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Change in Eating Competence in College Students Enrolled in Basic Nutrition Courses

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When exploring unfamiliar territory, it is helpful to bring along a map. It's even better to bring a guide or two. And the journey is more pleasant with friends or loved ones to provide encouragement. This project was certainly unfamiliar territory for me. Previous graduate students left maps along the way, but I could not have reached my destination with a completed project in hand if not for my excellent guides. I would like to thank my advisor, Dr. Nora K. Nyland, who provided invaluable insight and encouragement during this process. My committee members, Dr. Susan Fullmer and Dr. Lora Beth Brown, also shared their knowledge and expertise and I appreciate their efforts. Also, I would like to thank Dr. Dennis Eggett who provided statistical analysis and helped me sort through hundreds of pages of data. If not for his service and patience I could not have completed this project.

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ABSTRACT

Change in Eating Competence In College Students

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Objective: Determine change in eating competence (EC) and factors related to EC in students enrolled in basic nutrition courses at a major private university.

Design: Eating competence was measured by administering the ecSatter Inventory (ecSI) both before and after class intervention. Additional data on eating disorder prevalence, food security, and general demographics were also collected in the same structured survey. Significance identified with p value <0.01.

Setting/Participants: This survey was administered to 566 students enrolled in basic nutrition courses at a major private university in the western United States.

Analysis: ANOVA was used to determine relationships between ecSI end scores and participant characteristics. ANCOVA was used to determine relationships between change in ecSI scores over time and participant characteristics.

Results: Enrollment in NDFS 100 is associated with an overall increase in eating competence (EC). However, students with current eating disorders had a significant decrease in EC during enrollment. Current or past eating disorders and low or very low Food Security Status were associated with lack of EC. Females and younger participants were not eating competent at the course end. Enrollment in NDFS 201 was not associated with significant change in EC.

Conclusions: Basic nutrition instruction improves EC among students without eating disorders. Low food security status and presence of an eating disorder may be a barrier to improving EC.

Key Words: eating competence, students, nutrition courses, eating disorder, food security

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MANUSCRIPT

Prepared for the Journal of Nutrition Education and Behavior

Change in Eating Competence In College Students Enrolled in Basic Nutrition Courses

Introduction

The main purpose of eating is to sustain life. However, through their eating experiences, individuals develop an approach to personal food management. The conventional approach to personal food management includes an emphasis on conforming to external cues and regulations for calorie requirements and acceptable food choices. In the meantime, internal cues and oral hedonic needs are given less emphasis. In contrast, the Satter Eating Competence Model (ecSatter), an alternative approach to personal food management, emphasizes a positive, relaxed, and flexible approach to eating. Intrinsic motivation and internal cues for hunger, appetite, and satiety are primary motivators in eating-competent individuals.[1]

An individual's eating competence (EC) is measured using the 16-question ecSatter Inventory (ecSI).[2,3] Eating competence has four parts: 1) attitudes about eating and about food; 2) food acceptance skills; 3) internal regulation skills; 4) skills and resources for managing the food context and orchestrating family meals.

Attitudes about food and eating are shaped throughout life by experiences, changing sensory responsiveness,[4] economic circumstances,[4,5] weight management,[6] and health status.[7] All of these factors combine to form an attitude toward food and eating that acknowledges comfort and reward at one extreme and at the other extreme, anxiety and conflict. ecSatter eating attitudes include a positive interest in food and eating, responses to inner and outer food experiences, self-trust about managing food choices, and harmony among food desires, choices, and volume.[1]

Positive food acceptance skills lead to a wider repertoire of preferred and accepted foods. This, in turn, increases the likelihood that a diet will be nutritionally adequate.[1, 8-10] Additionally, The enjoyment of food may improve nutrient absorption in the body.[11, 12] Food acceptance is often developed through exposure to a variety of foods during the formative childhood years.[13-15]

The third part of EC, internal regulation, emphasizes heeding physiological homeostatic mechanisms including appetitive cues and the sensations of hunger and fullness. In combination with regular, sustainable physical activity, internal food regulation supports a stable, biologically preferred body weight.[16] Competence with food regulation includes the ability to tolerate hunger long enough to conform to social structures of eating, the ability to eat intentionally and pay attention to internal cues, the ability to stop eating when satisfied, feeling comfortable with the volume of food consumed and the feeling of satiety, and acceptance of body weight resulting from internal regulation.[1]

The final element of eating competence includes the skills and resources needed for managing the eating context. This includes: having the ability to provide enough satisfying food at regular intervals; paying attention to food and self while eating; feeling confident that there will be enough food to satisfy hunger; being able to choose preferred food and use salt, sugar, and fat to make food taste better; and making time for eating.[1]

The ecSatter Model of personal food management is likely to be associated with increased food variety and nutrient intake,[17,18] and has been found to support a nutritionally adequate diet.[19] Eating-competent individuals also have a significantly better coronary risk profile than do individuals who are not eating competent[6] and are less likely to have uncontrolled or emotional eating.[20] The Satter Eating Competence Model is

compatible with nutrition policy,[21,22] especially as it relates to eating context.[20,23] However, little research has focused on how EC can be increased through nutrition education.

Methods

Design

Students' EC was assessed at the beginning and end of the semester for students enrolled in two nutrition courses: An introductory course, Nutrition 100 (Essentials of Human Nutrition, N-100) or the intermediate course, Nutrition 201 (Nutrition and Prevention of Chronic Disease, N-201). N-100 is a consumer-based course designed to teach students practical application of basic nutrition and is a prerequisite to N-201. Eating Competence (EC) is not the subject of a unit or class period for this course. N-201 is an evidence-based course focusing on the relationship between nutrition and chronic disease. However, students in this course do learn about the Satter Eating Competence Model by reading two articles related to the topic.

It was unknown whether instruction from one class would affect EC more than instruction from another class. This descriptive study was undertaken to determine the impact of these courses on students' EC although neither course explicitly emphasized EC. The research was approved by the university's human subjects review board.

Sample Selection

Subjects were students enrolled in the courses N-100 and N-201 during winter semester 2009. Students were required to complete the survey as a class assignment and

received five points credited toward their final grade for each survey (pre- and post-instruction) completed. Students learned of the survey through announcements in class and by reading the class syllabus. Of the 566 student enrolled in N-100, 450 (79.5%) correctly completed both a pre-survey and a post-survey. Of the 157 students enrolled in N-201, 116 (73.9%) correctly completed both a pre-survey and a post-survey.

Survey Description and Administration

The 16-question survey features subscales to measure the four parts of the ecSatter Model. The subscales include five items related to attitude, three items related to acceptance, three items related to internal regulation, and five items related to eating context[2]. The range of scores possible with ecSI is 0-48 and eating competence is defined as a score ≥32. Demographic questions were asked on both the pre- and posttest. Eating disorder status was based on students' response to the question, "Do you now see or have you ever seen yourself as having an eating disorder?" with response options of "Yes, currently," "Yes, in the past but not now," and "No."

The survey was administered using an online delivery tool developed at the university where this study took place. Students were provided with a web address for each survey and were instructed to visit the site and follow instructions that would guide them through the survey. When the deadline for completing the survey was reached, names of students who completed the survey were given to their professors who then awarded five points to be included in calculating the students' course grades.

Statistical Analysis

Statistical analysis was completed using SAS statistical analysis software (version 9.2, Cary, NC). Only completed surveys were included in analyses. For analyses examining change from the beginning to the end of a course, only subject-matched pre- and post surveys were used. The level of statistical significance was set at $p < 0.01$.

Means were calculated for total post scores in both courses and the change in score was calculated and analyzed using General Linear Model (GLM). Analysis of Variance (ANOVA) was used to determine whether there were differences in the change in score between sections of N-100. Three different instructors taught N-100 during the data collection period, but course content and structure were constant. Students were enrolled in one of four sections, with 14 students in the smallest section and 166 students in the largest section. To ensure that divers teaching methods did not affect the change in student EC, results from each section were compared. All sections displayed a similar increase in EC after instruction and no section showed a statistically significant difference in the change in EC when compared to other sections. Because all sections were statistically similar, responses from all sections of N-100 were grouped together for further analysis. There was only one section of N-201, so no class comparison was necessary.

In order to determine whether certain characteristics were associated with a higher or lower ecSI score, differences in posttest scores within characteristic categories of Age, Gender, Marital Status, and Eating Disorder Status were calculated using ANOVA. Differences between the total change in scores within characteristic categories of Age, Gender, Marital Status, and Eating Disorder were identified using analysis of covariance

(ANCOVA), with pre-test score as a covariate. Tukey-Kramer was used to determine the pair-wise differences in the means of eating disorder subcategories ($p < 0.01$).

Results

Student Demographics

The majority (79.5%) of students were enrolled N-100, while the remainder (20.5%) were enrolled in N-201. Of the 566 total students, 69.8% were female, 82.3% were not married, and 52.3 % were age 18-20. The majority of students had never had an eating disorder (82%) (Table 1).

Posttest Total Mean Scores

The posttest mean score for students in N-201 was 1.2 points lower than the posttest mean score for N-100. However, with a p-value of 0.12, the trend is not significant.

Final posttest mean scores in the demographic categories of Age, Gender, Marital Status, and Eating Disorder Status within each class were analyzed for both courses (Table 2).

In N-100, students in the younger age group (18-20) had significantly lower posttest scores than did students in the older age group (21-25), and female students had significantly lower ecSI scores than did males. However, married students did not differ significantly from unmarried students. All categories for Eating Disorder Status showed

significantly different scores, with the lowest mean ecSI score for students with a current eating disorder and the highest mean ecSI score for students who had never had an eating disorder (Table 2).

In N-201, characteristics within Age, Gender, and Marital Status did not show any significant differences. For Eating Disorder, students who had never had an eating disorder had significantly higher scores than did students who had had an eating disorder in the past. Though students with a current eating disorder showed the lowest score within the Eating Disorder category, it was not significantly different from either students who had had an eating disorder in the past or who had never had an eating disorder (Table 2).

Posttest Mean Subscores

Student subscores for Attitude (maximum 15), Acceptance (maximum 9), Regulation (maximum 9), and Eating Context (maximum 15) were analyzed by demographics. For N-100 (Table 3), students in the older age category and male students had significantly higher Attitude subscores (12.1 and 12.7, respectively) than did students in the younger age category (10.7) and female students (10.6). Students with a current eating disorder had significantly lower Attitude subscores (5.3) than did students who had had an eating disorder in the past (9.5) and students who had never had an eating disorder (11.7). The difference between students who had never had an eating disorder and students who had had an eating disorder in the past was also significantly different.

For Acceptance, males had higher subscores (5.8) than did females (5.2). Students with a current eating disorder had significantly lower subscores (3.2) than did students

who had had an eating disorder in the past (5.6) and students who had never had an eating disorder (5.5).

In the category of Regulation, each eating disorder status was significantly different from the other two with students with a current eating disorder scoring 4.5, students with a past eating disorder scoring 6.1, and students with no eating disorder scoring 6.7. For food security status, students with a high or average FS scored higher (6.8) than students with low (5.8) or very low (5.3)FS.

Food Security Status was the only demographic category that showed statistical difference in Eating Context subscores. Students with a high or average FS scored higher (9.1) than students with low (7.5) or very low (8.6) FS.

For N-201 the only significant difference in Attitude subscores was for Eating Disorder Status. Students who had never had an eating disorder had significantly higher Attitude subscores (11.6) than did the small sample of students who had had an eating disorder in the past (8.4) and students who had a current eating disorder (4.7).

Change in Total Mean Scores

While the total mean scores show EC at one point in time, the change in total mean ecSI scores shows whether or not EC improved over time. For this study, the change in mean ecSI scores presumably shows whether or not enrollment in a nutrition class had an effect on student EC. For N-100, students showed a significant increase (1.8 points) in mean total ecSI score, suggesting that instruction in the consumer-based course had a positive impact on student EC. Examining characteristic categories showed that Age, Gender, and Marital Status had no significant associations with change in mean ecSI. However, students

with eating disorders actually showed a decrease in score (-5.1 points) that was significantly different from the increase in score for students who had had an eating disorder in the past (0.2 point) or who had never had an eating disorder (1.7 points).

For N-201, mean ecSI score did increase from pre-test to post-test. However, the change was not significant. Though students with a current eating disorder decreased in mean ecSI score (-5.1 points), the change was not significantly different from the small sample of students who had had (1.2 points) or who had never had (1.8 points) an eating disorder.

Change in Mean Subscores

The change in ecSI subcategory scores was examined to reveal whether or not course enrollment affected some components of total EC but not others. For N-100, Class Total subscores did not significantly change for Attitude or Acceptance. However, there was a significant increase in Regulation (0.4 point) and Eating Context (0.4 point) subscores. Eating Disorder Status was the only demographic associated with changes in Attitude and Acceptance subscores. For Attitude, students with a current eating disorder decreased more (-3.1) than did students who had had (-0.2) or who had never had (-0.6) an eating disorder. Similarly, for Acceptance, students with a current eating disorder showed a significantly different change (-1.4) than did students who had had (0.3) or who had never had (0.2) an eating disorder.

Performing the same analysis for N-201 showed no significant change in Class Total subscores or within demographic categories.

Table 1. Demographics of the Sample (n=566)

	NDFS 100		NDFS 201		Total	
	n	%	n	%	n	%
Characteristic						
Total	450	79.5	116	20.5	566	100
Age						
18-20	267	60.7	29	26.6	296	52.3
21-25	171	39.0	80	73.4	251	44.4
Gender						
Male	139	30.9	32	27.6	171	30.2
Female	311	69.1	84	72.4	395	69.8
Marital Status						
Single	386	85.4	80	68.4	466	82.3
Married	66	14.6	37	31.6	103	18.2
Eating Disorder Status						
Currently Have	12	2.7	3	2.6	15	2.7
Had in the Past	62	13.7	28	23.9	90	15.9
Never Had	378	83.6	86	73.5	464	82.0
Food Security						
High or Average	345	76.3	83	71.	428	75.6
Low	87	19.3	25	21.4	112	19.8
Very low	20	4.4	9	7.7	29	5.1

*Category totals vary due to nonresponse

Table 2. Final Mean ecSI Posttest Score by Demographic Categories for Both Classes

	NDFS 100		NDFS 201	
	Post Score ± SE	**p-value[a]**	**Post Score ± SE**	**p-value[a]**
Class Total	32.0 ±0.3		30.8 ± 0.7	
Age				
18-20	31.2 ± 0.4	.0056	29.9 ± 1.4	.4574
21-25	33.2 ± 0.6		31.1 ± 0.9	
Gender				
Male	34.4 ± 0.6	<.0001	33.1 ± 1.3	.0580
Female	31.0 ± 0.4		30.1 ± 30.1	
Marital Status				
Single	31.7 ± 0.4	.0162	30.1 ± 0.9	.1437
Married	34.0 ± 0.9		32.4 ± 1.3	
Eating Disorder				
Currently Have	19.8 ± 2.0^{x}	<.0001	$24.0 \pm 4.2^{x,y}$	.0007
Had in the Past	29.7 ± 0.9^{y}		26.7 ± 1.4^{x}	
Never Had	32.7 ± 0.4^{z}		32.4 ± 0.8^{y}	
Food Security Status				
High or Average	33.0 ± 0.4^{x}	<.0001	32.4 ± 0.8^{x}	.0009
Low	28.5 ± 0.8^{y}		$27.9 \pm 1.5^{x,y}$	
Very Low	$29.6 \pm 1.6^{x,y}$		24.3 ± 2.4^{y}	

[a] All p-values for ANOVA

$^{x, y, z}$Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer, $p<0.01$)

Table 3. Mean ecSI Posttest Sub-score by Demographic Categories for NDFS 100

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]
Class Total	11.2 ± 0.1		5.4 ± 0.1		6.6 ± 0.01		8.8 ± 0.1	
Age								
18-20	10.7 ± 0.2	<0.0001	5.3 ± 0.1	0.1802	6.4 ± 0.1	0.0149	8.9 ± 0.2	0.5033
21-25	12.1 ±0.2		5.6 ± 0.2		6.8 ± 0.1		8.7 ± 0.2	
Gender								
Male	12.7 ± 0.2	<0.0001	5.8 ± 0.2	0.0082	6.9 ± 0.1	0.0239	9.0 ± 0.2	0.4723
Female	10.6 ± 0.2		5.2 ± 0.1		6.5 ± 0.1		8.8 ± 0.2	
Marital Status								
Single	11.1 ± 0.2	0.0102	5.3 ± 0.1	0.0197	6.5 ± 0.1	0.0762	8.8 ± 0.1	0.5438
Married	12.1 ± 0.4		6.0 ± 0.3		6.9 ± 0.2		9.0 ± 0.4	
Eating DIsorder Status								
Currently Have	5.3 ± 0.8[x]	<0.0001	3.2 ± 0.6[x]	0.0007	4.5 ± 0.5[x]	<0.0001	6.8 ± 0.8	0.0380
Had in the Past	9.5 ± 0.4[y]		5.6 ± 0.3[y]		6.1 ± 0.2[y]		8.5 ± 0.4	
Never Had	11.7 ± 0.1[z]		5.5 ± 0.1[y]		6.7 ± 0.1[y]		8.9 ± 0.2	
Food Security Status								
High or Average	11.6 ± 0.2[x]	0.0003	5.5 ± 0.1	0.0483	6.8 ± 0.1[x]	<0.0001	9.1 ± 0.2[x]	<0.0001
Low	10.2 ± 0.3[y]		4.9 ± 0.2		5.8 ± 0.2[y]		7.5 ± 0.3[y]	
Very Low	10.1 ± 0.7[x,y]		5.7 ± 0.5		5.3 ± 0.4[y]		8.6 ± 0.4[y]	

[a]Maximum score 15, [b]Maximum score 9, [c]All p-values for ANOVA
[x,y,z]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

Discussion and Conclusion

Posttest Total Mean Scores

By definition, an ecSI score ≥32 is considered eating competent while a score <32 is considered not eating competent.[2] With that in mind, it is important to note that posttest mean Total ecSI scores showed that students enrolled in N-100 were eating competent at the end of the course (32.0). However, students enrolled in N-201 were not eating competent at the end of the course (30.8), even though EC did not decrease during enrollment. Because all students in N-201 are required to take N-100 as a pre-requisite, it appears that EC decreased between enrollment in the two classes and enrollment in N-201 did not completely make up for the decrease. However, the length of time between classes is varied and unknown for each student, so it cannot be said with certainty how soon after completing N-100 EC began to decrease.

For demographic categories in N-100, there were definite differences in EC. Males and older students (age 21-25) were eating competent while females and younger students (18-20) were not eating competent. Additionally, Eating Disorder Status was correlated with EC.

Change in Total Mean Scores

The significant increase of mean total ecSI score during enrollment in N-100 shows that enrollment in the course was associated with an increase in EC. However, there was no significant change in mean ecSI score in N-201, so it cannot be concluded that enrollment in the course affected EC.

ecSI Subcategories

Enrollment in N-100 significantly increased subscores in Regulation and Eating Context but not in Attitude and Acceptance. This suggests that instruction, coursework, projects, or other activities or curriculum pursued by students during enrollment focuses more on Regulation and Eating Context than on Attitude and Acceptance. Future students for N-100 may benefit from curriculum with enhanced focus on skills and behaviors relating to Attitude and Acceptance.

Eating Disorder Status

Eating Disorder Status had interesting implications for EC in this study. For both classes, students who had never had an eating disorder were eating competent at the end of the courses. However, students who had had an eating disorder in the past and who had current eating disorders were not eating competent. Status of low ecSI scores in students with eating disorders is consistent with previous findings.[2]

Unexpectedly, students with current eating disorders actually decreased (-5.1) in ecSI score during course enrollment. This is surprising because nutrition education is an integral part of multidisciplinary treatment for eating disorders.[24-26] However, it is unknown how nutrition education will affect individuals with present eating disorders who do not have multidisciplinary support or are not seeking treatment at all. Results of this study suggest that exposing students with a current eating disorder to nutrition instruction in an academic environment may actually have a detrimental impact on EC. Perhaps the intense focus on nutrition and food exacerbates inappropriate attitudes and behaviors already present in people with eating disorders. More research is needed to explore this relationship.

Breaking down ecSI scores into subcategories showed that students in N-100 with current eating disorders had a significant decrease in Attitude and Acceptance subscores during course enrollment. Interestingly, these are the same subcategories where total class scores did not improve. Additionally, students with current eating disorders had significantly lower posttest subscores in Attitude, Acceptance, and Regulation than did other students. Enhancing curriculum to address Attitude and Acceptance might have an impact on EC of students with current eating disorders. However, improving EC or achieving EC among populations who have experienced or are experiencing an eating disorder may prove more challenging than for populations who have never had an eating disorder.

Limitations

Neither course examined in this study was designed to increase EC and, therefore, the specific causes for increase or decrease in EC cannot be identified. Additionally, the results found in this study cannot be generalized to other populations or interventions.

Implications for Research

Because the results of this study show improvements in Regulation and Eating Context subcategories but not in Attitude and Acceptance, enhancing the curriculum to emphasize Attitude and Acceptance could possibly improve overall EC for students. Future studies could measure whether or not enhancing the curriculum has any impact on postinstruction EC or change in EC among students.

Further research is also needed to address the relationship between eating disorders and EC. Because these results suggest that formal nutrition instruction in an academic environment may decrease EC among students with eating disorders, further studies might improve understanding of this relationship. Specifically, examining stage of change[27] among students with eating disorders who are enrolled in a basic nutrition course might show whether the stage of change a student with an eating disorder is experiencing is associated with an increase or decrease in EC.

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APPENDIX A: COMPLETE INTRODUCTION AND LITERATURE REVIEW

INTRODUCTION

Overview

The Satter Eating Competence Model (ecSatter), an alternative approach to personal food management, emphasizes a positive, relaxed, and flexible approach to eating. Intrinsic motivation and internal cues for hunger, appetite, and satiety are primary motivators in eating-competent individuals (1).

Eating competence (EC) has four parts: 1) attitudes about eating and about food; 2) food acceptance skills; 3) internal regulation skills; 4) skills and resources for managing the food context and orchestrating family meals. An individual's EC is measured using the ecSatter Inventory (ecSI) (2,3).

The ecSatter Model of personal food management is likely to be associated with increased food variety and nutrient intake (4,5) and has been found to support a nutritionally adequate diet (6). Eating-competent individuals also have a significantly better coronary risk profile than individuals who are not eating competent (7) and are less likely to have uncontrolled or emotional eating (8).

The Satter Eating Competence Model is compatible with nutrition policy (9, 10), especially as it relates to eating context (8,11). However, more research is needed to identify if and how EC can be increased through nutrition education.

Questions

- Does enrollment in undergraduate beginning nutrition courses affect student eating competence?
- How does self-identified current or past experience with eating disorders affect eating competence?
- Is there a relationship between food security status and eating competence among students enrolled in undergraduate beginning nutrition courses?

Objective

The objective of this study was to evaluate post-class eating competence and change in eating competence in students who enroll in introductory and intermediate nutrition courses (Nutrition, Dietetics and Food Science (NDFS) 100 and NDFS 201) at a private university in the western United States.

Hypotheses

- There will be an increase in EC from the beginning to the end of NDFS 100.
- There will be an increase in EC from the beginning to the end of NDFS 201.
- There will be a greater increase in EC for NDFS 201 students than for NDFS 100 students.
- There will be no difference in EC between the end of NDFS 100 and the beginning of NDFS 201.
- Students will have a higher EC at the end of NDFS 201 than at the end of NDFS 100.
- There will be no difference in the change in EC between class sections.
- Students with self-reported current or past eating disorders will have a low final EC.
- Students with a low food security score will have low final EC.
- Married students will have higher final EC than unmarried students.

- Females will have higher final EC than males.
- Younger students (18-20) will have lower final EC than older students (21-25).
- Married students will have higher scores than unmarried students in the in the Eating Context subcategory.

Limitations

Neither course examined in this study was designed to increase EC and, therefore, the specific causes for increase or decrease in EC cannot be identified. Additionally, the results found in this study cannot be generalized to other populations or interventions.

Definitions

Eating Competence (EC): The ability to be "positive, comfortable, and flexible with eating" and to be "matter-of-fact and reliable about getting enough to eat of enjoyable and nourishing food" (1). Eating competence is indicated by an ecSatter Inventory Score ≥32. A score less than 32 is not considered eating competent (2).

Satter Eating Competence Model (ecSatter): A conceptualization of eating behaviors and attitudes characterized by flexibility, comfort, reliability, and enjoyment as related to food and feeding. The model was developed and validated by Ellyn Satter, MS, RD, LCSW, BCD (2).

ecSatter Inventory (ecSI): A descriptive measure of eating competence (See Appendix F). The inventory consists of 16 statements to be rated by respondents as always, often, sometimes, rarely, or never (scored as 3,2,1,0, and 0, respectively). The summed total score (0-48) is evaluated to categorize the respondent as either eating competent (≥ 32) or not eating competent (<32) (2).

Food Security Score: A number that indicates level of food security. For this study, answers to questions relating to food security were compiled and evaluated to yield a numeric score indicating high or average, low, and very low food security (0-1, 2-4, and 5-6, respectively).

LITERATURE REVIEW

Satter Eating Competence Model

The main purpose of eating is to sustain life. However, through their eating experiences, individuals develop an approach to personal food management. The conventional approach to personal food management includes an emphasis on conforming to external cues and regulations for calorie requirements and acceptable food choices. In the meantime, internal cues and oral hedonic needs are given less emphasis. In contrast, the Satter Eating Competence Model (ecSatter), an alternative approach to personal food management, emphasizes a positive, relaxed, and flexible approach to eating. Intrinsic motivation and internal cues for hunger, appetite, and satiety are primary motivators in eating-competent individuals. While conventional eaters might aim to consume a prescribed number of calories from foods distributed across food groups, eating competent individuals emphasize meal structure and planning but give themselves permission to eat preferred food at predictable times (1).

Eating competence (EC) has four parts: 1) attitudes about eating and about food; 2) food acceptance skills; 3) internal regulation skills; and 4) skills and resources for managing the food context and orchestrating family meals. An individual's EC is measured using the ecSatter Inventory (2, 3).

Definition of the ecSatter Inventory

The ecSatter Inventory (ecSI) is a 16 question survey that measures the behaviors and attitudes that lead to food consumption and is designed to evaluate EC (1, 2). The ecSI features subscales to measure the four parts of the ecSatter Model. The subscales include five items related to attitude, three items related to acceptance, three items related to internal regulation, and five items related to eating context (2). Respondents read each statement and rate their frequency of occurrence as always, often, sometimes, rarely, or never (scored as 3,2,1,0, and 0, respectively). The summed total score is evaluated to categorize the respondent as either eating competent (32 or greater) or not eating competent (less than 32) (2). Subscale evaluation may help respondents identify where EC can be improved.

The ecSI has been validated as a measure of EC and has been found reliable as an instrument used to evaluate the impact of nutrition education on EC (2, 3). In previous use of the ecSI, it was noted that eating competent individuals were older, less likely to worry about money for food, and displayed fewer psychosocial characteristics related to disordered eating (2). However, gender and BMI were not predictive of EC.

Eating Attitudes

The first component of EC is a positive attitude about eating (1). Attitudes are not defined solely as being comfortable with food behaviors, but also have to do with trusting both physical and emotional feelings related to eating and satiety. ecSatter eating attitudes include a positive interest in food and eating, responses to inner and outer food

experiences, self-trust about managing food choices, and harmony among food desires, choices, and volume (1).

Attitudes about food and eating are shaped throughout life by experiences, changing sensory responsiveness (12), economic circumstances (12,13), weight management (7), and health status(14). All of these factors combine to form an attitude toward food and eating that acknowledges comfort and reward at one extreme and at the other extreme, anxiety and conflict (1).

The ecSI measures an individual's ability to enjoy food and the feelings associated with finding pleasure in food. For a person who follows the conventional approach to personal food management, finding pleasure in food often leads to feelings of guilt and worry (15). Results from a Gallup Poll released in 1990 showed that Americans' worry over health took the fun out of eating (16). Half of those surveyed believed they gain weight when eating what they like and also said the foods they like aren't good for them. Those attitudes about eating are not consistent with high EC. Conversely, in French culture enjoyment of food is immensely important (17). The French spend more time eating but eat less food than Americans. Their focus on moderation and quality support a healthy lifestyle. In a cross-cultural study, Rozin et al (18) found that compared to Japanese, Flemish, and French participants, Americans associated food the most with health and the least with pleasure. The French participants associated food the most with pleasure and the least with health. Additionally, while Americans do the most to alter their diets to be healthy, they were the least likely to consider themselves healthy eaters. Despite this guilty attitude, in America there is growing support for finding pleasure in food (15).

Satter (1) maintains that accepting, trusting in, and responding positively to internal cues related to food choice and regulation allows "intrinsically rewarding nutritional behaviors" and leads to positive eating attitudes. Additionally, maintaining positive, relaxed, and comfortable attitudes about eating is important for supporting nutritional health.

Eating Disorders and Attitude

Dissatisfaction with body weight, size, or shape is reflected in attitudes about eating. People who feel they do not meet internal or external expectations for body weight, size, or shape often feel ashamed of their eating (19). Further analysis will likely show that, in the absence of disordered eating, many of these people are actually competent with eating but label their eating as defective as a result of feeling ashamed (1).

Dieting behaviors directly oppose EC because they promote negative, rigid, and uncomfortable attitudes about eating. Negative attitudes about eating may lead to behaviors that diminish nutritional adequacy and overall health. Westerberg-Jacobson et al (20) found that girls age 9-20 who wished to be thinner dieted more often and skipped more meals than did girls who were satisfied with their weight. Girls who wished to be thinner were also four times more likely to develop disturbed eating patterns and eating disorders over a five year period. Prolonged dissatisfaction with the body leads to poor eating attitudes and is associated with an increased risk for developing eating disorders in young women. Additionally, excessive attention placed on nutritional characteristics of food may contribute to the development of eating disorders (21).

Food Acceptance

Food acceptance is the second part of eating competence. Positive food acceptance skills lead to a wider repertoire of preferred and accepted foods. This, in turn, increases the likelihood that a diet will be nutritionally adequate (1, 22-24). In general, food acceptance attitudes include taking a positive interest in food, being comfortable in the presence of unfamiliar food, and being willing to try new foods (1). More specifically, ecSatter food acceptance includes the ability to be calm in the presence of both preferred and disliked foods, to be comfortable eating preferred food even when it is not labeled as nutritionally sound, to be able to accept or turn down offered foods, to be able to settle for less preferred foods in order to meet nutrition and caloric requirements, to be curious about a novel food and willing to try it, and to be able to develop a taste for previously unfamiliar foods (1).

The enjoyment of food may improve nutrient absorption in the body. Studies (25, 26) involving Swedish and Thai women found that the women absorbed significantly more iron when consuming food native to their culture compared to when eating foreign food. Additionally, pureeing a culturally preferred meal to a pasty consistency decreased iron absorption by 70% compared to when the same meal was served intact. It is believed that the sight, smell, and anticipation of eating preferred food prepares the gastrointestinal tract for digestion and therefore leads to more efficient and complete nutrient absorption. Developing food acceptance skills may lead to a more varied diet as well as more efficient nutrient absorption.

One key motivator in food seeking and acceptance is appetite. Appetite is the interest in eating based on both aesthetic and gustatory satisfaction. Gustatory satisfaction simply means hunger pangs are squelched, while aesthetic satisfaction comes from

enjoyment of taste, texture, and appearance. In general, most people prioritize aesthetic satisfaction when selecting food (27). Eating competent individuals gain aesthetic satisfaction from a variety of food, including food labeled as nutritious (1). Food acceptance is developed through exposure to a variety of foods during the formative childhood years (28-30). The current economic and situational framework also influences behaviors related to food acceptance (1, 12).

Internal Regulation

The third component of eating competence is internal regulation. According to Satter (1), internally regulated eating utilizes physiological homeostatic mechanisms including appetitive cues and the sensations of hunger and fullness. In combination with regular, sustainable physical activity, internal food regulation supports a stable, biologically preferred body weight (31). Competence with food regulation includes the ability to tolerate hunger long enough to conform to social structures of eating, confidence that there will be enough food to satisfy hunger and appetite, the ability to eat intentionally and pay attention to internal cues, the ability to stop eating when satisfied, feeling comfortable with the volume of food consumed and the subsequent feeling of satiety, and acceptance of body weight resulting from internal regulation (1).

Hunger and satiety cues are complex and often subconscious. Hunger may be experienced through gastric, mouth, head and general body sensations. In growing adolescents, satiety is experienced through sensations of gastric fullness. However, satiety for adults is generally experienced through a shift in mood (32).

Children are typically very aware of internal cues of hunger and satiety and respond subconsciously to energy density of meals. If a child eats high-caloric-density foods at one meal, less will be consumed at the next meal and vice versa (33). Attempting to control the volume of food consumed by children can have serious consequences when that child reaches adolescence and adulthood. Obesity, eating disorders, and binge eating are examples of complications that arise from lack of internal regulation (33, 34). Encouraging awareness of and trust in internal cues can lead to more effective internal regulation and less disordered eating.

Restrained Eating

Restrained eating is an attempt to override internal hunger and satiety cues in favor of external, social, and emotional feeding cues. In the conventional approach to food management, individuals often restrict preferred food from their diets as a result of belief that the food is not good for their weight, heart, or body in general. However, restriction often leads to a greater desire for restricted items (35). Conversely, including preferred items may actually reduce desire for similar items (36). Additionally, restricting food may intensify external food cues and activate spontaneous hedonic thoughts about food (35). Restrained eating in children causes preoccupation with food and increases overeating behaviors (33, 37).

Chronic dietary restraint is associated with eating disorders and may be a potential cause of these disorders (12). Skipping meals in the pursuit of thinness is also associated with a greater risk of developing eating disorders in young women (20).

Restricting food or "dieting" off and on is not associated with a decreased resting metabolic rate or increased percentage of body fat, but it is associated with earlier onset of obesity (38). Weight cycling may also lead to increased body weight and greater waist and hip circumferences. However, for obese women who are chronic dieters, size acceptance and internal regulation may lead to stable weight and improvement in blood cholesterol levels, blood pressure levels, activity and energy expenditure, and body satisfaction (39).

Eating Context

The final element of eating competence includes the skills and resources needed for managing the eating context. This includes: having the ability to provide enough satisfying food at regular intervals; paying attention to food and self while eating; the ability to tolerate hunger long enough to conform to social structures of eating; feeling confident that there will be enough food to satisfy hunger; being able to choose preferred food and use salt, sugar, and fat to make food taste better; making time for eating (1).

Eating competent people act with confidence when choosing food and preparing meals because they trust internal cues and honor preferences while still consuming a varied diet. Discipline and permission are important factors for supporting eating context. Discipline emphasizes maintaining structure with respect to eating while permission supports choosing preferred food in amounts that satisfy both hunger and appetite. Permission supports structure and leads to the ability to appropriately manage the eating context. For people who wish to improve competence in eating context, the primary nutrition goal is structure and the primary intervention is meal planning (1).

Food Security

The ability to operate positively within the eating context is dependent upon an individual's level in the Hierarchy of Food Needs. Patterned after Maslow's Hierarchy of Needs (40), Satter (41) has arranged food needs in order of importance to the individual. The needs of one level must be met before an individual can become aware of and address needs on subsequent levels. In this model, getting enough food is the first level, followed by obtaining acceptable food. Gaining reliable, ongoing access to food comes next and only after these three needs are met will an individual seek out preferred foods, novel foods, and finally, instrumental foods (foods chosen to achieve desired physical, cognitive, or spiritual outcomes).

One intrinsically rewarding behavior associated with EC is being able to provide regular and reliable access to a variety of satisfying foods (1). This is achieved only after basic needs are met in the Hierarchy of Food Needs. When access to preferred food and/or food in general is limited or unreliable, as in low-income families, food security is decreased and, consequently, an individual's eating competence suffers. Low-income families could benefit from interventions designed to improve diet quality and EC (42).

Food insecurity is associated with many physical, nutritional and psychosocial health risks (43-45). Food-insecure families tend to consume few fruits and vegetables, which leads to a diet of lower nutritional quality (44, 46). It is possible that these low calorie foods are rejected in favor for high-caloric-density items. Kern et al (13) found that hungry three and four year old children preferred to eat food they had previously found to be calorically dense. Because humans cope with food scarcity by seeking high-caloric-

density food items (47) instead of nutrient packed low-calorie fruits and vegetables, diet quality may suffer when access to food is limited.

One symptom of food insecurity is the inability to have regular meals due to lack of available food. When compared to people who eat irregularly or sporadically, individuals who eat regularly are likely to have a lower energy intake, greater postprandial thermogenesis, and lower total cholesterol and LDL cholesterol (48).

Evidence for ecSatter

There is strong evidence that supports the Satter Eating Competence Model. This evidence shows that eating competence is associated with a positive nutrition profile and desirable CVD biomarkers. Additionally, eating competent individuals posses fewer negative weight related issues.

Nutritional Adequacy

Positive food acceptance skills lead to a wider repertoire of preferred and accepted foods. This increases the likelihood that a diet will be nutritionally adequate. Bailey, et al (6) studied low-income females and found that compared to subjects with low EC, subjects with high EC had a dietary pattern associated with higher intakes of fiber, vitamin C, most B vitamins, vitamin A, and many minerals including iron.

Additionally, proper management of eating context as demonstrated through family meal times is correlated with increased food variety and nutrient intake (4, 5).

CVD Biomarkers

Many biomarkers are predictive for cardiovascular disease. Measuring serum total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein

cholesterol (HDL-C), triglycerides (TG), C-reactive protein (CRP), systolic blood pressure (SBP), diastolic blood pressure (DBP), and other biomarkers may provide a general picture of an individual's risk of cardiovascular disease (CVD). Exploring the relationship between CVD biomarkers and EC showed that eating competent individuals had a significantly better coronary risk profile than did individuals with lower ecSI scores (7). Specifically, eating competent individuals had lower overall blood pressure, lower ratios of total cholesterol:HDL-C, and lower scores on TG:HDL-C ratios. Trends were noted in these individuals to have higher HDL-C and lower TG as well. Results were controlled for BMI and gender. It is speculated that the association between EC and CVD biomarkers may be a reflection of personality and perceived stress. Steptoe and Wardle (49) showed that subjects with higher scores on measures of happiness also exhibited lower measures of CVD and stress biomarkers. Future research may confirm these findings and provide further insight on this relationship.

Eating Competence and Weight-related Issues

Satter (1) stated, "ecSatter is based on the principle that internal cues of hunger, appetite, and satiety, if properly attended to, are reliable and can be depended on to inform food selection and guide energy balance and body weight ." Although Lohse, et al (2) found that BMI is not predictive of EC, Clifford's (50) survey of 1,720 college students found that students who were not eating-competent has significantly higher BMI's than students who were eating-competent. Additionally, students with low EC were significantly less satisfied with their weight. Students who were trying to lose weight had lower EC than students who were not trying to lose weight and students who exercised regularly had higher EC than those who did not exercise regularly. In a study by Stotts et al (8), when compared to

female college students who were not eating-competent, female college students who were eating-competent had lower cognitive restraint, uncontrolled eating, and emotional eating.

Reliability and Validity of ecSatter

In a study designed to measure the reliability of the ecSI as a tool to measure eating competence, Stotts and Lohse (3) found that the survey has high test-retest reliability across all subcategories except internal regulation. Internal consistency measurements were also high with the exception of the statement "I assume I will get enough to eat," an item included on the internal regulation subscale. It is recommended that the internal regulation subscale be revised to address this issue.

Overall, the ecSI was found to be a reliable tool for measuring EC-focused interventions and education. Lohse, et al (2) examined the validity of the ecSatter Inventory. Responses to the ecSI were compared to responses to the Three-Factor Eating Questionnaire, the Eating Disorders Inventory-2, a Food Preference Survey, a fruit and vegetable Stage of Change algorithm, Expanded Food and Nutrition Education Program questions, self reported height and weight, and questions about food preparation practices, physical activity, and demographics. Results showed that the ecSI is a valid measure of EC and can be used for outcome measurements.

Nutrition Education and ecSatter

Although it would appear that the Satter Eating Competence Model rejects Federal policy as stated in the Dietary Guidelines for Americans (9) and MyPyramid (10), the section of the model related to eating context is quite compatible with Federal nutrition policy (11, 51). More research is needed to compare the conventional approach of nutrition

education, where clients are given explicit direction, to Satter's more client centered approach of offering guidance while moving at the client's pace (11).

As noted before, ecSI has been validated as a measure of nutrition education designed to improve eating competence (3). Recommendations for developing a curriculum designed to improve EC were outlined by Satter (52). A clinician with an EC-focused intervention will aim to establish and maintain flexible attitudes about eating. Helping individuals develop self-trust and harmony between food desires, food choices, and amounts eaten is essential to EC. Emphasizing pleasure and encouraging novel food sampling in a low-pressure environment will improve food acceptance and diet variety. Accepting body weight and tuning in to internal cues of hunger and satiety will enhance skills related to food regulation. Eating Context behaviors and skills can be improved by stressing family meals and strategic meal planning without laying out food or nutrition 'rules' (52).

Success of interventions designed to improve EC may be dependent upon the client's or student's readiness to change. Prochaska (53) conceptualized five stages that indicate readiness to change. This model is commonly referred to as the Transtheoretical Model (TTM). Although the TTM was initially used in relation to addictive behaviors such as smoking, research shows that it can be generalized to dietary habits and disordered eating as well (54-57).

Nutrition Education and Eating Disorders

Excessive attention placed on nutritional characteristics of food may contribute to the development of eating disorders (21). However, women with eating disorders seem to have similar or only slightly more nutrition knowledge than women without eating

disorders (58, 59). While nutrition education is an integral part of multidisciplinary treatment for eating disorders (60-62), it is unknown how nutrition education will affect individuals with present eating disorders who do not have multidisciplinary support or are not seeking treatment at all. Because the Satter Eating Competence Model does not emphasize calories, portion sizes, and adhering to rigid nutrition regimens, educating eating disorder patients on the model may lead to decreased eating disorder behaviors and increased eating competence (1).

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APPENDIX B: COMPLETE METHODS

METHODS

Overview

A survey questionnaire was administered to students enrolled in beginning nutrition courses at a private university in the western United States during winter semester 2009 (January-April). Institutional Review Board (IRB) approval was obtained and the survey was completed electronically as a class assignment. Statistical analysis took place in December of the same year.

Procedure

IRB Approval

Institutional Review Board application and approvals were completed in December 2008 and January 2009 (See Appendix E). Initial application to the IRB board was made in December 2008. Request for waiver or modification of consent was also completed in December 2008 and an amendment request to include a question about eating disorders was made at the same time. Approval for both was received in January 2009. An additional amendment request to add questions about food security to the post surveys was completed and approved in early January 2009.

Subject Selection

Subjects were students enrolled in Nutrition, Dietetics, and Food Science (NDFS) 100, Essentials of Human Nutrition, or NDFS 201, Nutrition and Chronic Disease, during winter semester 2009. NDFS 100 is a consumer-based course designed to teach students practical application of basic nutrition. Eating Competence (EC) is not the subject of a unit

or class period for this course. NDFS 201 is an evidence-based course focusing on the relationship between nutrition and chronic disease. However, students in this course do learn about the Satter Eating Competence Model by reading two articles related to the topic. It was unknown whether instruction in one class would affect EC more than in the other class.

Students were required to complete the survey as a class assignment and were rewarded with five points for each survey completed (pre- and post-instruction). Students learned of the survey through announcements in class and by reading the class syllabus. Of the 566 students enrolled in NDFS 100, 450 (79.5%) completed both a pre-survey and a post-survey. Of the 157 students enrolled in NDFS 201, 116 (73.9%) completed both a pre-survey and a post-survey.

Survey Description

The pre-survey for both classes included the ecSatter Inventory (ecSI) and five demographic questions addressing age, gender, marital status, class section, and eating disorder status (See Appendix F). The ecSI is composed of 16 questions divided into four categories to measure eating attitudes, food acceptance, regulation of food intake, and eating context. Items were scored on a Likert scale and assigned values of: Always=3, Often=2, Sometimes=1, Rarely=0, and Never=0. Response values were summed to produce a total score out of a possible 48 points. The post-survey was composed of all questions from the pre-survey except the demographic question on gender and also included standardized questions designed to measure food security status. The section on food security included six nominal questions with one additional follow-up question for an affirmative response on the fourth food security question (See Appendix F). Affirmative

responses to nominal food security questions were summed to produce a raw score and food security category as follows: 0-1=High or marginal food security; 2-4=Low food security; 5-6=Very low food security.

Survey Administration

The survey was administered using Qualtrics, an online research tool developed and used at BYU. Students were provided with a web address for each survey and were instructed to visit the site and follow instructions that would guide them through the survey. When the deadline for completing the survey was reached, names of students who completed the survey were given to their professors who then awarded five points to be included in calculating the students' final grades. Survey responses were collected from Qualtrics to be analyzed.

Statistical Analysis

Statistical analysis was completed using SAS statistical analysis software (version 9.2, Cary, NC). Only complete surveys were included in analyses. For analyses examining change from the beginning to the end of a course, only subject-matched pre- and post-surveys were used. When considering the sample size and number of tests to be run, it was determined that a p-value <0.01 would establish significance.

Means were calculated for total posttest scores in both courses. The change in score was calculated and analyzed using General Linear Model (GLM). Analysis of Variance (ANOVA) was used to determine whether there were differences in the change in score between sections of NDFS 100. Pre-scores for both courses were calculated by subtracting the change in score from the final score. Differences in final scores within characteristic

categories of Age, Gender, Marital Status, Eating Disorder, and Food Security Status (FS) were calculated using ANOVA. Differences in the change in scores within characteristic categories of Age, Gender, Marital Status, and Eating Disorder were identified using analysis of covariance (ANCOVA), with pre-test score as a covariate. Food security status was not included in the analysis of change in score because data for that variable was only collected on the posttest. Tukey-Kramer was used to determine the pair-wise differences in the means of eating disorder and food security subcategories.

APPENDIX C: COMPLETE RESULTS

RESULTS

Participant Demographics

Participants in this study were college students enrolled in two basic nutrition courses at a major private university in the western United States. The majority (79.5%) of participants were enrolled in Nutrition Dietetics and Food Science (NDFS) 100, while the remainder (20.5%) were enrolled in NDFS 201. Of the 566 total participants, 69.8% were female, 82.3% were not married, and 52.30 % were age 18-20. The majority of participants had never had an eating disorder (82%) and had high or average food security (75.6%). Information on race, level of education, and BMI were not collected (Table 1).

Table 1. Demographics of the Sample (n=566)

	NDFS 100		NDFS 201		Total	
	n	%	n	%	n	%
Characteristic						
Total	450	79.5	116	20.5	566	100
Age						
18-20	267	60.7	29	26.6	296	52.3
21-25	171	39.0	80	73.4	251	44.4
Gender						
Male	139	30.9	32	27.6	171	30.2
Female	311	69.1	84	72.4	395	69.8
Marital Status						
Single	386	85.4	80	68.4	466	82.3
Married	66	14.6	37	31.6	103	18.2
Eating Disorder Status						
Currently Have	12	2.7	3	2.6	15	2.7
Had in the Past	62	13.7	28	23.9	90	15.9
Never Had	378	83.6	86	73.5	464	82.0
Food Security						
High or Average	345	76.3	83	71.	428	75.6
Low	87	19.3	25	21.4	112	19.8
Very low	20	4.4	9	7.7	29	5.1

*Category totals vary due to nonresponse

Results by Section of NDFS 100

Three different instructors taught NDFS 100 during the data collection period, but course content and structure were constant. Students were enrolled in one of four sections, with 14 students in the smallest section and 166 students in the largest section. To ensure that divers teaching methods did not affect the change in student EC, results from each section were compared (Table 2). All sections displayed a similar increase in EC after instruction and no section showed a statistically significant difference in the change in EC when compared to other sections. Because all sections were statistically similar, responses from all sections of NDFS 100 were grouped together for further analysis. There was only one section of NDFS 201, so no comparison for the class was necessary.

Table 2. Change in Mean ecSI Score by NDFS 100 Section (p=0.47*)

Section	n	%	Mean Pre-Score	Mean Post-Score	Change ± SE
1	110	24.4	30.7	32.5	1.9 ± 0.50
2	166	36.9	31.3	32.2	0.9 ± 0.41
3	160	35.6	30.6	31.6	1.1 ± 0.42
4	14	3.1	29.9	31.3	1.4 ± 1.41

*p-value for ANOVA

Difference Between Classes

All students entering NDFS 201 must have previously completed NDFS 100 or received trnsfer credit for completing a similar introductory course elsewhere. It is unknown how much time passed between classes for each student, but there is potential for a lapse of a few days to three years or more. In order to determine whether EC might change during this time, the final mean score for NDFS 100 was compared to the beginning

mean score for NDFS 201 (Table 3). Though there was a difference in mean ecSI score with NDFS 201 measuring 1.8 points less than NDFS 100, the difference was not statistically significant (p-value 0.013). This suggests that EC doesn't significantly decrease between enrollment in NDFS 100 and NDFS 201. However, definitive conclusions cannot be made because the sample was not matched. A study comparing the same students' ecSI scores for NDFS 100 and NDFS 201 would yield more definitive results.

Table 3. Difference Between Posttest Mean Total and Sub-scores for NDFS 100 and Pretest Mean Total and Sub-scores for NDFS 201

	NDFS 100 Mean Score ± SE	NDFS 201 Mean Score ± SE	Difference	p-value[a]
Total Score[b]	32.0 ± 0.3	30.2 ± 0.7	-1.8	0.013
Subscores				
Attitude[c]	11.2 ± 0.1	10.5 ± 0.3	-0.8	0.018
Acceptance[d]	5.4 ± 0.1	5.4 ± 0.2	-0.1	0.816
Regulation[d]	6.6 ± 0.1	6.2 ± 0.2	-0.4	0.043
Skills[c]	8.8 ± 0.1	8.2 ± 0.3	-0.7	0.032

[a]p-value for difference, [b]Maximum score 48, [c]Maximum score 15, [d]Maximum score 9

Table 4 shows the difference between final mean ecSI scores for both classes. The final mean score for participants in NDFS 201 was 1.2 points lower than the total mean score for NDFS 100. However, with a p-value of 0.12, the trend is not significant. Again, following the same students from course to course and comparing the matched scores would give more conclusive results.

For each class Table 4 also shows the percent of maximum score possible for each subcategory. The percentages show that participants achieved a lower percentage of maximum score for Acceptance and Eating Context when compared with Attitude and Regulation. It is also significant to note that percentages for each class were similar in each subcategory.

Table 4. Difference Between Final Mean Total and Sub-scores by Class

	NDFS 100 Mean Score ± SE (%max score possible)	NDFS 201 Mean Score ± SE (%max score possible)	Difference	p-value[a]
Total Score[b]	32.0 ± 0.35 (66.7)	30.8 ± 0.68 (64.2)	-1.2	0.12
Subscores				
Attitude[c]	11.2 ± 0.1 (74.7)	10.7 ± 0.3 (71.3)	-0.6	0.08
Acceptance[d]	5.4 ± 0.1 (60.0)	5.4 ± 0.2 (60.0)	0.0	0.89
Regulation[d]	6.6 ± 0.0 (73.3)	6.3 ± 0.2 (70.0)	-0.2	0.20
Skills[c]	8.8 ± 0.1 (58.7)	8.4 ± 0.3 (56.0)	-0.4	0.17

[a]p-value for difference, [b]Maximum score 48, [c]Maximum score 15, [d]Maximum score 9

Comparing the change in mean ecSI score for NDFS 100 to the change in mean ecSI score for NDFS 201 (Table 5) showed that neither class had a change significantly different from the other class.

Table 5. Change in Mean ecSI Total and Sub-scores by Class

	NDF 100 Mean Change ± SE	NDFS 201 Mean Change ± SE	p-value[a]
Class Total	1.2 ± 0.3	0.7 ± 0.5	0.41
Subscores			
Attitude	0.2 ± 0.1	0.2 ± 0.2	0.98
Acceptance	0.2 ± 0.1	0.1 ± 0.2	0.66
Regulation	0.4 ± 0.1	0.1 ± 0.2	0.16
Context	0.4 ± 0.1	0.2 ± 0.2	0.57

[a]p-value for comparison

Final Total Mean Scores

The range of scores for demographic categories of Age, Gender, Marital Status, Eating Disorder Status, and Food Security Status are listed in Table 6. Score ranges for NDFS 100 were: pretest from 11-48, posttest from 5-48. Score ranges for NDFS 201 were as follows: pretest from 15-44, posttest from 10-48.

Table 6. High and Low Pretest and Posttest Scores by Demographic Category for Both Courses

	NDFS 100				NDFS 201			
	Pretest		Posttest		Pretest		Posttest	
	Low Score	High Score	Low Score	High Score	Low Score	High Score	Low Score	High Score
Class Total	11	48	5	48	15	44	10	48
Age								
18-20	11	48	5	48	19	40	15	42
21-25	16	48	11	47	15	44	10	48
Gender								
Male	16	48	19	46	21	44	16	48
Female	11	48	5	48	15	41	10	48
Marital Status								
Single	11	48	5	48	16	41	10	48
Married	19	48	23	46	15	44	17	48
Eating Disorder Status								
Currently Have	11	36	5	32	27	35	10	34
Had in the Past	11	48	10	46	15	36	12	48
Never Had	13	48	13	48	19	44	16	48
Food Security Status								
High or Average	n/a	n/a	11	48	n/a	n/a	10	48
Low	n/a	n/a	10	42	n/a	n/a	15	48
Very Low	n/a	n/a	5	44	n/a	n/a	20	38

Final mean scores for each class were analyzed for both courses (Table 7). Characteristics within the demographic categories that showed a difference with a p-value <0.01 were considered significant.

In NDFS 100, participants in the younger age group (18-20) had significantly lower final scores than did participants in the older age group (21-25), and female participants had significantly lower final ecSI scores than did males. However, married participants did not differ significantly from unmarried participants, though with a p-value of 0.0162, there was a trend toward single participants scoring lower than married participants. All categories for Eating Disorder Status showed significantly different final scores, with the lowest mean ecSI score for participants with a current eating disorder and the highest mean ecSI score for participants who had never had an eating disorder. For Food Security Status (FS), participants with a high FS had significantly higher scores than did those with low FS. However, participants with very low FS did not differ significantly from participants with either high or low FS (Table 7). A more substantial difference would be required to find significance with such a small sample size (n=20).

In NDFS 201, characteristics within Age, Gender, and Marital Status did not show any significant differences. For Eating Disorder, participants who had never had an eating disorder had significantly higher scores than did participants who had had an eating disorder in the past. Though participants with a current eating disorder showed the lowest score within the Eating Disorder category, it was not significantly different from either participants who had had an eating disorder in the past or who had never had an eating disorder. Again, a more substantial difference would be required to find significance with

such a small sample size (n=3). For FS, participants with high FS had significantly higher scores than did participants with very low FS. The final mean score for low FS did not show any significant difference from either high or very low FS (Table 7).

Table 7. Mean ecSI Posttest Score by Demographic Category for Both Classes

	NDFS 100		NDFS 201	
	Post Score ± SE	**p-value[a]**	**Post Score ± SE**	**p-value[a]**
Class Total	32.0 ±0.3		30.8 ± 0.7	
Age				
18-20	31.2 ± 0.4	0.0056	29.9 ± 1.4	0.4574
21-25	33.2 ± 0.6		31.1 ± 0.9	
Gender				
Male	34.4 ± 0.6	<0.0001	33.1 ± 1.3	0.0580
Female	31.0 ± 0.4		30.1 ± 0.8	
Marital Status				
Single	31.7 ± 0.4	0.0162	30.1 ± 0.9	0.1437
Married	34.0 ± 0.9		32.4 ± 1.3	
Eating Disorder Status				
Currently Have	19.8 ± 2.0[x]	<0.0001	24.0 ± 4.2[x,y]	0.0007
Had in the Past	29.7 ± 0.9[y]		26.7 ± 1.4[x]	
Never Had	32.7 ± 0.4[z]		32.4 ± 0.8[y]	
Food Security Status				
High or Average	33.0 ± 0.4[x]	<0.0001	32.4 ± 0.8[x]	0.0009
Low	28.5 ± 0.8[y]		27.9 ± 1.5[x,y]	
Very Low	29.6 ± 1.6[x,y]		24.3 ± 2.4[y]	

[a] All p-values for ANOVA
[x, y, z] Values not sharing a common superscript in the same category and column are significantly different from each other (Tukey-Kramer p-value <0.01)

Because a current eating disorder was associated with much lower mean ecSI scores in NDFS 100, scores from participants with an eating disorder were removed from the data and the analysis was run again (Table 8). When eating disorders are not present, it was found that younger and female participants still had significantly lower scores than their counterparts in NDFS 100. In the same class, high FS was again significantly different from low FS and very low FS showed no significant difference from either high or low FS. In

NDFS 201, categories within Age and Gender showed no significant difference, and, again, high FS was significantly different from very low FS but low FS was not significantly different from either high or very low FS. Marital status had no significant association with score for either class. In summary, removing data from participants with eating disorders did not change the outcome of the data analysis.

Table 8. Mean ecSI Posttest Score by Demographic Category for Both Classes Excluding Eating Disorders

	NDFS 100		NDFS 201	
	Post Score	**p-value[a]**	**Post Score**	**p-value[a]**
Class Total	32.8 ± 0.3		32.4 ± 0.7	
Age				
18-20	32.0 ± 0.5	0.0100	30.9 ± 1.3	0.1244
21-25	33.9 ± 0.6		33.2 ± 0.8	
Gender				
Male	34.5 ± 0.6	0.0004	33.2 ± 1.2	0.4340
Female	31.9 ± 0.4		32.0 ± 0.8	
Marital				
Single	32.5 ± 0.4	0.0930	31.9 ± 0.8	0.3069
Married	34.1 ± 0.9		33.4 ± 1.2	
Food Security Status				
High or Average	33.5 ± 0.4[x]	<0.0001	33.9 ± 0.7[x]	0.0003
Low	29.5 ± 0.8[y]		29.9 ± 1.5[x,y]	
Very Low	33.4 ± 2.1[x,y]		25.0 ± 2.2[y]	

[a] All p-values for ANOVA
[x, y] Values not sharing a common superscript in the same category and column are significantly different from each other (Tukey-Kramer p-value <0.01)

Final Mean Subscores

The ranges of subscores by demographic category are listed in Tables 9-12. For pretest results in NDFS 100 (Table 9), pretest scores ranged: Attitude from 0-15, Acceptance from 0-9, Internal Regulation from 0-9, and Eating Context from 1-15. For Posttest results in NDFS 100 (Table 10), posttest scores ranges as follows: Attitude from 1-15, Acceptance from 0-9, Internal Regulation from 0-9, and Eating Context from 0-15. For

pretest results in NDFS 201 (Table 11), pretest scores were: Attitude from 0-15, Acceptance from 1-9, Internal Regulation from 2-9, and Eating Context from 1-15. For Posttest results in NDFS 201 (Table 12), posttest scores were as follows: Attitude from 0-15, Acceptance from 0-9, Internal Regulation from 0-9, and Eating Context from 1-15.

Table 9. Pretest Range of ecSI Sub-score by Demographic Category for NDFS 100

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Low Score	High Score	Low Score	High Score	Low Score	High Score	Low Score	High Score
Class Total	1	15	0	9	1	9	0	15
Age								
18-20	1	15	0	9	1	9	0	15
21-25	4	15	0	9	1	9	0	15
Gender								
Male	5	15	0	9	2	9	0	15
Female	1	15	0	9	1	9	0	15
Marital Status								
Single	1	15	0	9	1	9	0	15
Married	4	15	0	9	3	9	3	15
Eating DIsorder Status								
Currently Have	1	14	0	9	1	8	0	12
Had in the Past	3	15	0	9	2	9	1	15
Never Had	3	15	0	9	1	9	0	15
Food Security Status								
High or Average	1	15	0	9	1	9	0	15
Low	3	15	0	9	2	9	0	13
Very Low	4	15	0	9	**1**	9	0	15

[a]Maximum score 15, [b]Maximum score 9

Table 10. Posttest Range of ecSI Sub-score by Demographic Category for NDFS 100

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Low Score	High Score	Low Score	High Score	Low Score	High Score	Low Score	High Score
Class Total	1	15	0	9	0	9	0	15
Age								
18-20	1	15	0	9	0	9	0	15
21-25	4	15	0	9	2	9	1	15
Gender								
Male	5	15	0	9	2	9	1	15
Female	1	15	0	9	0	9	0	15
Marital Status								
Single	1	15	0	9	0	9	0	15
Married	7	15	2	9	4	9	1	14
Eating DIsorder Status								
Currently Have	1	9	0	8	0	8	0	13
Had in the Past	1	15	1	9	3	9	1	15
Never Had	1	15	0	9	2	9	1	15
Food Security Status								
High or Average	1	15	0	9	0	9	1	15
Low	1	15	0	9	2	9	1	15
Very Low	1	15	0	9	**0**	9	0	13

[a]Maximum score 15, [b]Maximum score 9

Table 11. Pretest Range of ecSI Sub-score by Demographic Category for NDFS 201

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Low Score	High Score	Low Score	High Score	Low Score	High Score	Low Score	High Score
Class Total	0	15	1	9	2	9	1	15
Age								
18-20	3	15	1	9	3	9	1	13
21-25	0	15	1	9	2	9	2	15
Gender								
Male	7	15	1	9	4	9	3	13
Female	0	15	1	9	2	9	1	15
Marital Status								
Single	0	15	1	9	3	9	1	15
Married	4	15	2	9	2	9	2	13
Eating DIsorder Status								
Currently Have	0	9	3	7	7	9	10	15
Had in the Past	3	13	2	9	2	8	2	12
Never Had	6	15	1	9	4	9	1	15
Food Security Status								
High or Average	0	15	1	9	3	9	1	15
Low	3	15	1	9	3	9	3	13
Very Low	4	14	3	5	2	7	2	10

[a]Maximum score 15, [b]Maximum score 9

Table 12. Posttest Range of ecSI Sub-score by Demographic Category for NDFS 201

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Low Score	High Score	Low Score	High Score	Low Score	High Score	Low Score	High Score
Class Total	0	15	0	9	0	9	1	15
Age								
18-20	3	14	2	9	3	9	1	14
21-25	0	15	0	9	0	9	1	15
Gender								
Male	5	15	2	9	0	9	1	15
Female	0	15	0	9	0	9	1	15
Marital Status								
Single	0	15	0	9	0	9	1	15
Married	7	15	2	9	0	9	1	15
Eating DIsorder Status								
Currently Have	0	9	0	6	0	8	10	12
Had in the Past	3	15	1	9	3	9	2	15
Never Had	5	15	2	9	0	9	1	15
Food Security Status								
High or Average	0	15	0	9	0	9	1	15
Low	3	15	2	9	3	9	2	15
Very Low	5	13	3	8	0	6	2	11

[a]Maximum score 15, [b]Maximum score 9

To identify how subcategory scores differed by demographic category, participant subscores for Attitude, Acceptance, Regulation, and Eating Context were analyzed. For mean scores in NDFS 100 (Table 13), participants in the older age category and male participants had significantly higher Attitude subscores than did participants in the younger age category and female participants. Participants with a current eating disorder had significantly lower Attitude subscores than did participants who had had an eating disorder in the past and participants who had never had an eating disorder. Participants who had never had an eating disorder had significantly higher Attitude subscores than did participants who had had an eating disorder in the past. For FS, participants with high FS

had significantly higher Attitude subscores than did participants with Low FS. Participants with very low FS did not differ significantly from other FS characteristics.

For Acceptance, males had significantly higher subscores than did females. Participants with a current eating disorder had significantly lower subscores than did participants who had had an eating disorder in the past and participants who had never had an eating disorder. Age, Marital Status, and FS did not show significant differences. Although the difference in score for Marital Status was not significant, the p-value of 0.0197 was approaching the point of significance and indicates a trend that may need further testing.

Eating Disorder Status and FS were the only characteristic categories that showed statistical differences in Regulation subscores. Participants with a current eating disorder had significantly lower Regulation subscores than did participants who had had an eating disorder in the past and participants who had never had an eating disorder. Participants with high FS had significantly higher Regulation subscores than did participants with low or very low FS. No significant differences in Regulation subscores were found by age, gender, or marital status. Although the difference in score for Age was not significant, the p-value of 0.0149 was approaching the point of significance and indicates a trend that may need further testing.

For Eating Context, only FS characteristics showed significant differences. Participants with high FS had significantly higher Eating Context subscores than did participants with low or very low FS. No other characteristics showed significant differences.

Table 13. Mean ecSI Posttest Sub-score by Demographic Category for NDFS 100

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]
Class Total	11.2 ± 0.1		5.4 ± 0.1		6.6 ± 0.01		8.8 ± 0.1	
Age								
18-20	10.7 ± 0.2	<0.0001	5.3 ± 0.1	0.1802	6.4 ± 0.1	0.0149	8.9 ± 0.2	0.5033
21-25	12.1 ±0.2		5.6 ± 0.2		6.8 ± 0.1		8.7 ± 0.2	
Gender								
Male	12.7 ± 0.2	<0.0001	5.8 ± 0.2	0.0082	6.9 ± 0.1	0.0239	9.0 ± 0.2	0.4723
Female	10.6 ± 0.2		5.2 ± 0.1		6.5 ± 0.1		8.8 ± 0.2	
Marital Status								
Single	11.1 ± 0.2	0.0102	5.3 ± 0.1	0.0197	6.5 ± 0.1	0.0762	8.8 0.1	0.5438
Married	12.1 ± 0.4		6.0 ± 0.3		6.9 ± 0.2		9.0 ± 0.4	
Eating DIsorder Status								
Currently Have	5.3 ± 0.8[x]	<0.0001	3.2 ± 0.6[x]	0.0007	4.5 ± 0.5[x]	<0.0001	6.8 ± 0.8	0.0380
Had in the Past	9.5 ± 0.4[y]		5.6 ± 0.3[y]		6.1 ± 0.2[y]		8.5 ± 0.4	
Never Had	11.7 ± 0.1[z]		5.5 ± 0.1[y]		6.7 ± 0.1[y]		8.9 ± 0.2	
Food Security Status								
High or Average	11.6 ± 0.2[x]	0.0003	5.5 ± 0.1	0.0483	6.8 ± 0.1[x]	<0.0001	9.1 ± 0.2[x]	<0.0001
Low	10.2 ± 0.3[y]		4.9 ± 0.2		5.8 ± 0.2[y]		7.5 ± 0.3[y]	
Very Low	10.1 ± 0.7[x,y]		5.7 ± 0.5		5.3 ± 0.4[y]		8.6 ± 0.4[y]	

[a]Maximum score 15, [b]Maximum score 9, [c]All p-values for ANOVA
[x,y,z]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

For NDFS 201 (Table 14) the only significant difference in Attitude subscores was for Eating Disorder Status. Participants who had never had an eating disorder had significantly higher Attitude subscores than did participants who had had an eating disorder in the past and participants who had a current eating disorder. Although the difference in score for Age was not significant, the p-value of 0.0109 was approaching the point of significance and indicates a trend that may need further testing.

There were no significant differences by characteristic in Acceptance subscores. For Regulation, participants with a high FS had significantly higher Regulation subscores than

did participants with very low FS. Subscores for participants with low FS did not differ significantly from those with high FS scores or those with very low FS scores. There were no significant characteristic differences in Eating Context subscores.

Table 14. Mean ecSI Posttest Sub-score by Demographic Category for NDFS 201

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Post ± SE	**p-value[c]**	**Post ± SE**	**p-value[c]**	**Post ± SE**	**p-value[c]**	**Post ± SE**	**p-value[c]**
Class Total	10.7 ± 0.3		5.4 ± 0.2		6.3 ± 0.2		8.4 ± 0.3	
Age								
18-20	10.3 ± 0.6	0.5010	5.3 ± 0.4	0.7100	5.9 ± 0.4	0.2061	8.3 ± 0.6	0.9431
21-25	10.8 ± 0.4		5.5 ± 0.2		6.5 ± 0.2		8.4 ± 0.4	
Gender								
Male	11.9 ± 0.5	0.0109	5.7 ± 0.4	0.5315	6.7 ± 0.4	0.2325	8.8 ± 0.6	0.4062
Female	10.2 ± 0.3		5.4 ± 0.2		6.2 ± 0.2		8.2 ± 0.4	
Marital Status								
Single	10.3 ± 0.4	0.0688	5.3 ± 0.2	0.3876	6.2 ± 0.2	0.3332	8.3 ± 0.4	0.5995
Married	11.5 ± 0.5		5.7 ± 0.3		6.6 ± 0.3		8.6 ± 0.5	
Eating Disorder Status								
Currently Have	4.7 ± 1.6[x]	<0.0001	4.0 ± 1.2	0.1695	4.3 ± 1.2	0.0387	11.0 ± 1.9	0.1349
Had in the Past	8.4 ± 0.5[x]		5.0 ± 0.4		5.8 ± 0.4		7.5 ± 0.6	
Never Had	11.6 ± 0.3[y]		5.6 ± 0.2		6.6 ± 0.2		8.6 ± 0.4	
Food Security Status								
High or Average	11.2 ± 0.3	0.0252	5.5 ± 0.2	0.6664	6.8 ± 0.2[x]	<0.0001	8.9 ± 0.4	0.0293
Low	9.4 ± 0.6		5.4 ± 0.4		5.6 ± 0.4[x,y]		7.5 ± 0.4	
Very Low	9.4 ± 1.0		4.9 ± 0.7		3.7 ± 0.6[y]		6.3 ± 1.1	

[a]Maximum score 15, [b]Maximum score 9, [c]All p-values for ANOVA
[x,y]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

Removing data from participants with current eating disorders produced only slight differences in results. For NDFS 100 (Table 15), participants with high FS had significantly higher scores in Regulation and Eating Context than did participants with low FS. Very low FS was not significantly different from either high or low FS.

Table 15. Mean ecSI Posttest Sub-score by Demographic Category Excluding Eating Disorders for NDFS 100

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]
Class Total	11.7 ± 0.1		5.5 ± 0.1		6.7 ± 0.1		8.9 ±0.1	
Age								
18-20	11.2 ± 0.2	<.0001	5.3 ± 0.14	0.0642	6.6 ± 0.1	0.0567	9.0 ± 0.2	0.4488
21-25	12.5 ± 0.2		5.7 ± 0.2		6.9 ± 0.1		8.8 ± 0.2	
Gender								
Male	12.9 ± 0.2	<.0001	5.8 ± 0.2	0.0150	6.8 ± 0.1	0.2534	9.0 ± 0.2	0.7484
Female	11.1 ± 0.2		5.3 ± 0.1		6.6 ± 0.1		8.9 ± 0.2	
Marital Status								
Single	11.6 ± 0.1	0.0944	5.3 ± 0.1	0.0232	6.7 ± 0.1	0.2218	8.9 ± 0.2	0.9291
Married	12.2 ± 0.3		6.0 ± 0.3		7.0 ± 0.2		9.0 ± 0.4	
Food Security Status								
High or Average	11.9 ± 0.2	0.0083	5.5 ± 0.1	0.0312	6.9 ± 0.1[x]	<.0001	9.2 ± 0.2[x]	0.0015
Low	10.9 ± 0.3		4.9 ± 0.2		5.8 ± 0.2[y]		7.8 ± 0.3[y]	
Very Low	12.6 ± 0.8		6.3 ± 0.6		5.7 ± 0.5[x,y]		8.8 ± 0.9[x,y]	

[a]Maximum score 15, [b]Maximum score 9, [c]All p-values for ANOVA
[x,y]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

For NDFS 201 (Table 16), participants with high FS had significantly higher subscores in regulation than did participants with low or very low FS. All other subscores for both classes showed no significant differences among characteristics.

Table 16. Mean ecSI Posttest Sub-score by Demographic Category Excluding Eating Disorders for NDFS 201

	Attitude[a]		Acceptance[b]		Regulation[b]		Eating Context[a]	
	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]	Post ± SE	p-value[c]
Class Total	11.6 ± 0.3		5.6 ± 0.2		6.6 ± 0.2		8.6 ± 0.3	
Age								
18-20	11.0 ± 0.5	0.1132	5.3 ± 0.4	0.2452	6.3 ± 0.4	0.2527	8.3 ± 0.7	0.6802
21-25	12.0 ± 0.3		5.8 ± 0.2		6.8 ± 0.2		8.6 ± 0.4	
Gender								
Male	12.2 ± 0.5	0.1564	5.5 ± 0.4	0.7539	6.6 ± 0.4	0.9301	8.9 ± 0.6	0.5606
Female	11.3 ± 0.3		5.7 ± 0.2		6.6 ± 0.2		8.4 ± 0.4	
Marital Status								
Single	11.4 ± 0.3	0.2623	5.6 ± 0.2	0.7087	6.5 ± 0.2	0.6849	8.4 ± 0.4	0.4823
Married	12.1 ± 0.5		5.7 ± 0.4		6.7 ± 0.4		8.9 ± 0.6	
Food Security Status								
High or Average	12.1 ± 0.3[x]	0.0028	5.7 ± 0.2	0.6505	7.2 ± 0.2[x]	<.0001	8.9 ± 0.4	0.2787
Low	10.7 ± 0.7[x,y]		5.8 ± 0.5		5.6 ± 0.4[y]		7.9 ± 0.8	
Very Low	9.1 ± 0.9[y]		5.0 ± 0.7		3.6 ± 0.6[y]		7.3 ± 1.2	

[a]Maximum score 15, [b]Maximum score 9, [c]All p-values for ANOVA
[x,y]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

Change in Total Mean Scores

While the total mean scores show EC at one point in time, the change in total mean ecSI scores shows whether or not EC changed over time. For this study, the change in mean ecSI scores presumably shows whether or not enrollment in a nutrition class had an effect on participant EC. For NDFS 100 (Table 17), participants showed a significant increase (1.8 points) in mean total ecSI score, suggesting that instruction in the course had a positive impact on participant EC. Examining characteristic categories showed that Age, Gender, and Marital Status had no significant associations with change in mean ecSI. However, participants with eating disorders actually showed a decrease in score (-5.1 points) that was significantly different from the increase in score for participants who had had an eating disorder in the past (0.2) or who had never had an eating disorder (1.7).

Table 17. Change in Mean ecSI Score by Demographic Category for NDFS 100

	NDFS 100			
Category	**Pre-test Mean**	**Post-test Mean**	**Change** ± SE	**p-value**[a]
Class Total	30.8	32.0	1.8 ± 0.3	<0.0001[b]
Eating Disorder Status				
Currently Have	24.9	19.8	-5.1 ± 1.6[x]	<0.0001
Had in the Past	29.4	29.7	0.2 ± 0.8[y]	
Never Had	31.1	32.8	1.7 ± 0.4[y]	
Age				
18-20	31.2	29.9	-1.3 ± 0.8	0.3980
21-25	31.9	31.1	-0.8 ± 0.7	
Marital Status				
Single	32.7	31.7	-1.0 ± 0.6	0.8748
Married	35.1	34.0	-1.1 ± 0.9	
Gender				
Male	35.1	34.4	-0.8 ± 0.8	0.3796
Female	32.3	31.0	-1.4 ± 0.7	

[a]All p-values for ANCOVA except for Class total, [b]p-value for change in score
[x,y]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

For NDFS 201 (Table 18), mean ecSI score did increase from pretest to posttest. However, the change was not significant. Though participants with a current eating disorder actually decreased in mean ecSI score (-5.1 points), the change is not significantly different from participants who had had (1.2 points) or who had never had (1.8 points) an eating disorder. Characteristics within demographic categories also showed no significant difference from characteristics within the same demographic category.

Table 18. Change in Mean ecSI Score by Demographic Category for NDFS 201

	NDFS 201			
	Pre-test Score	**Post-test score**	**Change** ± SE	**p-value**[a]
Class Total	30.1	30.8	0.7 ± 0.5	0.24[b]
Eating Disorder Status				
Currently Have	29.1	24.0	-5.1 ± 3.4	0.12
Had in the Past	27.9	26.7	1.2 ± 1.4	
Never Had	34.2	32.4	1.8 ± 0.9	
Age				
18-20	30.9	29.9	-1.0 ± 1.8	0.66
21-25	31.6	31.1	-0.4 ± 1.2	
Marital				
Single	31.7	30.1	-1.6 ± 0.3	0.16
Married	32.2	32.4	0.2 ± 0.9	
Gender				
Male	33.2	33.1	-0.1 ± 1.8	0.34
Female	31.5	30.1	-1.4 ± 1.3	

[a]All p-values for ANCOVA except for Class Total, [b]p-value for change in score

Because participants with eating disorders had a greater change in score than did other participants, it was again prudent to remove scores from participants with current eating disorders and re-run the analysis. When removing participants with current eating disorders, results for NDFS 100 (Table 19) showed that total ecSI score increased significantly and no characteristics within categories showed a significantly different increase or decrease in score when compared with other characteristics within the same category. For NDFS 201 (Table 20), the change in score was not significantly different for the total class or for characteristics within categories. In summary, removing data from participants with eating disorders did not change the outcome of the data analysis.

Table 19. Change in Mean ecSI Score by Demographic Category for NDFS 100 Excluding Eating Disorders

	NDFS 100			
	Pre-test Mean	**Post-test Mean**	**Change**	**p-value[a]**
Class Total	31.6	32.8	1.2 ± 0.3	
Age				
18-20	30.9	32.0	1.1 ± 0.6	0.27
21-25	32.1	33.9	1.8 ± 0.5	
Marital Status				
Single	31.0	32.5	1.6 ± 0.3	0.69
Married	32.9	34.1	1.3 ± 0.7	
Gender				
Male	32.9	34.5	1.6 ± 0.6	0.62
Female	30.7	31.9	1.3 ± 0.4	

[a]All p-values for ANCOVA

Table 20. Change in Mean ecSI Score by Demographic Category for NDFS 201 Excluding Eating Disorders

	NDFS 201			
	Pre-test Score	**Post-test score**	**Change**	**p-value[a]**
Class Total	31.7	32.4	0.7 ± 0.5	
Age				
18-20	31.1	30.9	-0.3 ± 1.3	0.21
21-25	31.8	33.2	1.5 ± 0.7	
Marital				
Single	31.3	31.9	0.6 ± 0.8	0.99
Married	32.8	33.4	0.6 ± 1.2	
Gender				
Male	32.4	33.2	0.8 ± 1.3	0.82
Female	31.6	32.0	0.4 ± 0.8	

[a]All p-values for ANCOVA

Change in Mean Scores by Subcategory

The change in ecSI subcategory scores was examined to reveal whether or not course enrollment affected some components of total EC but not others. For NDFS 100 (Table 21), Class Total subscores did not significantly change for Attitude or Acceptance. However, there was a significant increase in Regulation (0.4 point) and Eating Context (0.4 point) subscores. A closer look at demographic categories showed that Age, Gender, and

Marital Status had no associations with change in Attitude, Acceptance, Regulation, or Eating Context subscores. However, for Eating Disorder Status, characteristics in this category showed significant differences for Attitude and Acceptance subscores. For Attitude, participants with a current eating disorder decreased more (-3.1) than did participants who had had (-0.2) or who had never had (-0.6) an eating disorder. Similarly, for Acceptance, participants with a current eating disorder showed a significantly different change (-1.4) than did participants who had had (0.3) or who had never had (0.2) an eating disorder.

Performing the same analysis for NDFS 201 (Table 22) showed no significant change in Class Total subscores. There were also no significant differences between changes within demographic categories.

Removing students with eating disorders from the analysis showed that in NDFS 100 (Table 23) there was still a significant change in Regulation (0.4 point) and Eating Context (0.4 point) subscores and there were no significant differences between changes within demographic categories. Analysis of NDFS 201 subcategory scores excluding participatants with eating disorders (Table 24) showed similar results as the previous analysis that included participants with eating disorders. There was no significant change in total subscores for Attitude, Acceptance, Regulation, or Eating Context and there were also no significant differences within demographic categories. In summary, removing data from participants with eating disorders did not change the outcome of the data analysis.

Table 21. Change in Mean Subcategory Score by Demographic Category for NDFS 100

	Attitude[a]			Acceptance[b]			Regulation[b]			Eating Context[a]		
	Pre	Post	Change ± SE	Pre	Post	Change ± SE	Pre	Post	Change ± SE	Pre	Post	Change ± SE
Class Total	11.0	11.2	0.2 ± 0.2	5.3	5.4	0.2 ± 0.1	6.2	6.6	0.4 ± 0.1[c]	8.4	8.8	0.4 ± 0.1[c]
Age												
18-20	11.8	10.7	-1.1 ± 0.3	5.5	5.3	-0.2 ± 0.2	6.5	6.4	-0.1 ± 0.2	8.9	8.9	0.0 ± 0.3
21-25	12.8	12.1	-0.7 ± 0.3	5.9	5.6	-0.4 ± 0.2	6.7	6.8	0.1 ± 0.2	8.8	8.7	-0.1 ± 0.3
Gender												
Male	13.4	12.7	-0.6 ± 0.3	6.0	5.8	-0.2 ± 0.2	6.9	6.9	0.0 ± 0.2	8.9	9.0	0.1 ± 0.3
Female	11.7	10.6	-1.2 ± 0.3	5.6	5.2	-0.4 ± 0.2	6.4	6.5	0.0 ± 0.2	8.9	8.8	-0.2 ± 0.3
Marital Status												
Single	12.0	11.1	-0.9 ± 0.2	5.7	5.3	-0.3 ± 0.2	6.6	6.5	-0.1 ± 0.2	8.7	8.8	0.0 ± 0.3
Married	13.0	12.1	-0.9 ± 0.4	6.2	6.0	-0.2 ± 0.3	6.9	6.9	0.0 ± 0.3	9.2	9.0	-0.2 ± 0.4
Eating Disorder Status												
Currently Have	8.4	5.3	-3.1 ± 0.6[x]	4.6	3.2	-1.4 ± 0.4[x]	5.1	4.5	-0.6 ± 0.4	7.5	6.8	-0.7 ± 0.7
Had in the Past	9.6	9.5	-0.2 ± 0.3[y]	5.3	5.6	0.3 ± 0.2[y]	6.1	6.1	0.1 ± 0.2	8.5	8.5	0.1 ± 0.3
Never Had	11.1	11.7	-0.6 ± 0.2[y]	5.2	5.5	0.2 ± 0.1[y]	6.2	6.7	0.5 ± 0.1	8.5	8.9	0.5 ± 0.2

[a]Maximum score 15, [b]Maximum score 9, [c]Statistically significant with p-value <0.01
[x,y]Values not sharing a common superscript in the same category and column are significantly different (Tukey-Kramer p<0.01)

Table 22. Change in Mean Subcategory Score by Demographic Category for NDFS 201

	Attitude[a]			Acceptance[b]			Regulation[b]			Eating Context[a]		
	Pre	Post	Change ± SE[c]	Pre	Post	Change ± SE[c]	Pre	Post	Change ± SE[c]	Pre	Post	Change ± SE[c]
Class Total	10.5	10.7	0.2 ± 0.2	5.4	5.4	0.1 ± 0.2	6.2	6.3	0.1 ± 0.2	8.1	8.4	0.3 ± 0.1
Age												
18-20	10.9	10.3	-0.6 ± 0.7	5.7	5.3	-0.4 ± 0.5	6.9	5.9	-0.9 ± 0.6	7.9	8.3	0.4 ± 0.8
21-25	11.0	10.8	-0.2 ± 0.5	5.7	5.5	-0.2 ± 0.4	7.0	6.5	-0.5 ± 0.4	8.2	8.4	0.2 ± 0.6
Gender												
Male	12.0	11.9	-0.1 ± 0.7	5.8	5.7	-0.2 ± 0.5	7.2	6.7	-0.5 ± 0.6	8.5	8.8	0.4 ± 0.8
Female	11.0	10.2	-0.7 ± 0.5	5.8	5.4	-0.4 ± 0.4	7.1	6.2	-0.9 ± 0.4	8.1	8.2	0.2 ± 0.6
Marital Status												
Single	11.0	10.3	-0.7 ± 0.6	5.8	5.3	-0.4 ± 0.4	7.0	6.2	-0.8 ± 0.5	8.3	8.3	0.0 ± 0.6
Married	11.5	11.5	-0.1 ± 0.7	5.8	5.7	-0.2 ± 0.5	7.3	6.6	-0.7 ± 0.6	8.0	8.6	0.6 ± 0.8
Eating Disorder Status												
Currently Have	6.6	4.7	-1.9 ± 1.4	5.1	4.0	-1.1 ± 1.0	6.9	4.3	-2.6 ± 1.2	11.0	11.0	0.0 ± 1.6
Had in the Past	8.5	8.4	-0.1 ± 0.5	5.2	5.0	-0.2 ± 0.4	5.7	5.8	0.1 ± 0.5	7.2	7.5	0.3 ± 0.6
Never Had	12.4	11.6	-0.8 ± 0.3	5.3	5.6	0.4 ± 0.2	6.2	6.6	0.3 ± 0.3	8.0	8.6	0.6 ± 0.4

[a]Maximum score 15, [b]Maximum score 9, [c]Changes in mean score within categories were not significantly different (Tukey-Kramer $p<0.01$)

Table 23. Change in Mean Subcategory Score by Demographic Category for NDFS 100 Excluding Eating Disorders

	Attitude[a]			Acceptance[b]			Regulation[b]			Eating Context[a]		
	Pre	Post	Change ± SE	Pre	Post	Change ± SE	Pre	Post	Change ± SE	Pre	Post	Change ± SE
Class Total	11.4	11.7	0.2 ± 0.1	5.7	5.5	0.2 ± 0.1	6.3	6.7	0.4± 0.1[c]	8.4	8.9	0.4± 0.1[c]
Age												
18-20	11.0	11.2	0.2 ± 0.2	5.1	5.3	0.2 ± 0.2	6.3	6.6	0.3 ± 0.2	8.5	9.0	0.5 ± 0.2
21-25	11.9	12.5	0.6 ± 0.2	5.4	5.7	0.3 ± 0.3	6.3	6.9	0.6 ± 0.1	8.4	8.8	0.4 ± 0.2
Gender												
Male	12.2	12.9	0.6 ± 0.2	5.6	5.8	0.3 ± 0.2	6.5	6.8	0.4 ± 0.2	8.4	9.0	0.5 ± 0.2
Female	11.0	11.1	0.2 ± 0.2	5.1	5.3	0.2 ± 0.1	6.1	6.6	0.6 ± 0.1	8.6	8.9	0.3 ± 0.2
Marital Status												
Single	11.2	11.6	0.4 ± 0.1	5.2	5.4	0.2 ± 0.2	6.2	6.7	0.4 ± 0.1	8.4	8.9	0.5 ± 0.1
Married	11.9	12.2	0.4 ± 0.3	5.8	6.0	0.3 ± 0.2	6.5	7.0	0.5 ± 0.2	8.6	9.0	0.3 ± 0.3

[a]Maximum score 15, [b]Maximum score 9, [c]Statistically significant with p-value <0.01

Table 24. Change in Mean Subcategory Score by Demographic Category for NDFS 201 Excluding Eating Disorders

	Attitude[a]			Acceptance[b]			Regulation[b]			Eating Context[a]		
	Pre	Post	Change ± SE[c]	Pre	Post	Change ± SE[c]	Pre	Post	Change ± SE[c]	Pre	Post	Change ± SE[c]
Class Total	11.4	11.6	0.2 ± 0.2	5.4	5.6	0.1 ± 0.2	6.5	6.6	0.1 ± 0.2	8.2	8.6	0.3 ± 0.2
Age												
18-20	11.2	11.0	-0.2 ± 0.5	5.4	5.3	-0.2± 0.4	6.4	6.3	-0.1 ± 0.5	8.2	8.3	0.1 ± 0.6
21-25	11.6	12.0	0.4 ± 0.3	5.4	5.8	0.4± 0.2	6.5	6.8	0.3 ± 0.3	8.2	8.6	0.5 ± 0.4
Gender												
Male	11.8	12.2	0.4 ± 0.5	5.5	5.5	0.0± 0.4	6.5	6.6	0.1 ± 0.5	8.7	8.9	0.2 ± 0.7
Female	11.5	11.3	-0.2 ± 0.3	5.5	5.7	0.2± 0.2	6.6	6.6	0.0 ± 0.3	8.0	8.4	0.4 ± 0.4
Marital Status												
Single	11.3	11.4	0.2 ± 0.3	5.4	5.6	0.1± 0.3	6.4	6.5	0.2 ± 0.3	8.3	8.4	0.1 ± 0.4
Married	12.0	12.1	0.1 ± 0.5	5.7	5.7	0.1± 0.4	6.8	6.7	0.0 ± 0.4	8.4	8.9	0.5 ± 0.6

[a]Maximum score 15, [b]Maximum score 9, [c]Changes in mean score were not statistically significant within categories.

APPENDIX D: COMPLETE DISCUSSION

DISCUSSION

The purpose of this study was to determine if enrollment in NDFS 100 or NDFS 201 affects eating competence in students. Additionally, relationships between eating competence and student characteristics were studied.

Addressing the Hypotheses

- *There will be an increase in EC from the beginning to the end of NDFS 100.*

The findings of this study support this hypothesis. Mean ecSI score significantly increased by 1.84 points from pretest to posttest in NDFS 100. This shows that enrollment in NDFS 100 was associated with improvement in EC. One exception to this finding is for students with eating disorders. Those students actually had a significant decrease in ecSI (-5.1).

When analyzing subscores, it was shown that participants in this class had significant improvements in Regulation and Eating Context subscales. For students with eating disorders, subscores significantly decreased for Attitude and Acceptance.

- *There will be an increase in EC from the beginning to the end of NDFS 201*.

The findings of this study do not support this hypothesis. Though mean ecSI score did increase by 0.70, the change was not considered statistically significant. The smaller sample size for NDFS 201 (n=116) suggests changes need to be more pronounced to be statistically significant. With such a small increase in mean ecSI score, we cannot confidently say that instruction in NDFS 201 increased EC.

- *There will be a greater increase in EC for NDFS 201 participants than for NDFS 100 participants.*

The findings of this study do not support this hypothesis. The increase for NDFS 100 (1.8) was greater than the increase for NDFS 201 students (0.7) and the increase in NDFS 201 was not statistically significant. The instruction in NDFS 201 is related to long term effects of eating and nutrition and so it is possible that the topics covered don't have an immediate effect on EC.

- *There will be no difference in EC between the end of NDFS 100 and the beginning of NDFS 201.*

The results of this study support this hypothesis. Though mean ecSI score decreased by 1.9 points from the end of NDFS 100 (32.0) to the beginning of NDFS 201 (30.2), the change was not statistically significant. The p value of this change (0.013), however, is so close to .01 that it is suggestive that further testing might reveal a significant change. Following subjects from class to class and matching EC scores from both classes for testing would provide more accurate results.

One challenge related to this hypothesis is that the time period between the end of NDFS 100 and the beginning of NDFS 201 is unknown and may vary for each student. In a future study it would be prudent to collect information on the time lapse between classes and factor that into the analysis.

- *Participants will have a higher EC at the end of NDFS 201 than at the end of NDFS 100.*

The results of this study do not support this hypothesis. In fact, results show a trend toward lower scores. Mean ecSI score at the end of NDFS 100 (32.0) was 1.2 points higher

than at the end of NDFS 201 (30.8). The difference is not statistically significant and may be due to a decrease in EC during a period when participants were not enrolled in any nutrition courses. Further research might reveal more about this trend toward a lower EC score at the end of a second nutrition class.

- *There will be no difference in the change in EC between class sections of NDFS 100.*

The results of this study support this hypothesis. Although there were three different instructors for NDFS 100, course content was standardized and there was no significant difference in the change in ecSI score between sections. It is possible that the instructors have similar styles and methods of teaching. However, if styles and methods were different, they apparently had no bearing on the change in EC among participants.

- *Participants with self-reported current or past eating disorders will have a low final EC (<32).*

The results of this study support this hypothesis. An ecSI score of 32 or higher shows that the respondent is eatingcompetent. Respondents with scores lower than 32 are considered not eatingcompetent. Participants with current eating disorders had low mean ecSI posttest scores in both classes (19.8 in NDFS 100 and 24.0 in NDFS 201) and participants with past eating disorders also fell well below 32 in both classes (29.7 in NDFS 100 and 26.7 in NDFS 201).

Eating disorder beliefs and behaviors are not compatible with high EC and it appears that instruction in nutrition courses may even contribute to a decrease in EC. One interesting and unexpected finding was that students with self-identified current eating disorders actually decreased in ecSI score after instruction in both classes (-5.1 in NDFS

100 and -5.1 in NDFS 201). Though the change was only significant in NDFS 100 (p-value <0.0001), the trend in NDFS 201 (p-value 0.12) is present.

- *Participants with a low Food Security Score will have low EC (<32).*

The results of this study support this hypothesis. Participants with low FS had low EC in both classes (28.5 in NDFS 100 and 27.9 in NDFS 201) and participants with very low FS also had low EC in both classes (29.6 in NDFS 100 and 24.3 in NDFS 201). While the mean ecSI score for low FS was significantly different than the mean ecSI score for high FS (33.0) in NDFS 100, the mean ecSI score for very low FS was not significantly different from the mean ecSI score for high FS. This means that participants with very low FS may not have very different scores from participants with high FS whose mean ecSI score classified them as eating competent. However, the raw score is less than 32 for very low FS and so is considered not eating competent.

Similarly, participants with low FS in NDFS 201 had a mean ecSI score less than 32 but it was not significantly different from the high FS group who had a mean ecSI score greater than 32. However, the raw score is less than 32 for very low FS and so is considered not eating competent. Participants with very low FS in NDFS 201 had a low mean ecSI score that was significantly different from the mean ecSI score for high FS.

- *Married participants will have higher final EC than unmarried students.*

The results of this study do not support this hypothesis. For NDFS 100, married participants had a mean ecSI posttest score of 34.0 compared to single participants with a mean ecSI score of 31.7. Though it appears that married participants have a higher mean

ecSI score, the difference is not significantly different at $p < 0.01$, though the p value was close to 0.01. Similarly, in NDFS 201 married participants had a final mean ecSI score of 32.4 and single participants had a final mean ecSI score of 30.1. Again, though the married participants have a higher score, the difference is not statistically significant.

- *Females will have higher final EC than males.*

The results of this study do not support this hypothesis. In NDFS 100 female participants had a significantly lower mean ecSI score (31.0) than did male participants (34.4). In NDFS 201 the difference was not significant but a similar trend was found, with female participant mean ecSI score of 30.1 and male mean ecSI score of 33.1. Further analysis of subcategory scores might show whether females are much lower in one subcategory than another. It is possible that females with body dissatisfaction related to social expectations for the female body to be unrealistically thin may have lower scores in Attitude than males. Eating may be viewed as a way to gain weight and thereby keeps women from reaching their goal of a thin body. It is possible that scores in Regulation and Eating Context may also be lower for the same reason.

- *Younger participants (18-20) will have lower final EC than older participants (21-25).*

The results of this study support this hypothesis for NDFS 100 but do not support this hypothesis for NDFS 201. Older participants in NDFS 100 had a significantly higher score (33.2) than did younger participants (31.2) in the same class. In NDFS 201 older participants also had a higher mean ecSI score (31.1) than younger participants (29.9). However, the difference for this class was not significant and is not conclusive. It is possible

that the small sample size affected results or it may be possible that the findings in NDFS 100 are not usual. Further research is needed to draw definitive conclusions.

- *Married students will have higher final mean scores than unmarried students in the Eating Context subcategory.*

The results of this study do not support this hypothesis. There was no significant difference between final mean subscores in Eating Context for married and unmarried students enrolled in either course.

Other Discussion

Final Total Mean Scores

By definition, an ecSI score ≥32 is considered eating competent while a score <32 is considered not eating competent (A2). With that in mind, it is important to note that final mean Total ecSI scores showed that participants enrolled in NDFS 100 were eating competent at the end of the course. However, participants enrolled in NDFS 201 were not eating competent at the end of the course, even though EC did not decrease during enrollment. Because all students in NDFS 201 are required to take NDFS 100 as a pre-requisite (or transfer credit from a similar course at another university), it must be concluded that EC decreased between enrollment in the two classes, and enrollment in NDFS 201 did not completely make up for the decrease. However, the length of time between classes is varied and unknown for each participant, so it cannot be said with certainty how soon after completing NDFS 100 EC began to decrease.

It is important to note that although students in NDFS 100 were eating competent at the end of the course, the final mean score was only 1.2 points higher than the final score in

NDFS 201. Practically speaking, the differences in score may not be associated with recognizable differences in skills and abilities related to EC.

For characteristic categories in NDFS 100, there were definite differences in EC. Males and older participants (age 21-25) were eating competent (mean scores 34.4 and 33.2, respectively) while females and younger participants (18-20) were not eating competent (mean scores 31.0 and 31.2, respectively). Additionally, eating disorder status and food security status were correlated with EC.

Change in Total Mean Scores

The significant increase of mean total ecSI score during enrollment in NDFS 100 shows that enrollment in the course was associated with an increase in EC. However, there was no significant increase in mean ecSI score in NDFS 201, so it cannot be concluded that enrollment in the course affected EC.

ecSI Subcategories

Enrollment in NDFS 100 significantly increased subscores in Regulation and Eating Context but not in Attitude and Acceptance. This suggests that instruction, coursework, projects, or other activities or curriculum pursued by students during enrollment focuses more on Regulation and Eating Context than on Attitude and Acceptance. Future students for NDFS 100 may benefit from curriculum that with enhanced focus on skills and behaviors relating to Attitude and Acceptance.

Eating Disorder Status

Eating Disorder Status had interesting implications for EC in this study. For both classes, participants who had never had an eating disorder were eating competent at the end of the courses. However, participants who had had an eating disorder in the past or who had current eating disorders were not eating competent. In fact, participants with current eating disorders actually decreased (-5.1) in ecSI score during course enrollment. This suggests that exposing students with a current eating disorder to nutrition instruction in an academic environment may actually have a detrimental impact on EC. Perhaps the intense focus on nutrition and food exacerbates inappropriate attitudes and behaviors already present in people with eating disorders. More research is needed to explore this relationship.

Breaking down ecSI scores into subcategories showed that participants in NDFS 100 with current eating disorders had a significant decrease in Attitude and Acceptance subscores during course enrollment. Interestingly, these are the same subcategories where total class scores did not improve. Additionally, participants with current eating disorders had significantly lower final subscores in Attitude, Acceptance, and Regulation than did other participants. Enhancing curriculum to address Attitude and Acceptance might have a great impact on EC of students with current eating disorders. However, improving EC or achieving EC among populations who have experienced or are experiencing an eating disorder may prove more challenging than for populations who have never had an eating disorder.

Food Security Status

At the end of both classes, High Food Security Status (FS) was associated with EC while low and very low FS was associated lack of EC. Breaking final mean ecSI scores into subcategory scores shows that participants with high or average FS had higher subscores for Attitude, Regulation, and Eating Context than did participants with low or very low FS. With these trends, it is possible that for students with low or very low FS, EC may be elusive until FS is improved.

Future Research

Because the results of this study show improvements in Regulation and Eating Context subcategories but not in Attitude and Acceptance, enhancing the curriculum to emphasize Attitude and Acceptance could possibly improve overall EC for students. Future studies could measure whether or not enhancing the curriculum has any impact on final EC or change in EC among students.

Further research is also needed to address the relationship between eating disorders and EC. Because these results suggest that formal nutrition instruction in an academic environment might actually decrease EC among students with eating disorders, further studies might improve understanding of this relationship. Specifically, examining stage of change (53) among students with eating disorders who are enrolled in a basic nutrition course might show whether the stage of change a student with an eating disorder is experiencing is associated with an increase or decrease in EC.

Additionally, because food security status is closely associated with EC, further research is needed to explore this relationship.

APPENDIX E: IRB APPROVAL

INSTITUTIONAL REVIEW BOARD FOR
HUMAN SUBJECTS

December 15, 2008

Lora Beth Brown
S245 ESC
Campus Mail

Re: *Impact of Two Nutrition Courses on Eating Competence in Winter Semester 2009*

Dear Lora Beth,

This is to inform you that Brigham Young University's IRB has approved the above research study.

The approval period is from **12/15/2008 to 12/14/2009. Your study number is E08-0308. Please be sure to reference this number in any correspondence with the IRB.**

Continued approval is conditional upon your compliance with the following requirements:

- All protocol amendments and changes to approved research must be submitted to the IRB and not be implemented until approved by the IRB.
- A few months before this date we will send out a continuing review form. There will only be two reminders. Please fill this form out in a timely manner to ensure that there is not a lapse in your approval.

If you have any questions, please do not hesitate to call me.

Sincerely,

Christopher Dromey, PhD, Chair
Sandee M.P. Muñoz, Administrator
Institutional Review Board for Human Subjects
CD/se
Enclosures

BRIGHAM YOUNG UNIVERSITY - A-285 ASB - PROVO, UTAH 84602
(801) 422-5841 / FAX (801) 422-0620

INSTITUTIONAL REVIEW BOARD FOR
HUMAN SUBJECTS

January 8, 2009

Lora Brown
S245 ESC
Campus Mail

Re: *Impact of Two Nutrition Courses on Eating Competence in Winter Semester 2009*

Dear Dr. Brown,

This is to inform you that Brigham Young's University's Institutional Review Board has reviewed your *Amendments dated* **12/24/08 and 1/7/09** for the above captioned study. The changes to the study have been approved.

The approval period for the study ends on 12/14/2009. Any additional modifications in the research protocol, study site/personnel, or consent form during this time period must first be reviewed and approved by the IRB.

If you have any questions, please let us know. We wish you well with your research!

Sincerely,

Christopher Dromey, PhD, Chair
Sandee M.P. Muñoz, Administrator
Institutional Review Board for Human Subjects
CD/se

BRIGHAM YOUNG UNIVERSITY · A-284 ASB · PROVO, UTAH 84602
(801) 422-1841 / FAX (801) 422-0529

REQUEST for WAIVER or MODIFICATION of CONSENT

Brigham Young University, Institutional Review Board

Request for Waiver/Modification of Consent

1. Title of the Study: Impact of Two Nutrition Courses on Eating Competence in Winter Semester 2009			
2. Principal Investigator: Lora Beth Brown		3. Contact Person (if different from PI):	
Title: Assoc Prof	Dept: NDFS	Title:	Dept:
Address: S-245 ESC, BYU City, State, Zip: Provo UT 845602		Address: City, State, Zip:	
Phone: 422-6672	Email: lorabeth_brown@byu.edu	Phone:	Email:
4. Co-Investigator(s) Name & Affiliation: Rickelle Richards PhD; Merrill J Christensen PhD both in NDFS Dept at BYU Pauline Williams MPA, Instructor of NDFS 100 at Salt Lake Center			
5. Correspondence Request: ☐ Mail ☒ Call for Pick-Up			
6. Explain why the research could not practicably be conducted without the waiver or alteration: The surveys will assess the impact of course instruction that all enrolled students receive.			
7. Explain the research and privacy risks of the research and whether they are no more than minimal[1]: The surveys expose students to minimal risks (time to complete the survey), or none. The survey questions are not personally senstive.			
8. Describe measures you will take to ensure the waiver or alteration will not adversely affect the rights and welfare of the subjects[2]: The survey questions are not personally sensitive. Data will be analyzed as group data and individual identification information will be removed from the data files.			
9. Explain how you will, if applicable and appropriate, provide the subjects with additional pertinent information after they have participated in the study,[3] **or indicate "Not applicable."** Not applicable.			
Principal Investigator's signature: _____ Date: Dec 11, 2008 Faculty sponsor's signature: _____ Date: *(faculty sponsor's signature is required only if PI is a student)*			

[1] *Minimal risk* means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests. 45 CFR 46.102(i)

[2] The IRB will assess whether subjects' rights, such as the right to privacy or the right to choose whether to participate in research, would be violated if the consent were waived. The IRB will consider your safeguards, such as for minimizing the potential invasion of privacy, and will consider the potential benefits of participation.

[3] In social science research involving deception, it is common practice to debrief the subjects at the conclusion of the study. In other studies, however, it would not be appropriate to provide additional information. For example, if the research proposed collection of sensitive information without identifiers, it would not be possible for the investigator to provide additional information since the identities of the subjects would be unknown.

APPENDIX F: MATERIALS

ecSatter Inventory

Below are 16 statements about your eating. Think about each one, then check the box that shows how often you think, do or feel that way.

Name:_____Date_____
Age_____

A=Always O=Often S=Sometimes R=Rarely N=Never

	A	O	S	R	N
1. I am relaxed about eating.	☐	☐	☐	☐	☐
2. I am comfortable about eating enough.	☐	☐	☐	☐	☐
3. I enjoy food and eating.	☐	☐	☐	☐	☐
4. I am comfortable with my enjoyment of food and eating.	☐	☐	☐	☐	☐
5. I feel it is okay to eat food that I like.	☐	☐	☐	☐	☐
6. I experiment with new food and learn to like it.	☐	☐	☐	☐	☐
7. If the situation demands, I can "make do" by eating food I don't much care for.	☐	☐	☐	☐	☐
8. I eat a wide variety of foods.	☐	☐	☐	☐	☐
9. I assume I will get enough to eat.	☐	☐	☐	☐	☐
10. I eat as much as I am hungry for.	☐	☐	☐	☐	☐
11. I eat until I feel satisfied.	☐	☐	☐	☐	☐
12. I tune in to food and pay attention to myself when I eat.	☐	☐	☐	☐	☐
13. I make time to eat.	☐	☐	☐	☐	☐
14. I have regular meals.	☐	☐	☐	☐	☐
15. I think about nutrition when I choose what to eat.	☐	☐	☐	☐	☐
16. I generally plan for feeding myself. I don't just grab food when I get hungry.	☐	☐	☐	☐	☐

Pre-Survey for NDFS 100

ecSatter Inventory

Complete this brief research survey for 5 points in NDFS 100. Be sure you fill in your name and other brief demographic information at the end of the survey so you can be credited with the points. Each student's answers are combined with other students' answers to provide a general picture of students enrolled in NDFS 100. Your specific answers are not associated with your name.

	Always	Often	Sometimes	Rarely	Never
1. I am relaxed about eating.	○	○	○	○	○
2. I am comfortable about eating enough.	○	○	○	○	○
3. I enjoy food and eating.	○	○	○	○	○
4. I am comfortable with my enjoyment of food and eating.	○	○	○	○	○
5. I feel it is okay to eat food that I like.	○	○	○	○	○
6. I experiment with new food and learn to like it.	○	○	○	○	○
7. If the situation demands, I can "make do" by eating food I don't much care for.	○	○	○	○	○
8. I eat a wide variety of foods.	○	○	○	○	○
9. I assume I will get enough to eat.	○	○	○	○	○
10. I eat as much as I am hungry for.	○	○	○	○	○
11. I eat until I feel satisfied.	○	○	○	○	○
12. I tune in to food and pay attention to myself when I eat.	○	○	○	○	○
13. I make time to eat.	○	○	○	○	○
14. I have regular meals.	○	○	○	○	○
15. I think about nutrition when I choose what to eat.	○	○	○	○	○
16. I generally plan for feeding myself. I don't just grab food when I get hungry.	○	○	○	○	○

Demographics

Last Name

First Name

Age

Gender

- Male
- Female

Marital Status

- Single
- Married

Section of NDFS 100

- 1 (T-Th, 8-9:15 am, Dr. Christensen)
- 2 (T-Th, 9:30-10:45 am, Dr. Christensen)
- 3 (T-Th, 1:35-2:50 pm, Dr. Brown)
- 4 (Th, 5-7:25 pm, Prof. Williams)

Do you now see or have your ever seen yourself as having an eating disorder?

- Yes, currently
- Yes, in the past but not now
- No

Pre-Survey for NDFS 201

ecSatter Inventory

Complete this brief research survey for 5 points in NDFS 201. Be sure you fill in your name and other brief demographic information at the end of the survey so you can be credited with the points. Each student's answers are combined with other students' answers to provide a general picture of students enrolled in NDFS 201. Your specific answers are not associated with your name.

	Always	Often	Sometimes	Rarely	Never
1. I am relaxed about eating.	○	○	○	○	○
2. I am comfortable about eating enough.	○	○	○	○	○
3. I enjoy food and eating.	○	○	○	○	○
4. I am comfortable with my enjoyment of food and eating.	○	○	○	○	○
5. I feel it is okay to eat food that I like.	○	○	○	○	○
6. I experiment with new food and learn to like it.	○	○	○	○	○
7. If the situation demands, I can "make do" by eating food I don't much care for.	○	○	○	○	○
8. I eat a wide variety of foods.	○	○	○	○	○
9.I assume I will get enough to eat.	○	○	○	○	○
10. I eat as much as I am hungry for.	○	○	○	○	○
11. I eat until I feel satisfied.	○	○	○	○	○
12. I tune in to food and pay attention to myself when I eat.	○	○	○	○	○
13. I make time to eat.	○	○	○	○	○
14. I have regular meals.	○	○	○	○	○
15. I think about nutrition when I choose what to eat.	○	○	○	○	○
16. I generally plan for feeding myself. I don't just grab food when I get hungry.	○	○	○	○	○

Demographics

Last Name

First Name

Age

Gender

- Male
- Female

Marital Status

- Single
- Married

Do you now see or have your ever seen yourself as having an eating disorder?

- Yes, currently
- Yes, in the past but not now
- No

Post-Survey for NDFS 100

Default Question Block

Last Name

First Name

Age

Demographics

Marital status

- Single
- Married

How often do you worry about having enough money for food?

- Always
- Often
- Sometimes
- Rarely
- Never

In the last 30 days, the food that I bought just didn't last, and I didn't have money to get more.

- Often true
- Sometimes true
- Never true
- Don't know

In the last 30 days, I couldn't afford to eat balanced meals.

- Often true
- Sometimes true
- Never true
- Don't know

In the last 30 days, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
-

No

- Don't know

In the last 30 days, how many days did this happen? (cutting the size of your meals or skipping meals because there wasn't enough money for food?)

- Number of days:
- Don't know

In the last 30 days, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
- No
- Don't know

In the last 30 days, were you ever hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- Don't know

Complete this brief research survey for 5 points in NDFS 100. Each student's answers are combined with other students' answers to provide a general picture of students enrolled in NDFS 100. Your specific answers are not associated with your name.

	Always	Often	Sometimes	Rarely	Never
1. I am relaxed about eating.	○	○	○	○	○
2. I am comfortable about eating enough.	○	○	○	○	○
3. I enjoy food and eating.	○	○	○	○	○
4. I am comfortable with my enjoyment of food and eating.	○	○	○	○	○
5. I feel it is okay to eat food that I like.	○	○	○	○	○
6. I experiment with new food and learn to like it.	○	○	○	○	○
7. If the situation demands, I can "make do" by eating food I don't much care for.	○	○	○	○	○
8. I eat a wide variety of foods.	○	○	○	○	○
9. I assume I will get enough to eat.	○	○	○	○	○
10. I eat as much as I am hungry for.	○	○	○	○	○

	Always	Often	Sometimes	Rarely	Never
11. I eat until I feel satisfied.	○	○	○	○	○
12. I tune into food and pay attention to myself when I eat.	○	○	○	○	○
13. I make time to eat.	○	○	○	○	○
14. I have regular meals.	○	○	○	○	○
15. I think about nutrition when I choose what to eat.	○	○	○	○	○
16. I generally plan for feeding myself. I don't just grab food when I get hungry.	○	○	○	○	○

Do you now see or have your ever seen yourself as having an eating disorder?

- ○ Yes, currently.
- ○ Yes, in the past but not now
- ○ No

Post-Survey for NDFS 201

Block 4

Last Name

First Name

Age

Demographics

Marital Status

- Single
- Married

How often do you worry about having enough money for food?

- Always
- Often
- Sometimes
- Rarely
- Never

In the last 30 days, the food that I bought just didn't last, and I didn't have money to get more.

- Often true
- Sometimes true
- Never true
- Don't know

In the last 30 days, I couldn't afford to eat balanced meals.

- Often true
- Sometimes true
- Never true
- Don't know

In the last 30 days, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
-

No

- Don't know

In the last 30 days, how many days did this happen? (cutting the size of your meals or skipping meals because there wasn't enough money for food?)

- Number of days:
- Don't know

In the last 30 days, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
- No
- Don't know

In the last 30 days, were you ever hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- Don't know

Complete this brief research survey for 5 points in NDFS 201. Each student's answers are combined with other students' answers to provide a general picture of students enrolled in NDFS 201. Your specific answers are not associated with your name.

	Always	Often	Sometimes	Rarely	Never
1. I am relaxed about eating.	○	○	○	○	○
2. I am comfortable about eating enough.	○	○	○	○	○
3. I enjoy food and eating.	○	○	○	○	○
4. I am comfortable with my enjoyment of food and eating.	○	○	○	○	○
5. I feel it is okay to eat food that I like.	○	○	○	○	○
6. I experiment with new food and learn to like it.	○	○	○	○	○
7. If the situation demands, I can "make do" by eating food I don't much care for.	○	○	○	○	○
8. I eat a wide variety of foods.	○	○	○	○	○
9. I assume I will get enough to eat.	○	○	○	○	○
10. I eat as much as I am hungry for.	○	○	○	○	○

	Always	Often	Sometimes	Rarely	Never
11. I eat until I feel satisfied.	○	○	○	○	○
12. I tune in to food and pay attention to myself when I eat.	○	○	○	○	○
13. I make time to eat.	○	○	○	○	○
14. I have regular meals.	○	○	○	○	○
15. I think about nutrition when I choose what to eat.	○	○	○	○	○
16. I generally plan for feeding myself. I don't just grab food when I get hungry.	○	○	○	○	○

Do you now see or have your ever seen yourself as having an eating disorder?

- ○ Yes, currently
- ○ Yes, in the past but not now
- ○ No