptible to counter-regulatory eating after what is perceived to be a high-calorie preload (Herman & Polivy, 1983). Counter-regulatory eating is the phenomenon of an individual consuming more food after eating food, rather than after having eaten nothing, which is contrary to normal food intake regulation (Herman, 2007). Polivy (1976) provided evidence for this using a "preload" paradigm, and found that when restrained eaters believed they were eating a high-calorie preload, regardless of the actual caloric content, they were more prone to overeat afterward. Ruderman (1986) called this the "disinhibition hypothesis," according to which restrained eaters will overeat after their cognitive self-control has been disrupted (e.g. eating a high-calorie milkshake). Unrestrained eaters were not as susceptible to counter-regulatory eating. Overeating after violating idiosyncratic rules about high-calorie foods supports the theory of restraint as a cognitive construct, and also provides evidence that restrained eaters differ in their consumptive patterns.

Based on the existing literature, it seems that a restrained eater's perception for whether a food is healthy has implications for guiding their eating behavior. Overall, perception of

healthiness of food differs according to food category and nutritional characteristics. Reports have shown that individuals, restrained and unrestrained, rely heavily on fat, sugar, and low-nutrient profile when rating the healthfulness of foods (Carels, Harper, & Konrad, 2006; Oakes, 2005; Rizk & Treat, 2014). Further, multiple studies suggest that restraint accounts for differences in perception of certain foods' healthiness (Paquette, 2005; Polivy, 1976; Provencher, Polivy, & Herman, 2009). Oakes and Slotterback (2002) found that, between dieters and non-dieters, dieters were more likely to consider fat content the most important factor when deciding how healthy a food was, whereas non-dieters judged more frequently according to "freshness." Restrained eaters were also more likely to rate sugar and high-sugar foods as foods to be avoided when on a weight-loss diet (Knight & Boland, 1989). In contrast, the ratings of fruits and vegetables (e.g. celery, lettuce, grapefruit, bean sprouts, etc.) were not associated with restrained eating behavior (Knight & Boland, 1989). Restrained individuals have been shown to perceive health in terms of weight loss, rather than overall health (Carels et al., 2006; Provencher et al., 2009), so restrained eaters probably view the "forbidden" foods as unhealthy, since they should be avoided when trying to lose weight. The diet environment, which is often full of messages that encourage people to avoid fats and sugars, may be one explanatory factor for this observation.

These different perceptive patterns may influence restrained versus unrestrained eaters' consumptive patterns. Current evidence suggests that restrained eaters may have episodes of overeating (Graham, Gluck, Vortuba, Krakoff, & Thearle 2014; Herman & Polivy, 1983; Ruderman, 1986; Wardle, Steptoe, Oliver, & Lipsey, 2000) that punctuate normative restrained eating (French & Jeffrey, 1994; Laessle, Tuschl, Kotthaus, & Pirke, 1989), contrasting consistently regulated eating of unrestrained individuals (Herman & Polivy, 1983). This

alternation in restrained eaters may explain the fact that there is little weight difference between restrained and unrestrained individuals (Herman & Mack, 1975). During episodes of overeating and binge eating individuals primarily consume high-calorie, low-nutrient foods (Allison & Timmerman, 2007). During normative consumption, however, dieters often stay away from high-fat, high-sugar, and high-calorie foods (French & Jeffrey, 1994; Klesges, Isbell, & Klesges, 1992; Laessle et al., 1989). Certain foods high in fat and sugar are most likely to be associated with individuals' restraint rules, and therefore, are typically avoided. However, when a restrained eater believes that he or she has violated a certain restraint rule (e.g. eating a "forbidden" food, eating a subjectively unhealthy food), he or she may engage in counter-regulatory eating (Knight & Boland, 1989). A similar pattern of overeating emerges during periods of high stress or when cognitive control is disturbed (Graham et al., 2014; Wardle et al., 2000). We hypothesize that this pattern of restrained eating, excluding the interruptions of overeating unusually high fat and sugar foods, is characteristically different than the consumptive pattern of unrestrained eaters. Restrained eaters may report lower consumption of high-fat and high-glycemic load (high-GL) foods than unrestrained eaters when asked about eating, unprompted by stress or a preload.

Food preference also varies according to gender. While men seem to prefer savory foods, such as meats and meal foods, women show a preference for sweet, fatty foods, such as donuts and cookies (Drewnowski, Kurth, Holden-Wiltse, & Saari, 1992; Reslan & Saules, 2011). Women also seem to avoid fat more than men, while men choose more high-fat options as compared to low-fat options (Day, McHale, & Francis, 2012; Paquette, 2005; Macdiarmid, Vail, Cade, & Blundell, 1998; Wardle, Haase, Steptoe, Nillapun, Jonwutiwes, & Bellisle, 2004). This may be explained by the differences in weight and diet standards between men and women, and the pressure women experience from the thin ideal (Striegel-Moore, Silberstein, & Rodin, 1986).

The current study will investigate the impact of nutritional components (e.g. fat content, GL) on how frequently various foods are reported to be consumed, and whether the individual characteristics of reported restraint and gender alter this association. This study will utilize hierarchical linear modeling in order to simultaneously examine the food-specific nutritional predictors and the participant-specific characteristics of restraint and gender on the frequency of consumption of a variety of foods.

Method

Participants

The University of Michigan Health and Behavioral Sciences Institutional Review Board approved the current study and informed consent was obtained from all participants. Participants (n = 120) were undergraduate students at the University of Michigan who were either recruited through the Psychology Subject Pool or flyers distributed on campus. Of these subjects, 39 were male and 81 were female. Participants' age ranged from 18-23 years old (mean [M] = 19.27 years, standard deviation [SD] = 1.27) and reported ethnicity varied (72.5% Caucasian/White, 19.2% Asian/Pacific Islander, 5.0% Hispanic, 4.2% African-American, 0.8% Arab, and 0.8% reported Other). Body Mass Index (BMI) of subjects ranged from underweight to obese (M = 23.03, SD = 3.20). Restraint, as measured by the Eating Disorder Examination Questionnaire, ranged from 0-5.40 (M = 1.41, SD = 1.24).

Procedures and Assessment Measures

Eating Disorder Examination Questionnaire. Restraint was measured according to the Eating Disorder Examination Questionnaire, or EDE-Q (Fairburn & Beglin, 1994), developed as a self-report version of the Eating Disorder Examination interview (Fairburn & Cooper, 1993). The questionnaire contains 36 items, which are scored on a 7-point scale, or frequency reports

(e.g. “Over the past 28 days, how many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances)?”). These items can be separated into four subscales: Restraint, Eating Concern, Weight Concern, and Shape Concern (Mond, Hay, Rogers, Owen, & Beumont, 2004). The Restraint subscale, the first five questions of the EDE-Q, was used in the data analyses for this study (e.g. “Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?”).

Frequency of Consumption. To collect reports of frequency of consumption, subjects completed an ePrime task, in which they indicated how often they consumed 35 different foods. These foods were systematically selected based on processing, fat, sodium, sugar, carbohydrate, protein, and fiber content, and these 35 foods fell into roughly four different categories. Some foods were high in both fat and refined carbohydrates (like white flour and sugar), such as cake and pizza; others were high in fat but low in refined carbohydrates group, such as steak and cheese; others were low in fat but high in refined carbohydrates group, such as gummy candy and pretzels; and finally, some foods were low in both fat and refined carbohydrates group, such as strawberries and broccoli. To quantify the “Frequency of Consumption” variable, participants were asked, “How frequently do you eat the following foods?” Then, using the keyboard, they indicated a number between 1 and 6, 1 being “never eat” and 6 being “eat very frequently.”

Demographics and BMI. Participants reported demographic information, such as ethnicity, gender, and age electronically. Height and weight were measured in the laboratory space to calculate BMI.

Data Analytic Plan

We used Hierarchical Linear Modeling 7 to analyze the data. We assessed whether food specific characteristics (i.e. fat content, glycemic load [GL]) influenced the frequency for which a food was reported as consumed at level one and if individual idiographic influences emerged as predictors for this relationship at level two.

Hierarchical linear modeling with robust standard errors was used to examine associations between nutritional characteristics (e.g. fat content, GL) and individual differences (e.g. gender, restraint) with how frequently a food was reported to be consumed. Data were analyzed with two-level regression analyses, with participants' reports of how frequently they consumed the 35 foods set as the outcome, and nutritional components of individual foods at level one nested within the 113 participants' characteristics at level two. By using this multi-level analysis, we were able to investigate the predictive power of food attributes on reported consumption frequency and the influence of individual characteristics on the association of food attributes and reports of consumption frequency.

Fat, Glycemic Load, and Frequency of Consumption

The current model specified fat content and GL as nutritional characteristics of interest. Previous research points to consumptive differences between men and women when looking at high-fat foods (Macdiarmid et al., 1998; Wardle et al., 2004). GL was examined since restrained eaters appear to differentially consume high-fat/high-sugar foods (Wardle et al., 2000), which have a high GL.

Results

Both fat content (centered) and GL (centered) had main effects for how frequently participants reported consuming a food, as seen in the level-one equation. The intercept for the level-one equation (β_0) represents the model-predicted participant-reported consumption

frequency for a food with average fat content and average GL. The partial slopes can be interpreted as the influence of fat (β_1) and the influence of GL (β_2) on consumption frequency report.

Level-One Equation for Fat and GL as a Predictor of a Food's Rating:

$$Frequency\ of\ Consumption = \beta_0 + \beta_1*(FAT) + \beta_2*(GL) + r$$

Chi-square tests revealed significant variation across participants reported consumption in foods focusing on fat content, $x^2(117) = 202.658$, $p < 0.001$, and GL, $x^2(117) = 182.968$, $p < 0.001$. Therefore, since the initial analysis indicated that there was significant individual variability between participant-reported consumption frequency, food-specific predictors of the intercept, fat, and GL were examined and all three parameters were treated as random effects. Fat content emerged as a large, negative predictor for reports of consumption frequency ($\gamma_{10} = -0.016$, d = -0.850, $p < 0.001$), meaning that for every one-gram increase in fat content, the average frequency of consumption decreased 0.016. GL was also a large, negative predictor for average reported consumption ($\gamma_{20} = -0.015$, d = -0.807, $p < 0.001$), as every one-unit increase in GL resulted in a 0.015 decrease in a food's reported consumption frequency.

Restraint and gender were then entered into this model as level-two predictors. These were used to examine changes in the association of GL and fat on frequency of consumption ratings based on participant-specific characteristics.

Level-Two Equations for Participant-Specific Predictors of Level-One Parameters:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}*(RESTRAINT_j) + \gamma_{02}*(GENDER_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}*(RESTRAINT_j) + \gamma_{12}*(GENDER_j) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}*(RESTRAINT_j) + \gamma_{22}*(GENDER_j) + u_{2j}$$

A participant with mean values (or male, as gender was measured dichotomously) on the level-two parameters reported an average rating of 3.28, on a scale from 1 ("never eat") to 6 ("eat very frequently"), for a food item with average fat and GL values (γ_{00}). For foods with average fat and GL, neither restraint nor gender had a significant effect (γ_{01} = 0.014, d = 0.087, p = 0.640, γ_{02} = 0.175, d = 0.301, p = 0.109). However, as foods' fat and GL content increased, two patterns emerged. Restraint was a moderate, negative predictor of the association between reported consumption frequency and GL (γ_{21} = -0.009, d = -0.515, p = 0.007; see *Figure 1*), meaning that for every one-unit increase in restraint, individuals reported eating foods less frequently (0.009 lower) per one-unit GL increase. There was no significant effect of an individual's level of restraint on reported consumption as fat increased (γ_{11} = 0.003, d = 0.236, p = 0.209; see *Figure 2*). Gender was a large, negative predictor of the association between reported consumption frequency and fat (γ_{12} = -0.031, d = -0.984, $p < 0.001$; see *Figure 3*), meaning that for every one-gram increase in fat content from the average, males reported increased consumption (0.031 higher) compared to females. The effect of a subject's gender on the consumption of foods as GL increased was insignificant (γ_{22} = 0.011, d = 0.273, p = 0.147; see *Figure 4*). See Tables 1 and 2 for details.

Discussion

The current study examined whether food attributes influenced reported frequency of consuming various foods and if individual characteristics altered this association. Individuals generally reported consuming foods high in fat content and GL less frequently. When participants reported restrained eating, they were especially likely to report less frequently consuming high GL foods; however they did not report eating less high fat foods. Finally, males

seemed to report more frequent rates of consumption of high fat foods, but there were no gender differences regarding reported consumption based on GL.

Food Characteristics

Fat. In our sample, fat had a significant negative effect on how frequently a food was reported to be consumed; generally, individuals tended to consume higher fat foods less often. This may be largely because individuals see fat as very unhealthy (Carels et al., 2006). There may also be contributing environmental influences. Since the 1980s, the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (USDHHS) have recommended that people reduce consumption of fat in an attempt to reduce the rate of heart attacks, strokes, and renal disease (USDA & USDHHS, 1980). The population has responded by decreasing the relative consumption of fats (Marantz, Bird, & Alderman, 2008). Further, this led to the production of "low-fat" and "no fat" options of traditionally high fat foods (i.e. Oreos, yogurt), and increased consumption of foods labeled as such, since these options are believed to be healthier (Wansink & Chandon, 2006; Paquette, 2005). These labels perpetuate an environment in which foods containing high amounts of fat are unhealthy and should be avoided. This could account for the downward trend in report of consumption frequency as foods increased in fat content.

Glycemic Load. GL captures both dose and rate of absorption of carbohydrates into the system (Carbohydrates and the Glycemic Load, 2015). Similar to fat, participants indicated eating high GL foods less frequently than low GL foods, in line with previous evidence of people limiting sugar in their diets (Paquette, 2005). This could be explained by the belief that high amounts of calories from carbohydrates promote weight gain (Oakes, 2005). High GL foods also tend to be seen as high-calorie, low-nutrient foods such as sweets (e.g. our study included

muffins, breakfast cereal, cake, etc.), which are perceived as unhealthy (Knight & Boland, 1989). This may also be linked to what people believe is healthy overall. Non-dieters tend to rate "freshness" as the most important characteristic contributing to food healthfulness (Oakes & Slotterback, 2002). GL foods tend to be foods that are highly processed (e.g. chips, candies), while fresh foods almost always have a low GL (e.g. bananas, lettuce). The lower consumption of GL could be a product of individuals consuming more fresh foods than processed foods.

Individual Characteristics

Restraint. Our analyses found that, as GL increases in a food, individuals report consuming that food less, and restraint exaggerates this negative correlation. That is, individuals who scored high in restraint report consuming high GL food less frequently than individuals with lower restraint scores. These findings suggest that restrained eaters' normative consumptive pattern is significantly different than unrestrained eaters' food intake. This corroborates the study conducted by Laessle and colleagues (1989), in which data collected with semi-structured eating habit interviews and food diaries showed that restrained eaters reported consuming less highly caloric food items and "fattening" foods.

It is possible that if restrained eaters were instructed to report their consumption during stressful periods or binges, their reports may be different. Others have studied the eating of restrained eaters when cognitive control is interrupted (Graham et al., 2014), under stress (Wardle et al., 2000), or after a preload (Herman & Mack, 1975; Ruderman, 1986). During these periods, restrained eaters seem more susceptible to overeat or binge (Herman & Polivy, 1985). Under binge circumstances, individuals consume large amounts of high-calorie, low-nutrient foods (Allison & Timmerman, 2007). However in our sample, restrained eaters reported successfully avoiding high GL foods, which are most often high-calorie, low-nutrient foods, than

their unrestrained peers. This seems to be consistent with a popular diet technique of avoiding desserts and sweets (French & Jeffrey, 1994) and restrained eaters' practice of consuming fewer calories from carbohydrate (Klesges et al., 1992). This finding may have resulted from the conditions of the study; participants were not subjected to preload or binge-prone circumstances, and were not prompted to recall overeating or binge episodes. Participants with more restraint may have been biased to report about their restrained normative eating behavior, due to embarrassment or shame about overeating or binge eating. Restrained eaters do not appear to consume fewer calories based on objective measures (de Witt Huberts, Evers, & de Ridder, 2013), but they may report less consumption of calorie-dense high-GL foods, reflecting their patterns of successful restraint. It is also noteworthy that the EDE-Q has been shown to not discriminate between successful and unsuccessful restraint (Stice, Sysko, Roberto, & Allison, 2010); patterns of GL consumption may differ according to whether an individual successfully restrains or not.

The finding that restrained eaters did not report consuming high fat foods differently than unrestrained eaters was surprising, especially considering past data suggesting that individuals view fat as unhealthy (Carels et al., 2006). One explanation may be related to a recent shift in popular culture in the view of fat. Foods high in "good fats" (e.g. nuts, avocados, olive oil, salmon) have been highlighted as nutritious (USDA & USDHHS, 2010) and there has been an increased focus on the contribution of sugar and refined carbohydrates to the obesity epidemic (Taubes, 2007). Restrained eaters may be more responsive to changes in messaging about what foods contribute to weight gain and may be more likely to avoid the consumption of high GL foods, like cakes and cookies. However, this is also inconsistent with a study conducted by Rizk and Treat (2014), which found that individuals relied more heavily on fat than sugar when

assessing the healthiness of foods, and this was exaggerated as disordered eating symptoms increased. Further research is needed to evaluate restrained eaters attitudes towards carbohydrates relative to fat, and explore why these two studies would have collected seemingly dissimilar data.

Gender. The gender effect found in this study indicates that males report eating more high fat foods than females. This is consistent with previous findings indicating that there are gender differences when looking at consumption of high fat foods, and that women generally avoid fat more than men (Day et al., 2012; Paquette, 2005; Macdiarmid et al., 1998; Wardle et al., 2004), even though males and females seem to both prefer fatty foods (Drewnowski et al., 1992). This difference may be attributable in part to the cultural ideal shifting toward low body weight as an important determinant in attractiveness and health for women specifically (Broom & Dixon, 2008; Cogan & Ernsberger, 1999; Garner, et al., 1980; Hesse-Biber et al., 2006; Saltonstall, 1993). Before 1970, voluptuous women were considered more beautiful than their angular counterparts, but the focus has since trended toward slimness and weight reduction (Cogan & Ernsberger, 1999; Garner et al., 1980). While males often have a muscular body ideal, females tend to desire to be thin (Boom & Dixon, 2008), and engage with more weight loss strategies and unhealthy eating patterns in order to lose weight (Cogan & Ernsberger, 1999). A study done by Carels and colleagues (2006) suggested that individuals have overlapping perceptions of "health" and the "ability to affect weight," while Saltonstall (1993) found that women in particular often link "'not being fat'" and "'being thin…'" with health. Thus, the thin ideal of beauty and health, along with the perceived healthiness surrounding high-fat foods discussed above, may encourage a low-fat diet for women specifically. Interestingly, there was no difference between men and women in reported consumption of foods with higher GL. This

may be due in part to the fact that women prefer sweet, high-carbohydrate/high-fat foods while men prefer savory, high-protein/high-fat foods (Drewnowski et al., 1992). While the thin ideal mechanism may create a difference between men and women's consumption of high-fat foods, which are equally preferred, it may lower reported consumption of high-GL foods in women so that men and women report consumption of high-GL foods equally. Further research is suggested to explore why a gender difference appears in consumption of high-fat foods, but not high-GL foods, and the role of the thin ideal in consumption preferences.

Limitations and Future Directions

The current study relies on self-report for individuals to indicate how frequently they consumed various foods. Restrained eaters may report their eating behaviors in a manner that would be consistent with successful dietary restraint, regardless of whether the individual is actually successfully restraining. However, if this is true, one may expect to see similar reported differences for high fat foods between restrained and non-restrained eaters. Nevertheless, this potential limitation emphasizes the importance of utilizing direct observation techniques to examine restrained eaters' behavior in the future. Another potential limitation is that restraint was measured using the EDE-Q, which appears to capture attempts at restrained eating without differentiating between successful and unsuccessful restraint (Stice et al., 2010). Additionally, the results from this study may not be generalizable to the US population, as the sample consisted of university students, and may not be applicable to adult or youth populations. Finally, future research should investigate the susceptibility of restrained eaters to environment, media messages, and other perceived guidelines about diet and their impact on consumption. As the food environment is constantly changing (McKie, MacInnes, Hendry, Donald, & Peace, 2000), it would be informative to collect data from restrained eaters of different ages or in different

environments to see what foods they consume and how frequently, and also how their reports are affected by external cues.

Conclusion

This study found that overall people report less frequent consumption of foods as fat content and GL increase. Consistent with prior research (Day et al., 2012; Paquette, 2005; Macdiarmid et al., 1998; Wardle et al., 2004), women report consuming high-fat foods less often than men. This may be accounted for by the greater social pressures women experience to be thin (Striegel-Moore et al., 1986), the view that high-fat foods are unhealthy (Carels et al., 2006), and perceived synonymy of fattening foods and unhealthy foods, especially in women (Saltonstall, 1993). The most notable finding was that restrained eaters reported lower consumption of high-GL foods, but did not differ in the reported consumption of foods with higher fat content. Contrasting a previous study conducted by Rizk and Treat (2014), high-GL foods may be of particular concern for a restrained eater, rather than high fat foods. This may be due to the changing dietary guidelines, both governmental (USDA & USDHHS, 1980; USA & USDHHS, 2010) and societal (Taubes, 2007), encouraging conscientious consumption of "good fats" and avoidance of high-carb, high-GL foods. The role of the media and perception of food messages is not yet understood, particularly among restrained eaters, so future research may consider this direction. The findings from this study address a gap in the literature regarding the unprimed consumption reports of restrained eaters. It will be important to compare these data to data gathered when restrained individuals are told to specifically report their normative non-binge consumption, in order to see how restraint is related to the frequency of consumption of certain foods during binges versus more typical consumption. These findings may inform treatment among clinical populations who report restrained eating. Perhaps treatment plans may pay

greater attention to restrained eaters' beliefs about high GL foods, and overall food messages in the environment.

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Table 1

Level one: The effects of fat and GL on reported consumption

Fixed Effect	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	3.387409	0.044729	75.732	117	<0.001
For FAT slope, β_1					
INTRCPT2, γ_{10}	-0.016026	0.003488	-4.595	117	<0.001
For GL slope, β_2					
INTRCPT2, γ_{20}	-0.014627	0.003353	-4.363	117	<0.001

Table 2

Level two: Restraint and gender within the effects of fat and GL on reported consumption

Fixed Effect	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value
For FAT slope, β_1					
INTRCPT2, γ_{10}	0.005231	0.004375	1.196	115	0.234
RESTRAINT, γ_{11}	0.003769	0.002983	1.264	115	0.209
GENDER, γ_{12}	-0.031354	0.005944	-5.275	115	<0.001
For GL slope, β_2					
INTRCPT2, γ_{20}	-0.022372	0.006672	-3.353	115	0.001
RESTRAINT, γ_{21}	-0.008532	0.003091	-2.760	115	0.007
GENDER, γ_{22}	0.011424	0.007817	1.462	115	0.147

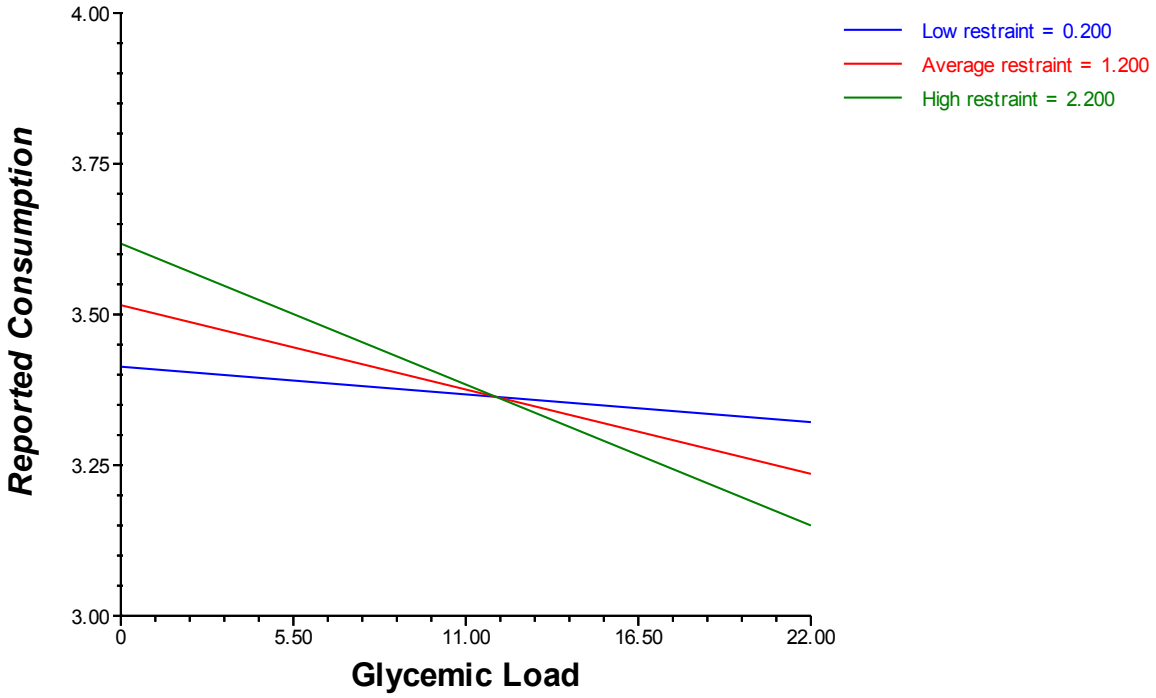

Figure 1. Consumption of frequency as GL increases, according to restraint

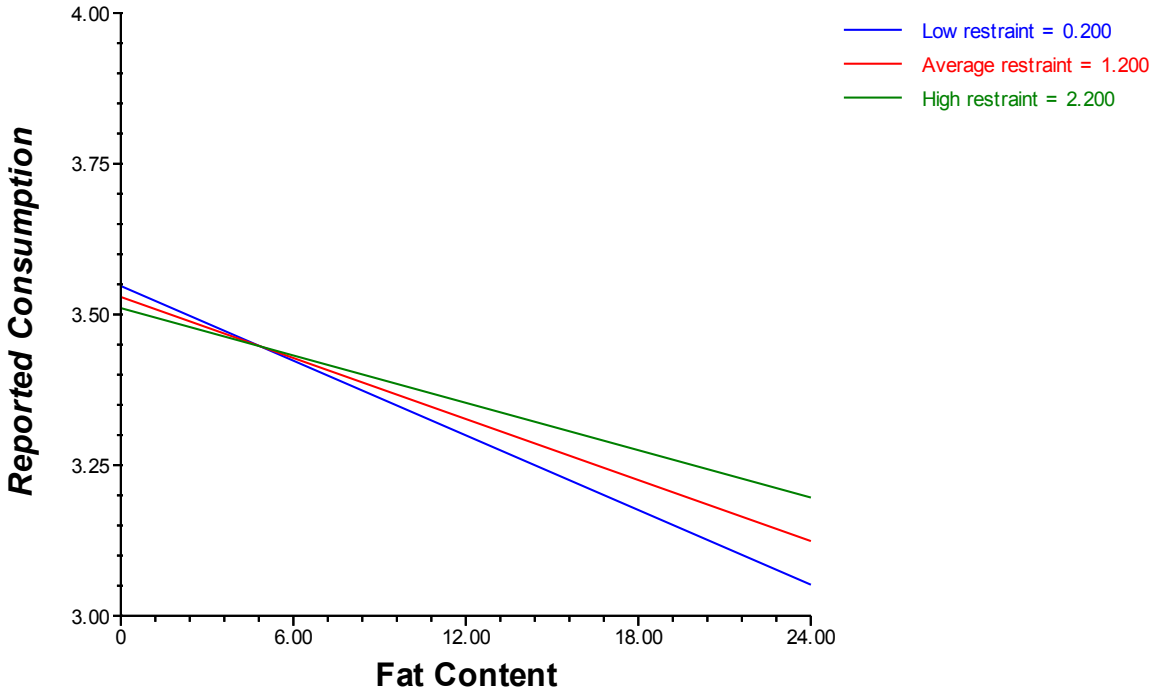

Figure 2. Consumption of frequency as fat increases, according to restraint

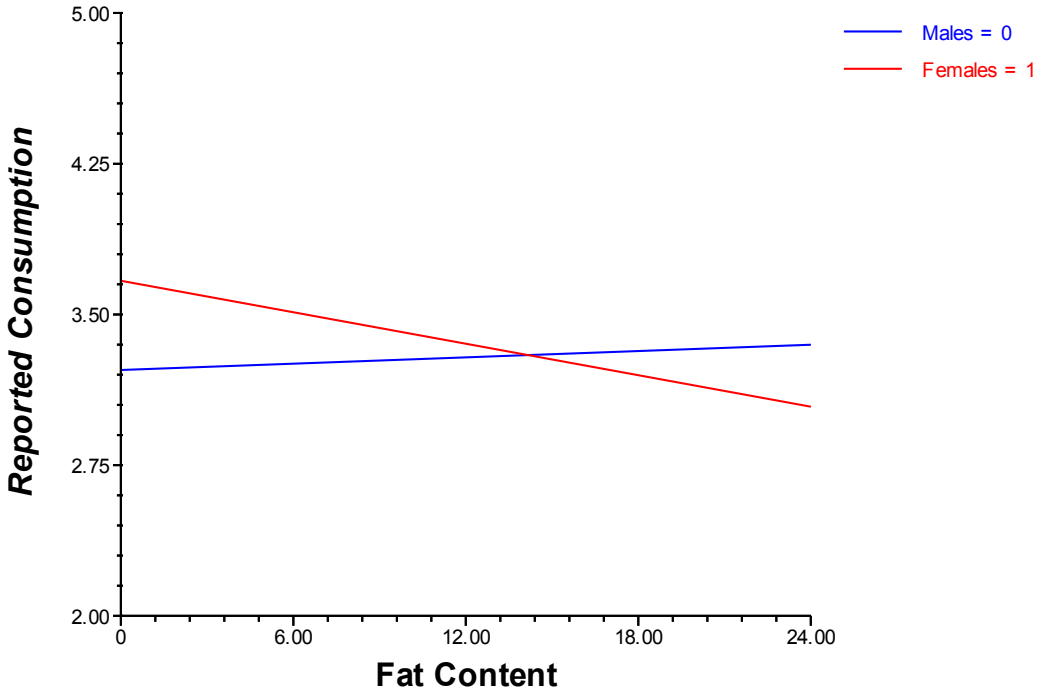

Figure 3. Consumption of frequency as fat increases, according to gender

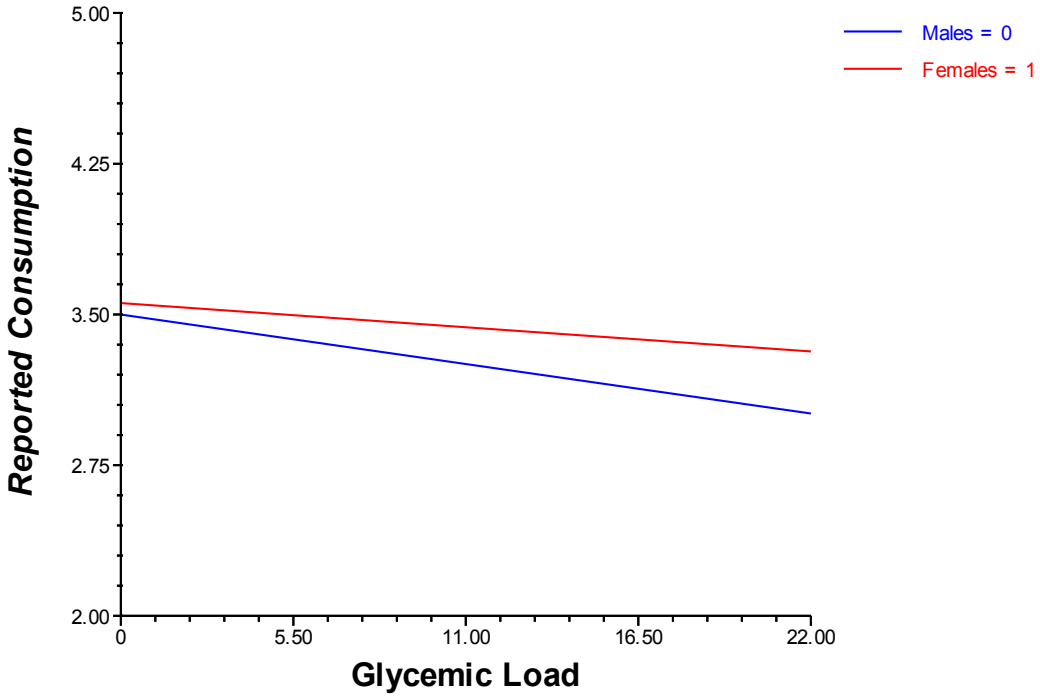

Figure 4. Consumption of frequency as GL increases, according to gender