

# Orthorexia Nervosa, Weight Bias, and Adverse Childhood Events Among Nutrition Students

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## Abstract

Nutrition student education focuses on teaching future nutrition professionals how to assist clients in health promotion, but many students and professionals in the field display disordered eating tendencies and weight bias. Adverse childhood experiences (ACEs) are a risk factor for the development of eating disorders but have not been studied in this population. The aim of this study was to explore the prevalence and associations between orthorexia (ON), weight bias, and ACEs among nutrition students, and their perceptions of the impact of nutrition curriculum on their diet and body. A mixed methods survey consisting of sociodemographic questions, ON tendencies, weight bias, ACEs, and perceptions of curriculum content was distributed to university nutrition programs in 12 mid-southeast states with the U.S. Pearson's Chi-squared test, Fisher's exact test, Person's correlation test, and independent samples t-tests assessing the relationship between variables. Open-ended responses were analyzed using inductive analysis. Of 164 respondents, the majority were female (92.1%) and white (82.0%). The mean ORTO-R (measure of orthorexia tendencies) was 14.57, 49.4% had a dysfunctional family (exposure to at least one family dysfunction), and participants demonstrated moderate levels of implicit weight prejudice,  $M=0.42$ ,  $SD=0.38$ , denoting a significant level of bias ( $P<0.001$ ). Undergraduates reported significantly greater ON symptoms than graduate students ( $P<0.001$ ). No significant associations between ON, weight bias, and ACEs were present. From the open-ended responses, negative curriculum impacts were perceived guilt and shame, commonly from self-assessment activities. Positive curriculum impacts were most often an improved relationship with food and learning about body inclusivity. Nutrition students are future nutrition professionals who will interact with clients for health promotion. Policies and procedures to support nutrition students with disordered eating are warranted, along with adapting current curriculum content to decrease stigma and encourage food and body inclusivity.

**Keywords:** nutrition student, orthorexia, weight bias, adverse childhood events

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## Introduction

Maintaining healthy eating behaviors has been an established key strategy for preventing chronic disease and reducing mortality (Schulze et al., 2018). Nutrition

professionals, such as registered dietitians (RDs) and nutritionists, are trained in assisting clients with the promotion of health through dietary behavior change (Barr et al., 2004). Additionally, RDs services have been shown to be cost-effective and impactful for

clients with diabetes, disorders of lipid metabolism, and other chronic conditions (Slawson et al., 2013). However, despite the evidence-based impact nutrition professionals can have on health, many report engaging in disordered eating patterns (Alvarenga et al., 2012; Asil & Sürücüoğlu, 2015; Tremelling et al., 2017) or an eating disorder, (Drummond & Hare, 2012; Ozenoglu et al., 2015). The term disordered eating covers a range of problematic eating behaviors, ranging from dieting and extreme weight control methods (e.g., fasting, binge eating, and purging) (American Dietetics Association, 2006; de Matos et al., 2021; Slevic & Tiggemann, 2011; Wildes & Marcus, 2013) to clinically diagnosable eating disorders (anorexia and bulimia nervosa, binge eating disorder, avoidant restrictive food intake disorder, other specified feeding and eating disorder, pica and rumination disorder) as described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association [APA], 2013).

For example, orthorexia nervosa (ON), classified as an unspecified feeding and eating disorder in the DSM-5 (APA, 2013), is a fixation on eating healthfully, which may lead to malnourishment and poor quality of life (Donini et al., 2022; Özdengül et al., 2021; Scarff, 2017), and has a high prevalence among health sciences professionals and students (Yoon et al., 2022). Unspecified and other specified eating disorders are diagnoses that clinicians can provide when situations warrant a diagnosis, yet the eating patterns do not align with a currently available DSM-5 diagnosis category. Previous studies have shown associations between ON symptoms and disordered eating (Farchakh et al., 2019; Haddad et al., 2019; Oberle, et al., 2022; Parra-Fernandez et al., 2019), and a recent systematic review and meta-analysis reported a moderate relationship between ON and

eating disorders (Zagaria et al., 2022). While ON does not have an official eating disorder diagnosis, several characteristics of ON are generally agreed upon and include: excessive concentration on food quality, compulsive behaviors around food, imposed dietary restrictions, and mental preoccupation (Cena et al., 2019; Donini et al., 2022; Dunn & Bratman, 2016; Niedzielski & Kaźmierczak-Wojtaś, 2021; Özdengül et al., 2021; Scarff, 2017). Most studies on the prevalence of ON have been conducted outside of the U.S., and range from 12.8-81.9% for RDs (Alvarenga et al., 2012; Asil & Sürücüoğlu, 2015; Tremelling et al., 2017) and 3.4%-88.7% for nutrition students (Agopyan et al., 2019; de Souza & Rodrigues, 2014; Depa et al., 2017; Dittfeld et al., 2016; Grammatikopoulou et al., 2018; Gubiec et al., 2015). In a cross-sectional study of RDs across the U.S., 49.5% were at risk for ON, and 8.2% self-disclosed treatment for an eating disorder (Tremelling et al., 2017).

In addition to ON tendencies, research indicates a substantial weight-bias among physicians, nurses, dietitians, psychologists, nutritionists, exercise professionals, and medical students (Lawrence et al., 2021; Ryan et al., 2023). Experiencing weight stigma or bias is associated with mental distress, isolation, depression, poor body image, weight gain, eating disorders, and poorer outcomes related to employment, interpersonal relationships, and education (Kaufmann & Bridgeman, 2021). In a systematic review evaluating weight stigma by RDs and nutrition students, six out of eight studies reported an explicit or implicit bias against individuals in larger bodies (Jung et al., 2015). Additionally, in a separate systematic review evaluating weight bias among exercise and nutrition professionals, eight out of 11 studies found evidence of weight bias (Panza et al., 2018). Being stigmatized for weight has been found to be a predictor of unhealthy eating behaviors and a

lack of physical activity (Puhl et al., 2009; Vartanian & Shaprow, 2008). Stigmatizing individuals for weight in health care settings can lead to an avoidance of health care appointments and treatment, contributing to negative health outcomes (Cohen et al., 2008). This is concerning since nutrition professionals have been identified as a high-risk group for disordered eating and struggling with disordered eating and weight bias may affect the education provided to clients, resulting in impaired outcomes (Drummond & Hare, 2012).

Risk factors for the development of an eating disorder include: interpersonal communication (family and peer fat talk), food insecurity, disordered eating/dieting, adverse childhood experiences (Yoon et al., 2022), and body dissatisfaction (Preston & Ehrsson, 2018). Adverse childhood experiences (ACEs), traumatic events that occur under the age of 18, causing a plethora of health complications, have been linked with conditions such as eating disorders (Guillaume et al., 2016; Smolak & Murnen, 2002), with one study showing the greater the number of childhood trauma types experienced, the worse the eating disorder pathology (Guillaume et al., 2016). Eating disorder pathology can impact adolescents long term and contribute to increased weight stigma as they become adults (Kral & Rauh, 2010; Loth et al., 2014). Moreover, choosing a career in helping professions, such as nutrition, has been associated with childhood trauma (Bryce et al., 2023).

It is important to evaluate the prevalence of disordered eating patterns such as ON, co-occurrence of ACEs and ON, and the associations with weight bias among nutrition students, to better the future of the nutrition profession, to improve the quality and impact of services provided to their future clients (Grammatikopoulou et al., 2018), and to prevent additional barriers to health promotion. To our knowledge, there

are no existing studies that examine the relationship between ON tendencies and weight bias in nutrition students. It is crucial to measure the ON and weight bias tendencies in correlation with variables, such as ACEs, that possibly perpetuate these tendencies (Guillaume et al., 2016). This study attempts to address this gap in the literature by exploring the associations between ON, ACEs, and weight bias among university nutrition students in the mid-southeastern U.S.

This study has the following objectives: 1) describe characteristics of students in nutrition programs: demographics, ON tendencies, distribution of ACEs, body satisfaction, and weight bias, 2) explore associations among ON tendencies and weight bias, weight bias and ACEs, and 3) qualitatively explore the impact of nutrition curriculum content on student food and body satisfaction.

## **Methods**

### **Participants**

During the Fall of 2020, students enrolled in approximately 17 different undergraduate and graduate nutrition programs in 12 mid-southeastern states (NC, SC, GA, MS, TN, AL, AR, FL, VA, WV, MD, and PA) were invited to participate in an anonymous survey. Nutrition programs were identified through an internet search. Researchers contacted nutrition program directors and requested survey distribution via their nutrition student listservs. Program directors were provided with recruitment language and a link to the survey and were asked to distribute the survey to their student cohorts and forward to any other nutrition programs if desired. Any nutrition majors (dietetics, wellness, etc.) were eligible to participate. Program directors were encouraged to resend

the survey as a reminder one week after distribution. Informed consent was described at the beginning of the survey. This study was considered exempt by the Institutional Research Office at Appalachian State University.

## **Survey Description and Variables Measured**

Data were collected using a survey administered through Qualtrics (Qualtrics, Provo UT; August 2019). It took approximately 15-20 minutes to complete and contained questions on ON tendencies, weight bias, ACEs, sociodemographics, and four open-ended questions on nutrition curriculum. Content validity was confirmed independently by three nutrition professors/registered dietitians familiar with survey design and with topic expertise. The survey was piloted with nine nutrition students who did not participate in the final study. Changes were made based on pilot results and are noted below.

### ***ON Tendencies***

Student ON tendencies were measured using the validated ORTO-R tool (see Rogoza & Donini, 2021 for original items and scale validation;  $\omega = .75$ ), a six-question Likert tool which is an abbreviated version of the ORTO-15 and recommended as a better measure of ON compared to previous longer versions (Rogoza & Donini, 2021). The ON tendencies measure was created by summing the responses across all six survey items. The presence of ON symptoms was based on this scale. Higher scores suggest an increased tendency towards ON. Table 1 shows the 4-point Likert Scale used for all six survey items. Given the ON Tendencies is a sum of these six items, the maximum value it can have is 24 if “always” (rank=4) was selected for all six items.

Due to pilot results, four questions were altered slightly as students found the wording confusing or leading. For example, “would you agree that eating healthy food increases your self-esteem?” was changed to “do you believe that eating healthy food increases your self-esteem?” Final wording of questions can be found in Table 1.

### ***Weight Bias (IAT)***

Implicit, or automatic, weight bias was measured using the weight attitude Implicit Association Test (IAT; Greenwald et al., 1998). Implicit bias refers to more automatic forms of bias that may operate outside of an individual’s awareness (Greenwald & Banaji, 1995). Implicit bias measures provide a way to measure stigma with fewer concerns regarding social desirability response bias. The IAT is a timed word classification task which has been used to assess anti-fat bias among health professionals (e.g., Jungnickel et al., 2022). The weight attitude IAT measures the strength of associations between target groups (i.e., fat people/thin people) and evaluations (i.e., good/bad). Participants are presented with words and images belonging to the target groups (fat people, thin people, good words, bad words) and must sort these stimuli into the correct categories using only two response keys. For half of all trials, target categories share response keys with evaluative categories in ways that are congruent with cultural prejudices (e.g., fat people and bad words share a response key). On the remaining trials, response mappings are incongruent with cultural prejudice (i.e., fat people/good words are sorted with the same key). If a participant incorrectly categorizes a stimulus, a red X appears on the screen until the participant corrects their response. The order in which these trials are presented is counterbalanced to prevent order effects. The IAT is the most commonly used validated

measure of implicit bias (average  $\alpha = .80$ ; Greenwald & Lai, 2020). D-scores were calculated as a standardized difference in the average response times on prejudice incongruent trials minus congruent trials, following the recommendations of Greenwald et al. (2003). In other words, a score of 0 would indicate no difference in positive associations for fat versus thin people. A higher positive score indicates stronger implicit anti-fat prejudice, and a more negative score would indicate stronger pro-fat associations.

### **ACES**

Table 2 shows the ACEs items. Any ACEs were measured using the Behavioral Risk Factor Surveillance System ACE optional 11-item module (Gupta, 2022), which has been used to collect information on child abuse (physical, emotional, and/or sexual) and household challenges. Participants were asked to answer questions based on their past experiences (prior to 18 years of age). We defined four binary variables depicting any domestic abuse, physical abuse, emotional abuse, and sexual abuse. In each case, the variable took a value of one if the response to the specific abuse frequency questions was “once” or “more than once.” The binary variable related to any sexual abuse took a value of one if the response to at least one of the sexual abuse questions was “once” or “more than once.” A dysfunctional family was defined as exposure to at least one case of mental illness, alcoholism, drugs, incarceration, or divorce. This definition follows the literature on household dysfunction as including the experiences of substance abuse, mental illness, violence, and imprisonment (Campbell et al., 2016; Centers for Disease Control and Prevention, 2021; Talbot et al., 2016). It also includes a child's living environment that can damage their sense of safety, stability, and bonding, such

as growing up in a household with substance use or instability due to parental separation or incarceration of a parent, sibling, or other members of the household (Felitti et al., 1998; Merrick et al., 2019). Per King et al. (2024), the response options (never, once, and more than once) for items 6–11 (also in Table 2) are dichotomized to “Yes” (at least once - once or more than once) and “No” (never) to maintain consistency with the other ACEs items.

Table 2 shows the distribution of ACEs and types of abuse. Most respondents did not experience adverse events, but 49.4% identified as coming from a dysfunctional family. Of the types of abuse, respondents reported experiencing emotional abuse most commonly (43.3%), then domestic (16.5%), physical (15.2%), and sexual (12.8%).

### **Demographics**

Sociodemographic questions included gender identity, race, ethnicity, living arrangement, university status, major, employment, and income. Students were also asked how satisfied they were with their bodies using a 5-point Likert scale with the options “Very Dissatisfied,” “Somewhat Dissatisfied,” “Neutral,” “Somewhat Satisfied,” and “Very Satisfied.” Finally, open-ended questions explored student experiences in nutrition classes/assignments and any experiences which impacted their perception of food or satisfaction with their body. Due to pilot study results, these questions were made broader by focusing on “nutrition and health-related classes” to include all nutrition majors.

### **Data Analysis**

Data analysis was conducted using Stata 15 (StataCorp, College Station, TX; 2017) and RStudio version 2023.9.1.494 (Posit, Boston, MA; 2023). Out of the 165 students

who completed the survey, one was excluded due to the unique physiological and psychological changes that occur during pregnancy. For the first objective, we conducted descriptive statistics for the student population. Depending on sample size and scale of measure for objective 2, we used Pearson's Chi-squared test, Fisher's exact test, Person's correlation test, or independent samples t-tests to assess the relationship between the variables.

A qualitative inductive analysis approach was used to analyze the open-ended responses on nutrition classes/assignments (Thomas, 2006). Each question was analyzed separately. Responses were categorized based on a yes/no answer. For each question, two trained researchers with prior expertise in qualitative analysis read through responses multiple times to gain an understanding of the text. Segments of each response were labeled to create minor themes that emerged. Minor themes were grouped based on a major theme or broader issue. Responses were read through again, categories revised if needed, and any discrepancies were discussed and resolved.

## Results

Of the 164 respondents, most were female (92.1%) and 18-24 years old (71.3%). Around 82% of the students were White, 7.9% were Black/African American, and 4.9% Asian. 65 participants (39.6%) were graduate students, 91.5% were full-time students, and the majority (78.1%) were dietetic majors. The average ORTO-R score was 14.57, and 41.5% were somewhat satisfied with their body and 14.6% were very satisfied, while 23% were somewhat dissatisfied and 7.3% were very dissatisfied with their body. We also defined two binary variables on body satisfaction: (1) body

satisfaction took a value of one if the responses were either "Somewhat Satisfied" or "Very Satisfied," else zero; (2) body dissatisfaction took a value of one if the responses were either "Somewhat Dissatisfied" or "Very Dissatisfied," else zero. 56.1% of respondents stated they were satisfied with their body while almost 30% stated they were dissatisfied with their body. These measures are included in Table 3.

Of the ORTO-R questions (Table 1), respondents chose "always" or "often" most commonly for, "do you believe that eating healthy food increases your self-esteem" and least commonly for "are your dietary choices rigid and restrictive."

Figure 1 shows the distribution of the IAT. Out of 164 respondents, two participants responded with a high percentage of responses that were incorrect, or very fast (under 400 ms), indicating that they did not follow task instructions. These participants were excluded from analyses<sup>1</sup>. On average, participants demonstrated moderate levels of implicit weight prejudice,  $M = 0.42$ ,  $SD = 0.38$ . A one-sample t-test examining whether weight bias was statistically different from the neutral point, 0, indicated that this was a significant level of implicit bias,  $t(169) = 14.42$ ,  $p < .001$ , 95%  $CI$ : [0.36, 0.48].

## Presence of ON Tendencies and Participant Characteristics

Table 3 reports whether there are significant differences in presence of ON tendencies (mean of the ON variable) across participant characteristics. Undergraduate students demonstrated a statistically significantly greater presence of ON symptoms (average ORTO-R score = 15.3) compared to graduate students (average ORTO-R score = 13.4;  $p < 0.001$ ). Similarly,

there were no other indicators of responding without following directions.

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<sup>1</sup> These 2 participants were included in all other analyses, where they provided responses, as

**Table 1***ORTO-R Participant Responses and Distribution for Nutrition Students (n=164).*

<b>ORTO-R Questions</b>	<b>n</b>	<b>Percent</b>
<b>Are your dietary choices rigid and restrictive? (due to health, not medically necessary dietary restrictions)</b>		
Always (rank=4)	6	3.7
Often (rank=3)	18	11.0
Sometimes (rank=2)	83	50.6
Never (rank=1)	57	34.8
<b>Do you believe that eating healthy food increases your self-esteem?</b>		
Always (rank=4)	58	35.4
Often (rank=3)	52	31.7
Sometimes (rank=2)	49	29.9
Never (rank=1)	5	3.1
<b>Do you believe that strictly consuming only healthy food may improve your appearance?</b>		
Always (rank=4)	15	9.2
Often (rank=3)	39	23.8
Sometimes (rank=2)	66	40.2
Never (rank=1)	44	26.8
<b>In the last three months, did thoughts of food make you feel guilt, ashamed, and/or anxious?</b>		
Always (rank=4)	17	10.4
Often (rank=3)	42	25.6
Sometimes (rank=2)	59	36.0
Never (rank=1)	46	28.1
<b>Does thinking about food excessively worry you daily?</b>		
Always (rank=4)	21	12.8
Often (rank=3)	21	12.8
Sometimes (rank=2)	49	29.9
Never (rank=1)	73	44.5
<b>Does eating healthy food change your lifestyle (frequency of eating out, friends, etc.)?</b>		
Always (rank=4)	20	12.2
Often (rank=3)	39	23.8
Sometimes (rank=2)	62	37.8
Never (rank=1)	43	26.2

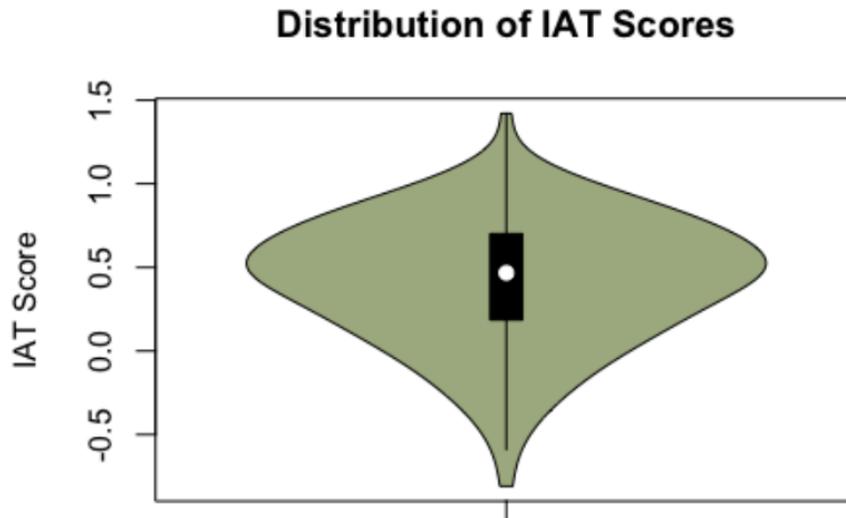
**Table 2***Adverse Childhood Events and History of Abuse for Nutrition Student Participants (n = 164).*

<b>Panel A: Distribution of Adverse Childhood Events</b>		
<b>Adverse Childhood Event</b>	<b>n</b>	<b>Percent</b>
Have you lived with someone who was depressed, mentally ill, or suicidal?		
Yes	57	34.8
No	92	56.1
Have you lived with anyone who was a problem drinker or alcoholic?		
Yes	30	18.3
No	119	72.6
Have you lived with anyone who used illegal street drugs or who abused prescription medications?		
Yes	23	14.0
No	126	76.8
Have you lived with anyone who served time or was sentenced to serve time in a prison, jail, or other correctional facility?		
Yes	8	4.9
No	141	86.0
Have you experienced parents getting separated or divorced?		
Yes	46	28.1
No	103	62.8
Any experience of a dysfunctional family (exposure to at least one of mental illness, alcoholism, drugs, incarceration, or divorce)		
Yes	81	49.4
No	83	50.6
<b>Panel B: Frequency of Exposure to Different Types of Abuse as a Child</b>		
How often have you experienced parents or adults in the home that ever slapped, hit, kicked, punched, or beat each other up? (domestic abuse)		
Never	122	74.4
Once	14	8.5
More than once	13	7.9
Have you experienced any domestic abuse? (Once/more than once)		
Yes	27	16.5
No	137	83.5
How often have you experienced a parent or adult in the home that ever hit, beat, kicked, or physically hurt you in any way (except spanking)? (physical abuse)		
Never	124	75.6
Once	12	7.3
More than once	13	7.9
Have you experienced any physical abuse? (Once/more than once)		
Yes	25	15.2
No	139	84.8

How often have you experienced a parent or adult in the home that ever swore at you, insulted you, or put you down? (emotional abuse)		
Never	78	47.6
Once	9	5.5
More than once	62	37.8
Have you experienced any emotional abuse? (Once/more than once)		
Yes	71	43.3
No	93	56.7
How often have you experienced anyone at least 5 years older than you or an adult that ever touched you sexually?		
Never	130	79.3
Once	12	7.3
More than once	7	4.3
How often have you experienced anyone at least 5 years older than you or an adult that tried to make you touch them sexually?		
Never	143	87.2
Once	4	2.4
More than once	2	1.2
How often have you experienced anyone at least 5 years older than you or an adult that forced you to have sex?		
Never	147	89.6
Once	1	0.6
More than once	1	0.6
Have you experienced any sexual abuse? (Once/more than once in at least one of the above 3 types of sexual abuse)		
Yes	21	12.8
No	143	87.2

**Figure 1**

*Violin Plot of the Distribution of Implicit Associations Test for Nutrition Student Participants (n=164).*



*Note.* Figure 1 represents a violin plot of IAT scores. A violin plot is a boxplot including the median (white dot) and interquartile range (black rectangle) but includes a visual representation of the frequency distribution of the variable (green area of the figure).

**Table 3**

*Presence of Orthorexia Tendencies across Participant Characteristics for Nutrition Student Participants (n=164).*

<b>Characteristic</b>	<b>N</b>	<b>ORTO-R Mean (SD)</b>	<b>P-value for difference in means</b>
<b>Gender</b>			<b>0.22</b>
Male	13	13.4 (2.8)	
Female	151	14.7 (3.7)	
<b>Race</b>			<b>0.08</b>
White	135	14.8 (3.6)	
Racial/Ethnic Minority	29	13.5 (3.6)	
<b>College level</b>			<b>&lt;0.001*</b>
Undergraduate	99	15.3 (3.4)	
Graduate student	65	13.4 (3.6)	
<b>Age Comparisons</b>			
18-24	117	15.0 (3.5)	<b>0.02*</b>
Older than 24	47	13.5 (3.7)	
<b>Body Satisfaction</b>			
Somewhat Satisfied/Very Satisfied	92	13.3 (3.7)	<b>&lt;0.001*</b>
Neutral/Somewhat Dissatisfied/Very Dissatisfied	72	16.2 (3.1)	
Somewhat Dissatisfied/Very Dissatisfied	49	16.8 (3.7)	<b>&lt;0.001*</b>
Neutral/Somewhat Satisfied/Very Satisfied	115	13.6 (3.2)	
<b>Adverse Childhood Events</b>			
Mental illness	57	14.7 (3.2)	<b>0.63</b>
No mental illness	92	14.4 (3.8)	
Alcoholic	30	15(3.3)	<b>0.40</b>
Not alcoholic	110	14.4 (3.6)	
Drugs	23	14.7 (2.5)	<b>0.83</b>
No drugs	126	14.5 (3.7)	
Incarceration	8	14.8 (4.7)	<b>0.84</b>
No incarceration	141	14.5 (3.5)	

Divorce	46	14.4 (3.2)	<b>0.80</b>
No divorce	103	14.6 (3.7)	
Dysfunctional family	81	14.5 (3.3)	<b>0.75</b>
No dysfunctional family	83	14.7 (3.9)	
Domestic abuse	27	15.7 (3.5)	<b>0.07</b>
No domestic abuse	137	14.3 (3.6)	
Physical abuse	25	15.8 (3.6)	<b>0.07</b>
No physical abuse (139)	139	14.4 (3.6)	
Emotional abuse	71	14.9 (3.7)	<b>0.36</b>
No emotional abuse	93	14.3 (3.6)	
Sexual abuse	21	14.6 ( 3.5)	<b>0.99</b>
No sexual abuse	143	14.6 (3.7)	

*Note.* \* Significant

**Table 4**

*Nutrition Students' Reported Perceptions of Nutrition Curriculum and Impacts to their Food Intake and Body (n=164).*

Questions	Frequency	Major Themes	Sub-Themes	Selected Quotes
Throughout your nutrition journey, have any of your classes (nutrition and health-related) and/or assignments <b>negatively</b> impacted the way you perceive <b>food</b> ? If yes, which ones and how did they impact the way you perceive food? (n=148)	Yes n=52 (35.1%)	Emotional Well-being n=32 (61.5%)	Guilt and shame (36.5%)	"...my [Intro class] had an assignment in which we had to track our food for 3 days and had to put in data about our weight, how much we eat, height, .....to me it felt degrading and uncomfortable.... and for my teacher to make us do something like that felt humiliating/embarrassing."
			Fear of nutrition implications (17.3%)	"intro nutrition classes made me much more nervous about food and health relationships"
			Triggering of previous disordered eating (7.7%)	"...my [Intro course] required the students to keep a food log as well as our daily amounts of nutrients consumed compared to the recommendations, and as someone trying to recover from a restrictive eating disorder, it was not helpful to see that my intake of certain nutrients/calories were higher than average."
		Reinforcement or Impact to Philosophy n=18 (34.6%)	Dichotomous thinking (21.1%)	"Introduction to Nutrition provided a very black and white view of healthy/unhealthy foods and body sizes."
			Weight centrism (13.5%)	"...in general my nutrition classes have demonized fat and normalized skinny culture. We are always trying to "help" people who are "obese or overweight" which puts an inherent bad label on fatness."
		Harmful Behavior Change n=18 (34.6%)	Diet restriction (19.2%)	"...It seemed as though only "healthful" foods were allowed and made me become more rigid with my diet and not allowing myself to have fun foods and things that would make me happy."
			Obsessive thoughts (15.4%)	"I think that sometimes I get to be a little more unsure of how many calories I should be taking in and I find myself

				often times obsessing over the amount of food that I intake a day.”
Throughout your nutrition journey, have any of your classes (nutrition and health-related) and/or assignments <b>positively</b> impacted the way you perceive <b>food</b> ? If yes, which ones and how did they impact the way you perceive food? (n=150)	Yes n=137 (91.3%)	Personal Impact n=77 (56.2%)	Relationship with food (37.2%)	“my nutrition classes have helped me gain a better relationship with food which was the opposite of what I thought would happen. They helped me see food as a necessity and practice moderation and variation instead of being so strict with myself.”
			Shift in food/social values (15.3%)	“...the food policy class I am currently enrolled in. It has opened my eyes to inequalities in the food system and shown how the current societal standard of "healthy eating" is a privilege.”
			Dietary behaviors (3.6%)	“Intro to nutrition educated me on general nutrition principles and I started trying to eat a more balanced diet and include more vegetables.”
		Knowledge Impact n=66 (48.2%)	Cognitive food knowledge (20.4%)	“...positively impacted the way I perceive food by making it more of a science and explaining how the food effects your body and what your body needs.”
			Dispelling false claims (19.0%)	“...learning that there are no bad food[s], just different nutritional values. This saw I could stop seeing foods as bad or good.”
			Skills and self-efficacy (8.8%)	“The cooking assignments have helped me and my culinary skills.”
Throughout your nutrition journey, have any of your classes (nutrition and health-related) and/or assignments <b>negatively</b> impacted the way	Yes n=42 (28.6%)	Emotional Well-being n=30 (71.4%)	Guilt and shame (52.4%)	“... we were asked to calculate our own ideal body weight and our own BMI. Mine were on the high end of normal and it made me feel very nervous about my own body. I felt like I needed to make a change in my life to change my body and make it fit into these categories better.”
			Societal expectations (19.0%)	“... when I declared the nutrition major, I felt out of place because I live in a larger body compared to other people that are in the major. I kind of felt like I didn't belong.”

you perceive your <b>body</b> ? If yes, which ones and how did they impact the way you perceive your body? (n=147)		Harmful Behavior Change n=5 (11.9%)	Diet restriction (7.1%)	“... the food tracking and evaluation of my own diet during basic nutrition was very disheartening for me. I hyper focused on what I was eating, and continued tracking my diet with MyFitnessPal.”
			Obsessive thoughts (4.8%)	“Assessment labs mess me up in the head. I don't think I am someone who should know my body fat % or someone who should be exposed and pinched with calipers. I do it to learn and to become a dietitian but it gives me extreme anxiety and affects me for weeks.”
Throughout your nutrition journey, have any of your classes (nutrition and health-related) and/or assignments <b>positively</b> impacted the way you perceive your <b>body</b> ? If yes, which ones and how did they impact the way you perceive your body? (n=139)	Yes n=66 (47.5%)	Knowledge Impact n=34 (51.5%)	Shape does not equal health (31.8%)	“I've learned that health can come in all sizes. You don't have to look a certain way or be a certain body type in order to be healthy.”
			Body appreciation (19.7%)	“I have learned that fueling my body with a balance of nutrient-dense foods and energy-dense foods will positively impact my health and how my body will perform.”
		Personal Impact n=23 (34.8%)	Positive body image (30.3%)	“...health counseling class has required me to do a lot of introspection/reflection that has led me to appreciating my body more and having a more positive outlook. I still have a lot of work to do in this area, but it has improved.”
			Relationship with food (4.5%)	“The ethnic restaurant and travel TV assignments have given me an appreciation for food outside of health benefits. They reminded me that I became a nutrition major because I like food.”

the youngest age group (between 18-24) demonstrated the greatest presence of ON symptoms, with an average ORTO-R score of 15.0 compared to 13.6 for the student population older than 24 ( $p = 0.02$ ), which likely includes more graduate students than undergraduates. Students who were dissatisfied with their bodies had the highest ORTO-R average score (16.8) compared to students not dissatisfied (13.8) ( $p < 0.001$ ). Based on a chi-squared test, we found no significant association between ON tendencies and any measure of ACEs among students who responded to our survey.

### **Association Between ON Tendencies and Weight Bias (IAT)**

Based on Pearson's product moment correlation, we found no significant association between ON tendencies and weight bias among students who responded to our survey,  $r(160) = 0.004$ ,  $P = 0.96$ , 95% *CI*: [-0.15, 0.16].

### **Association Between ACEs and Weight Bias (IAT)**

Four separate independent samples t-tests (two-tailed) were used to examine whether there were differences in IAT scores based on domestic, physical, emotional, and sexual ACEs. No test yielded a significant effect at the conventional .05 level, but there was some evidence of differences in IAT scores based on physical ACEs at the .10 level. Participants who had experienced physical ACEs demonstrated less implicit weight bias ( $M = 0.29$ ,  $SD = 0.41$ ), than children who had this type of adverse experience,  $M = 0.44$ ,  $SD = 0.37$ ,  $t(160) = 1.92$ ,  $P = 0.06$ , 95% *CI*: [-0.004, 0.30],  $d = 0.40$ . There was no evidence that weight bias differed based on domestic, sexual, or emotional ACEs, all  $p$  values  $> .14$ .

## **Qualitative Open-Ended Responses**

Responses are described in Table 4. Some participants reported a class and/or assignment had negatively impacted their perception of food (52/148) and their body (42/147). However, others reported a class and/or assignment had positively impacted their perception of food (137/150) and body (66/139).

Impact to their emotional well-being was the most common negative response theme overall ( $n = 62$ ). Of the emotional well-being responses, statements of guilt and shame were the most commonly reported sub-theme for both perceptions of body and food. Statements were commonly around completing assignments to track and analyze their dietary habits or personal body composition measurements.

Personal impact ( $n=100$ ) and knowledge impact ( $n=100$ ) were major themes for positive response categories. For positive personal impacts for student perceptions of food, the most common sub-theme was an improved relationship with food, and for student perceptions of their body, the most common sub-theme was an improved body image. For positive knowledge impacts on perceptions of food, the most common sub-theme reported was increased food knowledge, and the most common sub-theme for changes to perception of the body was learning about one's shape, not equaling health status.

## **Discussion**

Despite its importance, the prevalence of ON and weight bias among nutrition students remains an understudied area, as do potentially influencing factors. Previous studies have established higher rates of eating disorder tendencies in nutrition students (Agopyan et al., 2019; de Souza & Rodrigues, 2014; Depa et al., 2017; Dittfeld

et al., 2016; Grammatikopoulou et al., 2018; Gubiec et al., 2015). It is not well understood if ON tendencies are prevalent among students prior to choosing their nutrition major, and/or if nutrition courses foster tendencies due to curriculum topics such as diet, food, and health. In a previous study (Hughes & Desbrow, 2005), approximately 30% of students reported choosing nutrition due to experiences with obesity, eating disorders, or both, meaning students were already interested in these topics. However, the results of the present study suggest that ON tendencies may be perpetuated or fostered for some, as students reported feelings of guilt and shame, dietary changes, and impacts to how they view food and their bodies due to courses or assignments, specifically self-assessment assignments. On the other hand, many reported increased positive perceptions of food and their body in relation to topics or assignments focused on balance, moderation, and holistic health. Diet and physical assessments are an important skill in nutrition education; however, in light of these results, students might benefit from completing assessments on case studies or example clients, instead of themselves.

While only around 30% of students reported body dissatisfaction, through the answers to the open-ended questions, many reported feeling societal pressure to be thin and eat healthy because of their major. This is in line with other studies revealing that nutrition students and professionals believe controlling their weight will provide more credibility (Atkins & Gingras, 2009; Mahn & Lordly, 2015). Previous studies have reported the majority of nutrition students are at a normal body mass index but have a degree of body dissatisfaction (de Souza & Rodrigues, 2014). This is not unique to nutrition students, especially female students (Mahn & Lordly, 2015); however, they may, again, be often required to complete self-assessments because of the importance of dietary and

physical activity assessments in standard nutrition undergraduate and graduate education.

Almost half of our participants identified as growing up in a dysfunctional family and experiencing emotional abuse. However, our study did not find any significant relationship between ACEs and ON but did find marginal associations between ACEs and ON for domestic and physical abuse (both with  $p$  values = 0.07). Previous studies have established a relationship between childhood trauma and eating disorders (Guillaume et al., 2016; Kovács-Tóth et al., 2022), and a positive correlation between ACEs and food anxiety, chronic dieting, and binge eating (O'Connor et al., 2023). Due to this overlap of tendencies shared between ACEs and ON, future studies may reveal a relationship. Currently, however, ACEs in relation with ON specifically are not well understood or studied and were recently identified as a future direction in eating disorder research (Kovács-Tóth et al., 2022). Our findings support the need for more research on the connection between childhood trauma, ON, and choosing nutrition as a profession.

In this study, students demonstrated significant and moderately strong implicit weight bias on par or higher than levels in other studies of medical providers (Baker et al., 2017; Phelan et al., 2014). While there was not a significant association with weight bias and ON or ACEs in this study, there were significant relationships between body perception and ON tendencies. This is particularly concerning when coupled with higher rates of eating disorders in the nutrition profession (Alvarenga et al., 2012; Asil & Sürücüoğlu, 2015; Tremelling et al., 2017) and since nutrition professionals are charged with promoting health and preventing disease in the general population (Cohen et al., 2008; Puhl et al., 2009). With higher rates of weight bias and eating disorders, it is important to address weight

bias in nutrition curriculum and in professional development activities.

Because this study and others have shown a higher incidence of ON tendencies, weight stigma, and shame reported around food and body shape, particularly among nutrition students, programs could explore shifting curricula to focus on approaches that center on health rather than weight. Weight inclusive curricula, such as Health at Every Size (HAES), has a non-diet approach and focuses on body acceptance, internal hunger and fullness cues, and intrinsic benefits of physical activity. In a study by Humphrey et al. (2015), students enrolled in a HAES course had improved intuitive eating, body esteem, reduced anti-fat bias, and reduced dieting behaviors compared with control and comparison groups. Additionally, in a review evaluating effective practices for reducing weight stigma (Talumaa et al., 2022), interventions including HAES were successful in decreasing explicit bias. Other strategies that have been documented to reduce weight bias among nutrition students have included simulating a calorie-restricted diet for the development of empathy (Cotugna & Mallick, 2010) and anti-stigma films (Swift et al., 2013). Students may benefit from replacing traditional weight-focused course topics with a non-diet curriculum or developing entire courses on weight inclusive concepts. It is critical to implement weight bias education and training into the nutrition field in order to protect future clients who might receive inadequate health care if the nutrition professional is biased (Puhl et al., 2009).

Strengths of this study were data collection from multiple states in the U.S. and the inclusion of undergraduate and graduate students. However, in order for participants to remain anonymous, we did not collect the specific programs represented by each student, only their state and county. Additionally, researchers were dependent on

program directors to send out the survey. Choosing to participate in the survey is a bias that may have increased or decreased due to ON tendencies, ACEs, or weight stigma and could partially explain the small sample size. Choosing to participate could also have been limited due to the sensitive nature of the questions. Students or the program directors may have been more or less inclined to participate due to their personal feelings or experiences in these topic areas. Many questions relied on self-reported information, and there was a lack of response on every question. Also, the number of male and non-white participants was very small despite being representative of the typical nutrition student population. A major strength and novel contribution of this study is its examination of the association between ON tendencies and ACEs which, thus far, has been limited in the literature. The findings of the study warrant future exploration and could assist with the understanding of eating disorder tendencies in this vulnerable population.

### **Implications for Health Behavior Research**

This study provides a deeper, novel understanding of ON tendencies and weight bias in the presence of ACEs among nutrition students, with important implications for both health behavior research and health behavior fields. The students in this study, as in existing research, showed a prevalence of ON, weight bias, internalized societal pressures for thinness, and were exposed to curricula focused on diet, food, and health consequences. Three major themes emerged from this study that are at once gaps in the existing literature and potentially provide guidance to inform theory building, practice, policy, or future research.

First, student responses, similar to other studies, highlight a need for more supportive

learning environments that incorporate food and body inclusive language. Further research should investigate how to effectively incorporate such language in curriculum development and course delivery for this student population, which is potentially more vulnerable to these pressures.

Second, this study highlighted specific nutrition curriculum components that could be adapted or limited (food and body self-assessments) in order to mitigate students' negative perceptions of themselves and negative health behaviors. Future research could explore conducting assignments with case study formats or using a mock client instead of personal information as more effective approaches to promote nutrition education. These approaches will further help students focus on skill building instead of their own affirmation of diet or body size which require the use of their personal information.

Finally, there is a need to tailor curriculum assignments that are designed to reduce weight stigma. Additionally, it is critical that academic policies and procedures are set up to support students with disordered eating tendencies. Health professionals and university policy makers should utilize these findings to implement changes in the approach to providing education to health students. Future health professionals equipped with tools needed to identify and address disordered eating tendencies and weight bias, especially in the context of ACEs, will be able to provide the best quality of care to their future clients, with or without such vulnerabilities. Faculty should be aware and monitor potential disordered eating tendencies of students and should be equipped with the tools necessary to support these students.

## Discussion Questions

Our findings indicate that using personal information for diet and food assessments was harmful for some students. Other than utilizing a case study and/or mock clients for assessment teaching, what other methods of instruction or evaluation could health fields implement to build important assessment skills for students?

How does society pressure those in health fields to be thin? Why do you think that is, and how have you seen it portrayed in the media or in your everyday life? How can health professionals combat this type of pressure?

**Ethics approval:** This study was deemed exempt by the Appalachian State University Institutional Review Board.

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