# Stress and Eating Behaviors of Dietitians Amidst the COVID-19 Pandemic

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## Abstract

Stress and Eating Behaviors of Dietitians Amidst the COVID-19 Pandemic

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**Background:** Registered dietitians (RDs) encounter numerous work-related stressors from a multitude of sources amidst the COVID-19 pandemic. High stress has been identified as a risk factor for orthorexia nervosa (ON), a form of disordered eating characterized by a compulsive focus on eating foods perceived as healthy. Stress has also been tied to lower eating competence.
**Objective:** To determine the relationships between stress experienced by RDs, eating competence, and risk for ON amid the backdrop of COVID-19.
**Design:** A cross-sectional study was used to compare Perceived Stress Scale (PSS-14), ORTO-15 Questionnaire (ORTO-15), and Satter Eating Competence Inventory 2.0 (ecSI 2.0™) scores computed from participant responses to understand how prevalence of stress, risk for ON, and

eating competence in RDs relate to one another. Independent sample *t*-tests, Pearson's correlation coefficient, and two-way ANOVA were used to compare scores.

**Participants:** A random sample of 5,000 RDs in the United States were invited to complete an online survey; 155 responses were received.

**Results:** Scores for the final sample (*N*=83) suggested 63.9% had high stress, 61.4% were at risk for ON, and 80.7% were eating competent. Statistical analysis revealed a negative association between stress and eating competence, but no relationship between stress and ON risk. Risk for ON and eating competence were positively associated.

**Conclusions:** In this sample, stress was not related to ON but was negatively associated with eating competence. Further exploration of the relationship between stress and eating competence in RDs is warranted and may offer insight into addressing stress in the dietetics profession. The positive association between ON risk and eating competence may imply the presence of healthy orthorexia, or a non-pathological focus on eating healthfully, in RDs. The simultaneous existence of eating competence and maladaptive eating behaviors calls for future research into the relationship between ON and eating competence in RDs to provide a more precise differentiation between ON and healthy orthorexia.

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## INTRODUCTION

In late 2019, a novel coronavirus (COVID-19), which caused symptoms characterized by shortness of breath or difficulty breathing, fever, cough, and new loss of taste or smell, emerged out of Wuhan, China.[1,2] It quickly spread worldwide and as of this writing (December 15, 2021) there have been 270,791,973 confirmed cases and 5,318,216 deaths caused by COVID-19.[3] Both of these figures are expected to rise as spread of the virus continues at pandemic proportions.

During viral outbreaks, many people experience stress which can influence behavior during such outbreaks.[4] Stress is termed by the American Psychological Association (APA) as "the physiological or psychological response to internal or external stressors and can be manifested by palpitations, sweating, dry mouth, shortness of breath, fidgeting, accelerated speech, amplification of negative emotions, and fatigue." The APA further describes stress as contributing to psychological and physiological disorder and disease, affecting mental and physical health, and reducing quality of life.[5] One instrument for measuring individual stress levels is the Perceived Stress Scale (PSS-14). It is a questionnaire renowned for its validity and reliability across diverse samples since its development in 1983.[6,7] Stress has expectedly increased in populations across the globe amidst the COVID-19 pandemic.[8-10] Stress has further been found to be associated with maladaptive eating behaviors and disordered eating, both of which have also been observed to be on the rise during the pandemic.[11-17]

One population facing stress-induced challenges amid the backdrop of the pandemic is registered dietitians (RDs), many of whom are on the frontlines providing medical nutrition therapy to those infected with COVID-19. These stressors include increased workload, fears of contracting the virus or their families becoming infected, working with personal protective equipment, adapting to new and frequently changing protocols, caring for very sick patients, and

caring for colleagues who have fallen ill.[18] There is further evidence of work-related stressors that RDs experience that extend beyond those related to COVID-19. In previous studies, RDs have cited lack of respect from healthcare teammates, having their work undermined or ignored, being perceived as the "food police", and the need to be up to date on evidence-based nutrition as well as diet fads and myths as factors leading to bouts with stress.[19,20] Registered dietitians who serve as preceptors to dietetic interns face additional stressors such as the need to convince employers of the value of a dietetic preceptor, not being recognized for their efforts, and lack of time and pressure to balance their own workload and their precepting workload.[21,22]

Research suggests that a connection between stress and disordered eating arises early in health profession training and tends to linger throughout careers.[23-26] Additionally, a recent meta-analysis of 40 studies measuring the prevalence of stress in healthcare workers found an overall prevalence of 43% with the prevalence among the individual studies as high as 84%.[27] Given this frequency of stress and association between stress and maladaptive eating behaviors in health professionals, there is concern for the development of these behaviors in RDs experiencing stress. This is alarming as there is an estimated 49.5% prevalence of disordered eating behaviors, particularly orthorexia nervosa (ON), among RDs in the United States and a 41.9% to 81.9% prevalence worldwide.[28-31]

Orthorexia nervosa has no universally shared definition, but the core symptom of ON is compulsive and unsafe focus on eating foods perceived as healthy.[32] Orthorexia nervosa is characterized by restrictive, self-imposed inflexible dietary rules, persistent preoccupations related to food, and obsessive behaviors consequently resulting in medical or psychological complications such as malnutrition, anxiety, and/or functional impairment.[32,33] These

characterizations highlight the abnormal relationships with food and adverse health outcomes individuals with ON can have even if it is not distinctly classified as an eating disorder.[34]

The relationship between stress and ON has been studied by Kinzl et al[30], who examined the factors underlying ON in RDs and found that the reduced ability to cope with stress contributed to RDs changing their eating behaviors to those they perceive as healthy. There is evidence that the unhealthy eating behaviors associated with ON may contribute to significant amounts of stress, creating a cycle of psychological and physical impairment and stress.[35] Although many ON assessment tools exist, the ORTO-15 Questionnaire (ORTO-15) is one of few that has been widely used and deemed valid and reliable from multiple studies across the globe.[36-40] In addition, the ORTO-15 has also been evaluated for its diagnostic value, and considered satisfactory for its sensitivity, specificity, positive predictive value, and negative predictive value.[41]

While ON entails an obsessive relationship with healthy eating and maladaptive eating behaviors, another concept of orthorexia known as healthy orthorexia involves a healthy interest in diet, healthy eating behavior, and eating healthfully as part of one's identity in the absence of maladaptive eating behaviors.[42,43] The eating styles of ON and healthy orthorexia further differ in that ON has been found to be associated with eating disorder symptoms and weight control as the main motive for dietary choices while healthy orthorexia has been observed to be inversely associated with symptoms of disordered eating with health-related consequences of what is eaten as the motivation for dietary choices.[44,45] Orthorexia nervosa and healthy orthorexia are theorized to exist as part of a continuum with healthy orthorexia as a healthy diet being at one extreme and ON with an excessive fixation on healthy eating habits being at the other extreme.[46] These characteristics can also be described as stages in the development of ON. Healthy

orthorexia is considered the first stage as a simple preference to eat healthy while ON is the final stage deemed an unhealthy obsession with eating a healthy diet. Movement along the continuum occurs when pathological features such as obsessive thinking, compulsive behavior, and mounting self-imposed diet restrictions develop in frequency, intensity, and duration. This shift between stages can be gradual or dramatic.[47]

However, distinguishing between healthy orthorexia and ON is not absolute as there is evidence that higher scores for probable ON are associated with healthier eating.[48] This is of interest in studying the eating behaviors of RDs as they may be more susceptible to ON given a large focus is placed on food choices in both the development of ON and the work of RDs.[28] Moreover, ON has been recorded as being more common in RDs than the general population.[29-31]

Though not explicitly related to ON or healthy orthorexia, an evidence-based concept pertaining to eating behaviors is eating competence, based on the Satter Eating Competence Model (ecSatter). Eating competence is defined as "being positive, comfortable, and flexible with eating as well as matter-of-fact and reliable about getting enough to eat of enjoyable and nourishing food." There are four domains of eating competence: eating attitudes, food acceptance, internal regulation of food intake and body weight, and management of food and contextual skills.[49] Eating competence is assessed using a validated instrument known as the Satter Eating Competence Inventory 2.0 (ecSI 2.0™). Individuals who score at least 32 out of 48 on the ecSI 2.0™ are considered to be eating competent.[50] Being eating competent has been associated with a multitude of positive eating behaviors and health measures. Those determined to be eating competent consume a diet of higher nutrition quality and eat more fruits and vegetables.[51] They also are less likely to have metabolic syndrome and more likely have better insulin sensitivity.[52] Furthermore, eating competence is associated with positive body image,

less restrictive eating, healthier sleep patterns, and better social and emotional well-being.[51-59] As yet, ecSI 2.0™ has not been used to measure eating competence exclusively in RDs, thus the prevalence of eating competence in RDs is unknown. Prevalence of eating competence among various adult populations in the United States ranges from 41% to 60%.[51,56-58,60-62]

To date, there have been few studies on the relationships between stress and ON and eating competence; and none exclusively in RDs. Four studies have analyzed the association between stress and ON using different assessment tools and with mixed results. Three of the studies used the PSS-14 or some variation and all used orthorexia tests other than the ORTO-15, with Strahler[63] and Strahler et al[64] finding a moderate positive association between the two variables and Stutts[65] finding no association. The fourth study by Greetfeld et al[66] did not use the PSS-14 but found a moderate positive association between stress and ON.

A study published in Finland compared stress levels and eating competence using PSS-14 and ecSI 2.0™ and found higher perceived stress was associated with lower eating competence among overweight and obese adults. Further findings indicated those with high perceived stress were less likely to eat and drink according to hunger and satiety and more so by emotions and external cues. Additionally, those with the highest level of perceived stress had significantly lower contextual skill subscores.[67]

One study in the United States examined the relationship between ON and eating competence, although only ecSI 2.0™ subscores were measured. Findings denoted higher levels of ON behaviors were associated with less positive eating attitudes and lower internal regulation of food intake but were not related to the domains of food acceptance or contextual skills.[68] To the best of our knowledge, there have been no formal studies analyzing the relationship between ON and ecSI 2.0™ total scores. This study seeks to address this gap in the literature and the

underexplored relationship of stress and eating behaviors of RDs by examining whether stress is related to ON and eating competence in a sample of RDs from the United States. Registered dietitians are a population of interest in testing these relationships given they are noted to encounter stress and may be at greater risk for developing ON and disordered eating due to the nature of their work with food, nutrition, and eating behaviors.

The primary aim of this study was to explore if stress experienced by RDs is associated with risk for ON and/or eating competence. A secondary objective was to determine if a relationship exists between ON risk and eating competence. Understanding the relationships between stress, ON, and eating competence in RDs may aid in addressing stress, disordered eating, and maladaptive eating behaviors in the dietetics profession.

## METHODS

### Participants

A proposal was submitted to the Academy of Nutrition and Dietetics (AND) credentialing agency, the Commission on Dietetic Registration (CDR), as part of a request to access the RD database. A random sample of 5,000 e-mail addresses of credentialed RDs throughout the United States was provided by CDR. Each RD received an e-mail consisting of a brief description of the study and invitation to participate, which provided a link to the research survey. Participation demonstrated consent and no identifying information was collected. Respondents were included in the study if they were employed as an RD for at least one year as of January 1, 2020, reported they did not have a previous eating disorder diagnosis, were not currently pregnant or lactating, and reported working at least one hour outside the home as an RD. Participation was voluntary and participants received no compensation for their

participation. The Human Subjects Division at the University of Washington determined that this study was exempt from full board review.

**Survey Development**

A cross-sectional, web-based survey was developed using Qualtrics [Computer software]. July 2021 Version. Provo, UT: Qualtrics; 2021. The survey was distributed via e-mail in July 2021 and participants were given two weeks to complete the survey. The survey consisted of 51 questions: 50 multiple choice and one text entry. Each participant answered demographic questions related to working conditions regarding weekly hours of employment outside the home and primary work setting as an RD as well as experience with state-issued stay-at-home orders in the last six months. Forty-five questions were from the PSS-14, ORTO-15, and ecSI 2.0™.

**Instruments and Scoring**

Fourteen questions in the survey were from the PSS-14. Questions in the PSS-14 ask respondents to measure how often they felt or thought a certain way in the previous month in situations where stress can be elevated. Questions are not specific to food or eating behaviors. Likert scale response options for each question are in the order of Never, Almost never, Sometimes, Fairly often, Very often. Assigned scores for each response differ by question. Questions 1, 2, 3, 8, 11, 12, and 14 are scored from 0 (Never) to 4 (Very often). Questions 4, 5, 6, 7, 9, 10, and 13 are scored in the reverse direction. The PSS-14 has a score range of 0 to 56 with a higher score indicative of greater perceived stress.[6] There are no standard cutoff scores in the PSS-14 as it is not a diagnostic tool. For the purpose of this study, participants were dichotomized using a threshold PSS-14 score of 20, with scores of 0 to 19 grouped into the low

stress group and scores of at least 20 grouped into the high stress group. This methodology was based on the mean PSS-14 score of 19.62 in the validation study of the instrument, though the original authors did not consider this mean as a cutoff of low versus high stress.[69]

There were 15 questions in the survey from the ORTO-15. The ORTO-15 asks questions regarding the attitudes of respondents in choosing, buying, preparing, and consuming food they consider to be healthy.[70] Likert scale response options for each question are in the order of Always, Often, Sometimes, Never, with each option having an assigned score from 1 to 4. Assigned scores for each response vary by question. Response score values for Questions 3, 4, 6, 7, 10, 11, 12, 14, and 15 are in ascending order while Questions 2, 5, 8, and 9 are scored in descending order. Responses for Questions 1 and 13 are scored in the order of 2, 4, 3, 1 (i.e., Always=2, Often=4, Sometimes=3, Never=1). The ORTO-15 has a score range of 15 to 60 with a score below 40 indicating high risk for ON and a score greater than or equal to 40 indicative of normal eating behavior.[41]

The survey contained 16 items for the ecSI 2.0™. The format of ecSI 2.0™ consists of statements about eating related to each of the four domains of eating competence. Individuals express their responses using a Likert scale with response options for each statement in the order of Always, Often, Sometimes, Rarely, Never. Score values of responses for every statement are in the order of 3, 2, 1, 0, 0, respectively. The total possible score is 0 to 48. A total score of 32 or higher indicates eating competence.[50]

Each question in the survey allowed one answer only. Respondents who did not reply to every PSS-14, ORTO-15, and ecSI 2.0™ question in the survey were excluded as this negated the validity of their scores, i.e., total scores could not be determined. The estimated time to complete the survey as determined by Qualtrics was 8.1 minutes.

## Statistical Methods

Response data was analyzed using Qualtrics and Microsoft Excel [Computer software]. Version 16.52. Redmond, WA: Microsoft Corporation; 2021. Statistical comparisons between mean scores of the three questionnaires for the categorical variables of experience with stay-at-home orders and hours worked per week were performed using independent sample *t*-tests. A one-way ANOVA test was applied to compare score means between categories of work settings as an RD. Independent sample *t*-tests were used to compare means for the dependent variables, ORTO-15 and ecSI 2.0™ scores, between the stress level groups, with PSS-14 score as the independent variable. Scores for PSS-14, ORTO-15, and ecSI 2.0™ were further analyzed by a two-way ANOVA test and Pearson's correlation coefficient (*r*). A *P* value <0.05 was considered statistically significant.

## RESULTS

A total of 155 RDs responded to the survey for a response rate of 3.1%. Sixty-three respondents did not meet inclusion criteria. Two respondents chose "Other" as their primary work setting and were excluded for identifying they were retired in their explanation for their response. Seven respondents were excluded for not fully completing the survey, leaving *N*=83 participants whose responses and scores were entered into the final data analysis. The mean (±SD) PSS-14 score for perceived stress among all RDs was 22.3±8.2. For prevalence of risk for ON among the entire sample, 61.4% scored at a high risk for ON, with a mean (±SD) ORTO-15 score for all participants of 38.7±3.4. Among all RDs, 80.7% scored at or above the threshold for eating competence, with a mean (±SD) ecSI 2.0™ score for all participants of 35.9±6.2.

Sixty-five percent of participants had been under a stay-at-home order issued in the last six months by the state in which they were employed as an RD (Table 1). Mean (±SD) hours worked per week among all RDs was 34.7±12.6 hours. The most common primary work setting as an RD among all participants was hospital, HMO, or other healthcare facility (57%). This was followed by community or public health (18%), higher education or research (12%), private practice (8%), and corporate wellness (5%). Nine participants identified their primary work setting as "Other" and were prompted in the survey to explain their response. All responses identified as "Other" were re-categorized into existing response options based on respondents' explanations.

Registered dietitians working 40 hours or more per week had a mean ecSI 2.0™ score significantly greater than RDs working less than 40 hours per week (37.0 vs. 33.9, $P$=0.0279). Means for both groups were above the cutoff for eating competence. No other significant differences were found between characteristic groupings.

The primary objective of this study was to investigate if stress experienced by RDs is associated with risk for ON and/or eating competence. Based on the grouping criteria for PSS-14 (Table 2), 36.1% of participants were in the low stress group (n=30) with 60.0% scoring below 40 points on the ORTO-15 and 96.6% scoring at or above 32 points on ecSI 2.0™. In the high stress group (n=53), 62.2% scored at high risk for ON and 71.6% were considered eating competent. There were no significant differences in mean ORTO-15 scores between stress groups. Mean ecSI 2.0™ scores did however achieve significance between the groups with RDs in the low stress group scoring 4.4 points higher than those in the high stress group (38.7 vs. 34.3, $P$=0.0002). Both stress groups had a mean ecSI 2.0™ score above 32, indicating eating competence. Measuring the association between PSS-14 scores and ORTO-15 and ecSI 2.0™

scores using Pearson's correlation coefficient revealed a weak negative relationship ($r$=-0.21, $P$=0.0494) and moderate negative relationship ($r$=-0.47, $P$<0.0001), respectively (Figure 1).

The secondary aim of this study was to establish if a relationship exists between ON risk and eating competence. No differences in eating competence were identified when comparing RDs at high risk for ON with those at low risk ($t_{75}$=1.99, $P$=0.0773, Table 3). Additionally, no differences in ON risk were found when comparing RDs who were competent eaters with those who were not ($t_{19}$=2.09, $P$=0.1685, Table 4). A positive correlation was observed between the two variables, but the relationship was weak ($r$=+0.28, $P$=0.0094) (Figure 2). Analysis from a cross tabulated, chi square test for independence reaffirmed a lack of association ($X^2_1$=1.5, P=0.2150). A two-way ANOVA further corroborated a lack of statistical significance between eating competence and ON risk ($F_{1, 79}$=1.302, $P$=0.458). It also showed no main effect between ON risk (ORTO-15 scores) and PSS-14 scores ($F_{1, 79}$=2.376, $P$=0.366), nor was there a statistically significant interaction between the factors ($F_{1, 79}$=1.978, $P$=0.163).

**Table 1.** Characteristics of 83 registered dietitians (RDs) responding to an online survey assessing the prevalence of stress, orthorexia nervosa, and eating competence in RDs

| Characteristic | PSS-14 (Mean±SD) | ORTO-15 (Mean±SD) | ecSI 2.0™ (Mean±SD) |
|---|---|---|---|
| **Stay-at-home order** | | | |
| Yes (n=54) | 23.3±9.1 | 38.4±3.5 | 35.6±6.7 |
| No (n=29) | 20.3±5.7 | 39.3±3.2 | 36.3±5.0 |
| *P* value [a] | 0.0784 | 0.2233 | 0.5992 |
| **Hours worked per week** | | | |
| ≥ 40 (n=53) | 22.2±8.2 | 39.1±3.7 | 37.0±6.2 |
| < 40 (n=30) | 22.4±8.2 | 38.0±2.8 | 33.9±5.7 |
| *P* value [a] | 0.8904 | 0.1251 | 0.0279 |
| **Primary work setting** | | | |
| Hospital/HMO/healthcare facility (n=47) | 22.6±8.7 | 39.2±3.9 | 35.7±6.7 |
| Corporate wellness (n=4) | 20.5±5.9 | 38.5±1.1 | 39.0±4.3 |
| Private practice (n=7) | 20.9±8.2 | 38.3±2.5 | 38.0±4.5 |
| Community/public health (n=15) | 22.7±6.6 | 37.8±3.2 | 33.3±5.1 |
| Higher education/research (n=10) | 21.8±8.5 | 38.4±2.2 | 37.7±4.8 |
| *P* value [b] | 0.9721 | 0.7305 | 0.2540 |

PSS-14=Perceived Stress Scale, assessment tool for individual stress level. Scores ≥ 20 denote high stress, scores < 20 denote low stress.
ORTO-15=ORTO-15 Questionnaire, assessment tool for risk of orthorexia nervosa. Scores ≥ 40 denote low risk, scores < 40 denote high risk.
ecSI 2.0™=Satter Eating Competence Inventory 2.0, assessment tool for attainment of eating competence. Scores ≥ 32 denote eating competence.
SD=standard deviation.
[a] *P* values were calculated using independent sample t-tests.
[b] *P* values were calculated using one-way ANOVA tests.

**Table 2.** Comparisons of measures of orthorexia nervosa and eating competence in registered dietitians (RDs) with low perceived stress and RDs with high perceived stress

| PSS-14 Score Categories | ORTO-15 (Mean±SD) | ecSI 2.0™ (Mean±SD) |
|---|---|---|
| < 20 (n=30) | 39.1±2.6 | 38.7±3.5 |
| ≥ 20 (n=53) | 38.5±3.8 | 34.3±6.8 |
| *P* value [a] | 0.3701 | 0.0002 |

ORTO-15=ORTO-15 Questionnaire, assessment tool for risk of orthorexia nervosa. Scores ≥ 40 denote low risk, scores < 40 denote high risk.
ecSI 2.0™=Satter Eating Competence Inventory 2.0, assessment tool for attainment of eating competence. Scores ≥ 32 denote eating competence.
PSS-14=Perceived Stress Scale, assessment tool for individual stress level. Scores ≥ 20 denote high stress, scores < 20 denote low stress.
SD=standard deviation.
[a] *P* values were calculated using independent sample t-tests.

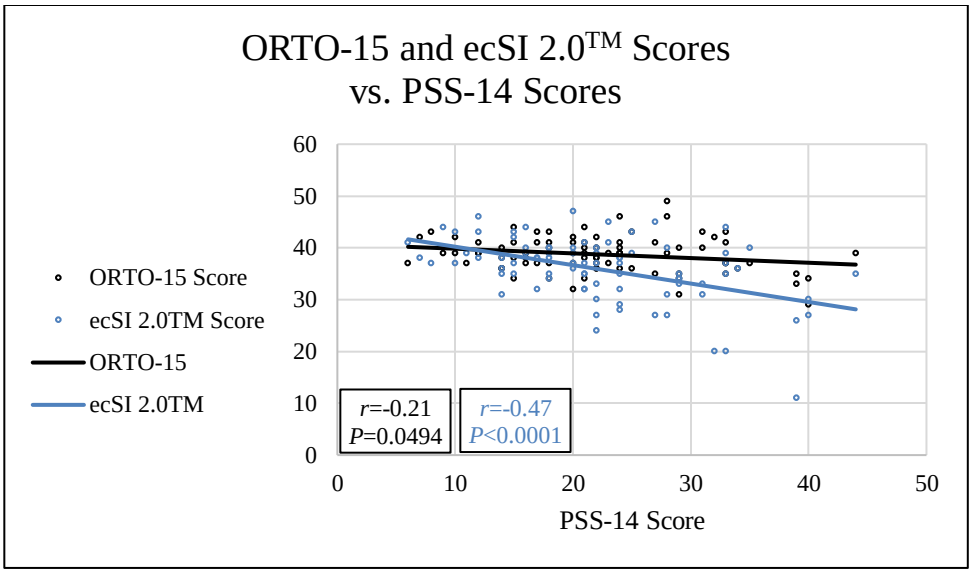


**Figure 1.** ORTO-15 scores and ecSI 2.0™ scores in relation to PSS-14 scores in a sample of registered dietitians. An ORTO-15 score < 40 indicates high risk for orthorexia nervosa, ecSI 2.0™ scores ≥ 32 signify eating competence, and PSS-14 scores ≥ 20 suggest high perceived stress levels.

**Table 3.** Comparison of eating competence in registered dietitians with low and high risk for orthorexia nervosa

| **ORTO-15 Score Categories** | **ecSI 2.0™ (Mean±SD)** |
|---|---|
| ≥ 40 (n=32) | 37.3±5.3 |
| < 40 (n=51) | 34.9±6.5 |
| *P* value [a] | 0.0773 |

ecSI 2.0™=Satter Eating Competence Inventory 2.0, assessment tool for attainment of eating competence. Scores ≥ 32 denote eating competence. ORTO-15=ORTO-15 Questionnaire, assessment tool for risk of orthorexia nervosa. Scores ≥ 40 denote low risk, scores < 40 denote high risk. SD=standard deviation.
[a] *P* value was calculated using independent sample t-test.

**Table 4.** Comparison of risk for orthorexia nervosa in registered dietitians who are eating competent and not eating competent

| **ecSI 2.0™ Score Categories** | **ORTO-15 (Mean±SD)** |
|---|---|
| ≥ 32 (n=67) | 39.0±3.2 |
| < 32 (n=16) | 37.4±4.0 |
| *P* value [a] | 0.1685 |

ORTO-15=ORTO-15 Questionnaire, assessment tool for risk of orthorexia nervosa. Scores ≥ 40 denote low risk, scores < 40 denote high risk. ecSI 2.0™=Satter Eating Competence Inventory 2.0, assessment tool for attainment of eating competence. Scores ≥ 32 denote eating competence. SD=standard deviation.
[a] *P* value was calculated using independent sample t-test.

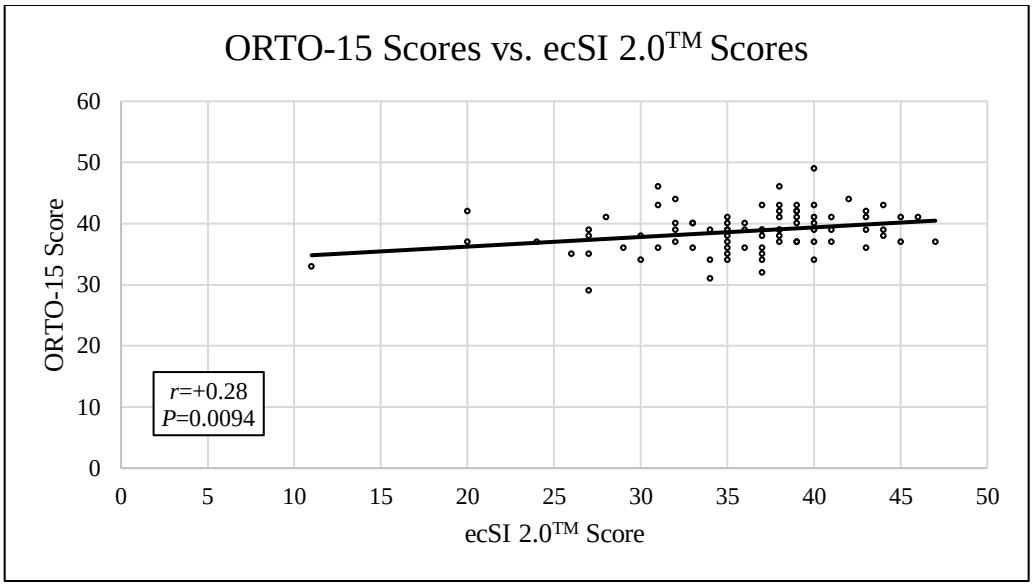


**Figure 2.** ORTO-15 scores in relation to ecSI 2.0™ scores in a sample of registered dietitians. An ORTO-15 score < 40 signifies high risk for orthorexia nervosa and ecSI 2.0™ scores ≥ 32 indicate eating competence.

## DISCUSSION

The objective of this study was to explore the relationships between stress and eating behaviors of RDs. This study is unique in that it examined these associations amidst COVID-19 which may have influenced results. As this is a cross-sectional study, any relationships between variables identified from the data cannot be directly attributed to the pandemic. Nonetheless, the data provides insight into how stress levels and eating behaviors in RDs interact.

This study reports a high prevalence of high perceived stress, risk for ON, and eating competence among RDs in this sample residing in the United States. There were 63.9% of RDs in this study who had PSS-14 scores suggesting high perceived stress. This is on par with a study measuring the prevalence of burnout as a result of stress in RDs that reported moderate to high levels of burnout were present in 57.5% of RDs.[71] Previous research found that risk for ON in RDs ranges from 41.9% to 81.9% globally and the observed frequency of 61.4% in this study falls nearly directly at the midpoint of this range.[28-31] Our percentage is noticeably higher than

an earlier study in the United States that found a prevalence of 49.5% using the ORTO-15, albeit from a much larger sample size of 636 RDs.[28]

The 80.7% prevalence of eating competence in this study provides new insight into the occurrence of eating competence in RDs. To our knowledge, this is the first study to explore this measure of eating behaviors exclusively in RDs. Previous studies on eating competence in adult populations in the United States indicate that 41% to 60% of adults are eating competent, with our result falling far outside and above this range.[51,56-58,60-62] Registered dietitians are credentialed health practitioners with a minimum education requirement of an undergraduate degree in nutrition/dietetics and 1,200 hours of supervised practice. During their education, RDs learn and apply skills that fall under the food management and contextual skills domain of ecSatter. These skills include planning menus and meals, grocery shopping, budgeting, and acquiring and preparing foods consistently. In ecSatter, individuals do best with food management when they are also adept in the eating attitudes, food acceptance, and internal regulation of food intake domains.[49] Attainment of food management and contextual skills from completion of accredited nutrition-focused curriculum and practicum experience may provide RDs with a higher competency of these ecSatter domains and, in turn, a greater potential to be eating competent than the general adult population.

Response data by RDs in this study indicated near identical prevalence of high perceived stress and ON, but stress was not associated with risk for ON. These results align with only one of four previous studies on the relationship between the two variables.[63-66] Our finding suggests that ON risk may not be simply attributed to stress. While stress may play a role, there are multiple, complex psychological components of ON such as obsessive thoughts, irrational fears, and compulsive behaviors.[32,33] A more thorough investigation that incorporates an assessment

tool for these risk factors in relation to ON risk may provide more deducible results. One such instrument is the Yale-Brown Obsessive Compulsive Scale (Y-BOCS). The Y-BOCS measures dimensions of resistance, control, and degree of distress, and its validity and reliability are well established.[72,73]

The significant association between lower stress and higher eating competence in this study agrees with previous research by Järvelä-Reijonen et al[67] and appears to align with ecSatter. Comfort, enjoyment, and relaxation; emotions not typically expressed while under stress, are emphasized in ecSatter. Competent eaters are comfortable eating preferred food, including food high in salt, sugar, and fat. They are also able to learn to like and enjoy a wide variety of food and have a relaxed trust about managing food and eating.[49] Registered dietitians in this study who were both eating competent and had low stress may be upholding these attitudes and behaviors. The relationship between stress and eating competence detected in our research warrants further investigation as this may provide a roadmap for addressing stress in the dietetics profession. One such direction could be embedding ecSatter into dietetics education and practice. Doing so may benefit the well-being of dietetics students and RDs by way of ecSatter being focused on positive emotions and relationships with eating.[49]

No significant relationship was found to exist in either direction between ON risk and eating competence, even though data suggested both were prevalent in RDs. This lack of association provides new insight into the relationship between ON and eating competence in RDs as the relationship has not been previously explored exclusively in this population. These results suggest that RDs who are competent eaters can be at high risk for ON and that RDs with low eating competence can have low risk for ON. While these associations may seem contradictory based on the definitions of ON and eating competence, they are plausible as both

concepts have to do with relationships with food and eating. Eating competence involves a positive relationship with food and eating while ON involves a negative relationship. Given the similarity of their subject matter there is bound to be overlap. Furthermore, RDs who scored as both competent eaters and high risk for ON may be more accurately described as having healthy orthorexia as opposed to ON since the two are not distinguishable by the ORTO-15 and healthy eating has been observed in samples scoring for probable ON in previous research.[45,48] As this was the first study to our knowledge to analyze the relationship between ON and eating competence exclusively in RDs, future studies should continue to explore this relationship. Dietary intake in this population could also be assessed to create a clearer distinction between ON and healthy orthorexia.

Interestingly, working more than 40 hours outside the home as an RD was significantly associated with higher eating competence. This finding may speak to the routine of going to work regularly. A principle of the contextual skills domain of ecSatter is the prioritization of structure and meal planning in conjunction with permission to eat sufficient amounts of desired food at predictable times. Together, frequent and consistent opportunities to eat and permission to eat preferred foods support positive eating attitudes and trust in internal hunger, appetite, and satiety cues.[49]

Like any cross-sectional survey, this study was susceptible to selection bias due to low response and misclassification due to recall bias, thereby limiting its results. Additionally, some RDs are likely familiar with the ORTO-15 and ecSI 2.0™ and may have provided answers that intentionally placed their score above that of being considered high risk for ON and over the target for demonstrating eating competence. It is also possible there may have been RDs who recognized the PSS-14 and purposefully chose low scoring responses. Other limitations include

not controlling for gender or race as females account for 93% of all RDs and 82% of RDs are white.[74] Furthermore, disordered eating behaviors are seen more frequently in women and racial differences in disordered eating behaviors have been observed.[75,76] The work of this study is further limited by not controlling for the presence of chronic diseases or dietary restrictions of participants as both could play a role in thoughts and attitudes about eating and in turn affect responses. It is notable that the survey was not developed and administered before COVID-19 reached a pandemic level in the United States. Consequently, pre-pandemic responses were not obtained for comparison to responses during the pandemic. This inability to compare responses along with stress and maladaptive eating behaviors both observed to having increased during the pandemic, further limit interpretation of the findings.[8-17]

Strengths of this study include its restriction to RDs as the research sample and precise application of the validated PSS-14, ORTO-15, and ecSI 2.0™ assessment tools. Including only RDs as participants allowed for the findings to provide implications regarding stress and eating behaviors specific to the dietetics profession, an area of research that is sparsely explored. Presenting the three assessment tools in their original, validated forms in the survey ensured the quality and accuracy of participants' scores.

## CONCLUSIONS

By comparing PSS-14, ORTO-15, and ecSI 2.0™ scores, this study established that stress has an inverse effect on eating competence, but no effect on ON risk of RDs. Based on this information, implementing the positive eating attitudes of ecSatter into dietetics practice has the potential to effectively address stress experienced in the dietetics field. Risk for ON and eating competence were not related. This suggests that RDs may simultaneously be competent eaters

and high risk for ON, while in reality they may be more appropriately categorized as having healthy orthorexia. To better understand where healthy orthorexia ends and ON begins in RDs, future studies could examine dietary patterns and tests for ON that distinguish between ON and healthy orthorexia.

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