

Orthorexia Nervosa: A Multi-Study Examination of the Positive Impact of Mindfulness and Self-Compassion.

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Abstract

Orthorexia Nervosa (ON) is a concept which has been introduced in recent years and is becoming more prevalent. ON is characterised by the obsessive focus on healthy and clean food, following strict eating regimens where restrictions escalate over time impacting the quality of life of the individual. Mindfulness, self-compassion, and mindful eating have been associated with alleviation of disordered eating as well as eating disorders where successful interventions have been developed to tackle such issues in general and specific populations. However, literature exploring these concepts in relation to ON is limited with only a handful of studies exploring mindfulness and mindful eating and no literature exploring self-compassion. The current thesis aims to explore mindfulness-based constructs and ON, as well as constructs such as quality of life, perfectionism, mental health and disordered eating. By gaining insight into the relationships between mindfulness-based constructs, ON and risk factors, it would allow to form a basis on how mindfulness-based interventions could be developed for orthorexic populations. Each chapter explores different risk factors in relation to ON and mindfulness-based constructs. Chapter 1 introduces ON, providing an overview of diagnostic measures, prevalence as well as constructs which formed the initial motivations to explore solutions such as mindfulness and self-compassion, as well as risk-factors such as perfectionism, mental health and eating behaviours. Chapter 2, 3, 4 and 5 investigate associations of orthorexia nervosa with mindfulness, self-compassion, and mindful eating to potential risk factors of orthorexia nervosa such as perfectionism, mental health, disordered eating and quality of life. Chapter 6 focuses on investigating different measures of ON in relation to mindfulness, self-compassion, and mindful eating to understand the conceptualisation of ON. Chapter 7 focuses on the qualitative investigation into ON. Chapter 8 synthesises the findings of the thesis and provides an overall discussion where limitations and practical implications are discussed. The findings from the thesis aid in conceptualising ON further as well as understanding how mindfulness-based constructs can be utilised in the development of future interventions.

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List of Abbreviations

ACT: Acceptance and Commitment Therapy

AN: Anorexia Nervosa

APA: American Psychological Association

BED: Binge Eating Disorder

BMI: Body Mass Index

BN: Bulimia Nervosa

BOT: Bratman Orthorexia Test

DASS: Depression, Anxiety and Stress Scale

DBT: Dialectical Behaviour Therapy

DOS: Dusseldorf Orthorexia Scale

DSM-5: Diagnostic and Statistical Manual of Mental Disorders

EAT: Eating Attitude Test

ED: Eating Disorder

EDQOL: Eating Disorder Quality of Life

EHQ: Eating Habits Questionnaire

FFMQ-SF: Five-Facet Mindfulness Questionnaire - Short Form

FMI: Freiburg Mindfulness Inventory

FMPS: Frost Multidimensional Perfectionism Scale

GAD: Generalised Anxiety Disorders

HeOr: Healthy Orthorexia

ICD-10: Classification of Mental and Behavioural Disorders

MBCT: Mindfulness-Based Cognitive Therapy

MBI: Mindfulness-Based Interventions

MEBS: Mindful Eating Behaviour Scale

MEBS-T: Mindful Eating Behaviour Scale- Trait

ON: Orthorexia Nervosa

ONI: Orthorexia Nervosa Inventory

OrNe: Orthorexia Nervosa

PEMS: Palatable Eating Motives Scale

PC: Perfectionistic Concerns

PS: Perfectionistic Strivings

QOL: Quality of Life

RPS: Research Participation Scheme

TOS: Teurel Orthorexia Scale

SCS: Self-Compassion Scale

SCS-SF: Self-Compassion Scale- Short Form

CHAPTER 1: GENERAL INTRODUCTION

As we age, health becomes a vital component of life (Deeks et al., 2009), placing significant emphasis on individuals' diets, research suggests that an optimum diet is

correlated to a higher life expectancy and reduction of chronic diseases (Katz & Meller, 2014). Currently, societal attitudes towards diets are shifting to clean eating, which has become more normalised (Greville-Harris et al., 2019). More consumers adapt their diets to be organic, unprocessed, and chemical-free to gain positive health outcomes (van de Vijver & van Vliet, 2012). However, clean eating and strict avoidance of foods that are considered unclean and impure could lead to undesirable health outcomes (Hunter & Crudo, 2018).

1.1. Overview of Orthorexia Nervosa

In 1997, a new description of engaging with food was developed by Bratman in 1997, which was referred to as Orthorexia Nervosa (ON), describing a “fixation on eating healthy food” (p. 9). The word orthorexia is derived from Greek translating “orthos” to right and “orexis” to appetite or hunger (Bratman & Knight, 2000). ON involves being over-concerned with healthy eating and affected individuals adhering to strict food rules (Bartel et al., 2020; Varga et al., 2014). Furthermore, individuals engage in obsessions and compulsions regarding their eating which dominate their lives (Dunn & Bratman, 2016; Varga et al., 2014). ON generally starts as a desire to overcome a chronic illness or to improve individuals’ general health (Bratman & Knight, 2000), but overtime, more products are eliminated from the one’s diet as they perceive them to be unhealthy, impure, and harmful (Olejniczak et al., 2017). A strict diet can lead to extreme malnourishment, impairments of social and academic functioning and poor quality of life (Koven & Arby, 2015; Meule et al., 2020) due to obsessive thoughts and behaviours focusing on healthy eating.

Orthorexia Nervosa (ON) can be understood through its nomological network, which situates it within a broader psychological framework of related constructs and behaviours (Cronbach & Meehl, 1955). ON is characterised by an extreme preoccupation with food purity and healthy eating, often leading to rigid dietary rules, compulsive behaviours, and interference with daily functioning (Dunn & Bratman, 2016). **Observable indicators** of ON

span across behavioural, cognitive, physical, and social dimensions, including obsessive meal planning, avoidance of "unhealthy" foods, guilt or anxiety over dietary choices, and social isolation due to food-related restrictions (Dunn & Bratman, 2016). **Empirical relationships** indicate that ON correlates positively with obsessive-compulsive traits (e.g., Costa & Hardan-Khalil, 2018), and anxiety disorders (e.g., Awad et al., 2021), sharing similarities with eating disorders, such as anorexia nervosa but differing in its emphasis on food quality over weight control. ON also predicts negative outcomes such as lower quality of life, heightened stress, and potential malnutrition, highlighting its distinctiveness from general healthy eating through its excessive rigidity. Furthermore, ON is **linked to related-constructs** such as perfectionism (e.g., Miley et al., 2022, Barnes & Caltabiano, 2017), body image disturbance (e.g., Messer et al., 2022; Brytek-Matera & Donini, 2018), and health anxiety (Chance & Kluck, 2021), reinforcing the psychological mechanisms that drive this behaviour. Understanding these relationships helps distinguish ON from adaptive dietary practices and underscores the potential mental and physical health risks associated with its extreme manifestations. The ability to create a framework to establish the validity of psychological concepts such as orthorexia requires a nomothetical network, where mapping the relationships between theoretical constructs, observable variables, and empirical findings is necessary. By outlining the relationships between orthorexia and related psychological, behavioural, and physiological variables presented in Figure 1.1, the following section aims to clarify its conceptual boundaries and contribute to the selection of reliable assessment tools and propose effective interventions.

Figure 1.1. The nomological network (Cronbach & Meel, 1955) for Orthorexia Nervosa



1.2. Diagnostic Criteria of Orthorexia Nervosa

Recently, the increase in the number of related studies to ON has accelerated knowledge in the field (e.g., Koven & Arby, 2015; Dunn & Bratman, 2016; Cena et al.,

2018); however, the classification of ON as a mental disorder is a subject of debate. ON is not currently recognised by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) or the Classification of Mental and Behavioural Disorders (ICD-10). In the initial conceptualisation of ON, it was argued that ON is a new form of an eating disorder (Bratman & Knight, 2000), however, no consensus has been reached as to whether ON is a new disorder, a variant of a known disorder or simply unhealthy eating habits (Mathieu, 2005). Although there is no official definition of ON or standardised criteria for diagnosis, some diagnostic criteria have been proposed by researchers (Donni et al., 2004; Dunn & Bratman, 2016; Mathieu, 2005; Varga et al., 2014). A review by Cena et al. (2018) has been conducted to assess the different definitions of ON that have been used amongst academics and clinicians, where the most popular words to describe ON were fixation, obsession and preoccupation with food. To further define the characteristics of ON, Table 1.2.1 presents the most recent diagnostic criteria proposed by Dunn and Bratman (2016).

Table 1.1

Diagnostic criteria of Orthorexia Nervosa (Dunn & Bratman, 2016)

Diagnostic criteria
<p>Criterion A. Obsessive focus on “healthy” eating as defined by dietary theory or set of beliefs whose specific beliefs may vary; marked by exaggerated emotional distress in relationship to food choices perceived as unhealthy; weight loss may ensue as a result of dietary choices, but this is not the primary goal. As evidenced by the following:</p> <ol style="list-style-type: none"> 1. Compulsive behaviour and/or mental preoccupation regarding affirmative and restrictive dietary practices believed by the individual to promote optimum health 2. Violation of self-imposed dietary rules causes exaggerated fear of disease, a sense of personal impurity and/or negative physical sensations, accompanied by anxiety and shame. 3. Dietary restrictions escalate over time and may come to include the elimination of entire food groups and involve progressively more frequent and/or severe “cleanses” regarded as purifying or detoxifying. This escalation commonly leads to weight loss, but the desire to lose weight is absent, hidden or subordinated to ideation about healthy eating. <p>Criterion B. The compulsive behaviour and mental preoccupation become clinically impairing by any of the following:</p> <ol style="list-style-type: none"> 1. Malnutrition, severe weight loss or other medical complications from a restricted diet 2. Intrapersonal distress or impairment of social, academic or vocational functioning secondary to beliefs or behaviours about healthy diet.

-
3. Positive body image, self-worth, identity and/or satisfaction excessively dependent on compliance with self-defined “healthy” eating behaviour.
-

1.3. Psychometric Tools:

The development of diagnostic criteria has resulted in several measures being designed to aid in measuring Orthorexia Nervosa (ON) (Bratman & Knight, 2000; Donini et al., 2004; Barthels et al., 2015a; Oberle et al., 2020). However, the lack of consensus on the criteria for identifying ON poses challenges to the reliability of research in this area. As a result, a major methodological issue in ON research is the absence of a standardized diagnostic tool, along with inconsistencies in the psychometric scales used. Although multiple questionnaires have been designed to establish a valid and reliable assessment for ON (Bratman & Knight, 2000; Donini et al., 2004; Barthels et al., 2015b; Oberle et al., 2020), the inconsistencies and differences between these scales make it difficult to compare results and limit our understanding of individuals with high ON scores. The psychometric tools will be briefly described below.

1.3.1. Bratman Orthorexia Test

Bratman Orthorexia Test (BOT) was the first diagnostic tool created by Bratman and Knight (2000), and it was used as an informal assessment tool for individuals who were concerned about following a healthy diet. The scale was used as self-assessment consisting of 10 items with a yes or no answer. Individuals who scored 10 points were diagnosed with orthorexia nervosa (Bratman, 2017). The sample items include “Do you spend more than 3 hours a day thinking about your diet” and “Do you feel guilty when you stray from your diet”. The use of the BOT was discouraged due to low reliability scores (Bundros et al., 2016; Opitz et al., 2020), and some researchers proposed that the BOT lacked clarity and theoretical foundation (Opitz et al., 2020; Valente et al., 2019). Despite its frequent use in previous

research (e.g., Dittfeld et al., 2017; Bundros et al., 2016), Bratman (2017) advised against its use as a diagnostic tool or psychometric measurement tools for ON.

1.3.2. ORTHO-15

ORTHO-15 was created by Donini et al. (2004) in an attempt of overcoming limitations, but was still partially based on the elements of the BOT. This scale includes six items from the BOT and nine additional items that reflect the obsessive traits presented in ON. The items assess individuals' obsessive preoccupation with selection, preparation and consumption of healthy food, indicating three factors that are assessing orthorexia nervosa: the cognitive factor, the clinical factor and emotional factor. The sample items include "In the last 3 months, did the thoughts of food worry you" and "At present, are you alone when having meals". To date, this is the most popular tool (Valente et al., 2019) and unlike the BOT, it has a cut-off point of 40, this is important as it differentiates between healthy eating and ON. However, researchers have raised concerns about this cut-off score suggesting that it is too high and would produce high number of false positives (Ramacciotti et al., 2011).

ORTHO-15 was originally created in Italian, but due to its popularity it has been translated into Turkish (Asil & Surucuoglu, 2015), Polish (Brytek-Matera et al., 2014), Portuguese (Alvarenga et al., 2012), Spanish (Parra-Fernandez et al., 2018), Arabic (Haddad et al., 2019) and English (Donini et al., 2004). However, several criticisms have been voiced about ORTHO-15. Firstly, it overestimates the prevalence of ON (Gramaglia et al., 2017), incorrectly identifying dieting as harmful and failing to measure the pathological concepts of eating (Brytek-Matera et al., 2017). Later qualitative research suggested that the ORTHO-15 only captures diet and lifestyle habits, and it fails to detect the pathological aspects of eating (Mitrofanove et al., 2021). Secondly, it does not take into consideration the new diagnostic criteria created by Dunn and Bratman (2016), which could lead to a wrongful measurement and diagnosis. Third, the variance produced by ORTHO-15, where it found that in an Italian sample, the prevalence was 6% and in a group of female nutritionists it produced a

prevalence of 88.7% (Dunn & Bratman, 2016). This shows that the ORTHO-15 is not a reliable tool as it produces great variance in prevalence scores in different populations that are more (or less) informed about healthy eating and nutrition, which raises concerns about the validity of the questions included in the tool and the potential of capturing the disordered nature of healthy eating, rather than healthy eating per se. Therefore, it has been suggested that the ORTHO-15 should be used with caution when measuring for ON (Roncero et al., 2017).

1.3.3. Dusseldorf Orthorexia Scale

The Dusseldorf Orthorexia Scale (DOS) was developed by Barthels et al. (2015b). It is a 10-item questionnaire utilising a 4-point Likert scale with a possible score of 10 to 40 points, a score of 30 or higher indicates orthorexic behaviour. The scale does not possess any subscales to measure orthorexic behaviour. The sample items include “I can only enjoy eating foods considered healthy” and “I find it difficult to go against my personal dietary rules”. The scale was constructed and validated in German and then translated into English. DOS has been further translated into Chinese (He et al., 2019), Polish (Brytek-Matera, 2020a) and Spanish (Parra-Fernandez et al., 2019). However, there are some criticisms of DOS, for example, Barthels et al. (2017) have demonstrated that in cases of investigating anorexia nervosa in-patients, the tool does not differentiate between patients with anorexia and orthorexia. The findings put the scale under much scrutiny as to how it could benefit from further development and was questioned on the effectiveness validly measuring orthorexia.

1.3.4. Teurel Orthorexia Scale

The Teurel Orthorexia Scale (TOS) developed by Barrada and Roncero (2018) assesses orthorexia along two dimensions: Healthy Orthorexia (HeOr) and Orthorexia

Nervosa (OrNe). Healthy orthorexia implies a healthy interest with healthy eating whereas orthorexia nervosa looks at the pathological aspect of healthy eating. The bidimensional structure has also been confirmed by researchers, Barthels et al. (2019) showed that HeOr was associated with positive affect whereas OrNe was associated with negative affect. Furthermore, study assessing motivations for healthy eating revealed that OrNe was associated with motivations for weight loss and HeOr was associated with the perceived benefits of healthy eating (Depa et al., 2019). The scale consists of 17 items, with 9 measuring HeOr and 8 assessing OrNe. Responses are captured using a 4-point Likert scale, ranging from “completely disagree” to “completely agree”. The scale has also been translated to Portuguese (Da Silva et al., 2021), Italian (Falgares et al., 2023) and French (Lasson et al., 2023). Sample questions include “I’d rather eat a healthy food that is not very tasty than a good tasting food that isn’t healthy” and “Thoughts about healthy eating do not let me concentrate on other tasks”.

1.3.5. Orthorexia Nervosa Inventory

To overcome previous problems with psychometric tools, Oberle et al. (2020) developed the Orthorexia Nervosa Inventory (ONI), which is the newest assessment tool for ON. The scale includes 24 items assessing 3 factors of orthorexic behaviours such as impairments, behaviours and emotions. The sample items include “I care much more about the healthiness of what I eat than the pleasurable taste of food” and “As a result of the amount of time I devote to my healthy diet, I have either missed time at work or missed classes at school”. Furthermore, ONI has been translated to Turkish (Kaya et al., 2021), supporting the original three-factor structure of the ONI that was obtained in the first validation study (Oberle et al., 2020). However, not a significant number of studies have been conducted using this scale, despite the consensus of the academic and clinical community investigating ON (e.g., Donini et al., 2022).

1.4. Prevalence

Academic literature on ON has attempted to examine the prevalence among various groups such as doctors (Bosi et al., 2007), yoga practitioners (Erkin & Gol, 2019), university students (Missbach et al., 2017) and athletes (Clifford & Blyth, 2019). Prevalence rates for ON vary greatly from 6% to 88.7% (Aksoydan & Camci, 2009; Agopyan et al., 2018; Dunn & Bratman, 2016; Clifford & Blyth, 2019; Fidan et al., 2010; Turner & Lefevre, 2017). However, the literature regarding ON prevalence is heavily dominated by the ORTHO-15. For example, Ramacciotti et al. (2011) demonstrated that ORTHO-15 had a problematic cut-off score of 40 as it would produce too many false positive ON cases. The prevalence using the 40-point cut-off score was 57.6%, when a lower cut-off point of 35 was used the prevalence rate dropped to 21% (Ramacciotti et al., 2011). The same pattern was found when using a lower cut-off score in other studies (Segura-Garcia et al., 2012), indicating that ORTHO-15 is problematic for estimating the prevalence of ON. However, as mentioned previously some research is conducted on health-oriented participants such as yoga practitioners, doctors, and dieticians, which may bias the findings through response and knowledge bias (Alvarenga et al., 2012; Bosi et al., 2007; De Souza & Rodrigues, 2014; Erkin & Gol, 2019). Indeed, these studies also produce high prevalence rates, which could be explained by the excessive attention and knowledge these individuals have to health and food, being a core aspect of their profession and lifestyle. However, possessing knowledge about healthy eating should not be equated with extreme or obsessive healthy eating behaviours characteristic of ON.

These findings are also inconsistent with the knowledge we have about eating disorders as it is estimated that Anorexia Nervosa (AN) and Bulimia Nervosa (BN) have prevalence rates of about 2% (Smink et al., 2012). However, this could be due to our limited knowledge of ON. ON may be significantly and substantially different as most of the population is experiencing some form of dietary restrictions and related health concerns.

Also, while anorexia and bulimia are not taught, experienced and/or seen as normative behaviours, potentially indicating a significant difference in prevalence.

1.5. BMI and ON

The motives for individuals to engage in orthorexic tendencies stem from health motivation (Dunn & Bratman, 2016), but is it possible that ON may initially emerge from in an attempt to lose weight? If that was the case, an assumption would be that individuals struggling with higher weight would be at greater risk. It is, therefore, important to investigate BMI. In terms of BMI and ON, the literature has shown mixed findings, where ON and BMI had significant positive correlations (e.g., Oberle et al., 2017), there was also a negative correlation between ON and BMI (e.g. Barrada & Roncero, 2018) and no correlation between BMI and ON (e.g., Oberle & Lipschuetz, 2020). A reason for mixed findings could be the different scales used to measure ON in these studies. The present thesis, therefore, will utilise the measure of ONI across all studies to determine whether BMI correlates with ON.

1.6. Eating Behaviours and ON.

Eating disorders and obesity are strongly associated with problematic eating behaviours such as restricted, emotional, and stress eating (e.g., Ferrer-Garcia et al., 2017; Turton et al., 2017; Sanchez-Ruiz et al., 2019; Elfhag & Morey, 2008; Konttinen, 2020; Loeber et al., 2018). Emotional eating (Frayn et al., 2018) is defined as eating (a large amount of food) in response to negative (and positive) emotions, which can lead to weight gain and the development of Binge Eating Disorder (BED) (Meule et al., 2013). Restrained eating, on the other hand, is defined as an intentional restriction of food consumption to lose and/or maintain weight (Polivy et al., 2020). Some studies have found that people with ON demonstrate high levels of restrained eating (Barthels et al., 2018; Brytek-Matera 2020b; Brytek-Matera, 2020c), but no studies have looked at the potential links between ON and emotional eating, when emotional eating relates positively to restraint eating, as well as

implications of higher consumption of unhealthy foods (Konttinen et al., 2010).

Understanding the function of restrained and emotional eating in ON will help design preventative and therapeutic programmes for people with more severe orthorexia symptoms. Furthermore, the ability to understand potential direct and indirect associations of mental health and personality on eating behaviours and ON may indicate targeted intervention on ON.

1.7. Depression, anxiety, stress and ON

There is conflicting research on mood and ON. For example, stress, anxiety, and negative emotions were found to be significant predictors of ON in both men and women (Stutts, 2020; Strahler et al., 2018), as well as characteristics that predict emotional eating (Tan & Chow, 2014; Rose et al., 2018), suggesting a link between ON and emotional eating. In contrast, Hayes et al. (2017) have not found a significant relationship between ON and depression and anxiety. A reason for such conflicting findings could be due to the measures being used to assess the severity of ON. For example, Hayes et al. (2017) has used BOT and ORTHO-15 to assess orthorexia, as mentioned previously these measures have problematic components. Whereas Strahler et al. (2018) and Stutts (2020) both used DOS as a measure of orthorexia. This implies that the measure used to assess levels of orthorexia may in fact produce contradicting findings. This might suggest that in some cases ON is not problematic, whereas in extreme cases it could lead to psychopathology, the measures used also influence the findings in relation to mental health. Therefore, further exploration of the relationship between ON and mental health needs to be conducted especially using newer measures of ON such as ONI.

1.8. Perfectionism and ON

Perfectionism is a multidimensional personality construct characterised by pursuit of flawlessness and the establishment of exceptionally high-performance standards, often

accompanied by a tendency for overly critical self-evaluation (Flett & Hewitt, 2002; Frost et al., 1990). This disposition extends across various aspects of life, particularly in academic and professional settings, and can also influence personal appearance and social relationships (Stoeber & Stoeber, 2009). Within this framework, two key dimensions of perfectionism have been identified: Perfectionistic Strivings (PS) and Perfectionistic Concerns (PC) (Frost, 1990; Frost et al., 1993; Stoeber & Otto, 2006). PS involve high personal standards and a self-driven pursuit of perfection, often linked to positive traits like conscientiousness, adaptive coping, and psychological well-being. In contrast, PC focus on fear of mistakes, self-doubt, and external evaluation, associated with negative traits such as neuroticism, maladaptive coping, and psychological distress (e.g., Sirois et al., 2017; Stoeber & Otto, 2006). These dimensions differ as PC has been consistently associated with maladaptive and dysfunctional outcomes whereas PS has been linked to both adaptive and maladaptive outcomes depending on contextual factors (Sirois et al., 2017; Stoeber et al., 2020). Meta-analysis indicates that both PS and PC are associated with eating disorder symptoms across clinical samples (e.g., Bills et al., 2023; Limburg et al., 2017). Additionally, researchers have indicated that the connection between orthorexia and perfectionism is less pronounced compared to other eating disorders (Bartel et al., 2020).

As there is a conceptual overlap between ON and ED, the presence of perfectionistic traits in ON needs further investigation, especially with newer measures of ON such as ONI. Empirical studies consistently report positive associations between ON and perfectionism (e.g., Barnes & Caltabiano, 2016; Bartel et al., 2020; Miley et al., 2021; Novara et al., 2021; Pratt et al., 2023; Yung & Tabri, 2022) regardless of the measures of ON being used, suggesting that perfectionism might be a core component of ON. A recent study by Novara and colleagues (2023) also examined the relationship between perfectionism and ON. They discovered that individuals classified as having high orthorexic tendencies exhibited higher levels of perfectionism both in terms of PC and PS, compared to those with lower orthorexic tendencies. Pratt et al. (2023) conducted a meta-analysis which revealed that both PS and PC

showed positive correlation to ON. It was also revealed that PS explained more variance in ON when compared to PC, suggesting that PS is a more central component to development of obsessional nutrition than the worries and concerns (Pratt et al., 2023). Given the prominent role of perfectionism in eating disorders and the shared features with orthorexia, it becomes crucial to delve deeper into the role of perfectionism within the context of orthorexia, especially in terms of PS and PC as only few studies explicitly examined the distinct contributions of PS and PC to ON.

1.9. Mindfulness and mindful eating

Mindfulness is a psychological concept that involves consciously attending to external and internal moment-to-moment experiences such as emotions, thoughts, and bodily sensations in a non-judgmental way (Kabat-Zinn, 2003). Mindfulness practices have been adopted and incorporated into medical and mental health interventions to promote individual well-being (Baer et al., 2006). Empirical research has indicated that mindfulness-based interventions (MBI) have improved psychological and physical well-being (Chiesa & Serretti, 2011; Keng et al., 2011). Several interventions have been developed based on mindfulness-related practices such as Mindfulness-Based Cognitive Therapy (MBCT) (Segal et al., 2002), Acceptance and Commitment Therapy (ACT) (Hayes et al., 1999) and Dialectical Behaviour Therapy (DBT) (Linehan et al., 1998). Each of these approaches share the core concept of mindfulness, however they differ in theoretical stance. For example, DBT increases awareness to reduce extreme behavioural reactions (Feigenbaum, 2007) whereas ACT improves psychological flexibility to separate actual and interpreted behaviours (Hayes et al., 2006). Therefore, mindfulness practices promote behavioural self-regulation through increased attention to physical, psychological and environmental cues. Overall, mindfulness-based interventions have been found to reduce both problematic eating behaviours and wider eating disorders (Atkinson & Wade, 2015; Godsey, 2013). One form of mindfulness, directed specifically towards the eating process is mindful eating. Mindful eating describes being

conscious during the eating process, and directing focus to the present moment, with the ultimate goal of fulfilling hunger (Wnuk & Du, 2017).

Mindful eating has been seen to challenge motivations when engaging in eating behaviours. Mantzios and colleagues (2019) found mindful eating interventions to inspire a gradual shift from external motivations (i.e., being distracted, high availability of food) to those that are internal (i.e., physical awareness of food and eating), with this being linked to healthier eating behaviours (see also Mantzios & Wilson, 2014, 2015a,b; Mantzios & Giannou, 2014; Zervos et al., 2022). In other research, it was seen to increase fruit and vegetable consumption (Dutt et al., 2019; Gilbert & Waltz, 2010), and reduce intake of high sugar and energy-dense food (Mantzios et al., 2020; Mason et al., 2016). Mindful eating has also been reported to be negatively associated with motivations to eat palatable foods (Keyte et al., 2019; Mantzios & Egan, 2018), fat and sugar consumption (Mantzios et al., 2018a), as well as grazing behaviours (Mantzios et al., 2018b). Pierson et al (2019) found that mindful eating interventions successfully promote control over dietary intake and a reduction in food cravings. Moreover, research reported that there is a negative relationship between mindful eating and emotional eating in different populations (e.g., Lattimore, 2020; Metin et al., 2023; Warren et al., 2017), other researchers also highlight its negative association with weight gain (Mantzios et al., 2014), and the subsequent effect on portion size and self-regulation (Hussain et al., 2021). Such evidence could blur the line between health behaviours and the potential promotion of ON. To date, only a few studies have explored mindfulness and mindful eating with orthorexia nervosa. Strahler (2020) was the first study to address the effects of mindfulness on ON directly. It was found that ON could be categorised by its two dimensions; healthy orthorexia and ON, with those in the healthy orthorexia group demonstrating enhanced mindfulness compared to the latter. This suggests that mindfulness and mindfulness-based constructs may play a protective role against the development of ON and promote healthier eating behaviours. However, the direction of such

mindfulness techniques to eating behaviours specifically, namely, mindful eating, may demonstrate a different, yet more relevant relationship with ON.

1.10. Self-compassion

Interlinked to mindfulness and mindful eating, the notion of self-compassion proposes yet another, slightly different solution and relation to eating behaviours and food consumption (Mantzios et al., 2018a, b). The understanding that suffering, inadequacy, and failure are all part of the human experience is characterised in the concept of self-compassion (Neff, 2003) and is something that people experience when wanting to eat healthier food (Mantzios & Wilson, 2015). Self-kindness, common humanity, and mindfulness are the three components of self-compassion, and higher levels of self-compassion are linked to higher levels of happiness, life satisfaction and lower levels of shame, depression, and anxiety (Neff et al., 2007; Neff et al., 2007). The opposite of being kind to oneself, which is more common amongst restrictive eaters and people who look after their diet is self-criticism. Self-criticism can lead to emotional distress, and may contribute to disordered eating, at times as a method to cope with internal and external pressures, and other times related to body image (Germer, 2009). For example, Ferreira et al. (2013) found a link between low self-compassion (i.e., high self-criticism) and higher levels of body dissatisfaction, the desire to be thin, and eating disorder symptoms. As self-compassion addresses one's thoughts, emotions and experiences with kindness and empathy, this can be used to regulate negative affect and threats (Johnson & O'Brien, 2013). Research suggests that adopting and maintaining healthy behaviours and attitudes about weight and body are more effective when individuals exhibit higher levels of self-compassion (Rodgers et al., 2017; Thofersen-Ntoumani et al., 2017). Self-compassion facilitates this process by implementing a non-judgmental and accepting approach towards one's personal challenges and failures. Rather than responding to dietary failures with harsh self-criticism, which often exacerbates disordered eating behaviours and emotional distress, self-compassion encourages individuals to respond with an understanding perspective and

kindness, which reduces the likelihood of engaging in rigid and compensatory behaviours (e.g., Wakelin et al., 2022). This relationship between self-compassion and healthier eating patterns is primarily attributed to the strong link between self-compassion and the ability to manage emotions effectively in terms of emotional regulation (Sirois et al., 2015; Sirois, 2015). This highlights the critical role of self-compassion, as more compassionate individuals tend to manage negative emotions more effectively thus reducing the reliance on maladaptive coping strategies (e.g., Ewert et al., 2021; Wisener & Khoury, 2022), this is critical for individuals with orthorexic tendencies.

Self-compassion has been heavily explored in eating behaviours especially in addition to mindfulness (e.g., Mantzios & Egan, 2018; Keyte et al., 2019; Gouveia et al., 2019; Mantzios et al., 2018), indicating that both components complement each other in relation to eating. There has also been significant amount of literature exploring self-compassion as a single component in relation to eating (e.g., Daye et al., 2014; Ferreira et al., 2013; Taylor et al., 2015). Higher levels of self-compassion have been associated with lower levels of disordered eating, thin idealisation and eating disorder symptomology (Tylka et al., 2015; Taylor et al., 2015). Additionally, a systematic review found evidence that self-compassion acts as a protective factor against body dysmorphia and eating disorders (Braun et al., 2016). Furthermore, Adams and Leary (2007) found that utilising a self-compassion intervention with restrictive eaters reduced their distress-related eating, this is noteworthy as both restrictive eating (Barthels et al., 2018) and self-judgement (Cheshire et al., 2020) are key factors associated with ON (Dunn & Bratman, 2016). Therefore, utilising self-compassion may reduce the symptomology of ON.

1.11. Self-compassion vs Self-kindness vs Self-efficacy

Self-compassion has been selected to be investigated in relation to ON over other constructs such as self-kindness and self-efficacy. Self-kindness is defined as treating oneself with warmth when experiencing struggles and it is one of the core components of self-compassion (Neff, 2003). Focusing on self-kindness, however, ignores the conceptualisation

that was put forward for self-compassion of being able to recognise struggles as being part of the shared human experience as well as treating oneself with kindness (Neff, 2003), which could potentially fall short of exploring holistic health as described in theoretical literature on the distinction of self-kindness elsewhere (see Mantzios et al., 2017; see also Chapter 7 for a relevant discussion). On the other hand, self-efficacy is defined as a person's ability to achieve goals and perform tasks effectively (Bandura, 1977). Individuals experiencing ON symptomatology have rigid dietary rules, experience negative emotions and thoughts when experiencing dietary lapses and have a significant impairment in everyday life, such as social functioning (Dunn & Bratman, 2016; Varga et al., 2014). Focusing on self-efficacy or self-kindness would not address how individuals respond to failure, self-criticism or emotional distress, which have been identified as being central to people scoring higher in ON symptomatology (Dunn & Bratman, 2016). Integrating self-compassion into interventions for other ED, such as Binge Eating (Webb & Forman, 2013) has shown that self-compassion is essential in self-regulation, acceptance of oneself and self-criticism (e.g., Goss & Allan, 2014; Webb & Forman, 2013; Pullmer et al., 2019). Since self-compassion encourages a balanced, more understanding and kinder perspective on personal shortcomings, which reduces harsh self-criticism and over-identification with negative emotions (Neff, 2003a), individuals with high self-compassion are more likely to have a positive perception of their abilities and greater self-efficacy compared to those with lower self-compassion. Therefore, self-compassion may propose a path to enhance and embed self-efficacy, but understanding the foundational association between self-compassion and ON is a necessary precursor to investigating more complex models between self-compassion and self-efficacy. Exploring both self-compassion and mindfulness-based constructs holds the potential to yield new insights for much-needed research and implications for intervention development for ON.

1.12 Present Thesis

The present chapter has introduced an essential foundation for understanding ON by introducing the concept, diagnostic challenges, and psychometric tools used to assess it. There were two primary aims for this thesis. First, judging from the lack of data in the most recent scale that met consensus which is the newly developed Orthorexia Nervosa Inventory (ONI), one primary aim of this thesis was to replicate research and create a baseline to identifying the potential associations to ON using the ONI. Elements such as associations to perfectionism, BMI, mental health and illness and eating behaviours were of primary concern to create continuity to past research and identify potential differences that would inform future research and practice. Second, research has strategically focussed on identifying potential populations at-risk, and elements that are predictive of ON, without the potential exploration of constructs that are associated with interventions and solutions to propose positive health behaviour change. The intentional inclusion of mindfulness, mindful eating and self-compassion in research chapters will serve as a guide to building potential paths to symptom reduction, and body-mind interventions that are founded in self- and emotion-regulation principles. Below is a brief outline of the research chapters included within this thesis: The primary objective of Chapter 2 is to examine the connections between ON, mindfulness, self-compassion, and perfectionism. The secondary goal of this study is to investigate the mediating power of mindfulness in the association between perfectionism and orthorexia nervosa. The final objective is to investigate self-compassion as the potential mediator of the relationship between perfectionism and orthorexia nervosa. Chapter 3 builds on this by shifting focus to the role of palatable foods in ON and investigating whether mindfulness and self-compassion mediate this relationship. Since perfectionism often influences rigid eating patterns, understanding how individuals with ON respond to palatable foods extends the discussion from Chapter 2. The primary goal of Chapter 3 is to examine the relationship between ON, mindfulness, self-compassion and motivations to eat palatable foods. The secondary goal of this study was to explore the mediating role of mindfulness and self-compassion on palatable foods and orthorexia nervosa. Chapter 4 then broadens the

scope to disordered eating and mental health, using mindfulness and self-compassion constructs to explore how these psychological factors relate to ON. This transition allows for a deeper understanding of ON's impact on overall well-being. Beyond these primary relationships in Chapter 4, both studies 1 and 2 explored a secondary question: could mindfulness and self-compassion act as intermediaries (mediators) in the connections between ON and its contributing factors?

Leading onto Chapter 5, which investigates how mindfulness, self-compassion, and mindful eating influence ON and Quality of Life (QoL). This transition expands from general mental health outcomes to a more focused look at QoL and how psychological factors moderate ON's impact on well-being, and orthorexia in a female population, given the higher prevalence of orthorexia in women. The secondary goal of this chapter is to investigate whether mindful eating, self-compassion, and mindfulness moderate the relationship between Orthorexia Nervosa (ON) and Quality of Life (QoL). Chapter 6 builds on this by refining the conceptualization of ON and introducing new measures of mindful eating, alongside exploring the relationship between Healthy Orthorexia, Orthorexia Nervosa, mindfulness, and self-compassion. This chapter also expands beyond student populations, reinforcing the broader applicability of the research. Chapter 6 examines the relationship between Healthy Orthorexia and Orthorexia Nervosa (as measured by the Teurel Orthorexia Scale) and mindfulness, self-compassion, and mindful eating. Chapter 6 also aims to expand on previous research beyond student populations by utilizing multiple orthorexia assessment tools, including the Orthorexia Nervosa Inventory, the Dusseldorf Orthorexia Scale, and the Teurel Orthorexia Scale. Chapter 6 lays the groundwork for a more quantitative understanding of ON, including measurement tools and theoretical distinctions. Chapter 7 then complements this with a qualitative exploration, focusing on how individuals with orthorexic tendencies conceptualize healthy eating and engage in mindfulness and self-compassion-based practices. This final chapter provides a deeper, lived-experience perspective, bridging the theoretical and empirical insights from previous chapters. Chapter 7 explores orthorexia nervosa

utilising a qualitative approach to investigate how mindfulness and self-compassion can be used in high orthorexic individuals. The research questions presented in Chapter 7 aim to answer are (a) how people with orthorexic tendencies conceptualise and understand healthy eating behaviours and (b) how people with orthorexic tendencies engage in mindfulness and self-compassion-based practices in eating behaviours.

CHAPTER 2: EXPLORATION OF THE MEDIATING ROLE OF SELF-COMPASSION AND MINDFULNESS ON ORTHOREXIA NERVOSA AND PERFECTIONISM

2.1. Abstract

Orthorexia Nervosa (ON) is characterised by an excessive preoccupation with healthy eating, accompanied by increasingly restrictive dietary practices over time. Considering the increased attention to ON, it is noteworthy that the existing body of research, specifically regarding mindfulness and self-compassion remains constrained in scope and depth.

A total of 151 participants over the age of 18 completed scales measuring Orthorexia, Self-Compassion, Mindfulness, and Perfectionism. The findings revealed that individuals exhibiting high levels of ON tended to have low levels of self-compassion and mindfulness, along with high levels of perfectionism. Furthermore, the results indicated that self-compassion and mindfulness acted as mediators in the relationship between perfectionism and ON. These findings deepen our comprehension of orthorexia and underscore the role of self-compassion and mindfulness, or their absence, as mediating factors in this context. The implications of these results and potential future directions are discussed.

2.2. Introduction

Healthy diets have become increasingly popular in recent years as means of achieving optimal health and a desire to improve current health or as a preventative measure however these are common underlying features which may lead to orthorexic tendencies (Dunn & Bratman, 2016). Orthorexia nervosa (ON) was first introduced by Bratman in 1997 (Bratman, 2017), who described ON as an obsessive fixation on healthy eating. While healthy eating is a desirable health behaviour for some individuals the drive for healthy eating may include obsessive thoughts, compulsive behaviours, and self-punishment and these are symptoms which collectively have been defined as ON (Bratman, 2017).

Individuals with orthorexic tendencies focus purely on food quality and purity (Koven & Arby, 2015) and spend significant time planning and preparing meals that adhere to their food rules. Many individuals who display ON eliminate specific food groups which they consider unhealthy (Dunn & Bratman, 2016). Over time, these restrictions become more

extreme resulting in the lack of enjoyment of food, as well as potentially resulting in malnutrition and further medical complications (Brytek-Matera et al., 2017; Cena et al., 2019; Dunn & Bratman, 2016).

The clinical recognition of ON as an eating disorder remains a topic of debate, despite the proposal of multiple diagnostic criteria; its absence in the DSM-5 is noteworthy (Donini et al., 2014; Koven et al., 2015). ON shares characteristics with established eating disorders (Bartel et al., 2020), and research indicates a link between prior eating disorders and ON development, manifesting as a shift from quantity to quality of food obsession, serving as a socially acceptable weight control strategy for those with disordered eating histories (e.g., Hanganu-Bresch, 2020; McComb & Mills, 2019). Considering the common characteristics between eating disorders and orthorexia, it is important to explore factors that have led to the development and maintenance of eating disorders. One of these factors is perfectionism – a construct that is multifaceted and multidimensional, with common characteristics of perfectionism of high personal standards, excessive concern over mistakes, fear of negative evaluations and self-criticism (Frost et al., 1990). Within this framework, there are two higher dimensions Perfectionistic Strivings (PS) and Perfectionistic Concerns (PC) (Frost, 1990; Frost et al., 1993; Stoeber & Otto, 2006). PS reflects the tendency to set and pursue high standards and are associated with adaptive characteristics, while PC heightens concern over mistakes and are more linked to maladaptive outcomes (Sirois et al., 2017; Stoeber & Otto, 2006). Perfectionism has been extensively researched in the development and maintenance of eating disorders (e.g., Bardone-Cone et al., 2007; Brown et al., 2012; Franco-Paredes et al., 2005; Rand-Giobannetti et al., 2022), as well as treatment of eating disorders (Bardone-Cone et al., 2009; Egan et al., 2011; Goldstein et al., 2014). A recent systematic review has suggested that perfectionism interventions have been shown to reduce disordered eating and Bulimia Nervosa (BN) (Robinson & Wade, 2021). One of the main features of ON is the strict adherence to dietary rules and experiencing self-criticism when deviating from these rules (Bratman, 2017; Mathieu, 2005), aligning with the two dimensions of perfectionism

(Stoeber & Otto, 2006). The strict pursuit of dietary purity reflects elevated PS, while distress, guilt and self-criticism due to non-adherence to strict dietary regimens are characteristics of PC (Frost et al., 1990).

Empirical studies have investigated ON and perfectionism (e.g., Barnes & Caltabiano, 2017; Miley et al., 2021; Pratt et al., 2023 Yung & Tabri, 2021) and found elevated levels of perfectionism to be associated with greater orthorexic tendencies. These findings were corroborated by Novara and colleagues (2022) who conducted a cross-sectional study investigating perfectionism and orthorexia and found that individuals classified under a high orthorexic group demonstrated higher levels of perfectionism compared to those in a lower orthorexic group, and individuals with orthorexic tendencies scored highest on the subscales of personal standards, which reflects the tendency to place high expectations upon oneself and organisation, which reflects the importance placed on maintaining order and structure, indicative of PS. Additionally, they found that those higher in the orthorexic group displayed higher levels of depression (Novara et al., 2022); a finding consistent with maladaptive profile linked to PC and central features of ON such as compromised social functioning and depressive mood (Oberle et al., 2020). However, research has also suggested that the relationship between orthorexia and perfectionism is weaker compared to other eating disorders such as AN (Bardone-Cone et al., 2007; Bartel et al., 2020; Donini et al., 2022). The majority of existing research on perfectionism has utilised the Frost Multidimensional Perfectionism Scale (FMPS) (e.g., Bartel et al., 2020; Domingues & Carmo, 2020; Hayes et al., 2017; Mavrandrea & Gonidakis, 2022; Oberle et al., 2017), and the present research aimed to ensure comparability with previous studies, which was a key consideration to allow for meaningful comparisons, meta-analyses, and a stronger integration of already existing findings in the literature. In contrast, researchers examining the diagnostic nature of orthorexia nervosa (ON) have commonly used different versions of the Eating Disorder Inventory (EDI), as it aligns with efforts to establish ON as a distinct disorder within the DSM framework (e.g., Novara et al., 2021; Novara et al., 2023; Parra-Fernández et al., 2018).

Given that perfectionism is a significant factor in eating disorders and considering that orthorexia shares similar characteristics with such eating disorders, it becomes essential to explore perfectionism further within the context of orthorexia.

Mindfulness and self-compassion are closely correlated constructs that have been extensively researched in the context of eating disorders, disordered eating, and perfectionism (e.g., Ferreira et al., 2014; Braun et al., 2016; Tobin & Dunkley, 2021; Manova & Khoury, 2023). According to Kabat-Zinn (2003), mindfulness is a psychological concept that entails paying conscious attention to both internal and exterior phenomena such as feelings, thoughts, and bodily sensations without passing judgment. Neff (2003a) has defined self-compassion as understanding that suffering and failure are all part of the human experience, with three key components of self-kindness, shared humanity and mindfulness. As these are closely related there are key differences between the constructs, self-compassion is utilised when facing challenges, personal failures, inadequacies and alleviating suffering (Neff & Knox, 2016) whereas mindfulness is about all experiences and not just the challenging ones in the present moment (Sigel et al., 2009). In other words, self-compassion measures mindfulness in response to suffering, while mindfulness is a more holistic measurement tool that explores both positive and negative experiences. Also, the Self-Compassion Scale (SCS) fails to capture the facets of mindfulness, such as the ability to observe, describe, and act with awareness in the present moment (Neff, 2003a). Both mindfulness and self-compassion are multidimensional constructs that are measured through subscales, which highlight their overlapping and distinct elements. Neff's (2003b) SCS includes six components: three positive dimensions (self-kindness, common humanity, and mindfulness) and three negative dimensions (self-judgment, isolation, and over-identification). Importantly, the mindfulness subscale within the SCS refers specifically to a balanced, non-reactive awareness of suffering rather than a general mindful state. This suggests that self-compassionate mindfulness is primarily concerned with mitigating distress, rather than fostering a broader awareness of moment-to-moment experiences. On the other hand, the Five Facet Mindfulness

Questionnaire (FFMQ), developed by Baer et al. (2006), assesses mindfulness using five distinct subscales: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. Unlike the SCS, which focuses on mindfulness in the context of suffering, the FFMQ captures mindfulness as a broad trait that applies to all experiences. The facets of observing and describing highlight an individual's ability to notice and articulate their thoughts, emotions, and surroundings, while acting with awareness pertains to engaging fully in present-moment experiences. The non-judging and non-reactivity components align more closely with self-compassion, as they emphasize an accepting, non-critical stance. While there is an overlap between the two constructs – particularly in the shared emphasis on non-judgment and awareness – the SCS does not comprehensively measure mindfulness in the way that the FFMQ does. Specifically, the ability to observe, describe, and act with awareness is not captured in the self-compassion framework, as self-compassion is more focused on responding to suffering. Conversely, while mindfulness as measured by the FFMQ encourages open awareness of both pleasant and unpleasant experiences, it does not explicitly include elements of warmth or self-kindness that are central to self-compassion (Baer et al., 2006; Neff, 2003a). An investigation into the interaction between mindfulness and self-compassion in ON, particularly by examining whether specific subscales of these constructs (e.g., non-judging from the FFMQ and self-kindness from the SCS) are protective factors against ON severity. Clinically, interventions that emphasise self-compassion alongside mindful awareness may help individuals with ON develop a more balanced relationship with food and reduce the distress associated with eating behaviours.

Research on ON, mindfulness and self-compassion is limited with only two studies (Kalika et al., 2022; Stahler, 2021). Results from these studies demonstrated that self-compassion and mindfulness are negatively correlated to ON suggesting that those with high orthorexic tendencies display lower levels of mindfulness and self-compassion. These results align with research on perfectionism and mindfulness where those who score highly on

perfectionism are in the state of mindlessness which prevents them from being aware of the present moment (Flett et al., 2020), suggesting merit in further exploring the link between orthorexia, perfectionism, and mindfulness. Furthermore, James and Rimes (2017) showed that students who experienced difficulties with perfectionism and were placed in mindfulness-based cognitive therapy showed higher levels of mindfulness and self-compassion post-treatment. Previous studies (Kuyken et al., 2010; Manova & Khoury, 2023) found mindfulness and self-compassion to act as mediators between perfectionism and social anxiety and depression, which provide empirical support for investigating similar relationships in the context of orthorexia. Social anxiety, depression, impaired social functioning, and impaired mood are mentioned as key concepts that are predictive of orthorexia (e.g., Awad et al., 2021; Baracat et al., 2024). Investigating the mediating role of self-compassion and mindfulness is paramount as it allows for a thorough exploration of risk factors, crucial elements in understanding orthorexia. This approach recognises the intricate connections among these variables and their potential impacts on the development or exacerbation of orthorexia. Given the central emphasis on the challenges and human suffering associated with orthorexia, the potential significance of self-compassion, particularly in comparison to mindfulness, in mediating present and future relationships, holds promise for offering practical solutions to individuals exhibiting high orthorexic tendencies.

The primary objective of this investigation was to examine the connections between ON, BMI, mindfulness, self-compassion, and perfectionism (PC and PS). Based on existing literature, it is hypothesized that ON will exhibit negative correlations with mindfulness and self-compassion (Kalika et al., 2022), while showing positive correlations with perfectionism (PC and PS) (e.g., Merhy et al., 2023; Miley et al., 2022; Novara et al., 2021) and BMI (Oberle et al., 2017). The secondary goal of this study was to investigate the mediating power of mindfulness in the association between perfectionism and orthorexia nervosa. The final objective was to investigate self-compassion as the potential mediator of the relationship

between perfectionism and orthorexia nervosa. The complex connections between perfectionism, orthorexia, mindfulness, and self-compassion warrant thorough examination. This study represents the inaugural exploration of these interconnected concepts which will aid in further understanding of orthorexia nervosa.

2.3. Methods

Participants

The present study looked at the general population in terms of orthorexia nervosa. A total of 224 participants were initially recruited for the study. However, 73 participants who did not complete the entire study were excluded from the final sample. The sample ($n = 151$) who were all adults (18 years- 67 years; $M = 30.47$, $SD = 10.84$) with a mean Body Mass Index (BMI) of $M = 23.40$ kg/m² ($SD = 4.73$). See Table 2.1 for an overview of Participant Characteristics. Correlation with 4 variables based on a power of .8 for medium effect size and set with the significance of .05 comes to a minimum of 118 participants (Cohen, 1992). Participants were recruited through volunteering sampling by advertising the study on several social media platforms and forums such as Facebook, Instagram, Twitter and LinkedIn. The advertisement on Facebook has been posted in eating groups requesting individuals to participate in the study. Individuals were also recruited through the university's Research Participation Scheme. Those who participated in the scheme were rewarded with research credits upon completion of the study. Participants were informed via the information sheet that the inclusion criteria for this study required them to be over the age of 18, have good knowledge of the English language and not be diagnosed with an eating disorder.

Table 2.1 Participant demographic information ($n = 151$).

Characteristic	n	%
Gender		
Female	116	76.8

Male	31	20.5
Prefer not to say	2	1.3
Prefer to self-describe	2	1.3
Ethnicity		
White	111	73.5
Asian	27	17.9
Black	5	3.3
Mixed	7	4.6
Other	1	0.7
Diet		
Vegan	10	6.6
Lacto-vegetarian	7	4.6
Lacto-ovo-vegetarian	10	6.6
Pescetarian	6	4.0
Semi-vegetarian	16	10.6
Occasional omnivore	20	13.2
Omnivore	82	54.3
Descriptive statistics for continuous variables.		
	M	SD
Age	30.47	10.84
BMI	23.38	4.72

Materials

Demographic information: a set of questions designed to collect general information about participants. Participants were required to report their age, gender, ethnicity, weight, height and type of diet e.g., omnivore, occasional omnivore, semi-vegetarian, pescatarian, lacto-ove-vegetarian, lacto-vegetarian, vegan.

Orthorexia Nervosa Inventory (ONI). The scale was developed by Oberle et al. (2020). It is a measure of ON symptomatology which includes 24 items assessing 3 factors of orthorexic behaviours such as impairments, behaviours and emotions. Impairments subscale measures the extent to which orthorexic behaviours interfere with an individual's daily functioning, including social life, work, and overall well-being. High scores indicate significant disruption caused by rigid eating practices. The behaviour subscale assesses the compulsive and rule-driven actions related to eating habits. It reflects the behavioural dimension of orthorexia, including strict dietary rules, ritualised food preparation, and

avoidance of "impure" foods. The emotions subscale captures the emotional consequences of orthorexic behaviours, such as guilt, anxiety, or distress when deviating from self-imposed dietary rules. It reflects the affective responses that reinforce orthorexic patterns. It utilises a 4-point Likert scale with the following responses: 1 (not at all true) to 4 (very true). The higher total score indicates a greater severity of ON, Oberle et al. (2021) has suggested a score of a minimum of 72 to indicate orthorexic tendencies. Sample questions are "My healthy eating is a significant source of stress in my relationships" and "I follow a healthy diet with many rules". The Cronbach alpha for the present study was .97. Additionally, the Cronbach alpha was calculated for the subscales; impairments was .94, behaviours was .92 and emotions was .89. Previous studies have looked at psychometrics of this scale indicating good convergent and criterion validity (Oberle et al., 2021; Zagaria et al., 2023) with Messer et al. (2023) utilising this scale for further validation of orthorexia nervosa symptoms.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). This is a shorter version of the original 39-item FFMQ. This scale was developed by Baer et al. (2008) and includes 15 items that measure five facets: Observing, Describing, Acting with Awareness, Non-Judging and Non-Reactivity. Observing involves noticing and attending to internal and external sensations, such as thoughts, feelings, and environmental cues. Describing refers to the ability to articulate or label these experiences in words, reflecting a person's capacity to understand and communicate their internal world. Acting with Awareness emphasizes engaging in activities with full attention, avoiding automatic or distracted behaviour, which allows individuals to be more present in their actions. Non-Judging reflects the ability to observe thoughts and emotions without evaluating them as good or bad, fostering acceptance and neutrality. Finally, Non-Reactivity involves the capacity to notice thoughts and emotions without immediately reacting to them, enabling a more balanced and less impulsive response to internal experiences. This scale utilises a 5-point Likert scale with the following responses: 1 (never true) to 5 (always true). A score is combined for each facet of the scale, with no minimum threshold. Sample questions include "I do jobs or tasks automatically without being

aware of what I'm doing" and "I find myself doing things without paying attention". The Cronbach alpha for the present study was .67. Additionally, the Cronbach alpha was calculated for the subscales; observing was .56, describing was .73, acting with awareness .80, non-judging of inner experience was .86 and non-reactivity was .67. The convergent and discriminant validity of the scale was established in previous research (Bohlmeijer et al., 2011)

Self-Compassion Scale (SCS). This is the original 26-item SCS, it was developed by Neff (2003b) to measure self-compassion. The items are rated on a 5-point Likert scale with the following responses, 1 (never) to 5 (always). The self-compassionate components are: Self-Kindness, which reflects being kind and understanding toward oneself during times of suffering or failure, as opposed to being harshly critical; Common Humanity, which involves recognizing that suffering and personal inadequacy are part of the shared human experience, rather than feeling isolated in one's struggles; and Mindfulness, which refers to being aware of one's emotions and experiences without becoming overwhelmed or over-identifying with them. On the other hand, the uncompassionate components are Self-Judgement, which involves being critical and harsh toward oneself; Isolation, which reflects feeling alone or disconnected when experiencing difficulties; and Over-Identification, which describes becoming excessively absorbed in negative emotions, preventing a balanced perspective. Sample questions include "When I fail at something important to me I become consumed by feelings of inadequacy" and "I try to be loving towards myself when I'm feeling emotional pain". The Cronbach alpha for the present study was .93. Additionally, the Cronbach's alpha was calculated for the subscales; self-kindness was .83, self-judgement was .84, common humanity was .81, mindfulness was .75 and over-identified was .71. This scale is a valid measure of self-compassion as research indicates strong predictive validity such as group validity (Neff, 2003b; Neff, 2015; Neff & Pommier, 2013) and good convergent validity (Neff et al. 2007).

Frost Multidimensional Perfectionism Scale (FMPS). This scale was originally developed by Frost et al. (1990); however, the current study is looking at Stober (1998) version which contains four subscales instead of six. There are 35 items measuring perfectionism. The Concern over Mistakes and Doubts about Actions subscale captures the tendency to be overly worried about making mistakes and doubting one's actions, leading to anxiety and self-criticism. The Excessive Concern with Parents' Expectations and Evaluations subscale reflects a strong preoccupation with meeting the perceived expectations and evaluations of one's parents, often leading to a sense of inadequacy if those expectations are not met. The Excessively High Personal Standards subscale measures the tendency to set unrealistically high standards for oneself, which can result in feelings of frustration and failure when these standards are not achieved. Finally, the Concern with Precision, Order, and Organization subscale assesses the need for orderliness and precision, where individuals often focus on being overly meticulous and structured in their approach to tasks and activities. In the present study, the dimensions of perfectionism were operationalised using specific subscales of FMPS. This is consistent with Stoerber and Otto's (2006) conceptual framework, the Doubts about Action and Concern over Mistakes were used to form PC. The Personal Standards were used to form PS. Following the theoretical recommendations, Organisation, Parental Expectations and Parental Concern were excluded from the dimensions as they did not align directly with the core dimensions of PC and PS, but still were used to conduct further correlations. Stoerber and Otto (2006) recommended excluding the Organisation subscale as it is not considered to be directly related to perfectionism. Each item is scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample questions include "My parents wanted me to be the best at everything" and "I am very good at focusing my efforts on attaining a goal". The Cronbach alpha for the present study was .95. Additionally, the subscales were calculated Concern over Mistakes and Doubts about Actions (PC) had .93, Excessive concern with parents' expectations and evaluations had .93, Excessively High Personal Standards (PS) had .83 and Concern with

precision, order and organisation had .88. The validity of the measure was tested by Hewitt et al. (1991) indicating that the scale has good validity.

Procedure

The study received Ethical approval from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited through social media groups and were encouraged to share the study with their connections. They were provided with information about the study, including the criteria for inclusion and exclusion, and the hyperlink to Qualtrics where they could access the questionnaire. Additionally, the university's Research Participation Scheme (RPS) was employed offering research credits to individuals who participated. Participants were given a Participant Information Sheet to read, prior to consenting. Participants consented and created a unique code for identifying data in the event of withdrawal. Participants were asked to complete demographic information, ONI, FFMQ, SCS and FMPS. After completion, participants were provided with a debrief form explaining the objectives of the study and the withdrawal process. The study consisted of a single 20-minute online session.

Data Analysis

Prior to conducting the analysis of the data, assumptions were tested, although options such as bootstrapping and heteroscedasticity-consistent inference can bypass the necessity for normality and homoscedasticity (e.g., Preacher & Hayes, 2008). Firstly, the data was checked for outliers. Cook's distance was used, and the range was between 0 and .104 which indicated that there were no outliers. According to Hair et al. (2010) the values between 2 to -2 for Skewness and 7 to -7 for Kurtosis are normal. The assumptions for normality were examined using the Skewness and Kurtosis. Skewness scores for ONI, SCS, FFMQ and FMPS were .82, -.08, -.61 and .05. Kurtosis scores for ONI, SCS, FFMQ and FMPS were -.39, -.62, .94 and -.61. So, the data met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 2.7 which is below the value of 5

(Tabachnick & Fidell, 2007) meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0; IBM Corp., 2017). Pearson's bivariate correlations were conducted to assess the associations between Orthorexia (ONI), Mindfulness (FFMQ), Self-compassion (SCS) and Frost Multidimensional Perfectionism Scale (FMPS) (see Table 2.2.).

Furthermore, mediation analysis was used to evaluate the indirect effects (via self-compassion and mindfulness) of perfectionism on orthorexia nervosa (see Figure 1). Hayes' (Preacher & Hayes, 2008) PROCESS macro (v3.3) was installed on SPSS (version 25.0) and was used to conduct mediation analyses (model 4) using 10,000 bootstrapping resamples to generate 95% bias-corrected confidence intervals for the indirect effect (Preacher & Hayes, 2008). According to specified guidelines using mediation analyses, Fritz and MacKinnon (2007) suggested that a sample size of 148 participants would enable research to observe an indirect effect of a small-medium sized alpha pathway coefficient (i.e., predictor to mediator) and a small-medium sized beta pathway coefficient (i.e., mediator to criterion) at 80% power using bias-corrected bootstrapping estimating procedures.

2.4. Results

A multiple correlation analysis has been used to identify which scales (BMI, SCS, FFMQ, FMPS, PC and PS) relate to ONI.

Inter-correlations between ONI, BMI, SCS, FFMQ, FMPS, PC and PS are presented in Table 2.2 with $r < 0.3$ indicating a weak correlation, $0.3 \leq r < 0.5$ indicating a moderate correlation and $r \geq 0.5$ indicating a strong correlation (Ratner, 2009). Findings indicate that there are significant negative relationships between ONI and FFMQ ($p < .001$), SCS ($p < .001$) and FMPS ($p < .001$) Only BMI was not significant concerning ONI. There are also significant positive correlations between ONI and the PC ($p < .001$) and PS ($p < .001$). A further correlation analysis has been conducted between the ONI, and subscales of FFMQ, SCS and

FMPS, the findings are presented in Table 2.3 found in Supplementary Materials in section D2.

Table 2.2

Bivariate correlations between ONI, BMI, FFMQ, SCS, FMPS, PC and PS and descriptive statistics (n=151).

	1	2	3	4	5	6	M	SD
(1) ONI							46.66	19.05
(2) BMI	.001						23.38	4.72
(3) FFMQ	-	.178*					45.56	7.35
	.427**							
(4) SCS	-	.179*	.663**				2.74	.83
	.470**							
(5) FMPS	.490**	.019	-	-			92.40	23.79
			.382**	.648**				
(6) PC	.534**	-.018	-	-	.933°		41.18	11.84
			.464**	.699**	°			
(7) PS	.244**	-.011	-.089	-.420°°	.796*	.622*	25.15	5.62
					*	*		

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. FMPS: Frost Multidimensional Perfectionism Scale. PC: Perfectionistic Concerns. PS: Perfectionistic Strivings

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

A mediation analysis was conducted to examine the relationship between perfectionistic strivings (PS) and orthorexia, with self-compassion included as a potential mediator (see Figure 2.1). PS significantly predicted lower self-compassion, $b = -.063$, $SE = .012$, $p < .001$, 95% CI $[-.087, -.039]$, and lower self-compassion, in turn, significantly predicted higher orthorexia scores, $b = -10.34$, $SE = 1.96$, $p < .001$, 95% CI $[-14.23, -6.45]$. The total effect of PS on orthorexia was significant, $b = 1.03$, $SE = 0.29$, $t = 3.50$, $p = .001$, 95% CI $[0.45, 1.61]$. However, when self-compassion was included in the model, the direct effect of PS on orthorexia was no longer significant, $b = 0.38$, $SE = 0.29$, $p = .204$, 95% CI $[-0.21, 0.96]$. These findings indicate that self-compassion fully mediates the relationship between perfectionistic strivings and orthorexia. Higher levels of PS are associated with reduced self-

compassion, which in turn contributes to greater orthorexic tendencies, highlighting self-compassion as a key psychological mechanism linking perfectionistic strivings to orthorexic behaviours.

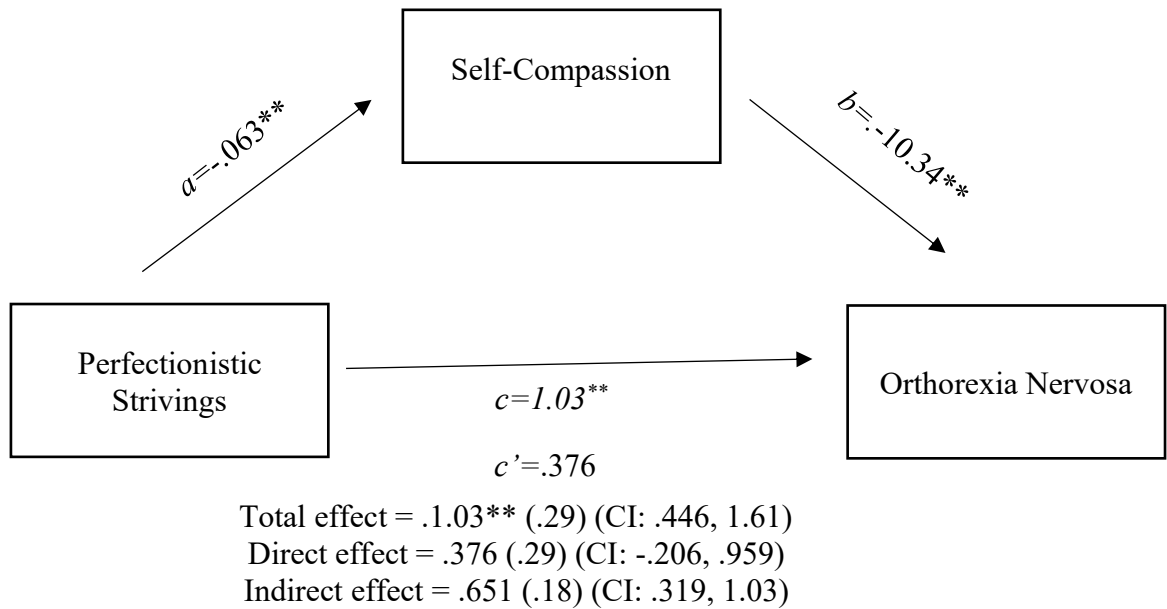


Figure 2.1 Parallel mediation using standardised regression coefficients to examine the interaction of self-compassion in the relationship between a) Perfectionistic Strivings and b) Orthorexia Nervosa. Notes: a is the effect of perfectionistic strivings on self-compassion; b is the effect of self-compassion on orthorexia nervosa; c is the effect of perfectionistic strivings on orthorexia nervosa; c' is effect of perfectionistic strivings on orthorexia nervosa with self-compassion in the model

A second mediation analysis was conducted to examine whether self-compassion (TSCS) mediated the relationship between perfectionistic concerns (PC) and orthorexia (TONI; see Figure 2.2). PC significantly predicted lower levels of self-compassion, $b = -0.049$, $SE = 0.004$, $p < .001$, 95% CI [-0.057, -0.040]. PC also significantly predicted orthorexia in the total effect model, $b = 0.925$, $SE = 0.117$, $p < .001$, 95% CI [0.695, 1.155]. When both PC and self-compassion were included in the model predicting orthorexia, PC remained a significant predictor, $b = 0.733$, $SE = 0.162$, $p < .001$, 95% CI [0.413, 1.053], whereas self-compassion did not significantly predict orthorexia, $b = -3.95$, $SE = 2.33$, $p = .092$, 95% CI [-8.55, 0.66].

The indirect effect of PC on orthorexia via self-compassion was not statistically significant, $b = 0.192$, $\text{BootSE} = 0.116$, 95% bootstrap CI $[-0.037, 0.418]$, as the confidence interval included zero. These findings indicate that self-compassion does not mediate the relationship between perfectionistic concerns and orthorexia. Instead, PC appears to exert a strong and direct influence on orthorexic tendencies, independent of self-compassion, suggesting that maladaptive aspects of perfectionism characterised by fear of mistakes and self-criticism may contribute to orthorexic behaviours through pathways other than reduced self-compassion.

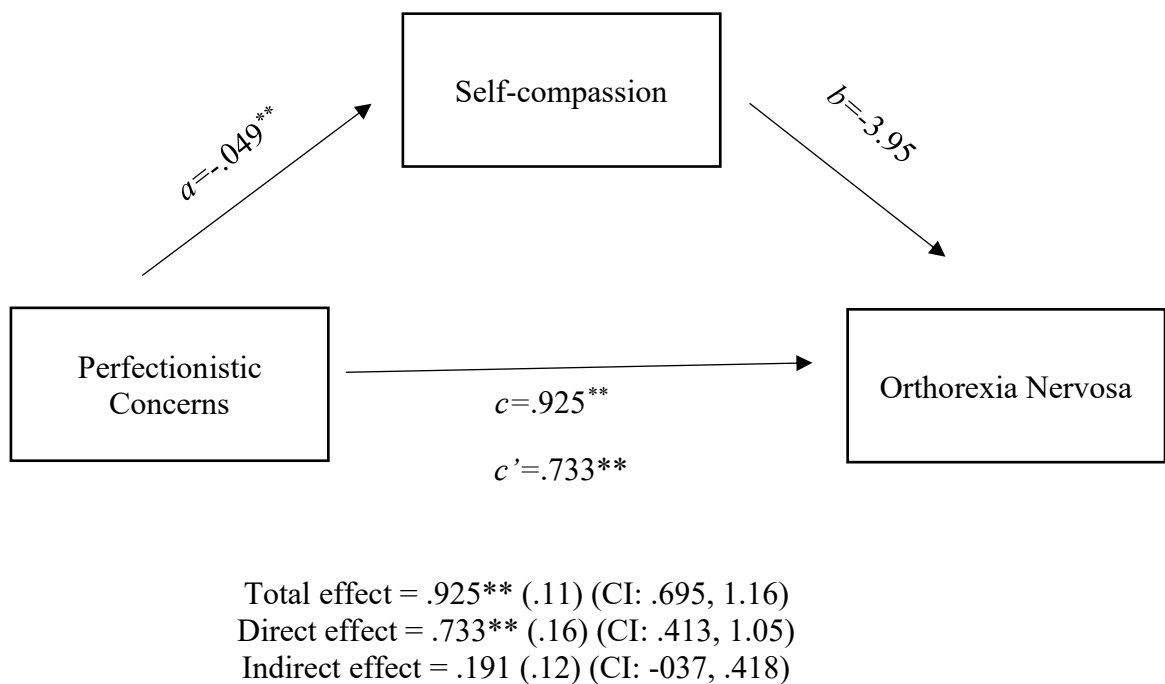
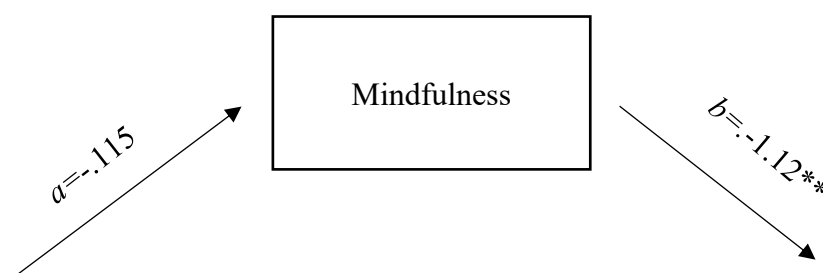


Figure 2.2 Parallel mediation using standardised regression coefficients to examine the interaction of self-compassion in the relationship between a) Perfectionistic Concerns (PC) and b) orthorexia nervosa. Notes: a is the effect of PC on mindfulness; b is the effect of self-compassion on orthorexia nervosa; c is the effect of PC on orthorexia nervosa; c' is effect of PC on orthorexia nervosa with self-compassion in the model

A mediation analysis was conducted to examine whether mindfulness mediated the relationship between perfectionistic strivings (PS) and orthorexia (Figure 2.3). PS did not significantly predict mindfulness, $b = -.115$, $SE = .116$, $p = .303$, 95% CI $[-0.34, 0.11]$.

Despite this, mindfulness significantly predicted orthorexia when included in the model alongside PS, $b = -1.12$, $SE = 0.20$, $p < .001$, 95% CI $[-1.51, -0.73]$, indicating that lower levels of mindfulness were associated with greater orthorexic tendencies. PS also remained a significant predictor of orthorexia in this model, $b = 0.76$, $SE = 0.26$, $p = .004$, 95% CI $[0.25, 1.27]$. The total effect of PS on orthorexia was significant, $b = 0.89$, $SE = 0.28$, $p = .002$, 95% CI $[0.33, 1.45]$. However, the indirect effect of PS on orthorexia via mindfulness was not statistically significant, $b = 0.13$, $BootSE = 0.14$, 95% bootstrap CI $[-0.19, 0.39]$, as the confidence interval included zero. These findings indicate that mindfulness does not mediate the relationship between perfectionistic strivings and orthorexia. Although lower mindfulness is independently associated with higher orthorexic tendencies, perfectionistic strivings do not significantly predict mindfulness levels. This suggests that the influence of PS on orthorexia operates through mechanisms other than reduced mindfulness, highlighting a direct pathway between striving-oriented perfectionism and orthorexic behaviours rather than an indirect pathway via mindful awareness.



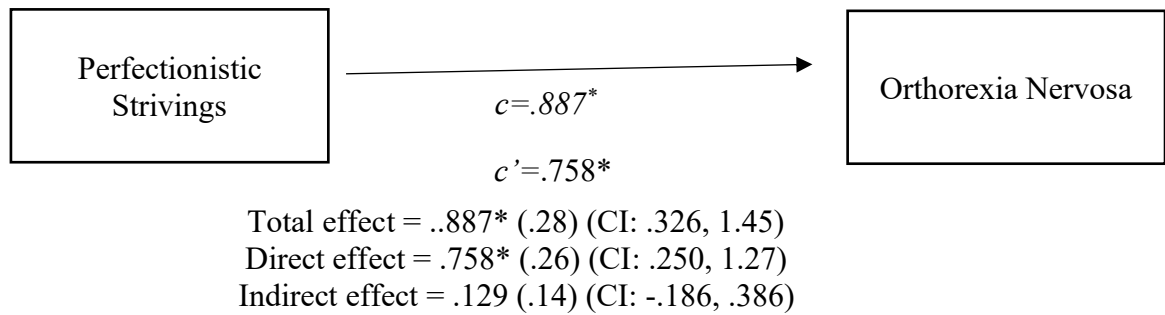
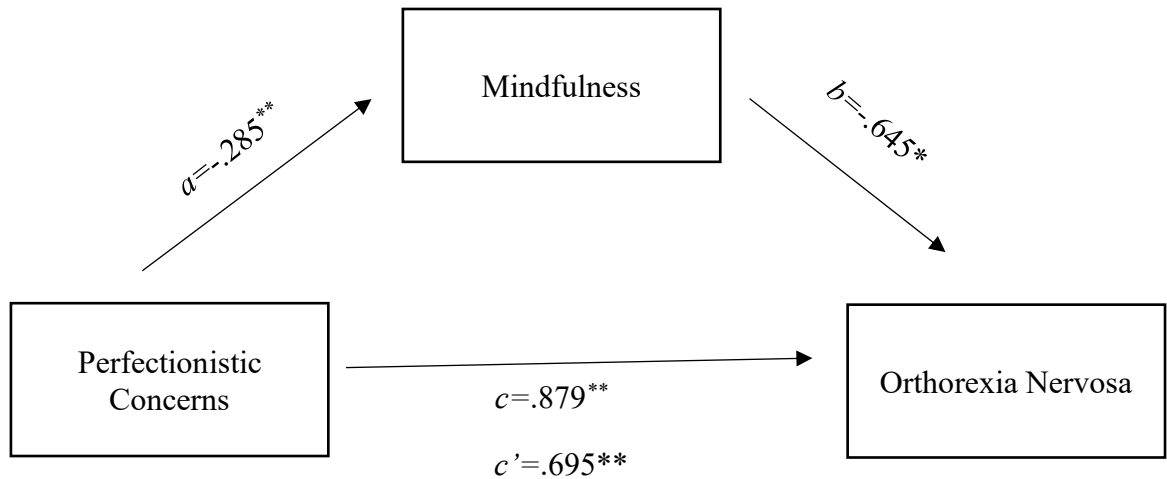


Figure 2.3 Parallel mediation using standardised regression coefficients to examine the interaction of mindfulness in the relationship between a) Perfectionistic Strivings and b) Orthorexia Nervosa. Notes: a is the effect of perfectionistic strivings on mindfulness; b is the effect of mindfulness on orthorexia nervosa; c is the effect of perfectionistic strivings on orthorexia nervosa; c' is effect of perfectionistic strivings on orthorexia nervosa with mindfulness in the model

A fourth mediation analysis was conducted to examine whether mindfulness mediated the relationship between perfectionistic concerns (PC) and orthorexia (TONI; see Figure 2.4). PC significantly predicted lower levels of mindfulness, $b = -.285$, $SE = .047$, $p < .001$, 95% CI $[-0.38, -0.19]$. Lower mindfulness, in turn, was significantly associated with higher orthorexia scores when included alongside PC in the model, $b = -.645$, $SE = 0.206$, $p = .002$, 95% CI $[-1.05, -0.24]$. The total effect of PC on orthorexia was significant, $b = .879$, $SE = .116$, $p < .001$, 95% CI $[0.65, 1.11]$. When mindfulness was included in the model, the direct effect of PC on orthorexia remained significant but was reduced, $b = .695$, $SE = .127$, $p < .001$, 95% CI $[0.44, 0.95]$. The indirect effect of PC on orthorexia via mindfulness was statistically significant, $b = .184$, $BootSE = .066$, 95% bootstrap CI $[0.06, 0.32]$. These findings indicate that mindfulness partially mediates the relationship between perfectionistic concerns and orthorexia. Higher levels of PC are associated with reduced mindful awareness, which in turn contributes to greater orthorexic tendencies. However, because the direct effect of PC on orthorexia remained significant, the results suggest that PC influences orthorexic behaviours both directly and indirectly through reduced mindfulness.



Total effect = .879** (.12) (CI: .650, 1.11)
 Direct effect = .697** (.13) (CI: .445, .946)
 Indirect effect = .184 (.07) (CI: .062, .320)

Figure 2.4 Parallel mediation using standardised regression coefficients to examine the interaction of mindfulness in the relationship between a) Perfectionistic Concerns (PC) and b) orthorexia nervosa. Notes: a is the effect of PC on mindfulness; b is the effect of mindfulness on orthorexia nervosa; c is the effect of PC on orthorexia nervosa; c' is effect of PC on orthorexia nervosa with mindfulness in the model

2.5. Discussion

This study represents the inaugural exploration of the connections between ON, perfectionism (PC and PS), mindfulness and self-compassion, with the potential to develop further relevant research and interventions. As hypothesised, ON had a negative relationship with mindfulness and self-compassion. The results of this study corroborate prior findings demonstrating a consistent negative relationship between mindfulness and self-compassion and orthorexia nervosa (Kalika et al., 2022; Stahler, 2021). Findings suggest that individuals who display higher levels of orthorexic tendencies display lower levels of self-compassion and mindfulness. These results also align with existing research on eating behaviours and mindfulness, as mindfulness has been linked to lower levels of disordered eating (Beshara et al., 2013; Dutt et al., 2019; Mantzios & Wilson 2013, 2014, 2015; Mantzios et al., 2018;

Mantzios et al., 2019). Three of the subscales were negatively correlated with ON, these were *non-judgement*, *acting with awareness* and *describing*, which follows recent findings (Kalika et al., 2022). Unsurprisingly individuals with orthorexic tendencies display high levels of judgement as research has shown that those who violate their food rules display elevated levels of distress, self-judgement and self-punishment (Bratman, 2017; Koven & Abry, 2015). A surprising finding is that individuals with higher orthorexic tendencies display lower levels of awareness. This is contradicting past research, which could link orthorexic tendencies as deliberate and conscious decision-making behaviours around food choices but the present findings could indicate decision-making could be more automatic and compulsive due to lack of awareness. The describing subscale of FFMQ suggests that individuals may struggle to regulate their emotions and thoughts about food leading to increased distress, this corroborates findings on self-regulation (e.g., Friese & Hofmann, 2016; Masicampo & Baumeister, 2007) implying that mindfulness-based interventions could aid in self-regulation. The only positive correlation that was found was with observing subscale which suggests that individual may have heightened awareness of food-related cues such as ingredient lists and nutritional information. However, it is important to note that the observing subscale has been criticised in the literature, with some researchers recommending its removal from future analyses due to its inconsistent relationship with other mindfulness constructs and its problematic nature with some populations (e.g., Goldberg et al., 2016; Petrocchi & Ottavani, 2016; Rudkin et al., 2017). Still, and until further research is conducted, such findings support previous literature as individuals with ON tendencies place significant emphasis on purity and quality of food (Dunn & Bratman, 2016), despite the maladaptive nature it may take when it leads to obsessive food monitoring.

The present study has shown that there was a negative association between ON and self-compassion, in relation to the subscales it was found that all of the subscales were negatively correlated to ON. It is not surprising that self-judgement, isolation and overidentification have negative relationship with ON. A strong relationship with self-

judgement suggests that individuals with high orthorexic tendencies are self-critical when it comes to their eating decisions and habits, and aligns with the harsh internal dialogue that orthorexic individuals may engage in when they fail to adhere to their dietary practices (Dunn & Bratman, 2016; Donini et al., 2023). Similarly, isolation is negatively correlated with ON, indicating that ON is strongly associated with feelings of isolation, which could be because individuals with ON tendencies may withdraw themselves from social settings that involve food (Dunn & Bratman, 2016; Donini et al., 2023). This also relates to the subscale of common humanity, as individuals with ON have lower recognition that others may also struggle with food choices, they may view their dietary struggles as uniquely their own, reinforcing the feelings of isolation. A key concept of self-compassion is self-kindness (Neff, 2003), the present study has found that the self-kindness subscale had the lowest levels in relation to orthorexia, which is an interesting finding. Having lower levels of self-kindness might indicate that individuals with orthorexic tendencies do not view orthorexic eating as a way of being kind to themselves. This contrasts with research that suggests that they engage in “healthy eating” as a means of improving their health; something that could otherwise be interpreted as a form of self-kindness. A qualitative study done by Lewthwaite and LaMarre (2022) supports these findings as they have found that orthorexic individuals acknowledged that restrictive eating was not viewed as an act of self-kindness. However, others recognised that having dietary flexibility where they consumed treats and occasional unhealthy foods was an act of self-kindness as it allowed them to become more healthful individuals. This could potentially mean that there is a distinctive difference between Healthy Orthorexia (HeOr) and Orthorexia Nervosa (OrNe) proposed by Roncero et al. (2021). HeOr refers to non-pathological healthy eating and interest in nutrition, whereas OrNe refers to disordered eating that is characterised by obsessive preoccupation with healthy eating (Zickgraf & Barrada, 2022). Therefore, those who display HeOr could have higher levels of self-compassion and mindfulness as they acknowledge that there needs to be flexibility in terms

of eating (Lewthwaite & LaMarre, 2022) while those with OrNe could potentially have low levels of self-compassion and mindfulness.

Investigating perfectionism was also one of the main aims of this study. As hypothesised, the present study reveals that individuals with higher orthorexic tendencies display higher levels of perfectionism, encompassing both Perfectionistic Strivings (PS) and Perfectionistic Concerns (PC). Within this framework, PS corresponds to Personal Standards subscale, whereas PC corresponds to Concerns over Mistakes and Doubts about Actions. Although the Parental Expectations and Criticism subscale was included, these are generally considered developmental influences rather than core component of perfectionism (Stoeber, 2008; Smith et al., 2022). These findings align with previous research reporting positive associations between orthorexia and perfectionism (e.g., Merhy et al., 2023; Miley et al., 2022; Novara et al., 2021), supporting conceptualisation of perfectionism as a characteristic in orthorexic symptomatology. High levels of PC have been associated with higher levels of AN and BN (e.g., Boisseau et al., 2013; Bulik et al., 2003) and eating pathology (Davies et al., 2009; Egan et al., 2011). Due to ON having similar characteristics to other eating disorders, the prominence of PC is theoretically coherent. Individuals with high orthorexic tendencies set themselves strict dietary rules and experience intense self-criticism, guilt and distress following failure to adhere to these rules (Bratman, 2017; Mathieu, 2005), these processes mirror the fear of mistakes and harsh self-evaluation characteristics of PC. In addition, PS also positively associated with orthorexic tendencies, indicating that both PC and PS are relevant to orthorexia. PS reflects the tendency to set high standards and to strive for personal ideals (Stoeber & Otto, 2006). Such strivings may manifest in terms of rigid goals surrounding dietary purity, health optimisation and moralised eating practices, where individuals might be motivated to adhere to self-defined nutritional rules, spend substantial amount of time researching, planning and controlling food choices in pursuit of their idealised version of healthy and pure eating (Bratman, 2017).

Beyond establishing associations, the present study sought to examine psychological mechanisms linking perfectionism to orthorexia by testing self-compassion and mindfulness as mediators, separately for PS and PC. Distinct mediation patterns emerged for the two dimensions of perfectionism. Self-compassion fully mediated the relationship between Perfectionistic Strivings and orthorexia, suggesting that PS is not inherently maladaptive. Rather, high personal standards appear to increase orthorexic tendencies only when accompanied by low self-compassion. Individuals high in PS may engage in rigid dietary behaviours when they respond to perceived failures with self-criticism rather than kindness, consistent with evidence that self-compassion buffers against restrictive eating and orthorexia (Kalika et al., 2022). In contrast, self-compassion did not mediate the relationship between Perfectionistic Concerns and orthorexia. Although PC was associated with lower self-compassion, its effect on orthorexia remained direct and significant, indicating that maladaptive perfectionistic concerns such as fear of mistakes and harsh self-evaluation may contribute to orthorexic behaviours independently of self-compassion.

Mindfulness showed a different pattern of effects. It did not mediate the relationship between PS and orthorexia, as PS did not significantly predict mindfulness. However, mindfulness partially mediated the relationship between PC and orthorexia, suggesting that individuals high in PC may be more vulnerable to orthorexia due to reduced present-moment awareness and increased cognitive rigidity. This aligns with prior findings showing mindfulness as a mediator between perfectionism and maladaptive outcomes such as anxiety and negative thinking (Manove & Khoury, 2023; Short & Mazmanian, 2013), which are also characteristic of orthorexia-related distress (Dunn & Bratman, 2016). Overall, these findings highlight that PS primarily influences orthorexia through reduced self-compassion, whereas PC exerts both direct effects and indirect effects via diminished mindfulness, underscoring the importance of distinguishing between adaptive and maladaptive dimensions of perfectionism in understanding orthorexic behaviours. Collectively, the four mediation analyses proposed that PS leads to orthorexia entirely because it reduces self-compassion, PC

influences orthorexia directly; self-compassion does not bridge this link, PS does not significantly impact mindfulness levels, and PC leads to ONI both directly and by reducing mindful awareness.

2.6. Limitations and Future Directions

The present study has several limitations. There is a debate in terms of which orthorexia measure seems more viable. The current study has used the Orthorexia Nervosa Inventory (Oberle et al., 2020) which is the newest measure of orthorexia, therefore, has been used a limited amount in the research (Kalika et al., 2022; Kaya et al., 2021; Oberle et al., 2020). As previously discussed, there could be differences between mindfulness and self-compassion if other measures of orthorexia are used. For example, Kalika et al. (2022) demonstrated that there was no association between mindful eating and orthorexia when using the Dusseldorf Orthorexia Scale whereas the present study utilised ONI. Therefore, future research into self-compassion and mindfulness should utilise other measures of orthorexia to establish if the findings are replicated. A prospective avenue for further exploration lies in examining the ramifications of healthy orthorexia and the dual capacity of mindfulness-based constructs to both foster and undermine manifestations of both constructive and detrimental forms of orthorexia.

The FMPS was particularly well-suited for this study due to its multidimensionality of perfectionism as it distinguishes between PC and PS which captures the core cognitive and developmental features. However, alternative scales may offer additional insights. For instance, the Multidimensional Perfectionism Scale (MPS; Hewitt & Flett, 1996), which focuses on social expectations and interpersonal aspects of perfectionism, could help clarify whether ON is socially prescribed and what the expectations of self vs. others are regarding perfectionism. Similarly, the Almost Perfect Scale-Revised (APS-R; Slaney et al., 1996), which distinguishes between adaptive and maladaptive perfectionism, may be valuable in exploring whether healthy and unhealthy orthorexia align with these two

perfectionism types. These alternative scales have been underutilised in orthorexia research. Focusing primarily on social expectations (MPS) or the distinction between adaptive and maladaptive perfectionism (APS-R) may offer greater insights on whether ON is in a way socially "prescribed", and if healthy and unhealthy orthorexia overlaps with adaptive and maladaptive perfectionism. Unfortunately, only one report provided data on the MPS (Miley et al., 2022), but with a mindful eating scale that was prone to validity errors (see Mantzios, 2020), and the subcomponents of the MPS were not explored in detail. Currently, no studies to date have used the APS-R in relation to ON. While the present research makes it particularly valuable for understanding both the origins and ongoing impact of perfectionism across different contexts, the findings provide a baseline for future, more insightful research.

Caution should be taken when interpreting the results due to the small number of participants in this study, as well as the ratio between the genders. Future studies should utilise a higher sample size and ensure that the gender ratio is equal as these are important for the generalizability of the findings.

As demonstrated by the present study, self-compassion and mindfulness have a mediating capacity with orthorexia. Future research should look into experimental approaches utilising mindfulness and self-compassion-based interventions to determine their effectiveness in reducing orthorexic tendencies. ON has gained a lot of popularity with research looking at cross-sectional data, therefore utilising an experimental approach will add further insight into many much-needed interventions for orthorexia.

Furthermore, there is a need for qualitative research when it comes to mindfulness and self-compassion in the orthorexic population. Currently, there is limited literature that explored orthorexia qualitatively (e.g., Cheshire et al., 2020; White et al., 2021; Valente et al., 2020) and to date, no one looked at mindfulness, self-compassion and ON specifically. Gaining a deeper understanding of those concepts would allow further development of potential interventions for the orthorexic population.

2.7. Conclusion

In conclusion, ON is positively correlated with perfectionism and negatively correlated to mindfulness and self-compassion. The present study has also conducted a mediation analysis which revealed that mindfulness and self-compassion can successfully mediate the relationship between perfectionism and orthorexia nervosa. The study offers a novel approach to understanding perfectionism with orthorexia, highlighting that self-compassion and mindfulness can be used as key components in much-needed interventions for ON. Further research needs to explore these concepts further, especially experimentally and qualitatively as this would aid in further understanding of ON.

CHAPTER 3: ORTHOREXIA NERVOSA AND MOTIVATIONS TO EAT PALATABLE FOODS: EXPLORING THE MEDIATING ROLE OF MINDFULNESS AND SELF-COMPASSION.

3.1. Abstract

Orthorexia Nervosa (ON) is marked by an intense focus on healthy eating, leading to increased restrictions over time. The present study aimed to explore the relationships between ON, palatable eating, mindfulness and self-compassion and perform a mediation analysis between these constructs. Three hundred and fifty-seven participants took part in the study, and the results suggested a positive relationship between ON and palatable foods and a negative relationship between ON, mindfulness and self-compassion. Moreover, the findings also proposed that the relationship between palatable foods and ON is mediated by self-compassion and mindfulness. The present study indicates potential avenues for interventions for individuals with high orthorexic tendencies utilising the concepts of mindfulness and self-compassion.

3.2. Introduction

As society's focus on health-conscious eating intensifies, so do the concerns surrounding Orthorexia Nervosa (ON), a condition characterised by an obsessive pursuit of clean and healthy eating habits (Bratman, 2017). Unlike more widely recognised eating disorders, ON emphasises food quality over quantity, often leading individuals down a restrictive dietary path that is conceptualised as an obsessive preoccupation with healthy and clean eating (Bratman, 2017). Unlike other eating disorders (ED) such as Anorexia and Bulimia nervosa, ON focuses on the quality over the quantity of food, but there is an overlap between EDs and ON such as perfectionism, anxiety and the need for control (Koven & Arby, 2015; Zickgraf et al., 2019). ON is not an eating disorder that is presented in DMS-5 or ICD-11 (American Psychological Association [APA], 2013), although researchers have developed several diagnostic tools for ON (e.g., (Dunn & Bratman, 2016; Niedzielski &

Kazmierczak-Wojtas, 2021), there is still a notable challenge in differentiating between healthy eating behaviours and orthorexic tendencies.

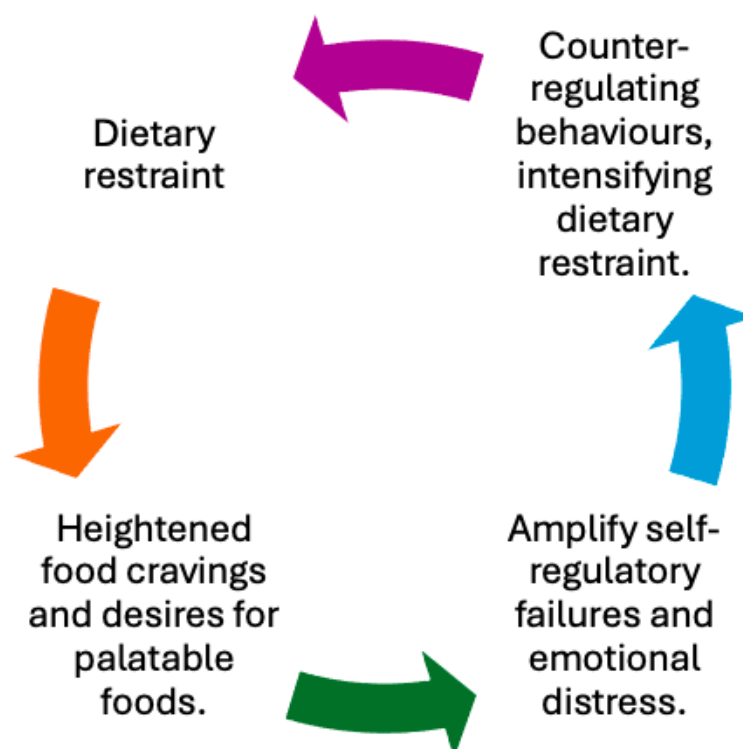
The main goal of individuals who have orthorexic tendencies is to achieve a feeling of purity, optimal health or to overcome a chronic illness (e.g., Brytek-Matera, 2012; Costa et al., 2017) and this is usually done through avoidance of foods characterised by high fats, sugars and carbohydrates, eliminating products containing preservatives, colour additives and flavourings, overall engaging in restrictive eating practices such as fasting and detoxes (e.g., Dunn & Braman, 2016; Niedzielski & Kazmierczak-Wojtas, 2021; Taabri et al., 2022; Valente et al., 2019). Gradually, these restrictions escalate, increasing dietary limitations extremely. Consequently, individuals may experience diminished enjoyment of food and face potential risks of malnutrition, further medical complications, and impairment of social and academic functioning (Brytek-Matera et al., 2017; Cena et al., 2019; Dunn & Bratman, 2016). These severe restrictions may also impact the individuals' psychological well-being as ON has been associated with several negative consequences such as heightened stress, anxiety and depression (e.g., Awad et al., 2021; Strahler et al., 2022) leading to a potential reduction in quality of life.

The intense focus on “healthy” eating leads to restriction of palatable foods, but psychological and physiological responses to restrictions (like cravings and non-hunger motives) might paradoxically increase the drive to consume those very foods (e.g., Cena et al., 2019). The self-imposed food rules of what is healthy and unhealthy are specific to an individual’s self-perceived needs, but still, healthy food is often defined as natural, organic, fresh and free from preservatives (Greville-Harris et al., 2022). Palatable foods are usually rich in fat and sugar (Erlanson-Albertsson, 2005), and can frequently contribute to weight gain and health implications (Bellise, 2014). They consist of tasty foods such as sweets and snacks, and are often classified as junk food or unhealthy foods. Individuals with orthorexic tendencies display much-restricted diets due to avoidance of such foods (Hunter & Crudo, 2018), as they contain preservatives, additives and animal products (Moroze et al., 2015).

However, restrictive eating can increase cravings for such foods (Hill et al., 1991), potentially leading to disinhibition and binge eating (Burton et al. 2007; Polivy & Herman, 2017). Such cycle of restriction, craving and potential binging further reinforces restrictive behaviours in an attempt to regain control, and, in effect, may exacerbate ON symptomology. This paradox highlights the need to understand motivations for palatable foods in ON (see Figure 3.1).

Figure 3.1

Cycle of dietary restraint.



Pleasurable, often energy-dense foods like fast food, sweets, and snacks, are considered "palatable." These are consumed for reasons beyond basic hunger. Burgess et al. (2014) developed the Palatable Eating Motives Scale (PEMS) to explore non-hunger motives like coping, reward, social influence, and conformity. Their findings linked coping motives to

higher BMI and binge-eating severity (Boggiano et al., 2014, 2016; Burgess et al., 2014). Additionally, PEMS predicted future weight changes, with increased coping motives associated with future weight gain (Boggiano et al., 2015). Mortas et al. (2023) further highlighted the importance of motives by demonstrating their connection to emotional and restrained eating. Understanding the motivations behind palatable food consumption in orthorexia nervosa (ON) is crucial, given its association with restrictive eating, emotional eating, and disordered cognitions. As ON is characterised by strict dietary restrictions, and such restrictions typically fuel stronger motivations to consume the very foods being avoided, the PEMS scale, which measures these non-hunger motivations, is expected to predict ON tendencies. To develop a deeper understanding, the potential link between mindfulness, self-compassion, and these motivations needs to be investigated. Mindfulness and self-compassion are known to reduce stress and improve coping mechanisms, potentially influencing cravings for palatable foods (Bluth et al., 2015; Brenton-Peters et al., 2022; Keyte et al., 2020; Mantzios & Egan, 2018; Soysa & Wilcomb, 2013).

Mindfulness, as defined by Kabat-Zinn (2003), involves focusing on present experiences (thoughts, emotions, sensations) without judgment. Self-compassion, as described by Neff (2003a), acknowledges that suffering and failure are inevitable human experiences, to be approached with kindness and understanding. While closely linked, they differ in focus: self-compassion is applied during hardship, while mindfulness encompasses all experiences (Neff & Knox, 2016; Sigel et al., 2009). Research shows promise for using mindfulness and self-compassion to address problematic eating behaviours like binge eating (Coubresson et al., 2011; Kelly & Carter, 2015; Kristeller et al., 2014), emotional eating (Alberts et al., 2012), and restrictive eating (Adams & Leary, 2009). Additionally, these practices have been linked to healthier eating habits, including reduced sugar and fat intake, decreased palatable food consumption, and less grazing (Dutt et al., 2019; Hussain et al., 2023; Mantzios & Egan, 2018; Mantzios & Wilson, 2014, 2015a, 2015b). Despite the established benefits of mindfulness and self-compassion, research on their connection to ON

is limited, with only three studies (Kalika et al., 2022; Stahler, 2021). These studies suggest that lower levels of mindfulness and self-compassion are associated with higher levels of orthorexia (Kalika et al., 2022). Moreover, mindful individuals tend to have lower desires for palatable foods (Mantzios & Egan, 2018). This limited research suggests a need for further investigation into the relationships between motivations for palatable food consumption, orthorexia nervosa, and the potential moderating effects of mindfulness and self-compassion.

This study aims to shed light on the interplay between Orthorexia Nervosa, mindfulness, self-compassion, and motivations for consuming palatable foods, offering some insights into this unexplored territory, and valuable insights into intervention strategies and support mechanisms for those navigating the complexities of disordered eating. The primary goal of this study was to examine the relationship between ON, mindfulness, self-compassion and motivations to eat palatable foods. Drawing from existing research on eating disorders, motivation for consuming palatable foods, and restrained eating, it is hypothesised that motivations for consuming palatable foods will be positively associated with ON. Additionally, in line with previous studies (e.g., Boggiano et al., 2023; Kalika et al., 2022; Mantzios & Egan, 2018), self-compassion and mindfulness are expected to be negatively correlated with ON and motivations to eat palatable foods. The secondary goal of this study was to explore the mediating role of mindfulness and self-compassion on the relationship between palatable foods and orthorexia nervosa. According to the past literature on restrictive dieting (Kalika et al., 2022) self-compassion and mindfulness may act as mediators.

3.3. Method

Participants

The study analysed data from 357 adults (190 females, 161 males, 3 non-binary, 3 undisclosed) recruited through social media, university research schemes, and Prolific (compensation minimum 6£/ph). Participants (mean age: 27.69 years, SD: 9.44, mean BMI: 24.80 kg/m², SD: 4.91). The participant characteristics can be found in Table 3.1. Inclusion

criteria required participants to be 18+, English-proficient, and without diagnosed eating disorders.

Table 3.1 Participant demographic information ($n = 357$).

Characteristic	n	%
Gender		
Female	190	53.2
Male	160	44.8
Prefer not to say	3	0.8
Prefer to self-describe	3	0.8
Ethnicity		
White	215	60.2
Asian	42	11.8
Black	69	19.3
Mixed	25	7.0
Other	6	1.7
Diet		
Vegan	23	6.4
Lacto-vegetarian	8	2.2
Lacto-ovo-vegetarian	6	1.7
Pescetarian	8	2.2
Semi-vegetarian	10	2.8
Occasional omnivore	37	10.4
Omnivore	265	74.2
Descriptive statistics for continuous variables.		
	M	SD
Age	27.69	9.44
BMI	24.89	4.91

Materials

Demographic information: See Chapter 2, page 29 for information.

Orthorexia Nervosa Inventory (ONI). See Chapter 2, page 29 for the scale description.

The Cronbach alpha for the present study was .944. Additionally, the Cronbach alpha was calculated for the subscales; impairments was .899, behaviours was .879 and emotions was .842.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .714.

Self-Compassion Scale (SCS). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .911. Additionally, the Cronbach's alpha was calculated for the subscales; self-kindness was .84, self-judgement was .78, common humanity was .74, mindfulness was .78, isolation was .75 and over-identified was .75.

Palatable Eating Motives Scale (PEMS)- This scale was developed by Boggiano (2016) which is a 20-item measure that assesses the frequency with which participants consume tasty food and drinks to various motives. The scale is divided into four subscales, each capturing a different aspect of why people turn to palatable foods. The Coping subscale reflects the tendency to eat pleasurable foods as a way to manage negative emotions, stress, or psychological distress. The Reward Enhancement subscale measures the use of food for enhancing positive feelings or to increase pleasure and enjoyment. The Conformity subscale assesses eating in response to social pressure or to fit in with the norms and behaviors of others in a given social context. Lastly, the Social Motives subscale reflects eating in social settings, driven by social interactions and the desire to bond or share experiences with others. It utilises a 5-point Likert scale with the following responses, 1 (Never) to 5 (always), with the total score reflecting intake of tasty foods for non-metabolic consumption. A sample question includes "I consume these foods/drinks to forget my worries". The Cronbach alpha for the present study was .916.

Procedure

The study received Ethical approval from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited through social media groups and were encouraged to share the study with their connections. The participants were also recruited via prolific where they received a compensation of £6 per hour. Participants were provided with information about the study, including the criteria for

inclusion and exclusion, and the hyperlink to Qualtrics where they could access the questionnaire. Participants were given a Participant Information Sheet to read, prior to consenting. Participants consented and created a unique code for identifying data in the event of withdrawal. Participants were asked to complete demographic information, ONI, FFMQ, SCS and FMPS. After completion, participants were provided with a debrief form explaining the objectives of the study and the withdrawal process. The study consisted of a single 20-minute online session.

Data Analysis

Prior to conducting the analysis of the data, assumptions were tested, despite bootstrapping and heteroscedasticity-consistent inference options eliminating the need for normality and homoscedasticity (e.g., Preacher & Hayes, 2008). Firstly, the data was checked for outliers. Cook's distance was used, and the range was between 0 and .040 which suggested that there were no outliers. According to Hair et al. (2010) the values between 2 to -2 for Skewness and 7 to -7 for Kurtosis are normal. The assumptions for normality were examined using the Skewness and Kurtosis. Skewness scores for ONI, SCS, FFMQ and PEMS were 1.31, -.15, -.03 and .26. Kurtosis scores for ONI, SCS, FFMQ and FMPS were 1.33, .13, .60 and -.53. So, the data met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 1.68 which is below the value of 5 (Tabachnick & Fidell, 2007) meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0; IBM Corp., 2017). Pearson's bivariate correlations were conducted to assess the associations between Orthorexia (ONI), Mindfulness (FFMQ), Self-compassion (SCS) and Palatable eating motive scale (PEMS). (see Table 1).

Furthermore, mediation analysis was used to evaluate the indirect effects (via self-compassion and mindfulness) of palatable foods on orthorexia nervosa (see Figure 1). Hayes'

(Preacher & Hayes, 2008) PROCESS macro (v3.3) was installed on SPSS (version 25.0) and was used to conduct mediation analyses (model 4) using 10,000 bootstrapping resamples to generate 95% bias-corrected confidence intervals for the indirect effect (Preacher & Hayes, 2008). According to specified guidelines using mediation analyses, Fritz and MacKinnon (2007) suggested that a sample size of 148 participants would enable research to observe an indirect effect of a medium-sized alpha pathway coefficient (i.e., predictor to mediator) and a medium-sized beta pathway coefficient (i.e., mediator to criterion) at 80% power using bias-corrected bootstrapping estimating procedures.

3.4. Results

Inter-correlations between ONI, BMI, SCS, FFMQ and PEMS, are presented in Table 3.2 with $r < 0.3$ indicating a weak correlation, $0.3 \leq r < 0.5$ indicating a moderate correlation and $r \geq 0.5$ indicating a strong correlation (Ratner, 2009). Findings indicate that there are two significant negative relationships between ONI and FFMQ ($p < .001$) and SCS ($p = .012$). There are also two significant positive correlations between ONI and BMI ($p = .006$) and ONI and PEMS ($p < .001$). Further correlations between ONI and SCS subscales have been conducted and are presented in Table 3.3 in the Supplementary Materials in section D3.

Table 3.2

Bivariate correlations between ONI, BMI, FFMQ, SCS and PEMS and descriptive statistics (n=357).

	1	2	3	4	<i>M</i>	<i>SD</i>
(1) ONI					39.72	13.55
(2)BMI	.145**				24.89	4.91
(3) FFMQ	-.124*	-.024			36.95	6.45
(4) SCS	-.136*	-.069*	.630**		2.97	.57
(5) PEMS	.249**	.147**	-.221**	-.158**	46.81	14.35

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS : Self-Compassion Scale. PEMS: Palatable Eating Motives Scale.

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

A mediation analysis was conducted to examine whether self-compassion mediates the relationship between palatable eating and orthorexia (see Figure 3.1). Palatable eating significantly predicted lower self-compassion, $b = -0.006$, $SE = 0.002$, $p = .004$, 95% CI [-0.011, -0.002]. However, self-compassion did not significantly predict orthorexia when controlling for palatable eating, $b = -2.11$, $SE = 1.26$, $p > .05$, 95% CI [-4.58, 0.351]. The direct effect of palatable eating on orthorexia remained significant when self-compassion was included in the model, $b = 0.227$, $SE = 0.05$, $p < .001$, 95% CI [0.127, 0.32]. The indirect effect of palatable eating on orthorexia through self-compassion was statistically significant, $b = 0.014$, $SE = 0.009$, 95% CI [0.002, 0.036], suggesting a partial mediation. This indicates that self-compassion plays a minor role in mediating this relationship. These results suggest that while palatable eating influences self-compassion, which in turn may have a weak effect on orthorexic behaviours, the primary association between palatable eating and orthorexia is largely direct.

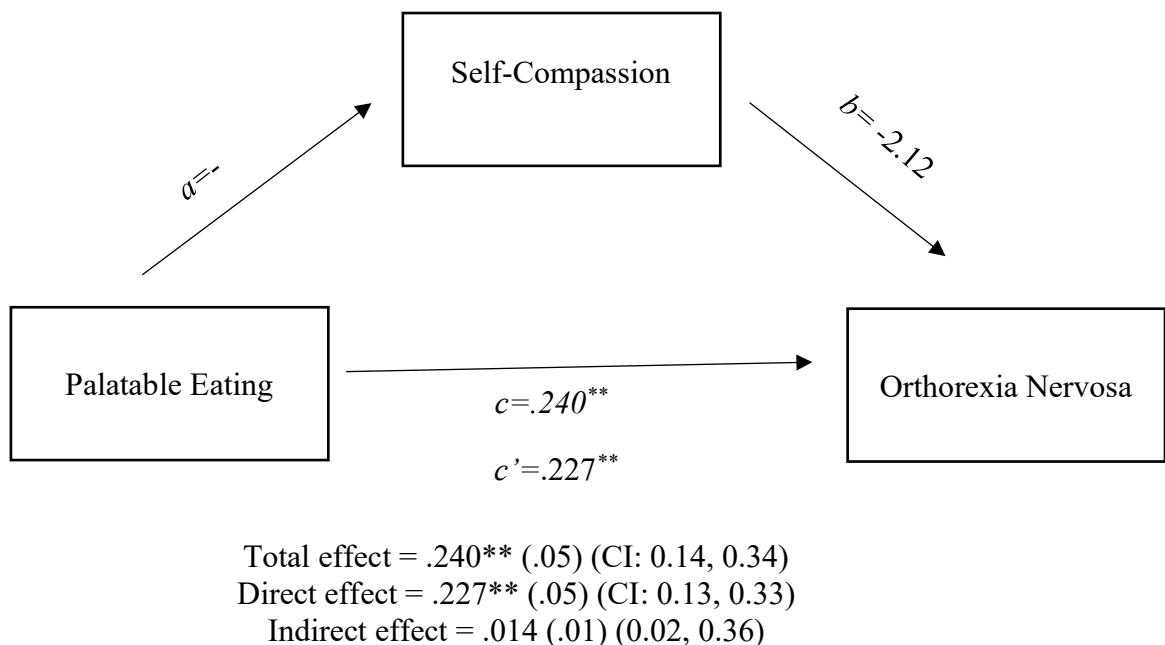


Figure 3.1 Parallel mediation using standardised regression coefficients to examine the interaction of self-compassion in the relationship between a) Palatable eating and b) orthorexia nervosa. Notes: a is the effect of palatable eating on self-compassion; b is the effect of self-compassion on orthorexia nervosa; c is the effect of palatable eating on orthorexia nervosa; c' is effect of palatable eating on orthorexia nervosa with self-compassion in the model.

A mediation analysis was conducted to assess whether mindfulness mediates the relationship between palatable eating and orthorexia (see Figure 3.2). Palatable eating significantly predicted lower levels of mindfulness, $b = -0.099$, $SE = 0.024$, $p < .001$, 95% CI $[-0.146, -0.053]$. However, mindfulness did not significantly predict orthorexia when controlling for palatable eating, $b = -0.133$, $SE = 0.111$, $p > .005$, 95% CI $[-0.352, 0.087]$. The direct effect of palatable eating on orthorexia remained significant after including mindfulness in the model, $b = 0.220$, $SE = 0.05$, $p < .001$, 95% CI $[0.121, 0.318]$, suggesting only partial mediation. The indirect effect of palatable eating on orthorexia via mindfulness was statistically significant, $b = 0.013$, $SE = 0.007$, 95% CI $[0.007, 0.040]$. These findings indicate that mindfulness plays a minor mediating role in the relationship between palatable eating and orthorexia. Although palatable eating was associated with reduced mindfulness, the contribution of mindfulness to orthorexia was not statistically significant, and the primary association between palatable eating and orthorexic tendencies appears to be largely direct.

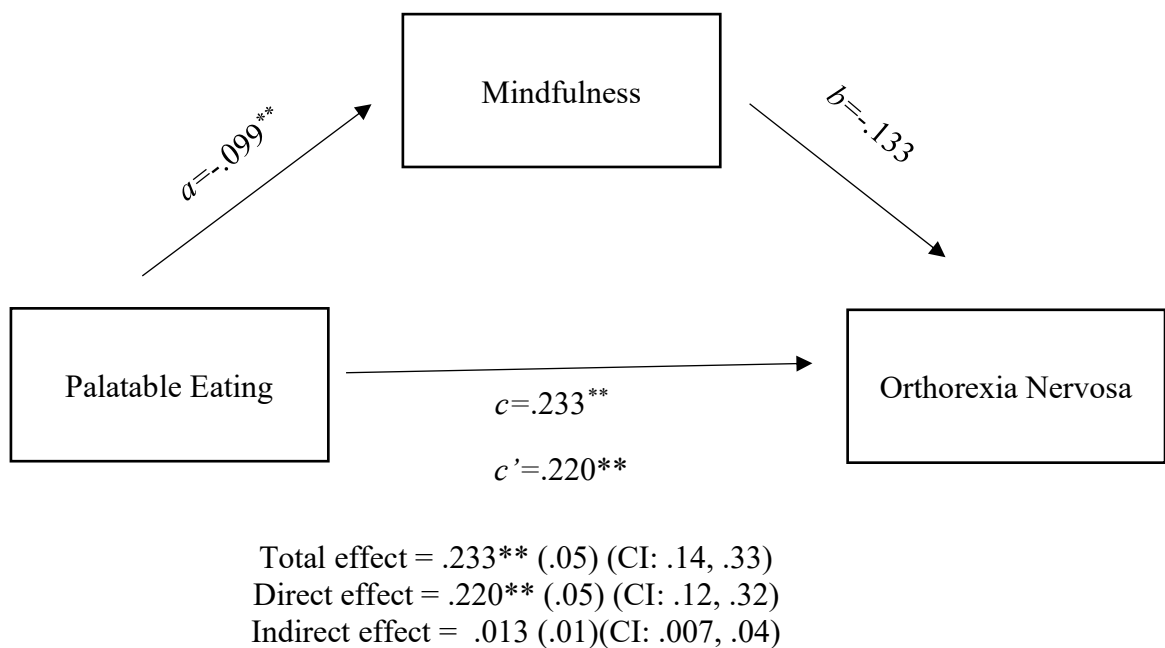


Figure 3.2 Parallel mediation using standardised regression coefficients to examine the interaction of mindfulness in the relationship between a) Palatable eating and b) orthorexia

nervosa. Notes: a is the effect of palatable eating on mindfulness; b is the effect of mindfulness on orthorexia nervosa; c is the effect of palatable eating on orthorexia nervosa; c' is effect of palatable eating on orthorexia nervosa with mindfulness in the model.

3.5. Discussion

This study has uncovered new insights into the interplay between Motives to eat palatable foods and Orthorexia Nervosa (ON), mindfulness, and self-compassion. The findings strongly support the hypothesis that individuals with ON are more inclined to be motivated to consume palatable foods. Despite exhibiting high levels of self-control in their dietary habits, driven by their adherence to strict food rules as a means of avoiding loss of control (Tabri et al., 2022), these individuals paradoxically demonstrate heightened motivation towards palatable foods, which can pose significant challenges in everyday life. An assumption here in explaining the results would be the psychological underpinnings of this paradox through cognitive dissonance, where the experience of internal conflict between one's strong desire for palatable foods and the rigid self-imposed dietary restrictions may reinforce for individuals the symptoms of ON. A possible explanation for this finding could be the scale used in the study, which evaluates the motivations for consuming palatable foods rather than the actual consumption of these foods (Boggiano, 2016). Therefore, as noted earlier, a desire and craving for palatable foods may lead individuals to develop stronger orthorexic tendencies; yet, they may avoid doing so as it contradicts their self-imposed dietary rules. However, as ON is so restrictive with elimination of certain foods and food groups (Dunn & Bratman, 2017), individuals who display ON might engage in binge eating of those eliminated foods as it has been presented in the ED literature, where the restraint model of binge eating suggests that restrictions to diet promote binge eating (Polivy & Herman, 1985). However, this model suggests that this is usually due to weight and shape concerns, which usually is not presented in orthorexic populations as their motivations to eat healthy is to overcome health implications and not weight concern (Depa et al., 2019).

People with orthorexia nervosa (ON) often experience high anxiety due to their strict food rules and obsession with food purity and health (Cena et al., 2018; Rangel et al., 2012). This strictness creates a complex relationship with palatable foods. These individuals might use palatable foods as a coping mechanism to manage stress, anxiety, or negative emotions related to their rigid diets (Bilici et al., 2020). The sensory pleasure and comfort from palatable foods (Gibson, 2006) may provide a temporary escape from their obsessive thoughts and the pressure to adhere to strict rules, offering a sense of normalcy. This can be seen as a form of emotional regulation through palatable foods (Vuillier et al., 2020), leading to a cycle of indulgence and restraint. However, relying on palatable foods as a coping mechanism can have negative consequences. After indulging, individuals with ON may experience guilt, shame, and self-criticism for breaking their food rules (Dunn & Bratman, 2015). These negative emotions can worsen their distress, perpetuate the restrictive eating cycle, and intensify their struggles with ON. While palatable foods may offer temporary comfort, they can also contribute to a cycle of emotional turmoil and worsen disordered eating behaviours (Schnepper et al., 2020). Even individuals who resist the temptation of palatable foods can experience distress. The mere desire to consume them can contribute to suffering, adding another layer of complexity to supporting people with ON. Since palatable food consumption is linked to coping (Boggiano et al., 2014; Burgess et al., 2014), understanding the motivations behind wanting these foods can lead to much-needed interventions to alleviate the stress and anxiety experienced by individuals with ON.

Studies investigating the relationship between Body Mass Index (BMI) and Orthorexia Nervosa (ON) yielded inconsistent findings. Some studies, such as those by Varga et al. (2014) and Findan et al. (2010), found a positive correlation, while others, such as Kalika et al. (2022), found no relationship between BMI and ON. Similar to the present study, Kalika et al. (2022) used the DOS scale to measure ON tendencies, whereas other studies employed scales like the ORTHO-15. The present study found a positive association, suggesting that individuals with ON might have displayed higher BMIs compared to those

without orthorexic tendencies. This could be because individuals with higher BMIs, facing health concerns like diabetes (Pi-Sunyer, 1991), might have adopted stricter diets in an attempt to improve their overall health. (Depa et al., 2019). A larger exploration of BMI with ON should be conducted to determine the significance of this relationship and determine the role of BMI and weight on the development of ON.

The present study also found negative correlations between self-compassion and mindfulness with both orthorexia nervosa (ON) and motives for palatable food consumption. This aligns with previous research (Boggiano et al., 2023; Kalika et al., 2022; Mantzios & Egan, 2018), suggesting that higher levels of these qualities are associated with lower ON and reduced desire for palatable foods. Mindfulness and self-compassion have been linked to healthier eating habits (Beshara et al., 2013; Dutt et al., 2019; Mantzios & Wilson, 2013-2015; Mantzios et al., 2018, 2019) and reduced symptoms in eating disorders (Frenches et al., 2019). Hence, they may serve as protective factors against ON and offer potential intervention strategies. This study also conducted two mediation analyses with mindfulness and self-compassion acting as mediators between palatable food motives and ON. Both mediators were significant, suggesting their potential role in the relationship, and proposing future exploration of mindfulness and self-compassion-based interventions for ON, particularly targeting palatable food motivations. Interestingly, research suggests a link between palatable food consumption and loneliness (Sirois & Biskas, 2023), while individuals with ON often experience social isolation (Horovitz et al., 2023). These connections warrant further investigation as social isolation may exacerbate cravings for palatable foods, either as a means of comfort or as a reaction to dietary deprivation. Understanding the dynamics between isolation, cravings, palatable foods and typical and atypical rating perceptions and behaviours may indicate more holistic understandings and solutions for people scoring high in ON considering the implications for social and emotional well-being. Finally, mindfulness and self-compassion are known to help manage distress (e.g., Bluth et al., 2015; Soysa & Wilcomb, 2015). When applied to ON, this could address

the conflict between strict dietary rules and internal desires, leading to emotional and behavioural dysregulation. Mindfulness and self-compassion practices could potentially reduce this dysregulation. This is particularly important for individuals who display orthorexic symptomology as it could lead to potential intervention avenues.

3.6. Limitations and future directions

The PEMS only measures motivation to consume palatable foods, not actual consumption. While this limits our understanding of behaviour, it's a valuable first step. Future studies should address consumption through dietary tracking or explore how external cues influence choices. Additionally, a qualitative study would be beneficial to understand how the orthorexic population defines "palatable" foods, as their perception might differ from typical classifications, and explore the assumed associations to cravings and restrictive eating. Furthermore, the present research on the total score of PEMS, rather than its subscales provide a holistic measure of motivation. While individual subscales assess specific motives (e.g., coping, social influence), the total score reflects an overall predisposition toward motivations to eat palatable foods. While discrete motivational pathways are significant, a clear theoretical framework would be needed, and does not exist in current literature. For example, individuals who already eat a healthy and clean diet may not be motivated to consume palatable foods as there has been societal pressure to conform to healthy diet and lifestyle, or may be motivated to eat palatable foods as family and peer pressure may override personal beliefs and motivations. Future research may benefit from analysing subscale variations in relation to ON once a theoretical framework, the context and in-depth lived experiences provide enough justification for hypothesis testing. Lastly, it may seem plausible that the directionality is reversed; so rather than motives to eat palatable foods predicting ON symptoms, stronger ON symptoms increase the desire to eat palatable foods. The latter, however, makes an assumption that overlooks the broader context of dietary behaviours. The majority of the population engages in some form of dieting or restriction, and it is precisely

this restriction that amplifies the desire for palatable foods. Future research could explore experimentally the potential directionality by exploring high and low scores in ON, and typical disinhibition experiments seen in historical and contemporary literature (e.g., Herman & Mack, 1975; Adams & Leary, 2007).

3.7. Conclusion

The present study has produced novel findings in the orthorexia nervosa literature. To date, this is the only study that has looked at palatable foods and orthorexia nervosa, where the present study has suggested an association between ON and palatable foods. Understanding the motives for palatable foods and whether individuals with orthorexic tendencies still engage in the consumption of palatable foods even if it goes against their rigid rules sheds light on the complicated concept that orthorexia nervosa is, showing that it is not a simple eating behaviour and should be treated as an eating disorder. Mindfulness and self-compassion have been successful mediators between palatable foods and orthorexia nervosa indicating that these concepts could potentially open new avenues for establishing interventions for individuals with orthorexia nervosa.

CHAPTER 4: MINDFULNESS AND SELF-COMPASSION AS MEDIATORS IN THE PATHWAY FROM DISORDERED EATING AND MENTAL HEALTH TO ORTHOREXIA NERVOSA: A TWO-STUDY INVESTIGATION

4.1. Abstract

Understanding Orthorexia Nervosa (ON) requires examining its relationship with disordered eating and mental health. While ON is characterized by an obsessive fixation on healthy eating, disordered eating represents a broader spectrum of unhealthy eating behaviours. Notably, mental health difficulties are often linked to the development and maintenance of both disordered eating and ON, while mindfulness and self-compassion offer a series of benefits to people struggling with eating difficulties and mental health. This two-study manuscript explores the relationships between ON, disordered eating, mental health, mindfulness, and self-compassion. Study 1 ($n = 331$) assessed ON, mental health, mindfulness and self-compassion. Study 2 ($n = 415$) replaced mental health measures with the disordered eating scale. Results showed positive correlations between ON and disordered eating, and mental ill-health, while mindfulness and self-compassion displayed negative correlations with ON. Further analysis suggested that mindfulness and self-compassion mediated the relationship between disordered eating/mental health and ON. These findings highlight the interconnectedness that suggests that integrating these practices into interventions could promote well-being for individuals with high orthorexia tendencies.

4.2. Introduction

While healthy eating is generally positive, the constant influx of new diets aimed at weight loss has arguably contributed to a rise in disordered eating (Ackard et al., 2002). Disordered eating encompasses unhealthy behaviours like calorie restriction, eliminating food groups, binge eating, and laxative use (Herpertz-Dahlmann et al., 2008). While it may not lead to a clinical diagnosis like Anorexia or Bulimia Nervosa, it significantly impacts the quality of life and wellbeing of people (e.g., Dias Santana et al., 2019; Jenkins et al., 2011; Tozun et al., 2010). This trend has led to a phenomenon called Orthorexia Nervosa

(ON)(Bratman, 1997). Here, the pursuit of healthy eating becomes pathological, harming physical and emotional well-being, and distinctive from other disordered eating. Orthorexia Nervosa (ON) is defined as an obsessive fixation on healthy and pure eating, which is characterised by individuals own self-induced rules and beliefs of what is healthy (Bratman, 2015). ON has several consequences such as a reduction of quality of life (e.g., Koven & Arby, 2015), avoidance of social interactions (Valente et al., 2020) and potential malnourishment (Moroze et al., 2015). Several diagnostic criteria have been developed for ON, including a preoccupation with restrictive diets, social and professional dysfunction, potential malnutrition, and worsening dietary restrictions over time (Dunn & Bratman, 2017), which reveal significant overlap with both disordered eating and eating disorders.

Some researchers have investigated the concepts of disordered eating, eating disorders and orthorexia nervosa (e.g., Brytek-Matera et al., 2020; Zickgraf & Barrada, 2021; Zagaria et al., 2021), and found that individuals with high orthorexic symptomology display higher levels of disordered eating (e.g., Brytek-Matera et al., 2022; Zickgraf & Barrada, 2021). While disordered eating can be a contributing factor to the development of orthorexia, similar to other eating disorders, orthorexia itself is a dynamic condition that can fluctuate in severity, and potentially worsen due to co-occurring mental health difficulties (Strahler et al., 2018).

Indeed, research has shown that Generalised Anxiety Disorders (GAD) could be a potential risk factor for the development of ON (Koven & Arby, 2015). Individuals with restrictive eating patterns, which are characteristic for people scoring high in orthorexia, as well as eating disorders, have been associated with mental health difficulties such as anxiety, depression and stress (e.g. Aurajo et al., 2010). Other studies have suggested that ON might hold a clinical relevance due to decreased psychological well-being and increased levels of stress in those who displayed orthorexic tendencies (e.g., Brathels et al., 2019; Strahler et al., 2018). Additionally, previous research revealed a positive relationship between anxiety, stress and orthorexia nervosa (e.g., Strahler et al., 2018; Awad et al., 2021). While research

has established connections between Orthorexia Nervosa (ON), disordered eating, and mental health, the potential impact of promoting well-being through mindfulness and self-compassion remains largely unexplored. This presents a unique opportunity to investigate novel relationships that may lead to therapeutic approaches and offer much-needed solutions for individuals struggling with these conditions.

Mindfulness and self-compassion have been extensively researched with disordered eating, eating disorders and mental health (e.g., Baer et al., 2005; Barney et al., 2019; Coffey et al., 2010; Marques et al., 2021; Sala et al., 2022). Mindfulness involves being present and fully engaged in the present moment, non-judgmentally, and plays a pivotal role in promoting mental and emotional well-being (Kabat-Zinn, 2003; Siegel et al., 2009). Mindfulness can be applied to improve eating behaviours, where mindfulness promotes healthier eating such as consumption of fruit and vegetables, reduction of fats and sugars and palatable eating (e.g., Dutt et al., 2018; Hussain et al., 2021). This practice can be beneficial in combating disordered eating patterns and orthorexia nervosa as it shifts the focus from external dietary rules to internal awareness (Kristeller et al., 2006). Self-compassion involves treating oneself with kindness and being understanding when facing struggles (Neff & Knox, 2016). Individuals with disordered eating and eating disorders often face self-criticism and body dissatisfaction (Marques et al., 2021), which can exacerbate their disordered eating behaviours. Research has shown that being more self-compassionate can alleviate the symptoms of disordered eating through several attributes such as a non-judgmental attitude, distress tolerance and relief of suffering (Goss, 2011), instrumentally influenced through the enhanced emotion regulation that is observed in self-compassion (Sirois et al., 2019). Similarly, there is mounting evidence suggesting that mindfulness and self-compassion constructs and interventions can offer significant benefits for mental health (e.g., Bohlmeijer et al. 2010; Dundas et al., 2017; Khoury et al. 2013, Inwood & Ferrari, 2018).

Mindfulness and self-compassion have been linked to improvements in mood, reduced anxiety, and enhanced emotional regulation, all of which are factors commonly

associated with various mental health conditions. Mindfulness interventions have been used in a variety of clinical and nonclinical populations for example students (e.g., Zollars et al., 2019), children (e.g., Kallapiran et al., 2015), cardiovascular patients (e.g., Marino et al., 2021) and patients with psychiatric disorders (e.g., Goldberg et al., 2018). This demonstrates that mindfulness and self-compassion has the ability to reduce symptoms associated with the deterioration of mental well-being in multiple settings. Incorporating these practices can help individuals become aware of the present thoughts and feelings in a non-judging way which can decrease symptoms of anxiety, stress and negative emotions (Carpenter et al., 2019). Not only does mindfulness and self-compassion alleviate negative mental health outcomes but they also promotes positive mental health, positive affect and life satisfaction (e.g., Michael & Graham, 2010; Carpenter et al., 2019)

Given the established positive effects of mindfulness and self-compassion on both disordered eating and mental health, it stands to reason that these interventions may also hold promise for individuals struggling with ON. While research into orthorexia nervosa, mindfulness and self-compassion is still limited, it was found that mindfulness and self-compassion have a negative relationship with orthorexia nervosa (Kalika et al., 2022; Stahler, 2020). This is also replicated in terms of disordered eating and eating disorders where mindfulness and self-compassion are negatively linked (e.g., Katterman et al., 2014; Taylor et al., 2015; Sala et al., 2020), highlighting the similarities in psychopathology between ON, eating disorders and disordered eating. Furthermore, mindfulness-based and self-compassion-based interventions have been successful in treating disordered eating and eating disorders (e.g., Wanden-Berghe et al., 2014; Godsey, 2013; Kelly & Carter, 2015) as well as depressive symptoms, anxiety and stress (e.g., Grossman et al., 2004; Khoury et al., 2015; de Souza et al., 2020). Utilising the concepts of mindfulness and self-compassion individuals can reduce negative self-perceptions and self-criticism and encourage coping skills to navigate emotional challenges without engaging in disordered eating as a means of coping (e.g., Bergunde & Dritschel, 2020; Geller et al., 2014).

The aim of the present chapter was two-fold, set to explore primary and secondary goals. For the primary goals, Study 1 hypothesised that disordered eating will be positively related to orthorexia nervosa (e.g., Brytek-Matera et al., 2022; Zickgraf & Barrada, 2021), whereas mindfulness and self-compassion will be negatively related to both disordered eating and orthorexia nervosa (Kalika et al., 2022; Stahler, 2020). Study 2 hypothesised that depression, anxiety and stress will be positively correlated to orthorexia nervosa (e.g., Grossman et al., 2004; Khoury et al., 2015; de Souza et al., 2020). Beyond these primary relationships, both studies 1 and 2 explored a secondary question: could mindfulness and self-compassion act as intermediaries (mediators) in the connections between ON and its contributing factors? Study 1 examined this specifically for disordered eating, while Study 2 focused on mental health. The selection of variables and analytic strategies was informed by theoretical frameworks emphasizing underlying psychological mechanisms. In both Study 1 and Study 2, mediation analyses were used to explore how specific predictors may lead to orthorexia nervosa (ON) through psychological processes such as mindfulness and self-compassion. In Study 1, disordered eating was identified as a predictor of ON due to shared characteristics like dietary rigidity, with mindfulness and self-compassion proposed as mechanisms that could explain this link. Similarly, Study 2 examined mental health difficulties (depression, anxiety, and stress) as predictors of ON, again focusing on mindfulness and self-compassion as mediators that may account for how psychological distress contributes to orthorexic behaviours. Thus, the use of mediation in both studies was theoretically driven, aiming to clarify *how* these predictors influence ON rather than *when* or *under what conditions*, which would align more with moderation frameworks. To minimize potential bias caused by the order in which participants complete self-report questionnaires (e.g., answering questions about disordered eating or mental health first might influence responses about mindfulness-based constructs, or vice versa), and to gain a more nuanced understanding of the complex relationships between these factors and Orthorexia Nervosa (ON), participants only took part in one of the two studies.

Study 1

4.3. Method

Participants

This study examined orthorexia nervosa in the general population. The sample ($n = 331$), all of whom were adults (Age: $M = 26.44$, $SD = 8.76$) with a mean Body Mass Index (BMI) of $M = 24.58$ kg/m² ($SD = 5.00$). See table 4.2 for an overview of Participant Characteristics. Participants were recruited through volunteering sampling by advertising on media platforms such as Facebook, Instagram, Twitter and Prolific. The advertisement on Facebook was posted in eating groups requesting individuals to participate in the study. Individuals were also recruited through the university's Research Participation Scheme. Those who participated in the scheme were rewarded with research credits upon study completion. Individuals recruited through Prolific were also compensated for their time (6£/ph). Participants were informed via the information sheet that the inclusion criteria for this study required them to be over the age of 18, have good knowledge of the English language and not be diagnosed with an eating disorder. There were 113 individuals recruited from RPS and 218 via Prolific, no participants were recruited via social media. Students (ONI: $M = 40.99$, $SD = 15.60$, SCS: $M = 2.75$, $SD = .57$, FFMQ: $M = 35.07$, $SD = 5.72$, EAT: $M = 14.31$, $SD = 14.39$) and prolific (ONI: $M = 37.69$, $SD = 11.44$, SCS: $M = 2.96$, $SD = .62$, FFMQ: $M = 36.09$, $SD = 7.06$, EAT: $M = 12.23$, $SD = 11.47$), means and standard deviations revealed a difference between two groups therefore t-tests were also conducted. It was concluded that there was a significant difference between two groups in terms of ONI ($p = .045$) and SCS ($p = .003$) and non-significant difference in FFMQ ($p = .158$) and EAT ($p = .184$) which reflected differences in correlations observed for the groups when tested independently (see Supplementary Material Section D3 for correlation tables split between students and prolific).

Table 4.1

Means, Standard Deviations, and Group Comparisons Between Students and Prolific Participants

Measure	Students (n = 113)	Prolific (n = 218)	<i>t</i> -test <i>p</i> -value
ONI	M = 40.99, SD = 15.60	M = 37.69, SD = 11.44	.045*
SCS	M = 2.75, SD = 0.57	M = 2.96, SD = 0.62	.003**
FFMQ	M = 35.07, SD = 5.72	M = 36.09, SD = 7.06	.158
EAT	M = 14.31, SD = 14.39	M = 12.23, SD = 11.47	.184

Note. ONI = Orthorexia Nervosa Inventory; SCS = Self-Compassion Scale; FFMQ = Five-Facet Mindfulness Questionnaire; EAT = Eating Attitudes Test.

p < .05. **p** < .01.

Table 4.2 Participant demographic information (*n* = 331).

Characteristic	n	%
Gender		
Female	205	61.9
Male	124	37.5
Prefer not to say	1	0.3
Prefer to self describe	1	0.3
Ethnicity		
White	202	61.0
Asian	45	13.6
Black	61	18.4
Mixed	16	4.8
Other	7	2.1
Diet		
Vegan	11	3.3
Lacto-vegetarian	4	1.2
Lacto-ovo-vegetarian	15	4.5
Pescetarian	7	2.1
Semi-vegetarian	11	3.3
Occasional omnivore	28	8.5
Omnivore	255	77.0
Descriptive statistics for continuous variables.		
	M	SD
Age	26.44	8.76
BMI	24.58	5.00

Materials

Demographic information: See Chapter 2, page 29 for information.

Orthorexia Nervosa Inventory (ONI). See Chapter 2, page 29 for scale description.

The Cronbach alpha for the present study was .94.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .70.

Self-Compassion Scale (SCS). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .92. Additionally, the Cronbach's alpha was calculated for the subscales; self-kindness was .86, self-judgement was .86, common humanity was .78, mindfulness was .77, isolation was .83 and over-identified was .78.

Eating Attitude Test (EAT-26). This is the shorter version of the original EAT-40, the EAT-26 was developed by Garner et al. (1982), which measures disordered eating. An overall score is generated where higher scores indicate higher disordered eating attitudes. The authors recommended a cut off score of above 20. The scale includes three key subscales: Dieting, which assesses behaviours and attitudes related to restrictive eating and efforts to control body weight; Bulimia and Food Preoccupation, which measures symptoms related to binge eating, purging behaviours, and an unhealthy preoccupation with food; and Oral Control, which evaluates the extent to which individuals exercise control over their food intake and eating habits. Sample questions include "Feel extremely guilty after eating" and "Have gone on eating binges where I feel that I may not be able to stop". The Cronbach alpha for the present study was .90. Cronbach alpha was also explored for the subscales: dieting (.82), bulimia and food preoccupation (.78) and oral control (.67).

Procedure

The study received Ethical approval from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited through social media and Prolific. They were provided with information about the study, including the criteria for inclusion and exclusion, and the hyperlink to QuestionPro to access the questionnaire. Before consenting, participants were given a Participant Information Sheet to

read. Participants consented and created a unique code for identifying data in the event of withdrawal. Participants were asked to complete demographic information, ONI, FFMQ, SCS and EAT-26. After completion, participants were provided with a debrief form explaining the objectives of the study and the withdrawal process. The study consisted of a single 15-minute online session.

Data Analysis

Prior to analysing the data, assumptions were tested, although options such as bootstrapping and homoscedasticity-consistent inference can bypass the necessity for normality and homoscedasticity (e.g., Preacher & Hayes, 2008). Firstly, the data was checked for outliers. Cook's distance was used, and the range was between 0 and .156 which indicated that there were no outliers. According to Hair et al. (2010) the values between 2 to -2 for Skewness and 7 to -7 for Kurtosis are normal, the skewness and kurtosis values for the present study were within those limits, suggesting that the met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 1.75 which is below the value of 5 (Tabachnick & Fidell, 2007) meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0; IBM Corp., 2017). Pearson's bivariate correlations were conducted to assess the associations between Orthorexia (ONI), Mindfulness (FFMQ), Self-compassion (SCS) and Eating Attitude Test (EAT-26). Due to different recruitment methods the differences between participants will be explored in follow up analysis by splitting the data by the recruitment methods (see Supplementary Materials).

Furthermore, mediation analysis was used to evaluate the indirect effects (via self-compassion and mindfulness) of Eating attitudes on orthorexia nervosa (see Figure 1). Hayes' (Preacher & Hayes, 2008) PROCESS macro (v3.3) was installed on SPSS (version 25.0) and was used to conduct mediation analyses (model 4) using 10,000 bootstrapping resamples to

generate 95% bias-corrected confidence intervals for the indirect effect (Preacher & Hayes, 2008). According to specified guidelines using mediation analyses, Fritz and MacKinnon (2007) suggested that a sample size of 148 participants would enable research to observe an indirect effect of a medium-sized alpha pathway coefficient (i.e., predictor to mediator) and a medium-sized beta pathway coefficient (i.e., mediator to criterion) at 80% power using bias-corrected bootstrapping estimating procedures.

4.4. Results

Table 4.3 presents the inter-correlations among ONI, BMI, SCS, FFMQ, and EAT. According to Ratner (2009), a correlation coefficient r of less than 0.3 denotes a weak correlation, $0.3 \leq r < 0.5$ indicates a moderate correlation, and $r \geq 0.5$ signifies a strong correlation. The results reveal one significant positive correlation: between ONI and EAT ($p < .001$). Additionally, there are two significant negative correlations: between ONI and FFMQ ($p = .002$), and between ONI and SCS ($p < .001$). There was no significant relationship between BMI and ONI. Further correlations have also been explored between ONI and the subscales of EAT (please see Table 4.4). The results revealed all positive correlations between ONI and dieting ($p < .001$), bulimia and food preoccupation ($p < .001$) and oral control ($p < .001$). Further correlation split by the prolific vs student have also been conducted and are presented in Table 4.5 and 4.6 presented in Section D3. Correlations between ONI and subscales of SCS have also been conducted and are presented in Supplementary Materials (see section D3 and D4).

Table 4.3

Bivariate correlations between ONI, BMI, FFMQ, SCS and EAT and descriptive statistics (n=331).

	1	2	3	4	<i>M</i>	<i>SD</i>
(1) ONI					38.88	13.16
(2)BMI	.080				24.58	5.00
(3) FFMQ	-.168**	.019			35.72	6.61
(4) SCS	-.185**	.003	.589**		2.89	.61

(5) EAT	.658**	.000	-.285**	-.326**	12.98	12.63
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Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. EAT: Eating Attitude Test.

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Table 4.4

Bivariate correlations between ONI, Dieting (EAT), Bulimia (EAT) and Oral Control (EAT) (n=331).

	1	2	3	<i>M</i>	<i>SD</i>
(1) ONI				38.88	13.15
(2) Dieting	.638**			7.90	7.87
(3) Bulimia	.539**	.705**		2.00	3.11
(4) Oral Control	.458**	.534**	.563**	3.14	3.45

Note: ONI: Orthorexia Nervosa Inventory. EAT: Eating Attitude Test

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

A mediation analysis was conducted to investigate whether self-compassion mediates the relationship between disordered eating and orthorexia (see Figure 4.1). Disordered eating significantly predicted lower levels of self-compassion, $b = -.009$, $SE = .003$, $p = .004$, 95% CI $[-.014, -.004]$, and lower self-compassion, in turn, significantly predicted higher orthorexia scores, $b = -4.91$, $SE = .85$, $p < .001$, 95% CI $[-5.85, -2.50]$. The direct effect of disordered eating on orthorexia remained significant, $b = .594$, $SE = .04$, $p < .001$, 95% CI $[.515, .673]$. The indirect effect of disordered eating on orthorexia via self-compassion was statistically significant, $b = .039$, $SE = .01$, 95% CI $[.020, .060]$, suggesting a partial mediation. Although the indirect effect was modest, its significance underscores self-compassion as a meaningful psychological mechanism partially explaining the link between disordered eating and orthorexic behaviour.

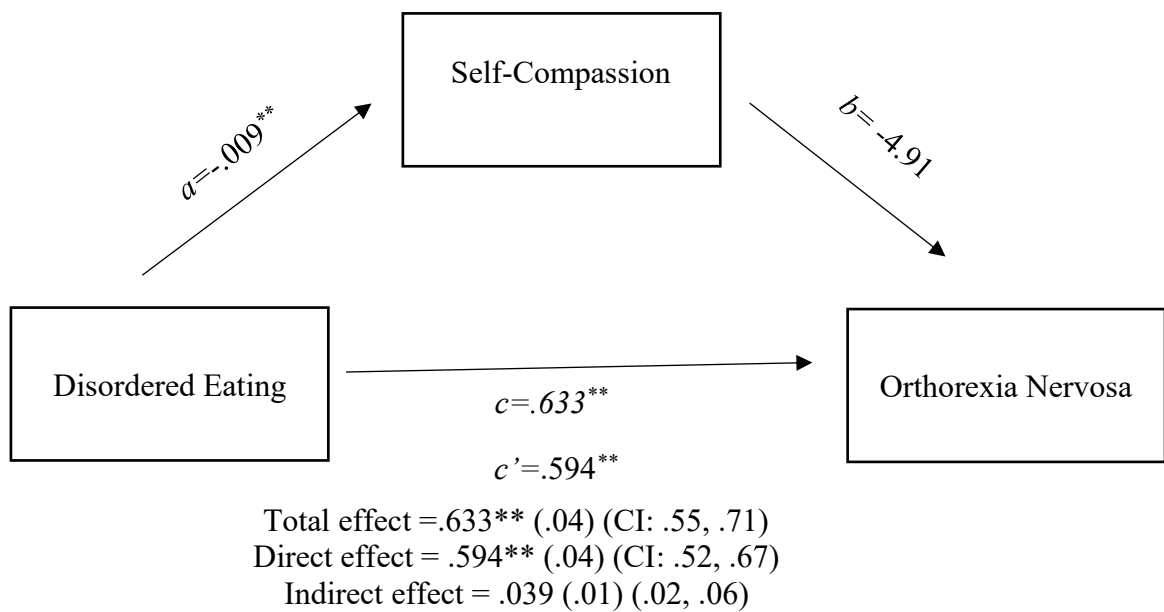


Figure 4.1 Parallel mediation using standardised regression coefficients to examine the interaction of self-compassion in the relationship between a) disordered eating and b) orthorexia nervosa. Notes: a is the effect of disordered eating on self-compassion; b is the effect of self-compassion on orthorexia nervosa; c is the effect of disordered eating on orthorexia nervosa; c' is effect of disordered eating on orthorexia nervosa with self-compassion in the model.

A second mediation analysis was conducted to examine whether mindfulness mediates the relationship between disordered eating and orthorexia (see Figure 4.2). Disordered eating significantly predicted lower levels of mindfulness, $b = -.086$, $SE = .028$, $p = .002$, 95% CI $[-.141, -.031]$, and lower mindfulness significantly predicted higher orthorexia scores, $b = -.335$, $SE = .080$, $p < .001$, 95% CI $[-.493, -.178]$. The direct effect of disordered eating on orthorexia remained significant $b = .599$, $SE = .04$, $p < .001$, 95% CI $[.520, .678]$. The indirect effect through mindfulness was also statistically significant, $b = .029$, $SE = .013$, 95% CI $[.009, .060]$, suggesting a partial mediation. This indicates that lower mindfulness plays a small yet meaningful role in explaining the link between disordered eating and orthorexic behaviours. These findings suggest that mindfulness may serve as a psychological buffer, partially mediating the impact of disordered eating on orthorexic tendencies.

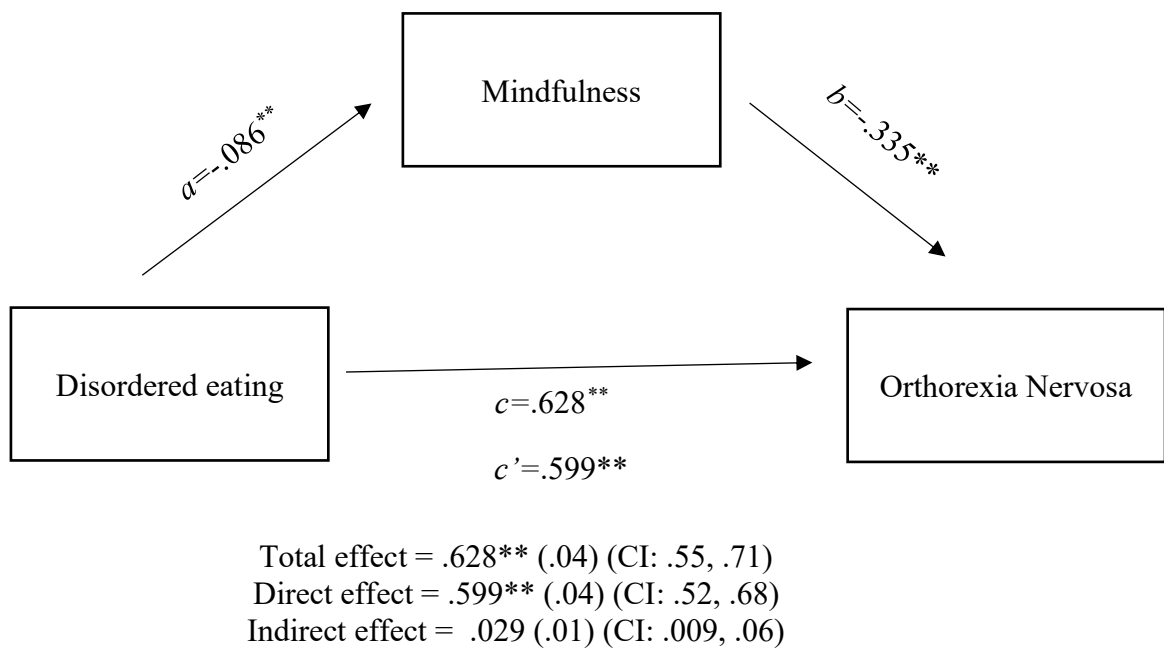


Figure 4.2. Parallel mediation using standardised regression coefficients to examine the interaction of mindfulness in the relationship between a) disordered eating and b) orthorexia nervosa. Notes: a is the effect of disordered eating on mindfulness; b is the effect of mindfulness on orthorexia nervosa; c is the effect of disordered eating on orthorexia nervosa; c' is effect of disordered eating on orthorexia nervosa with mindfulness in the model.

Study 2

4.5. Method

Participants

This study examined orthorexia nervosa in the general population. The sample ($n = 415$) included 222 females, and 190 males, 3 preferred to self-describe as non-binary, all of whom were adults (Age: $M = 26.02$, $SD = 8.09$) with a mean Body Mass Index (BMI) of $M = 24.94$ kg/m² ($SD = 5.55$). See Table 4.9 for participant characteristics. The recruitment process for Study 2 follows Study 1. There were 139 individuals recruited from RPS and 276 via Prolific, no participants were recruited via social media. Students (ONI: $M = 42.58$, $SD = 13.99$, SCS: $M = 73.79$, $SD = 15.50$, FFMQ: $M = 35.68$, $SD = 6.61$, DASS: $M = 20.46$ $SD = 13.54$) and prolific (ONI: $M = 37.36$, $SD = 11.44$, SCS: $M = 75.81$ $SD = 16.06$, FFMQ: $M = 36.51$, $SD = 6.62$, DASS: $M = 18.75$ $SD = 13.28$), means and standard deviations revealed a difference between two groups therefore t-tests were also conducted (see Table 4.8 for summary). It was concluded that there was a significant difference between two groups in

terms of ONI ($p < .001$) and non-significant difference in SCS ($p = .111$) FFMQ ($p = .118$) and DASS ($p = .109$) which reflected differences in correlations observed for the groups when tested independently (see Supplementary Material (Section D5- Table 4.10 and 4.11) for correlations table split by students and prolific participants).

Table 4.8

Means, Standard Deviations, and Group Comparisons Between Students and Prolific Participants

Measure	Students (n = 139)	Prolific (n = 276)	t-test p-value
ONI	M = 42.58, SD = 13.99	M = 37.36, SD = 11.44	< .001***
SCS	M = 73.79, SD = 15.50	M = 75.81, SD = 16.06	.111
FFMQ	M = 35.68, SD = 6.61	M = 36.51, SD = 6.62	.118
DASS	M = 20.46, SD = 13.54	M = 18.75, SD = 13.28	.109

Note. ONI = Orthorexia Nervosa Inventory; SCS = Self-Compassion Scale; FFMQ = Five Facet Mindfulness Questionnaire; DASS = Depression Anxiety Stress Scales.
 $p < .001$.

Table 4.9 Participant demographic information ($n = 415$).

Characteristic	n	%
Gender		
Female	222	53.5
Male	190	45.8
Prefer not to say	0	0
Prefer to self describe	3	0.7
Ethnicity		
White	269	64.8
Asian	45	10.8
Black	46	11.1
Mixed	35	8.4
Other	20	4.8
Diet		
Vegan	7	1.7
Lacto-vegetarian	6	1.4
Lacto-ovo-vegetarian	14	3.4
Pescetarian	11	2.7
Semi-vegetarian	12	2.9
Occasional omnivore	34	8.2
Omnivore	331	79.8

Descriptive statistics for continuous variables.		
	M	SD
Age	26.02	8.09
BMI	24.94	5.55

Materials:

Demographic information: For description, see Study 1.

Orthorexia Nervosa Inventory (ONI). For a description, see Study 1. The Cronbach alpha for the present study was .944.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). For a description, see Study 1. The Cronbach alpha for the present study was .680.

Self-Compassion Scale (SCS). For a description, see Study 1. The Cronbach alpha for the present study was .907. Additionally, the Cronbach's alpha was calculated for the subscales; self-kindness was .82, self-judgement was .87, common humanity was .74, mindfulness was .79, isolation was .85 and over-identified was .83.

Depression, Anxiety and Stress Scale. (DASS-21). The original version of the scale was developed by Levibond & Levibond (1995) which included 46 items, the reduced version of this scale contains 21 items (Henry & Crawford, 2005). This scale measures three domains: depression (7 items), anxiety (7 items) and stress (7 items). The Depression subscale measures the emotional symptoms associated with depression, such as feelings of sadness, hopelessness, and a lack of interest in activities. The Anxiety subscale focuses on symptoms related to anxiety, including nervousness, fear, and physiological arousal. Finally, the Stress subscale assesses the experience of tension, irritability, and an inability to relax, reflecting the psychological and physiological responses to stress. It is measured on a 0 to 4 likert scale (never to almost always), higher scores indicating higher psychopathology.

Sample questions include “I found it difficult to work up the initiative to do things” and “I felt I was close to panic”. The Cronbach alpha for the present study was .944.

Procedure

The procedure for Study 2 followed Study 1, please see Study 1 for full description.

Data Analysis

The data analysis for Study 2 followed Study 1, please see Study 1 for full description.

4.6. Results

Table 4.12 presents the inter-correlations among ONI, BMI, SCS, FFMQ, and DASS. The results reveal one significant positive correlation: between ONI and DASS ($p < .001$), Additionally, there are two significant negative correlations: between ONI and FFMQ ($p = .002$), and between ONI and SCS ($p = .016$). There was no significant relationship between BMI and ONI. Further correlations were conducted between ONI and subscales of SCS, they are presented in Table 4.13 in Supplementary Materials (see Section D6).

Table 4.12

Bivariate correlations between ONI, BMI, FFMQ, SCS and DASS and descriptive statistics (n=415).

	1	2	3	4	<i>M</i>	<i>SD</i>
(1) ONI					39.11	13.09
(2)BMI	.021				24.94	5.55
(3) FFMQ	-.151**	-.023			45.35	7.28
(4) SCS	-.118*	-.018	.653**		2.89	.61
(5) DASS	.356**	.091	-.484**	-.618**	19.32	13.09

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. DASS: Depression, Anxiety and Stress Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

A mediation analysis was conducted to examine whether self-compassion mediates the relationship between mental health and orthorexia (see Figure 4.3). Mental health significantly predicted lower self-compassion, $b = -.734$, $SE = .046$, $p < .001$, 95% CI $[-.825, -.644]$, and self-compassion significantly predicted orthorexia, $b = .136$, $SE = .048$, $p < .001$, 95% CI $[.042, .230]$. The direct effect of mental health on orthorexia was significant, $b = 0.449$, $SE = 0.06$, $p < .001$, 95% CI $[0.337, 0.560]$. The indirect effect of mental health on orthorexia via self-compassion was also significant, $b = -.099$, $SE = .04$, 95% CI $[-.170, -.030]$, suggesting a partial mediation. Although modest in size, the negative indirect effect suggests that better mental health is associated with reduced orthorexic tendencies through increased self-compassion. These findings underscore the role of self-compassion as a meaningful, inverse mediator in the relationship between mental health and orthorexia.

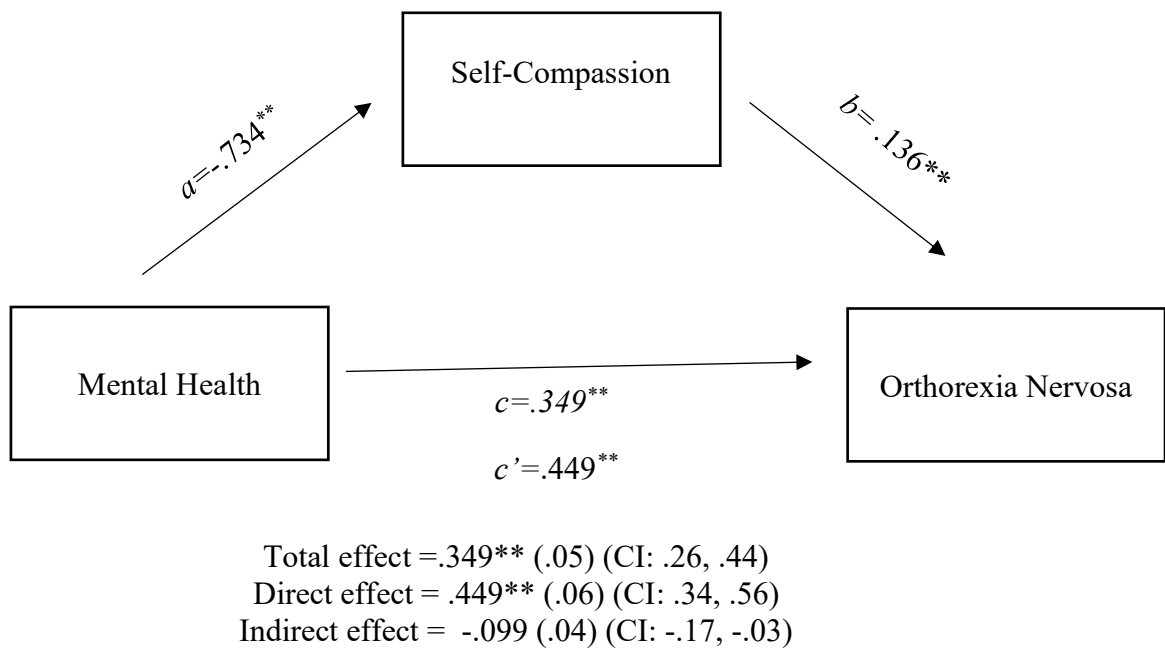


Figure 4.3. Parallel mediation using standardised regression coefficients to examine the interaction of self-compassion in the relationship between a) mental health and b) orthorexia nervosa. Notes: a is the effect of mental health on self-compassion; b is the effect of self-compassion on orthorexia nervosa; c is the effect of mental health on orthorexia nervosa; c' is effect of mental health on orthorexia nervosa with self-compassion in the model.

A second mediation analysis was conducted to assess whether mindfulness mediates the relationship between mental health and orthorexia (see Figure 4.4). Mental health significantly predicted lower mindfulness, $b = -.241$, $SE = .022$, $p < .001$, 95% CI $[-.283, -.199]$; however, mindfulness did not significantly predict orthorexia, $b = .042$, $SE = .055$, $p > .05$, 95% CI $[-.162, .247]$. The direct effect of mental health on orthorexia was significant, $b = .349$, $SE = .05$, $p < .001$, 95% CI $[.247, .451]$, indicating that mindfulness did not account for a substantial portion of the association. The indirect effect of mental health on orthorexia through mindfulness was small and not statistically significant, $b = -.010$, $SE = .03$, 95% CI $[-.060, .040]$, suggesting that mindfulness does not significantly mediate this relationship. While mental health does influence mindfulness, mindfulness does not appear to explain the link between mental health and orthorexia. These findings indicate that the relationship is primarily direct and not meaningfully mediated by mindfulness.

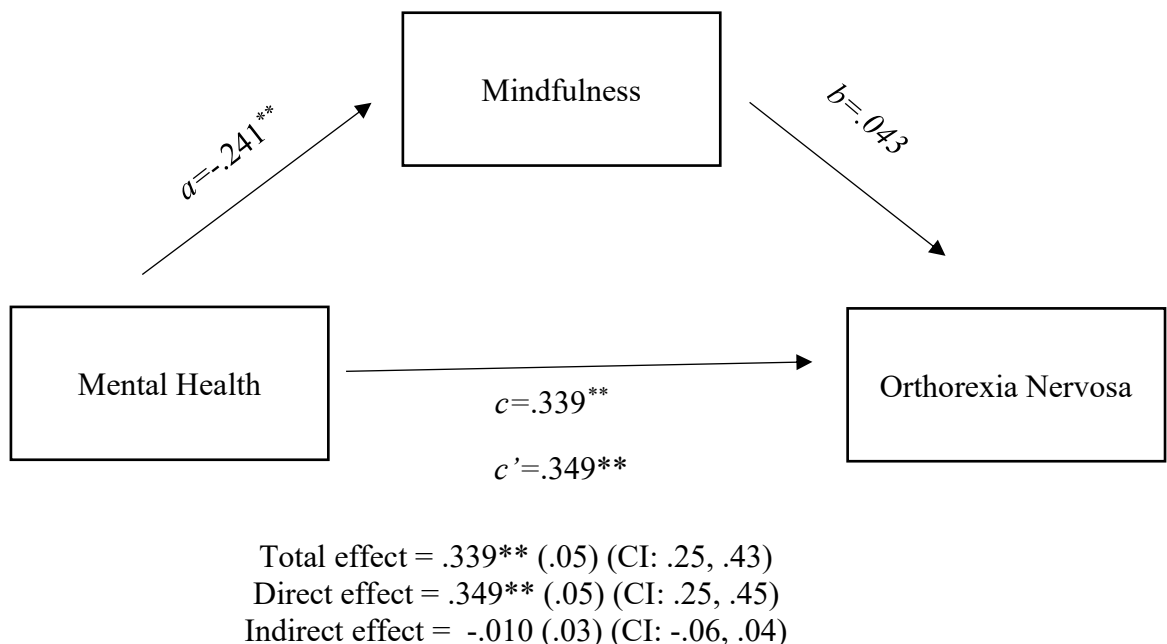


Figure 4.4. Parallel mediation using standardised regression coefficients to examine the interaction of mindfulness in the relationship between a) mental health and b) orthorexia nervosa. Notes: a is the effect of mental health on mindfulness; b is the effect of mindfulness on orthorexia nervosa; c is the effect of mental health on orthorexia nervosa; c' is effect of mental health on orthorexia nervosa with mindfulness in the model.

4.7. Discussion

Study 1 set out to determine the associations between Orthorexia Nervosa, Eating Attitudes, Mindfulness and Self-compassion. The study indicated negative relationships between Orthorexia and both the mindfulness and the self-compassion, as well as a positive relationship with eating attitudes when exploring the primary goal of interrelations which confirmed the hypothesis for the present study. This suggests that individuals with higher orthorexic tendencies display lower levels of mindfulness and self-compassion and higher levels of disordered eating. These findings support the hypothesis that disordered eating will be positively related to orthorexia nervosa, whereas mindfulness and self-compassion will be negatively related to orthorexia, and also confirm the findings of past research (e.g., Kalika et al., 2022; Stahler, 2021). Research in orthorexia, mindfulness and self-compassion uniformly suggest that mindfulness and self-compassion could provide the necessary means for much-needed interventions. Study 1 is the first study in the literature that investigated all of the concepts together, other studies looked at disordered eating and orthorexia (e.g., Dunn et al., 2019). While disordered eating and orthorexia have been previously researched using measures such as ORTHO-15, TOS and EHQ (e.g., Brytek-Matera et al., 2017, Brytek-Matera et al., 2022), which were assumed to be problematic (Barrada & Mueller, 2024), the present study utilised the ONI and replicated previous research. The findings of Study 1 are consistent with past research where ON is positively related to disordered eating suggesting that eating disorder pathology is related to ON. A systematic review by Zagaria et al. (2021) proposed that ON is more correlated to EDs rather than obsessive-compulsive disorder, highlighting the need for the classification of orthorexia nervosa as an eating disorder. Furthermore, disordered eating, mindfulness and self-compassion were also negatively correlated, supporting previous findings in the literature (e.g., Masuda et al., 2012a; Masuda et al., 2012b; Wilson & O'Connor, 2017; Geller et al., 2015; De Oliveira & Cordas, 2022; Wang et al., 2023). This finding is not surprising, as disordered eating and orthorexia nervosa

are closely linked (Dunn et al., 2017), suggesting mindfulness and self-compassion could potentially reduce the symptoms of both conditions. Therefore, further investigating the mediating role of mindfulness and self-compassion was necessary.

The secondary goal of Study 1 was to explore the mediating role of mindfulness and self-compassion in the relationship between disordered eating and orthorexia nervosa. Two mediations were conducted where both mindfulness and self-compassion successfully mediated the relationship between disordered eating and orthorexia nervosa. This highlights that the effect of disordered eating on ON symptomology may be partially transmitted through diminished mindfulness and self-compassion. These findings suggest that individuals exhibiting disordered eating behaviours may be more likely to experience orthorexic tendencies due to reduced capacity for present-moment awareness and self-compassion – mechanisms that have been previously implicated in anxiety and shame surrounding eating behaviours (e.g., Callow et al., 2021; Hofmann et al., 2010). According to the diagnostic criteria by Dunn and Bratman (2015), a violation of dietary rules can cause fear and a sense of impurity, accompanied by anxiety and shame when deviating from their dietary practices. Thus, the current results underscore the importance of mindfulness and self-compassion as potential psychological pathways linking general disordered eating patterns to orthorexic symptomology.

The primary aim of Study 2 was to explore the associations between Orthorexia Nervosa, Mindfulness, Self-compassion and Depression, Anxiety and Stress. The current findings support the hypothesis that Orthorexia Nervosa is positively linked to DASS suggesting that individuals with orthorexic tendencies may experience increased mental health problems. Replicating Study 1 and aligning with past research (Kalika et al., 2022; Stahler, 2021), Study 2 found that individuals with higher orthorexic tendencies reported lower levels of mindfulness and self-compassion. Mental health is an important component in the development as well as maintenance of eating disorders, where mental health problems such as depression and anxiety are more prevalent (e.g., Tan et al., 2023). As mentioned

previously, Study 2 has found a positive relationship between ON and mental health problems such as depression, anxiety and stress. The negative association between mindfulness/self-compassion and ON tendencies in both studies aligns with the known characteristics of Orthorexia Nervosa. Individuals with ON often experience heightened stress and anxiety when they deviate from their strict dietary rules or face social situations involving food (Koven & Arby, 2015). This research reinforces the potential for mindfulness and self-compassion interventions to address these underlying emotional aspects of ON, potentially leading to improved well-being. If the individual with orthorexia is constantly worrying about their health as well as eating behaviours, then the levels of stress and anxiety could be much higher in comparison to other EDs, signifying that implications of Orthorexia Nervosa may have more of a detrimental impact on individuals well-being. Future research needs to closely inspect the deviation and strength to enable more conclusive data and analyses.

4.8. Limitations and Future Recommendations

The current studies have several limitations that should be considered. Both studies were conducted in the general population, and therefore the findings are not specific to orthorexic population that are exceeding the threshold. Future studies should aim to recruit individuals who score over a threshold on the orthorexia nervosa measures to fully determine the impact of mindfulness and self-compassion. Both studies aimed to recruit an equal sample concerning gender; however, the samples were female-dominated. Future studies should aim to recruit an equal number across genders to explore potential gender differences. Future studies should compare orthorexia nervosa with other EDs in terms of depression, anxiety and stress to fully explore the deviation and strength of impact that orthorexia nervosa might have on individuals. Last, having had two methods of recruitment may have indicated different problems and future directions. For example, both mindfulness and self-compassion are prone to age differences, and a more detailed exploration of age may be

appropriate in future research (Mahlo & Windsor, 2021; Karakasidou et al., 2020).

Nevertheless, attributing the differences in findings solely to age would be inaccurate, as variations in compensation and occupational stressors between the two samples suggest other potential confounding factors warranting further investigation.

4.9. Conclusion

In conclusion, this manuscript contributes to the literature on orthorexia nervosa, characterized by an obsessive focus on healthy eating. Study 1 highlighted that orthorexia nervosa is strongly correlated with disordered eating and negatively correlated with mindfulness and self-compassion. Using mediation analysis, the study suggested that mindfulness and self-compassion, or the lack thereof, explain the relationship between disordered eating and orthorexia nervosa. Study 2 highlighted the same findings as Study 1 in relation to mindfulness and self-compassion as well as showed a positive relationship between orthorexia nervosa and mental health. By fostering present-moment awareness and self-kindness, these practices can improve individuals' relationships with food and promote healthier eating habits. While we already know the potential of mindfulness and self-compassion in tackling the association of perfectionism and eating disorder quality of life, and now disordered eating as well as mental health, such interventions have shown promising results in promoting mental well-being and reducing symptoms associated with ON, suggesting their potential utility in holistic treatment approaches. Future research should incorporate these concepts into interventions to address orthorexia and improve the quality of life for individuals exhibiting such disordered eating.

CHAPTER 5: EXPLORING THE MODERATING ROLE OF MINDFULNESS, MINDFUL EATING, AND SELF-COMPASSION ON THE RELATIONSHIP BETWEEN EATING-DISORDERED QUALITY OF LIFE AND ORTHOREXIA NERVOSA.

5.1. Abstract

Orthorexia nervosa (ON) is characterised by an obsessive focus on healthy eating, following restrictive dietary practices and dietary restrictions escalating over time. The aim of this study was to explore mindfulness, mindful eating, self-compassion and quality of life (QOL) in a female population. Two hundred eighty-eight participants completed Orthorexia, Self-Compassion, Mindful eating, Mindfulness and Eating Disorder Quality of Life scales. The results indicated that there was a negative relationship between ON and mindfulness, self-compassion and mindful eating. Furthermore, the present study found a positive relationship between lower quality of life and ON, while findings indicated that self-compassion and the awareness facet of mindfulness moderated the relationship between ON and QOL. The present results contribute to a better understanding of orthorexic eating behaviours in a female population, and identify the moderating capacity of self-compassion and mindfulness. Further implications and future directions are discussed.

5.2. Introduction

Research has shown that engaging in restrictive rituals for healthy eating can lead to the development of Orthorexia Nervosa (ON) (e.g., Brytek-Matera, 2020; Cena et al., 2019). ON was defined as an obsessive fixation on healthy eating (Bratman, 2017). Individuals who display orthorexic tendencies place significant emphasis on food quality and purity and spend a significant amount of time planning and preparing healthy meals (Koven & Abry, 2015). The imposition of extreme restrictions can result in malnourishment and medical complications (Brytek-Matera et al., 2017; Dunn & Bratman, 2016) and severely reduce enjoyment of food (Cena et al., 2019).

Distinguish between ON and healthy eating can be challenging, particularly in social climates where engaging in extreme dieting restrictions are normalised and endorsed. Bratman (2017) proposes that symptomology including obsessive thoughts, compulsive behaviours, self-punishment and extreme restrictions help to distinguish healthy eating from

ON. Currently, there are no diagnostic criteria for ON in the classification system (American Psychological Association [APA], 2013), although some recent literature has proposed guidelines that meet consensus by researchers and clinicians (Donini et al., 2022). The lack of one universally accepted diagnostic tool contributes to widely varying prevalence rates between 1% to 82.7% (e.g., Brytek-Matera et al., 2015a; Depa et al., 2017; Plichta & Jezewska-Zychowicz, 2019; Oberle et al., 2020). In addition, some researchers identified that the scales used in the past may have overestimated the prevalence of orthorexic eating behaviours (e.g., Opitz et al., 2020), adding to the immense difference in prevalence rates. The present study utilised a new assessment tool called Orthorexia Nervosa Inventory (ONI) (Oberle et al., 2020) to measure orthorexia, which was introduced as meeting consensus in measuring orthorexia by developers of other scales and leaders in the field of orthorexia (Donini et al., 2022; Niedzielski & Kazmierczak-Wojtas, 2021). This tool that takes into consideration the preoccupation with healthy food, physical and psychosocial impairments and emotional distress factors, which are all central in the conceptualisation of ON (Oberle et al., 2020). Significantly, elements that are accounted for in measuring ON proposes implications for quality of life, especially when considered in parallel literature that has looked into disordered eating.

Quality of life (QoL) is defined as a patient-centred method of appraising the impact of symptoms on the individual's health (Engel et al., 2009). Individuals with AN, Bulimia Nervosa (BN) and Binge Eating Disorder (BED) have reported worse QoL than the general population (e.g., Agh et al., 2016; DeJong et al., 2013; De la Rie et al., 2005; Jenkins et al., 2011; Mason et al., 2018; Winkler et al., 2014). Research has shown that people with ON also experience reduced QoL due to self-punishment following dietary violations (Koven & Arby, 2015), avoidance of social gatherings where food is involved leading to social isolation (Dunn & Bratman, 2016), depression and anxiety (Bosi et al., 2017). Individuals who have experienced an ED for several years may suffer from impairments in psychological, physical, and social aspects of life (Jenkins et al., 2011, Winkler et al., 2014), to our knowledge no

studies have examined the quality of life specific to eating disorders in individuals who display orthorexic symptoms. The Eating Disorder Quality of Life (EDQOL) scale was chosen over a generic QoL measure due to its ability to assess the specific impact of disordered eating on an individual's day-to-day functioning and wellbeing. While general QoL scales provide valuable insights into broad life domains such as finances, relationships and physical health (e.g., Moorehead et al., 2003), these may overlook the nuanced psychosocial distress experienced by those with disordered eating and eating disorders, including ON. As ON is characterised by rigid dietary rules, anxiety around food and social isolation (Koven & Arby, 2015; Dunn & Bratman, 2016), these could be assumed that directly compromise eating-related quality of life. The EDQOL captures domains such as psychological wellbeing, cognitive/physical functioning and social/occupational impact, which are more directly impacted by disordered eating behaviours than what a general QoL would reflect. This approach also aligns with the literature proposing that mindfulness-based intervention effectiveness is prone to eating congruent constructs, and may impact more significantly emotion regulation and food-related distress (Mantzios & Wilson, 2015), highlighting the importance of addressing eating-related QoL as a baseline measure before broader QoL outcomes.

Mindfulness is defined as a psychological concept that involves consciously attending to external and internal experiences such as emotions, thoughts, and bodily sensations in a non-judgmental way (Kabat-Zinn, 2003). Reviews of empirical research have indicated that mindfulness-based interventions (MBI) have improved psychological and physical wellbeing (Chiesa & Serretti, 2011; Keng et al., 2011). Several studies also show that mindfulness has a positive effect on the quality of life, including in healthy individuals, patients with ulcerative colitis, asthma, multiple sclerosis, depression, and schizophrenia (Jedel et al., 2013; Khoury et al., 2015; Rayan, 2017; Rayan & Ahman, 2016; Schirda et al., 2015). One form of mindfulness, directed specifically towards the eating process is mindful eating. Mindful eating is defined as sustained attention on a sensory element of the eating

experience (e.g., taste) and a non-judgmental (or non-evaluative) awareness of thoughts and feelings that are incongruent with the sensory elements of the present eating experience (Mantzios, 2020). Within explorations of eating behaviours, mindful eating has been shown to challenge motivations. Mantzios et al. (2019) discovered that mindful eating interventions inspire a gradual shift from external motivations to internal motivations, which is linked to healthier eating behaviours (Mantzios & Wilson 2013, 2014, 2015; Mantzios & Giannou, 2014; Zervos et al., 2021). Only one study has looked at mindful eating and self-compassion in relation to ON, and the findings suggested that mindful eating was not associated with ON, which was mostly attributed to the vegan population that was recruited and the naturally more restrictive diet, but self-compassion displayed a negative association with ON (Kalika et al., 2022). Mindful eating offers a unique and valuable extension to the exploration of mindfulness and self-compassion in the context of disordered eating behaviours, particularly ON. While mindfulness broadly encompasses a non-judgmental awareness of internal and external experiences (Kabat-Zinn, 2003), mindful eating applies this awareness specifically to eating, which allows for a more direct examination of the psychological mechanisms involved in food-related distress.

The notion of self-compassion is linked to mindfulness and mindful eating, in terms of their relation to eating behaviours and food consumption (Mantzios et al., 2018a, b). The understanding that suffering, inadequacy, and failure are all part of the human experience is characterised as self-compassion (Neff, 2003). Self-kindness, shared humanity, and awareness are the three components of this concept. Higher levels of self-compassion are linked to higher levels of happiness, life satisfaction and lower levels of shame, depression, and anxiety (Neff, Kirkpatrick, et al., 2007; Neff, Rude, et al., 2007). Furthermore, Ferreira et al. (2013) have found that lower levels of self-compassion are associated with higher levels of body dissatisfaction, drive for thinness and eating disorder pathology. The nature of self-judgement can evoke distress which could result in disordered eating, serving as a coping strategy for managing internal and external threats by avoiding criticism due to body shape

and weight (Germer & Salzberg, 2009). However, this can ultimately result in worse negative emotional states. As self-compassion addresses one's thoughts, emotions and experiences with kindness and empathy, this can be used to regulate negative affect and threats (Meyer et al., 2018). A recent systematic review found evidence that self-compassion acts as a protective factor against body dysmorphia and eating disorders (Braun et al., 2016). Whereas Adams and Leary (2007) found that utilising self-compassion intervention with restrictive eaters has reduced their distress-related eating. Each of these factors is associated with ON such as restrictive eating (Barthels et al., 2018) and self-judgement (Cheshire et al., 2020). Therefore, utilising self-compassion may reduce the symptoms of ON, and therefore, improve the quality of life of an individual that displays orthorexic tendencies.

The first aim of this study was to explore mindfulness, self-compassion, mindful eating and orthorexia in the female population due to a greater prevalence of orthorexia in female samples (e.g., Dell'Osso et al., 2018; Gorrasi et al., 2019; Parra Fernandez, 2018; Ruiz & Quiles, 2021). The second aim of this study was to explore whether mindful eating, self-compassion and mindfulness moderate the relationship between ON and QoL. To our knowledge only one study looked at mindfulness (Strahler, 2020), and another study has looked at mindful eating and self-compassion (Kalika et al., 2022). In accordance with previous literature, it is hypothesised that mindful eating, self-compassion and mindfulness will be negatively correlated with ON. Furthermore, the present study aimed to investigate eating disorder quality of life, which is based on the literature of quality of life in eating disorders and a novel investigation in the orthorexia literature, with a hypothesis that individuals with high orthorexic tendencies would demonstrate a lower quality of life. Additionally, although previous chapters have primarily focused on the mediating role of mindfulness and self-compassion in ON, the use of moderation analysis in the present study provides an understanding of how these variables may buffer the impact of ON on EDQOL. By testing for moderation, this study will investigate whether the presence of mindfulness-

based constructs can protect the individuals from the negative consequences on QoL associated with ON symptomology.

5.2. Methods

Participants

The sample for the present study consisted of 288 female participants who were all adults (18 years or over; $M = 24.79$, $SD = 7.08$) with a mean Body Mass Index (BMI) of $M = 24.26$ kg/m² ($SD = 6.45$). See Table 5.1. for an overview of Participant Characteristics. Participants were recruited through volunteering sampling by advertising the study on several social media platforms and forums such as Facebook, Instagram, Twitter, LinkedIn and MiniMins. The advertisement on Facebook has been posted in healthy eating groups requesting individuals to participate in the study. Individuals were also recruited through the university's Research Participation Scheme. Those who participated in the scheme were rewarded with research credits upon completion of the study. Participants were informed via the information sheet that the inclusion criteria for this study required them to be over the age of 18, have good knowledge of the English language and not be diagnosed with an eating disorder.

Table 5.1 Participant demographic information ($n = 288$).

Characteristic	n	%
Gender		
Female	288	100%
Male	0	0
Prefer not to say	0	0
Prefer to self describe	0	0
Ethnicity		
White	199	69.1
Asian	57	19.8
Black	10	3.5
Mixed	8	2.8

Other	14	4.9
Diet		
Vegan	7	2.4
Lacto-vegetarian	9	3.1
Lacto-ovo-vegetarian	17	5.9
Pescetarian	18	6.3
Semi-vegetarian	20	6.9
Occasional omnivore	33	11.5
Omnivore	184	63.9
Descriptive statistics for continuous variables.		
	M	SD
Age	25.40	7.69
BMI	24.43	6.12

Materials

Demographic information: See Chapter 2, page 29 for information.

Orthorexia Nervosa Inventory (ONI; Oberle et al., 2020). See Chapter 2, page 29 for scale description. The Cronbach alpha for the present study was .947. Additionally, the Cronbach alpha was calculated for the subscales; impairments was .918, behaviours was .873 and emotions was .857.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .736. Additionally, the Cronbach alpha was calculated for the subscales; observing was .485, describing was .807, acting with awareness .714, non-judging of inner experience was .776 and non-reactivity was .637.

The Mindful Eating Behaviour Scale (MEBS). Scale developed by Winkens et al. (2018), it contains 17 items that measures four components of mindful eating, these are focused eating, hunger and satiety cues, eating with awareness and eating without distraction. The Focused Eating subscale reflects the ability to concentrate on the act of eating, engaging fully with the sensory experience of food. The Hunger and Satiety Cues subscale assesses an individual's awareness and responsiveness to their body's internal signals of hunger and fullness, emphasizing a balanced approach to eating. The Eating with Awareness subscale

evaluates the extent to which individuals are present and attentive to their eating experience, avoiding mindless or automatic eating habits. Lastly, the Eating without Distraction subscale measures the degree to which individuals eat without external distractions, such as television or smartphones, allowing for a more mindful and intentional eating experience. This scale utilises a 5-point Likert scale with the following responses 1 (never) to 5 (always). The higher the score the more mindful the individual. It is recommended by the author to use the four subscales separately rather than producing a total score. Sample questions include “I notice how my food looks”. The Cronbach alpha for the present study was .790. Additionally, the Cronbach alpha was calculated for the subscales; eating while focusing on the food was .875, eating while paying attention to hunger and satiety cues was .894, being aware of eating was .907 and eating while not being distracted was .780.

Self-Compassion Scale-Short Form (SCS-SF). This is a shorter form which contains 12 items of the original 26-item SCS, it was developed by Raes et al. (2011) to measure self-compassion. The items are rated on a 5-point Likert scale with the following responses, 1 (never) to 5 (always). This scale includes three compassionate components and three uncompassionate components, these components are self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification. Sample questions include “I try to see my failings as part of the human condition”. The Cronbach alpha for the present study was .814.

Eating Disorder Quality of Life (EDQOL). Scale developed by Engel et al. (2006) and it measures the impact of eating disorder symptoms on the individual’s quality of life. It includes 25-items which measure four domains: psychological, physical/cognitive, financial and school/work. The psychological subscale measures the emotional and mental toll of eating disorders, including feelings of distress, self-esteem issues, and emotional well-being. The Physical/Cognitive subscale evaluates the impact of the eating disorder on physical health and cognitive functioning, such as energy levels, concentration, and overall physical well-being. The Financial subscale addresses the economic burden caused by the eating

disorder, including healthcare costs or financial strain related to treatment or the disorder's impact on daily functioning. Lastly, the School/Work subscale assesses how the eating disorder affects an individual's academic or professional life, including work or school performance, attendance, and social interactions in these environments. Answers are given on a 4-point Likert scale with the following responses, 0 (never) to 5 (always). The higher scores indicate a worse quality of life. Sample questions include "How often has your eating/weight made you feel lonely". The Cronbach alpha for the present study was .951. Additionally, the Cronbach alpha was calculated for the subscales; psychological was .947, physical/cognitive was .911, financial was .931 and work/school was .949. Some studies explored the QoL in EDs using generic QoL measures such as the SF-36 Health Survey (e.g., Jenkins et al., 2014). In the present study, the Eating Disorder Quality of Life measure (EDQOL) was used, which has been shown to be sensitive to the unique characteristics of ED. Engel et al. (2009) indicated that QoL is an important element of ED assessment, and generic QoL measures needed to be adapted to account for the unique characteristics of ED.

Procedure

Ethical approval was obtained from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited via forums and social media groups and were asked to share the study with their contacts. They were presented with information about the study such as inclusion and exclusion criteria, and the hyperlink to Qualtrics that directed them to the questionnaire. Furthermore, the university Research Participation Scheme was utilised where individuals gained research credits for participation. Participants were asked to read the information about the research in a Participant Information Sheet, which appeared prior to consenting. Participants consented and created a unique code to identify data in case of withdrawal. Participants were then presented with demographic information, ONI, FFMQ, MEBS, SCS-SF and EDQOL. After completion, the participant was presented with a debrief form which explained the aims of the study and the

procedure in case of withdrawal. The study consisted of one online session, which lasted approximately 30 minutes.

Data Analysis

Prior to conducting the analysis of the data, assumptions were tested. Firstly, the data was checked for outliers. Cook's distance was used and the range was between 0 and .115 which indicated that there were no outliers. According to Hair et al. (2010) the values between 2 to -2 for Skewness and 7 to -7 for Kurtosis is considered to be normal. The assumptions for normality were examined using the Skewness and Kurtosis. Skewness scores for ONI, EDQOL, SCS, FFMQ and MEBS were 1.5, .94, .16, -.08 and -.16. Kurtosis scores for ONI, EDQOL, SCS, FFMQ and MEBS were 2.3, .29, .16, .88 and -.22. So, the data met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 1.5 which is below the value of 5 (Tabachnick & Fidell, 2007) meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0; IBM Corp., 2017). Pearson's bivariate correlations were conducted to assess the associations between Orthorexia (ONI), Mindfulness (FFMQ), Mindful Eating (MEBS), Self-compassion (SCS) and Eating Disorder Quality of Life (EDQOL) (see Table 5.2). A further correlation analysis was conducted to examine the relationships between ONI, subscales of FFMQ and EDQOL (see Table 5.3).

Furthermore, moderation analysis was used to determine which variables moderated the association of orthorexia nervosa on quality of life in female sample. Hayes' (Preacher & Hayes, 2008) PROCESS macro (v3.3) was installed on SPSS (version 25.0) and was used to conduct moderation analyses (model 1). No covariates were controlled for this moderation model. Participant's BMI has been calculated using the height and weight information provided by the participant.

5.3. Results

A multiple correlation analysis has been used to identify which scales (BMI, FFMQ, MEBS, SCS-SF, EDQOL) relate to ONI.

Inter-correlations between BMI, ONI, FFMQ, MEBS, SCS-SF and EDQOL, are presented in Table 5.2. Findings indicate that there is a significant negative relationship between ONI and Focused eating MEBS ($p = .029$), Hunger and Satiety MEBS ($p < .001$), Eating Awareness MEBS ($p = .004$), FFMQ ($p = .012$) and SCS ($p = .008$). The only positive relationship was EDQOL ($p < .001$), Only eating without Distraction subscale in MEBS was not significant as well as BMI. In addition, correlational analysis on the subscales of ONI was performed results are presented in Table 5.3.

Table 5.2

Bivariate correlations between BMI, ONI, FFMQ, MEBS, SCS-SF and EDQOL and descriptive statistics (n=288).

	1	2	3	4	5	6	7	8	M	SD
(1) ONI									36.25	11.96
(2) BMI	.056								24.26	6.45
(3) FFMQ	-.155*	-.006							45.32	7.02
(4) MEBS- Focused Eating	-.134*	.002	.183**						18.64	4.37
(5) MEBS- Hunger & Satiety	-.243**	-.197**	.175**	.452*					16.61	4.86
(6) MEBS- Eating with Awareness	-.179**	-.110	.289**	.214**	.237**				10.93	3.36
(7) MEBS- Eating without distraction	-.084	.012	.296**	.058	.124*	.508**			12.75	3.48
(8) SCS-SF	-.160**	-.055	.548*	.078	.146*	.131*	.180**		2.79	0.63
(9) EDQOL	.605**	.123*	-.203**	-.233**	-.355**	-.360	-.244**	-.208**	3.78	2.90

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ-SF: Five-Facet Mindfulness Questionnaire- Short Form EDQOL: Eating Disorder Quality of Life Scale.

SCS-SF: Self-Compassion Scale-Short Form. MEBS: Mindful Eating Behaviour Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Table 5.3

Bivariate correlations between subscales of ONI, SCS, FFMQ, MEBS and EDQOL and descriptive statistics (n=288).

	1	2	3	4	5	6	7	M	SD
(1) Impairments (ONI)								14.15	5.06
(2) Behaviour (ONI)	.828**							14.18	4.75
(3) Emotion (ONI)	.657**	.651**						8.55	3.47
(4) EDQOL	.604**	.461**	.499**					3.78	2.90
(5) SCS-SF	-.116	-.038	-	-				2.79	0.63
(6) MEBS	-	-.097	-	-	.199**			59.15	10.82
(7)FFMQ	.183**	-.007	.342**	.442**				45.33	7.03
	-.118		-	-	.548**	.345**			
			.276**	.203**					

Note: ONI: Orthorexia Nervosa Inventory. FFMQ: Five-Facet Mindfulness Questionnaire
EDQOL: Eating Disorder Quality of Life Scale. SCS-SF: Self-Compassion Scale-Short Form. MEBS: Mindful Eating Behaviour Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

A further correlation analysis has been conducted between the subscales of ONI, and EDQOL, the findings are presented in Table 5.4. All of the subscales of ONI showed all positive associations with subscales of EDQOL; Psychological, ($p < .001$), Cognitive ($p < .001$), Financial ($p < .001$) and Work subscales ($p < .001$).

Table 5.4

Bivariate correlations between subscales of ONI and EDQOL and descriptive statistics.

	1	2	3	4	5	6	<i>M</i>	<i>SD</i>
(1) Imp-ONI							14.15	5.06
(2)Beh-ONI	.828**						14.18	4.75
(3) Emo-ONI	.657**	.651**					8.55	3.47
(4) EDQOL- Psychological	.404**	.303**	.560**				1.73	1.04
(5) EDQOL- Cognitive	.557**	.409**	.437**	.559**			1.24	1.06
(6)EDQOL- Financial	.487**	.395**	.279**	.301**	.608**		.45	.78
(7)EDQOL- Work	.471**	.377**	.268**	.284**	.588**	.842**	.38	.76

Note: ONI: Orthorexia Nervosa Inventory FFMQ: Five-Facet Mindfulness Questionnaire
EDQOL: Eating Disorder Quality of Life Scale.

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

The analysis also ran multiple moderation model analyses. The first moderation model analysis used ONI as the independent variable, EDQOL as a dependent variable, and SCS as a potential moderator (see Table 5.5). The ONI significantly predicted the EDQOL $b = .15, p < .001, 95\%CI [.13, .18]$, whereas SCS did not $b = -.38, p > .05, 95\%CI [-.84, .08]$. However, there was a significant ONI x EDQOL $b = .08, p = .0027, 95\%CI [.03, .13]$ indicating that there is evidence of SCS acting as a moderator. This has been explored with the use of simple slopes around the EDQOL mean, at the -1SD there was a significant relationship between ONI and SCS $b = .11, p < .001, 95\%CI [.07, .14]$, while this remained significant at the EDQOL mean $b = .15, p < .001, 95\%CI [.13, .18]$ the effect size has increased. At the +1SD the relationship was still significant $b = .20, p < .001, 95\%CI [.16, .25]$ with the effect size still increasing. Overall, this analysis suggests that SCS moderates the relationship at all levels between ONI and EDQOL, results are presented in Table 5.6. The simple slopes plot is presented in the supplementary materials (D7) to help the visualisation of the moderation effect.

Table 5.5

Results of moderation analyses using ONI to predict EDQOL with SCS-SF as moderator ($n=288$).

SCS				
<i>Model statistics</i>				
	R	R ²	f	p
Predictors	.63	.39	55.98	<.001
<i>Predictor statistics</i>				
	b		p	95% CI
ONI	.15		<.001	.12 to .18
SCS-SF	-.38		.11	-.84 to .08
Interaction	.076		.0027	.027 to .13

Note: SCS-SF: Self-Compassion Scale- Short Form. Bold figures indicate significant figures.

Table 5.6.

Conditional Effects of ONI on EDQOL at SCS-SF (+/- 1SD)

SCS-SF	Effect of EDQOL on ONI	SE	t	p	95% CI (LLCI, ULCI)
-.638	0.106	0.019	5.50	.000	[0.068, 0.144]
.000	.155	0.013	12.08	.000	[0.129, 0.180]
.638	.203	0.022	9.41	.000	[0.160, 0.245]

The second moderation model analysis used ONI as the independent variable, EDQOL as a dependent variable, and FFMQ and components of FFMQ as potential moderators. The results indicated that the awareness subscale of FFMQ ($p=.03$) acted as a moderator in the relationship between ONI and EDQOL. This has been explored with the use of simple slopes around the EDQOL mean, at the -1SD there was a significant relationship between ONI and acting with awareness (FFMQ) $b= .13, p <.001, 95\%CI [.10, .16]$, while this remained significant at the EDQOL mean $b= .16, p <.001, 95\%CI [.14, .19]$ the effect size has increased. At the +1SD the relationship was still significant $b= .19, p <.001, 95\%CI [.15, .24]$ with the effect size still increasing. The rest of the moderators were non-significant. The results are presented in Table 5.7. The condition effects of ONI on EDQOL at FFMQ (acting with awareness) are presented in Table 5.8.

Furthermore, the third moderation model analysis used ONI as the independent variable, EDQOL as a dependent variable, and the four components of MEBS as potential moderators. The results indicated that none of the MEBS components were significant moderators in the relationship between ONI and EDQOL. However, the subscale of Hunger and Satiety was close to significance level with $p=.053$. The results are presented in Table 5.9.

Table 5.7

Results of moderation analyses using ONI to predict EDQOL with mindfulness and constructs of mindfulness as moderators (n=288).

	FFMQ				Describing (FFMQ)				Non-Judgement (FFMQ)			
	<i>Model statistics</i>				<i>Model statistics</i>				<i>Model statistics</i>			
Predictors	R	R2	f	p	R	R2	f	p	R	R2	f	p
	.61	.38	50.78	<.001	.62	.38	53.10	<.001	.63	.40	56.59	<.001
	<i>Predictor statistics</i>				<i>Predictor statistics</i>				<i>Predictor statistics</i>			
	b		p	95% CI	b		p	95%CI	b		p	95%CI
ONI	.15		<.001	.13 to .18	.16		<.001	.13 to .18	.15		<.001	.12 to .18
FFMQ	-.05		.023	-.09 to -.01	-.11		.052	-.22 to .001	-.18		.0018	-.30 to -.07
Interaction	-.001		.76	-.005 to .004	-.01		.053	-.02 to .0001	.007		.23	-.005 to .02
	Observing FFMQ)				Awareness (FFMQ)				Non-Reactivity (FFMQ)			
	<i>Model statistics</i>				<i>Model statistics</i>				<i>Model statistics</i>			
Predictors	R	R2	f	p	R	R2	f	p	R	R2	f	p
	.61	.37	49.27	<.001	.62	.38	52.90	<.001	.61	.37	50.07	<.001
	<i>Predictor statistics</i>				<i>Predictor statistics</i>				<i>Predictor statistics</i>			
	b		p	95% CI	b		p	95%CI	b		p	95%CI
ONI	.16		<.001	.13 to .19	.16		<.001	.14 to .19	.16		<.001	.13 to .19
FFMQ	.05		.43	-.07 to .17	-.07		.25	-.20 to .05	-.06		.38	-.19 to .07
Interaction	-.007		.21	-.02 to .005	.01		.03	.001 to .025	-.003		.52	-.01 to .01

Note: FFMQ: Five Facet Mindfulness Questionnaire. Bold figures indicate significant figures.

Table 5.8.

Conditional Effects of ONI on EDQOL at FFMQ (Acting with Awareness) (+/- 1SD)

FFMQ (Acting with Awareness)	Effect of EDQOL on ONI	SE	t	p	95% CI (LLCI, ULCI)
-2.30	0.133	0.016	8.47	.000	[0.102, 0.164]
.000	.163	0.014	11.75	.000	[0.136, 0.191]
2.30	.194	0.023	8.48	.000	[0.149, 0.238]

Table 5.9.

Results of moderation analyses using ONI to predict EDQOL with mindful eating and constructs of mindful eating as moderators (n=288).

	MEBS				Hunger and Satiety (MEBS)				Distraction (MEBS)			
	<i>Model statistics</i>				<i>Model statistics</i>				<i>Model statistics</i>			
Predictors	R	R2	f	p	R	R2	f	p	R	R2	f	p
	.68	.27	71.51	<.001	.65	.42	61.63	<.001	.63	.40	55.28	<.001
	<i>Predictor statistics</i>				<i>Predictor statistics</i>				<i>Predictor statistics</i>			
	b		p	95% CI	b		p	95%CI	b		p	95%CI
ONI	.14		<.001	.11 to .16	.14		<.001	.12 to .17	.15		<.001	.13 to .18
MEBS	-.08		<.001	-.11 to -.06	-.14		<.001	-.19 to -.08	-.15		.001	-.24 to -.08
Interaction	-.002		.09	-.004 to .0003	-.004		.053	-.009 to .0001	.001		.80	-.01 to .01
	Focused Eating (MEBS)				Awareness (MEBS)							
	<i>Model statistics</i>				<i>Model statistics</i>							
	R	R2	f	p	R	R2	f	p				
Predictors	.63	.39	55.24	<.001	.66	.43	64.50	<.001				
	<i>Predictor statistics</i>				<i>Predictor statistics</i>							
	b		p	95% CI	b		p	95%CI				
ONI	.15		<.001	.12 to .17	.15		<.001	.12 to .17				
MEBS	-.11		.002	-.17 to -.04	-.22		<.001	-.30 to -.14				
Interaction	-.002		.36	-.007 to .003	.002		.62	-.01 to .01				

Note: MEBS: Mindful Eating Behaviour Scale. Bold figures indicate significant figures.

5.4. Discussion

The primary aim of the current study was to explore the associations between ON, mindfulness, mindful eating, self-compassion and eating disorder QoL, as well as the potential moderation of self-compassion, mindfulness, and mindful eating. The findings in the present study have confirmed a negative relationship between orthorexia and mindfulness, and are in line with eating behaviours research and mindfulness, as mindfulness is associated with healthier eating (Beshara et al., 2013; Dutt et al., 2019; Mantzios & Wilson 2013, 2014, 2015; Mantzios et al., 2018; Mantzios et al., 2019) and protective values against the development of disordered eating (Moore et al., 2014). Two of the subscales were related negatively to orthorexia; non-judgement and acting with awareness. Research showed that individuals with orthorexic behaviours display high levels of distress, self-judgement, and self-punishment when dietary violations occur (Bratman, 2017; Koven & Abry, 2015). However, it is interesting that individuals with high orthorexic tendencies display low levels of acting with awareness. This goes against findings in the orthorexia literature as research suggested that those individuals engage in obsessions with nutrition where their entire focus is on the preparation of food and ensuring the quality of food before consumption (Koven & Abry, 2015). Findings may be relevant to recent literature dictating a separation of decision-making around food from mindful eating behaviours (Mantzios, 2020), and food preparation would certainly not relate to decision-making in the present moment as described in both mindfulness and mindful eating.

The present study has hypothesised that Self-compassion and mindful eating will have a negative relationship with ON. A previous study by Kalika et al. (2022) showed both concepts had a negative relationship between self-compassion and ON, but no relationship between mindful eating and ON. The finding in the present study regarding self-compassion has been in accordance with past research (Kalika et al., 2022). However, mindful eating has

also been significant in the present study, which contradicts the findings done by Kalika et al. (2022). Thorne et al. (2022) also investigated the role of mindful eating on ON and the findings showed that there was a negative relationship between some of the constructs of mindful eating, indicative of proposals for separation of decision making for mindful eating from the eating behaviour that occurs as a result of mindful eating guidance. Previous research has shown that self-compassion is associated with a variety of positive eating behaviours; individuals with higher levels of self-compassion tend to have lower levels of disordered eating, as well as more intuitive eating that relies on satiety cues and lower dietary restraint (Schoenefeld & Webb, 2013). Furthermore, high self-compassion has been linked to more mindful eating, lower disordered eating, and lower BMI (Mantzios et al., 2018a, b; Taylor et al., 2015). In addition, previous findings also demonstrated a clear link between self-compassion and mindful eating (Keyte et al., 2020; Egan & Mantzios, 2018), which was replicated by the findings in the current study.

The present study looked at the constructs of mindful eating and there were three significant relationships with orthorexia. The subscales of *eating with awareness*, *focused eating and hunger and satiety* were all negatively associated with ON. As previously mentioned, only three other studies looked at mindful eating, Kalika et al. (2022) found no associations between ON and mindful eating whereas Thorne et al. (2022) found negative relationships between ON, hunger and satiety, eating with awareness and eating without distractions. This study replicated the findings of Thorne et al. (2022) however in the current study eating without distractions was non-significant. A reason for contradicting findings to Kalika et al. (2022) was that they have investigated vegan only population therefore this could explain the variation in the results in regard to mindful eating. It is interesting that ON has been negatively associated with eating with awareness as individuals with orthorexic tendencies focus on the quality of their food (Koven & Abry, 2015). Hunger and satiety

subscale was negatively associated with ON, suggesting that individuals high with ON respond to external food cues, like other EDs such as BED (Meule et al., 2018) and not rely on hunger and satiety. Findings related to the focused eating subscale are interesting as studies on orthorexic tendencies suggests that those with high orthorexic tendencies spend a significant amount of time preparing their meals and researching (Koven & Arby, 2015) thus higher focus on the eating related behaviours however the present study suggests that those with high orthorexic tendencies in fact have a low focused eating. This confirms findings on restraint eaters and attention bias, where research suggests that individuals with restraint pathology have an increased attention bias for food cues, which result in increased food cravings and food intake (Meule et al., 2012). These findings are very interesting; however, caution needs to be taken when interpreting the findings. Keyte et al. (2020) have highlighted possible limitations of the MEBS scale that this scale focuses more on the attentive rather than mindful eating aspect of behaviour, which are two separate concepts of eating literature altogether. Furthermore, Mantzios (2020) has suggested that hunger and satiety may in fact not relate to mindful eating, but to the decision-making prior to engaging in eating. While there are several limitations that have been highlighted in measuring mindful eating, and the choice of using the MEBS was the best choice available, future research should aim to develop and explore mindful eating through more valid and appropriate measures.

To our knowledge, this is the first study that investigated the eating disorder quality of life in relation to ON. Past research has demonstrated that individuals with eating disorders display poor quality of life (Agh et al., 2016; DeJong et al., 2013; Jenkins et al., 2011; Winkler et al., 2014), this is demonstrated in the present study as individuals with higher scores on ONI displayed lower levels of quality of life. The findings indicate that higher scores on ONI have an impact on all the subscales of the EDQOL such as the psychological, physical/cognitive, financial and work/school aspects; therefore, demonstrating that

orthorexia could significantly impact individuals' quality of life, affecting physical, psychological, financial and work aspects. This highlights that higher orthorexic tendencies have a significant impact on individuals' quality of life just like other ED that are presented in the DSM-5 such as AN, BN and BED (e.g., Bamford & Sly, 2010; Jenkins et al., 2011; Mason et al., 2018). Exploring QoL is important, especially in association to ON, as there are no known interventions for orthorexia.

The current study has also utilised the use of ONI to assess the severity of ON in the current sample. Most of the research into ON has used scales such as the Dusseldorf Orthorexia Scale and ORTHO-15 (e.g., Barthels et al., 2018; Stutts, 2020). Only two studies to date have used ONI (Kaya et al., 2021; Oberle et al., 2020) which showed a similar mean score as the present study. The current study showed a mean of 36.53 whereas Kaye et al., (2021) showed a mean of 39.03 in their female sample and Oberle et al., (2020) showed a mean of 41.13 in their mixed sample. The present study had the lowest mean score compared to the other two studies, which could be a result of using specific populations such as nutrition and psychology students (Oberle et al., 2020)

In addition, several moderation analyses were conducted between orthorexia and eating disorder quality of life with moderators being mindfulness, self-compassion and mindful eating. The current study found significant moderators to be self-compassion and the awareness aspect of mindfulness. The findings in the present study showed that self-compassion is a moderator at all levels with higher levels of self-compassion having a higher moderating effect on the relationship between ON and EDQOL. This suggests that higher levels of self-compassion in fact strengthens the relationship between orthorexia and quality of life. This is an unexpected finding as the associations in the present study showed that there was a negative relationship between self-compassion and orthorexia and quality of life. Taking into account what is known about self-compassion and the associations in the present

study self-compassion should have weakened the relationship between orthorexia and quality of life. Past research has demonstrated that self-compassion in fact is interlinked with better quality of life in individuals who displayed anxious and depressive symptoms (Van Dam et al., 2011). The findings of the present study go against this suggesting that individuals with high orthorexic tendencies and high self-compassion will demonstrate worse quality of life. A reason for this could be that individuals with high self-compassion believe that engaging in healthy eating rituals and physical activity are means of improving their optimum health and a form of self-care (Lewthwaite & LaMarre, 2022; Mantzios & Egan, 2018; Egan et al., 2019); however, orthorexic tendencies have been shown to impact individual in a social and psychological way resulting in lower quality of life. Another significant moderator was the awareness facet of mindfulness, acting with awareness suggesting that the individual is focusing all the attention on a current activity (Brown et al., 2015) such as food preparation or researching organic and pure produce. Again, this goes against the associations presented in the present study as there were negative relationships between awareness and orthorexia and quality of life. Research has shown that individuals with high orthorexic tendencies often obsess about their eating behaviours and regimens (Bratman, 2017). Acting with awareness was also a moderator at all levels with higher levels of awareness having a higher effect on the relationship between ON and EDQOL. The findings of the present study go against our understanding of utilising self-compassion and mindfulness concepts in populations with disordered eating, mindfulness-based interventions have shown to be effective as a treatment for eating disorders (e.g., Wanden-Berghe et al., 2010). Research shows that self-compassion and mindfulness promote healthy eating (e.g., Atkinson & Wade, 2015; Mercado et al., 2020; Wanden-Berghe et al., 2010), which could explain why self-compassion and awareness were moderators as individuals with high orthorexic tendencies believe that they are engaging in

healthy eating behaviours and might be utilising these concepts as forms of self-care and promoting optimum health.

5.5. Limitations and Future Directions

A clear limitation of this study is the female-only sample, therefore the findings cannot be generalised to male populations. Gender differences are consistently observed in eating pathology (Blashill, 2011; Striegel-Moore et al., 2009) and some studies into ON have shown that symptomology has been greater in men than women (e.g., Fidan et al., 2010). However, findings in ON research are inconsistent as other studies show that the symptomology is greater in women (e.g., Donini et al., 2004) and other studies suggest that there are no gender differences (e.g., Brytek-Matera et al., 2015b; Dunn et al., 2017; Herranz Valera et al., 2014). Therefore, future research should focus on equal male recruitment and conducting studies with male-only populations as there is a lack of literature across the field.

Furthermore, the present study has utilised the ONI to measure the ON severity in this sample. This is a new measure of ON which has only been used in two previous studies (Kaya et al., 2021; Oberle et al., 2020), even though this measure assesses physical impairments and emotional distress caution should be taken as there are no diagnostic criteria for ON, ONI should be used as a measure to assess the risk of ON development.

Additionally, previous research that supports and contradicts the findings of the present study have used different measures of ON such as DOS and TOS (Kalika et al., 2022; Straus, 2020). For example, Kalika et al. (2022) showed that mindful eating was not related to ON whereas the present study showed a negative relationship between the two constructs.

Therefore, future research should utilise the ONI as a measure of ON to further investigate concepts of mindfulness and self-compassion.

Another limitation is that only associations of EDQOL can be made to ONI due to the sample not having been diagnosed with ON. The conclusions drawn from this measure can

only be that those with higher ONI had poorer ED quality of life, and conversely, those with lower or less ON symptoms did not have better QOL generally, but that their eating or weight did not affect their quality of life. Therefore, future research using the EDQOL should use sample that consists of individuals diagnosed with ON.

There is a need for qualitative research to be conducted on the ON populations. Exploring qualitative research will allow a further understanding of how self-compassion, mindfulness and mindful eating are utilised in this population. There is limited literature available that has explored ON qualitatively (e.g., Cheshire et al., 2020; White et al., 2021; Valente et al., 2020), and could potentially lead to the official classification of ON, especially since quality of life is an important aspect as individuals with a classified eating disorder display lower quality of life (Agh et al., 2016; DeJong et al., 2013; Jenkins et al., 2011; Mason et al., 2018; Winkler et al., 2014). There is also the question about the pleasure of eating, as suggested by Egan and Mantzios (2018) in their qualitative study, where individuals could engage in unhealthy eating behaviours due to utilising the concept of self-kindness and treating themselves with unhealthy foods, which in turn, could lead to weight gain. Egan and Mantzios (2018) further explained that social aspects rather than actual food are derivative of individuals finding pleasure in eating, and it would be beneficial to see whether that trend also occurs in orthorexic populations when past research has indicated that they usually avoid social situations (Brytek-Matera et al., 2017; Sfeir et al., 2021).

Future research should investigate self-compassion, mindfulness, and orthorexia nervosa using an experimental approach with mindfulness-based and self-compassion-based interventions to help determine their effectiveness. As orthorexia research advances, developing interventions for this disorder will become increasingly important.

5.6. Conclusion

The present study provides a comprehensive examination of the complex relationships between orthorexia nervosa (ON), mindfulness, mindful eating, self-compassion, and eating disorder-related quality of life (EDQOL). The findings confirm and extend previous literature by highlighting several key associations and unexpected moderating effects. Firstly, ON was negatively associated with overall mindfulness, specifically the facets of non-judgement and acting with awareness, suggesting that individuals with orthorexic tendencies may experience greater self-criticism and reduced present-moment awareness in their eating behaviours. This contradicts some previous assumptions that ON entails heightened food-related awareness, potentially supporting emerging views that food preparation and decision-making may not align with mindful eating practices. **Importantly, the findings indicate that ON is linked to substantial impairments in eating disorder-specific quality of life across psychological, physical/cognitive, financial, and occupational domains, comparable to those observed in DSM-5.** The use of the ONI scale adds robustness to these findings, despite the relatively lower mean score in the sample, possibly reflecting differences in population characteristics.

Overall, these results highlight the need for a nuanced understanding of how adaptive constructs like mindfulness and self-compassion can interact with disordered eating behaviours such as ON. They highlight a critical need for future research to refine measurement tools (particularly in mindful eating), investigate these constructs across diverse populations, and inform intervention strategies that can differentiate between genuinely health-promoting behaviours and those driven by pathological control.

Chapter 6: Healthy vs. Pathological Orthorexia: The interrelations and predictability of Mindfulness, Mindful Eating and Self-Compassion.

6.1. Abstract

Orthorexia Nervosa (ON) is an obsessive focus on healthy eating. Mindfulness, mindful eating, and self-compassion are concepts that have been identified as being useful for people scoring highly in ON, but further investigations are required due to the limited population data and the wider orthorexia spectrum that has been described in some literature and differential scales. The current study explored three different measures that describe a wider spectrum of ON: Orthorexia Nervosa Inventory (ONI), Düsseldorf Orthorexia Scale (DOS), and Teruel Orthorexia Scale (TOS), orthorexia, and aimed to examine these with mindfulness, self-compassion, and mindful eating. The study recruited 476 adults, and the results showed that the ONI was negatively associated with mindfulness and self-compassion, while DOS negatively correlated with self-compassion. The healthy orthorexia dimension of the TOS was positively associated with mindful eating, self-compassion, and mindfulness; however, the ON dimension of TOS was negatively associated with mindfulness and self-compassion. These findings highlight that the Healthy Orthorexia dimension could act as a protective factor, and mindfulness and self-compassion practices could be integrated into possible interventions for individuals who score highly on the Orthorexia Nervosa dimension. Implications of mindfulness, mindful eating and self-compassion are discussed.

6.2. Introduction

Healthy eating is widely regarded as a positive behaviour in combating chronic diseases and obesity (Evert et al., 2019; McCullough et al., 2002; Munt et al., 2016). This

emphasis on healthy eating can, however at times overshadow positive behaviour change and become a pathological obsession; a phenomenon called Orthorexia Nervosa (ON) (Bratman, 2015). Orthorexia Nervosa (ON) is defined as an obsessive fixation on healthy and pure eating, characterised by self-imposed rules and beliefs about what is considered healthy (e.g., Cena et al., 2018; Dunn & Bratman, 2018; Donini et al., 2022). ON has several consequences, such as a reduction in quality of life (e.g., Koven & Arby, 2015), avoidance of social interactions, and potential malnourishment (e.g., Donini et al., 2022). Various diagnostic criteria for ON have been developed, including a preoccupation with restrictive diets, social and professional dysfunction, potential malnutrition, and worsening dietary restrictions over time (e.g., Donini et al., 2004; Dunn & Bratman, 2017; Moroze et al., 2015); all of which are significantly overlapping with other eating disorders (e.g., Atchison & Zickgraf, 2022; Segura-Gracia et al., 2015; Pontillo et al., 2022).

Several psychometric tools have been created to measure orthorexia nervosa, with the most cited valid tools being the Orthorexia Nervosa Inventory (ONI) (Oberle et al., 2020), Dusseldorf Orthorexia Scale (DOS) (Chard et al., 2018) and Teurel Orthorexia Scale (TOS) (Barrada et al., 2018). There are major differences among these three psychometric tools, showcasing a wide spectrum of orthorexia. For example, the ONI measures orthorexia in terms of three key concepts: physical impairments, emotional distress and behaviours, and preoccupation with healthy eating (Oberle et al., 2020). In contrast, the TOS measures orthorexia in terms of two dimensions; that is, Healthy Orthorexia (HeOr) and Orthorexia Nervosa (OrNe) (Barrada et al., 2018). Healthy orthorexia implies a beneficial interest in healthy eating, whereas orthorexia nervosa suggests a pathological interest in healthy eating (Barrada et al., 2018). There is also the DOS, which is a one-factor model that measures one subscale which is orthorexic eating behaviours, this scale only includes 10 items (Chard et al., 2018). Research within the domain of orthorexia has utilised these scales and provided

useful research on the prevalence of orthorexia (e.g., Niedzielski & Kazmierczak, 2021), risk factors such as gender, diet, personality and perfectionism (e.g., Brytek-Matera, 2021; McComb & Mills, 2019; Zickgraf & Barrada, 2022) and potential benefits of constructs, such as mindfulness-based constructs, that could be utilised to tackle symptom severity in ON. Only a few studies explored mindfulness-based constructs with the scale highlighted above in terms of orthorexia nervosa (Miley et al., 2022; Strahler, 2020; Barlow et al., 2024; Kalika et al., 2022; Davies et al., 2023), despite the growing evidence concerning eating behaviour change and health.

Indeed, mindfulness, self-compassion and mindful eating are concepts that are interlinked and have been heavily explored with eating behaviours (e.g., Adams & Leary, 2007; Egan et al., 2020; Mantzios et al., 2020; Atkinson & Wade, 2015). Mindfulness is a state achieved by focusing on the present moment whilst maintaining an accepting awareness of thoughts and feelings that emerge, moment by moment (Kabat-Zinn, 2003; Siegel et al., 2009). Mindful eating is a practice of applying mindfulness principles to eating habits ensuring that individuals are eating in a conscious way, focusing on the present moment to satisfy hunger needs (Wnuk & Du, 2017). Self-compassion is closely connected to mindfulness, mindful eating, and their impact on eating behaviours and food intake (Mantzios et al., 2018a, b). Self-compassion is defined as the recognition that suffering, inadequacy, and failure are inherent aspects of the human experience (Neff, 2003). A recent systematic review provided evidence that self-compassion serves as a protective factor against body dysmorphia and eating disorders (Braun et al., 2016), while Adams and Leary (2007) demonstrated that a self-compassion intervention for restrictive eaters reduced distress-related eating. Given the associations between these factors and Orthorexia Nervosa (ON)—such as restrictive eating (Barthels et al., 2018) and self-judgment (Cheshire et al., 2020)—utilizing self-compassion may alleviate ON symptoms and enhance the quality of life

for individuals exhibiting orthorexic tendencies. All of these concepts have also been explored in terms of eating disorders where research has suggested that mindfulness-based interventions are successful in reducing the symptomology of eating disorders such as Anorexia Nervosa (AN) (e.g., Dunne, 2018; Dunne et al., 2021), Binge Eating Disorder (BED) (e.g., Katterman et al., 2014; Kristeller et al., 2014) and Bulimia Nervosa (e.g., Hessler-Kaufmann et al., 2020). As ON shares similar characteristics with other eating disorders such as AN and BN (e.g., Atchison & Zickgraf, 2022; Segura-Gracia et al., 2015; Pontillo et al., 2022), investigating the effects of mindfulness, self-compassion and mindful eating to ON may offer different insights in the care and support for people who are neglecting overall wellbeing for healthy eating.

As previously mentioned, only seven studies explored such associations (Miley et al., 2022; Strahler, 2020; Barlow et al., 2024; Kalika et al., 2022; Davies et al., 2023), all of which have utilised different scales to measure ON. There is no consensus on which scale is most appropriate to measure orthorexic behaviours, and findings vary when it comes to mindfulness, self-compassion and mindful eating. For example, the first study which explored mindfulness with orthorexia was done by Strahler (2020) who utilised Teurel Orthorexia Scale. The findings indicated that there was a positive correlation between Healthy Orthorexia and mindfulness, whereas Orthorexia Nervosa had a negative correlation with mindfulness. However, Strahler used the Freiburg Mindfulness Inventory (FMI), which was validated using a sample of Buddhist meditators, suggesting limitations for use with the general population. While often assumed applicable to the public, a qualitative study revealed that individuals without meditation experience frequently misinterpreted FMI items (Belzer et al., 2013). This raised concerns about the validity of using the FMI in orthorexia research. The next two studies that were conducted were Kalika et al. (2022) and Miley et al. (2022), both exploring mindful eating and Orthorexia Nervosa used the Dusseldorf Orthorexia Scale.

Kalika et al. (2022) showed that there was a negative association to self-compassion and no association with mindful eating, whereas Miley et al. (2022) demonstrated that mindful eating subscales of “hunger and satiety” and “distraction while eating” (MEBS; Winkens et al., 2018) were unrelated to ON, but a negative association with orthorexia when “eating with awareness”, and a positive association with “focused eating”. Discrepancies in findings likely stem from differences in study populations, as Kalika focused on vegans, and methodological limitations such as a mindful eating behaviour scale that was assessing decision making rather than eating behaviour (e.g., Mantzios, 2021). The mindful eating measure used in early research of orthorexia has been criticised for its questionable validity and subscale structure (Mantzios, 2021, 2023). In contrast, other studies show contradictory findings. Barlow et al. (2023) demonstrated that the Dusseldorf Orthorexia Scale was positively associated with mindfulness and only Healthy Orthorexia from TOS was positively associated with mindfulness, but the study utilised FMI to assess mindfulness, which suffers from the same limitations as discussed earlier in Strahler’s research. Furthermore, Davies et al. (2023) measured mindful eating using MEBS (Winkens et al., 2018) and utilised DOS to measure orthorexia, there were no associations between mindful eating and ON except a positive correlation with focused eating, partially replicating Miley’s research findings. The findings are varied across the studies as there are different measures of ON as well as mindfulness, self-compassion, and mindful eating. To address these methodological concerns and move the field forward, the present study employed the newly developed Mindful Eating Behaviour Scale – Trait (MEBS-T; Mantzios, 2023). This scale more directly measures the experiential aspects of mindful eating, capturing two theoretically grounded components: sensory attention and non-judgmental awareness. Unlike prior tools, the MEBS-T focuses explicitly on the moment-to-moment experience of eating, aligning more closely with theoretical definitions of mindfulness and eating behaviour. This shift in measurement represents a

meaningful methodological advancement and helps explain novel outcomes identified in the current study, particularly where previous research found inconsistent or contradictory results.

While research has increasingly explored the links between Orthorexia Nervosa (ON), mindfulness, self-compassion, and mindful eating, the theoretical rationale for these associations remains underdeveloped. ON, characterized by an obsessive focus on healthy eating, often reflecting maladaptive self-regulation strategies similar to those found in other eating disorders (Brytek-Matera et al., 2020). Psychological theories of emotion regulation and cognitive control suggest that rigid eating behaviours may emerge as coping mechanisms for managing distress, anxiety, and negative self-evaluation (e.g., Lowe & Kleifield, 1988; Willem et al., 2020; Micanti et al., 2017). Constructs such as mindfulness and self-compassion—rooted in adaptive emotion regulation—may serve as protective factors, reducing the likelihood of these behaviours becoming rigid and pathological. Mindfulness encourages present-moment awareness and non-judgmental acceptance of thoughts and emotions (Kabat-Zinn, 2003), while self-compassion promotes kindness toward the self during moments of perceived failure or inadequacy (Neff, 2003). Both constructs have shown promise in improving emotional well-being and reducing disordered eating symptomatology (e.g., Adams & Leary, 2007; Braun et al., 2016). Theoretically, individuals high in mindfulness and self-compassion may be better equipped to navigate internal stressors without resorting to rigid dietary control (e.g., Hussain et al., 2023; Braun et al., 2016), making these traits relevant to understanding ON. This study builds upon previous empirical work by providing a more theoretically informed examination of these constructs. Unlike earlier studies that focused primarily on bivariate associations or used psychometrically limited scales, this research employs three well-established and theoretically distinct measures of ON – the Orthorexia Nervosa Inventory (ONI), the Dusseldorf Orthorexia Scale

(DOS), and the Teurel Orthorexia Scale (TOS) – alongside validated measures of mindfulness, self-compassion, and mindful eating. This approach allows for a nuanced analysis of both pathological and non-pathological eating behaviours and helps clarify the conceptual overlap between ON and broader eating disorder symptomatology.

This study aimed to investigate the relationship between the Teurel Orthorexia Scale, mindfulness, self-compassion, and mindful eating. By expanding on previous research limited to student populations and mindfulness and mindful eating scales of questionable validity, the present research employed the Orthorexia Nervosa Inventory, the Dusseldorf Orthorexia Scale and the Teurel Orthorexia Scale. Based on past research it is hypothesised that Healthy Orthorexia (TOS) will be positively associated with mindfulness, self-compassion and mindful eating (Strahler, 2020; Barlow et al., 2023) whereas Orthorexia Nervosa (TOS) will be negatively associated with mindfulness, self-compassion and mindful eating (Strahler, 2020; Kalika et al., 2022).

6.3. Method

Participants

The study analysed the data from 476 adults (mean age: 34.66 years, SD: 14.66, mean BMI: 26.51 kg/m², SD: 9.69) through Prolific (compensation minimum 6£/ph). See Table 6.1. for an overview of participant characteristics. Inclusion criteria required participants to be 18+, English-proficient, and without diagnosed eating disorders.

Table 6.1 Participant demographic information ($n = 476$).

Characteristic	n	%
Gender		
Female	282	59.2
Male	189	39.7
Prefer not to say	3	0.6

Prefer to self describe	2	0.4
Ethnicity		
White	312	65.5
Asian	62	13.0
Black	70	14.7
Mixed	31	6.5
Other	1	0.2
Diet		
Vegan	5	1.1
Lacto-vegetarian	1	0.2
Lacto-ovo-vegetarian	21	4.4
Pescetarian	0	0.0
Semi-vegetarian	28	5.9
Occasional omnivore	40	8.4
Omnivore	381	80.0
Descriptive statistics for continuous variables.		
	M	SD
Age	34.66	14.66
BMI	26.51	9.69

Materials

Demographic information: see Chapter 2, page 29 for information.

Orthorexia Nervosa Inventory (ONI). See Chapter 2, page 29 for scale description.

The Cronbach alpha for the present study was .92.

Dusseldorf Orthorexia Scale (DOS). The scale was developed by Chard et al. (2018) as means of measuring orthorexic behaviour, the scale was originally created in German but was translated to English. The scale has 10 items which utilise a 4-point Likert scale with following statements “this applies to me” to “this does not apply to me”. The maximum score is 40, with higher scores indicating more orthorexic eating behaviour. There is a cut off score for orthorexic behaviour of more than 30, whereas a score between 25 to 29 indicates a risk of ON. Sample questions include “I try to avoid getting invited over to friends for dinner if I know that they do not pay attention to healthy nutrition” and “I feel upset after eating unhealthy foods”. The Cronbach alpha for the present study is .88.

Teruel Orthorexia Scale (TOS). This scale was developed by Barrada et al. (2018) which measures orthorexia by two dimensions. The first dimension is Healthy Orthorexia (HeOr) and the second dimension is Orthorexia Nervosa (OrNe). Healthy Orthorexia reflects a non-pathological interest in healthy eating that is characterized by a genuine motivation to maintain health and well-being through food choices. Individuals scoring high on this subscale are typically conscientious about eating healthfully without experiencing significant distress or impairment in daily functioning. Orthorexia Nervosa refers to a maladaptive and obsessive preoccupation with healthy eating, where dietary practices become rigid, intrusive, and interfere with one's psychological or social well-being. Individuals high in OrNe may experience anxiety, guilt, or compulsive thoughts about food, often leading to impaired concentration, reduced flexibility in eating, and social isolation. The scale consists of 17 items with 9 items belonging to HeOr and 8 items for OrNe. It measures the responses on a 4-point Likert scale with responses statements ranging from completely disagree to completely agree. Sample questions include "I'd rather eat a healthy food that is not very tasty than a good tasting food that isn't healthy" and "Thoughts about healthy eating do not let me concentrate on other tasks". The Cronbach alpha for the present study is .90.

Mindful Eating Behaviour Scale- Trait (MEBS-T). This scale was recently developed by Mantzios (2023) which measures two components of mindful eating: Sensory attention and non-judgmental awareness, both of which are assessed by 4 items each. Sensory Attention refers to the ability to be fully present with the sensory experience of eating, including taste, texture, smell, and the act of chewing or swallowing. Individuals scoring high on this subscale are attentive to the immediate experience of food without distraction, showing an enhanced awareness and appreciation of the eating process. Non-Judgmental Awareness captures an individual's capacity to observe thoughts, feelings, and bodily sensations related to eating without criticism or emotional reactivity. This includes the ability

to notice internal experiences—such as cravings, emotions, or distractions—while maintaining a calm, accepting, and intentional approach to eating. This scale utilises a 4-point Likert scale with responses ranging from strongly disagree to strongly agree. Sample questions include “When I’m eating, I overcome unrelated thoughts and/or feelings by focusing on the food and the sensation of eating” and “I fully taste every bite that I am eating”. The Cronbach alpha for the present study was .85.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .70.

Self-Compassion Scale (SCS). See Chapter 2, page 30 for scale description. The Cronbach alpha for the present study was .87.

Procedure

The study received Ethical approval from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited through Prolific where they were compensated £6 per hour for their time. Participants were provided with information about the study, including the criteria for inclusion and exclusion, and the hyperlink to QuestionPro where they could access the questionnaire. Before consenting, participants were given a Participant Information Sheet to read. Participants consented and created a unique code for identifying data in the event of withdrawal. Participants were asked to complete demographic information, ONI, TOS, DOS, FFMQ, SCS-SF and MEBS-T. After completion, participants were provided with a debrief form explaining the study objectives and the withdrawal process. The study consisted of a single 20-minute online session.

Data Analysis

Firstly, the data was checked for outliers. Cook’s distance was used, and the range was between 0 and .17 which suggested that there were no outliers. According to Hair et al.

(2010) the values between 2 to -2 for Skewness and 7 to -7 for Kurtosis are normal. The assumptions for normality were examined using the Skewness and Kurtosis. Skewness scores for ONI, DOS, HeOr, OrNe, FFMQ, SCS and MEBS were .09, .49, -.04, .59, .17, -.04 and -.06. Kurtosis scores for ONI, DOS, HeOr, OrNe, FFMQ, SCS and MEBS were -.24, .54, .32, .45, -.13, -.11 and .10. So, the data met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 2.99 which is below the value of 5 (Tabachnick & Fidell, 2007) meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0; IBM Corp., 2017). Pearson's bivariate correlations were conducted to assess the associations between Orthorexia Nervosa Inventory (ONI), Dusseldorf Orthorexia Scale (DOS), Teruel Orthorexia Scale (HeOR and OrNe) Mindfulness (FFMQ), Self-compassion (SCS) and Mindful Eating Behaviour Scale (MEBS).

6.4. Results

Table 6.2 presents the inter-correlations among ONI, DOS, TOS, BMI, SCS, FFMQ, and MEBS. According to Ratner (2009), a correlation coefficient r of less than 0.3 denotes a weak correlation, $0.3 \leq r < 0.5$ indicates a moderate correlation, and $r \geq 0.5$ signifies a strong correlation. The results reveal significant positive correlations: between ONI and DOS ($p < .001$), HeOr ($p < .001$), OrNe ($p < .001$). Additionally, there are two significant negative correlations: between ONI and FFMQ ($p = .002$), and between ONI and SCS ($p < .001$). There was no significant relationship between BMI and ONI. DOS has been found to have a positive relationship with HeOr ($p < .001$) and OrNe ($p < .001$) and a negative relationship with SCS ($p < .001$). The TOS scale measures two separate dimensions: HeOr has found to have positive correlations with OrNe ($p < .001$), FFMQ ($p < .001$), SCS ($p < .001$) and MEBS ($p < .001$). Whereas OrNe found to have negative relationships with SCS ($p < .05$)

and FFMQ ($p < .05$). BMI did not have any significant correlations. Further investigation into the MEBS-T subscales with the measures of ON was carried out. Sensory subscale of MEBS-T revealed non-significant results with all of the ON measures. Whereas Awareness subscale of MEBS-T revealed positive correlations with ONI (Impairment) ($p = .015$), ONI (Behaviour) ($p = .018$), DOS ($p = .004$), HeOr ($p < .001$), and OrNe ($p = .005$) see Supplementary Materials for Table 6.3 in section D8.

Table 6.2

Bivariate correlations between ONI, DOS, TOS, BMI, FFMQ, SCS and MEBS and descriptive statistics (n=476).

	1	2	3	4	5	6	7	M	SD
(1) ONI								45.55	11.33
(2)DOS	.722**							19.18	5.39
(3) HeOr	.492**	.635**						21.30	4.53
(4) OrNe	.637**	.767**	.544**					14.61	4.50
(5) BMI	.073	.045	.031	.077				26.52	9.69
(6)FFMQ	-.172**	-.050	.153**	-.110*	.040			46.85	6.49
(7)SCS	-.243**	-.181**	.148**	-	.006	.543*		36.27	7.54
(8) MEBS	.061	.086	.147**	.232**	-.003	.219*	.105*	21.61	3.81

Note: ONI: Orthorexia Nervosa Inventory. DOS: Dusseldorf Orthorexia Scale. HeOR (TOS): Healthy Orthorexia (Turnel Orthorexia Scale). OrNe (TOS): Orthorexia Nervosa (Turnel Orthorexia Scale)

BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS-SF: Self-Compassion Scale. MEBS: Mindful Eating Behaviour Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

To determine the influence of mindfulness, self-compassion and mindful eating on different scales of Orthorexia Nervosa, multiple regression was conducted. The first model with ONI was significant [$F(3,471)= 11.88, p < .001$] and the predictive capacity calculated through R^2_{adj} was .065 this revealed that all the mindfulness-based constructs predicted

6.5% variance in ONI. The analysis shows that self-compassion did significantly predict ONI ($\beta = -.209$, $t(471) = -3.94$, $p < .001$), and mindful eating ($\beta = .101$, $t(471) = 2.21$, $p = .028$), however mindfulness ($\beta = -.081$, $t(471) = -1.50$, $p = .136$) did not significantly predict ONI. The second model looked at DOS which was also significant [$F(3,469) = 7.37$, $p < .001$] and the predictive capacity calculated through R^2_{adj} was .039 suggesting a lower variance of 3.9%. The analysis showed that self-compassion did significantly predict DOS ($\beta = -.213$, $t(469) = -3.96$, $p < .001$) and mindful eating ($\beta = .101$, $t(469) = 2.19$, $p = .029$), however mindfulness ($\beta = .040$, $t(469) = -.73$, $p = .496$) did not significantly predict DOS. The third regression model looked at HeOr which was also significant [$F(3,469) = 7.08$, $p < .001$] and the predictive capacity calculated through R^2_{adj} was .037 which revealed 3.7% variance when all mindfulness-based constructs were applied. The analysis showed that mindful eating did significantly predict HeOr ($\beta = .121$, $t(469) = 2.62$, $p < .05$), however mindfulness ($\beta = .072$, $t(469) = 1.30$, $p = .194$), and self-compassion ($\beta = .098$, $t(469) = 2.19$, $p = .029$) did not significantly predict HeOr. The fourth model looked at OrNe where the model was significant [$F(3,470) = 10.01$, $p < .001$] and predictive capacity calculated through R^2_{adj} was .054 suggesting a 5.4% variance. The analysis showed that self-compassion did significantly predict OrNe ($\beta = -.241$, $t(470) = -4.50$, $p < .001$), however mindfulness ($\beta = .002$, $t(470) = .043$, $p = .966$), and mindful eating ($\beta = .086$, $t(470) = 1.86$, $p = .064$) did not significantly predict OrNe.

6.5. Discussion

The goal of the present study was to investigate the associations between different orthorexia scales such as ONI, DOS and TOS in relation to mindfulness, self-compassion and mindful eating. The first hypothesis stated that ONI will be negatively associated with mindfulness, self-compassion, the present study has supported this hypothesis. It was also stated that mindful eating would be negatively associated with ONI, however the present

findings indicate that there is no association between mindful eating and ONI. The second hypothesis stated that the DOS will be positively associated with mindfulness and self-compassion (Barlow et al., 2023) whereas only some facet of mindful eating could be significant (Miley et al., 2023). The present findings are contradictory of the past research, the present study found no associations with mindful eating and mindfulness and a negative relationship with self-compassion. The third hypothesis stated that Healthy Orthorexia (TOS) will be positively associated with mindfulness, self-compassion and mindful eating (Strahler, 2020; Barlow et al., 2023) whereas Orthorexia Nervosa (TOS) will be negatively associated with mindfulness, self-compassion and mindful eating (Strahler, 2020; Kalika et al., 2022). The present study has supported the previous findings in terms of Healthy Orthorexia, where mindfulness, mindful eating and self-compassion had a positive strong association with healthy orthorexia. Whereas Orthorexia Nervosa had negative relationship with mindfulness and self-compassion but there were no significant associations with mindful eating.

There is no surprise that mindfulness and self-compassion have negative relationship with ONI as well as OrNe in the TOS as past research has indicated clear findings (Strahler, 2020; Kalika et al., 2022). However, what is surprising is that mindful eating was only positively associated with Healthy Orthorexia. This is a novel finding as previous literature only stated that certain subscales of mindful eating such as “eating with awareness”, and “focused eating” of mindful eating were associated with orthorexia (Miley et al., 2023; Davis et al., 2023; Kalika et al., 2022), whereas the present study displayed that mindful eating is only associated with healthy orthorexia. A reason for such findings could be that the past studies used DOS to measure ON which only assesses one dimension of ON. The current study has also demonstrated that DOS did not have any significant correlations with mindfulness and mindful eating which could indicate that it might not truly measure Orthorexia Nervosa unlike the other two measures. However, the correlations do suggest that

all the measures of ON are highly correlated to each other, the only difference between the measures is that DOS only measures one facet whereas ONI and TOS measure multiple factors that contribute to the assessment of ON.

Research has shown that there could be in fact two dimensions of ON: Healthy orthorexia differs substantially to orthorexia nervosa as it has been established that healthy orthorexia relates to a healthy interest with diet and food whereas orthorexia nervosa is a pathological obsession with healthy eating (Barrada et al., 2018). Research suggests that the dimension of Healthy orthorexia could in fact act as a protective factor and healthy eating should not be considered as an element of orthorexia nervosa but of healthy orthorexia (Depa et al., 2019), indicating that changes to diagnostic criteria may be needed. This could explain why mindful eating is then associated with Healthy Orthorexia as both practices prioritise the awareness of the food and food choices the individuals will make due to prioritisation of nutritional values, purity and health benefits. Research in terms of mindful eating and orthorexia nervosa is complex and requires further investigation as the findings are contradictory. As discussed previously, there were several limitations with the mindfulness and mindful eating measures that were previously used in research (Mantzios, 2023). A new measure of mindful eating has been developed by Mantzios (2023) hence the present study utilised the MEBS-T to measure mindful eating. This is a first study that explored the new scale in terms of orthorexia nervosa, and it is noteworthy that only Healthy Orthorexia was associated with the new scale. The scale measures two subscales- Sensory attention and non-judgmental awareness which are essential in measuring mindful eating (Mantzios, 2023). The present study indicated that only non-judgmental awareness was significant in relation to orthorexia nervosa and healthy orthorexia. This is an interesting finding as individuals who engage in orthorexic behaviours might consciously choose to be non-judgmental about their intrusive thoughts and emotions such as cravings for unhealthy foods or feelings of guilt

about their strict eating habits (e.g., Cena et al., 2018; Dunn & Bratman, 2018; Donini et al., 2022). Therefore, this non-judgmental approach might reassure them, without staying focused on their eating and without adding emotional distress, this ensures that their restrictive patterns are supported without engaging in self-criticism during their eating. This would allow those individuals to gain sense of control and calm during their meals while still being driven by their obsessive thoughts about healthy eating. In regard to the sensory attention element of mindful eating, the results can be explained by the fact that orthorexic individuals place significant emphasis on the quality and purity of the food (e.g., Cena et al., 2018; Dunn & Bratman, 2018; Donini et al., 2022) therefore they do not pay attention to their senses when eating. This suggests that potential interventions for ON need to place focus on improving the judgmental aspect of orthorexia as this causes significant emotional distress in relation to eating.

6.6. Limitations and future research

The main limitation of this study is that participants were recruited through an online platform where they were compensated for their time. This could suggest that participants could have been motivated by financial gains as they were reimbursed for their time (Bentley & Thacker, 2004). On the other hand, utilising these platforms allows for high recruitment without compromising the quality of the data (Mercer et al., 2015). Future research should explore orthorexic populations in order to fully understand the associations between orthorexia nervosa, mindfulness, self-compassion and mindful eating. The sample size of the present study has been high however it is not fully representative of gender as well as types of diets.

From previous research, it is known that gender might have an influence on orthorexia nervosa as well as type of diet the individuals engage (e.g., Kalika et al., 2022; Fidan et al., 2010). For example, vegan diet has been associated more with orthorexic tendencies (Kalika

et al., 2022), therefore types of diets need to be explored in relation to mindfulness, mindful eating and self-compassion.

Future research should also utilise the use of qualitative methods, this will aid in further understanding of how individuals with orthorexic tendencies engage in mindfulness and self-compassion practices and whether there is a difference between individuals who are in healthy orthorexia dimension in comparison to those in orthorexia nervosa dimension. Furthermore, future research should use the MEBS-T to establish if the findings are replicated in clinical populations.

6.7. Conclusion

To conclude, the present study has contributed to understanding orthorexia nervosa in relation to mindfulness, self-compassion and mindful eating. As there are number of measures that assess orthorexia nervosa the findings in the literature are inconsistent. The study has highlighted that variations in orthorexia measurements may be associated with differences in the roles of mindfulness, self-compassion and mindful eating. The present study indicated that research is consistent when using ONI measure as the study replicated previous findings of negative relationship between ONI, mindfulness and self-compassion. In the present study, only self-compassion was negatively associated with DOS whereas OrNe in TOS was negatively associated with mindfulness and self-compassion and HeOr was positively associated with all components. It is noteworthy that only HeOr dimension was associated with mindful eating, this is a novel finding as other measures of mindful eating did not produce consistent results. The replication of the findings demonstrates that mindfulness and self-compassion could open up potential avenues for intervention options for orthorexic individuals.

Chapter 7: Exploring health perceptions of people with high orthorexic tendencies, and the potential role of mindfulness-based constructs in eating behaviours: An interview study.

7.1. Abstract

There is limited qualitative research on Orthorexia Nervosa (ON), which has led to a lack of understanding of the lived experiences associated with this condition. The present study aimed to explore the personal experiences of individuals with high orthorexic tendencies ($n = 54$) by screening participants using the Orthorexia Nervosa Inventory (ONI) cut-off scores. A total of 17 participants took part in the study and were interviewed about their dietary practices, the data was analysed using thematic analysis. The study aimed to explore how people with orthorexic tendencies conceptualise healthy eating and whether and how they utilise mindfulness-based and self-compassion-based practices in eating behaviours. Three themes have emerged from the analysis. The first theme, “Foundation of Healthy Eating” explored participants' motivations and understanding of healthy eating, and indicated differences in their dietary practices and perceptions of health. The second theme, “Discipline and Emotional Coping” and the third, “The Ripple Effect of External Judgement on Healthy Eating Journeys and Internal Evaluations” suggested a central role of the discipline required for healthy eating, the emotional challenges of deviating from it, and the impact of the external and internal judgment, proposing a clear path for mindfulness-based practices as emotion regulation mechanisms. The study has also yielded significant findings that could contribute to a broader classification of orthorexia nervosa (ON) as an eating disorder, incorporating additional elements beyond its current classification parameters.

7.2. Introduction

There is a prevailing positive perception surrounding healthy eating, largely influenced by societal norms and the highly pervasive presence in social media; an influence

that actively promotes the normalisation of restrictive dietary practices such as caloric restrictions, intermittent fasting and specific food group restrictions (e.g., Mattson et al., 2017; Wilson et al., 2021). This normalisation poses many challenges for healthcare professionals and researchers in distinguishment between healthy eating and Orthorexia Nervosa (ON), with research indicating that engaging in restrictive eating and healthy eating may result in the development of ON (Brytek-Matera et al., 2020; Cena et al., 2019). The term Orthorexia Nervosa was developed by Bratman in 1997 (Bratman, 2017) and it is characterised as an obsessive fixation with only healthy eating. Individuals who display high orthorexic tendencies place a substantial focus on the quality and purity rather than the quantity of the food, which makes it significantly different from other eating disorders (Cena et al., 2019). Currently, ON is not recognised in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) or International Classification of Diseases (ICD-11) and researchers and clinicians are working on a standardised definition and symptomatology to allow for diagnosis and treatment. Researchers have proposed diagnostic criteria for ON (e.g., Cena et al., 2019; Donini et al., 2022; Dunn & Bratman, 2016) which state that individuals with ON spend a significant amount of time researching, planning and preparing nutritious meals that adhere to their rigid rules (Bratman, 2017; Koven & Arby, 2015). Bratman (2017) proposed that the pathological symptomatology of orthorexia also includes obsessive thoughts, self-punishment when deviating from self-imposed rules and extreme restrictions. This highlights the distinctive features that Orthorexia presents making it clear when healthy eating turns pathological.

Most of the research into the construct of Orthorexia has been utilising quantitative methods to explore prevalence rates and contextual factors (e.g. Brytek-Matera et al., 2022; Dunn et al., 2016; McComb & Mills, 2019) which allows investigation of at-risk populations as well as factors which contribute to the development of Orthorexia. Qualitative research is

limited, with only a few studies that have looked at Orthorexia by utilising blogs, forums and Instagram accounts (e.g. Cinquegrani & Brown, 2018; Greville-Harris et al., 2020), with some research exploring self-diagnosed individuals or those recovering from Orthorexia (McGovern et al., 2020; Valente et al., 2020). White et al. (2021) interviewed college students who scored highly on ORTHO-7 measure. Their findings diverged from the predominant trend in quantitative research, showing that alongside health motivations, body image concerns and weight concerns emerged as primary drivers of Orthorexia. Other findings also highlighted the role of the family environment in the development of Orthorexia, which was only explored in one study (Mutluer & Yilmaz, 2023). However, other eating disorders have shown that family influences play an important role in the development of restrictive eating and eating disorders (e.g., Erriu et al., 2020; Haynos et al., 2016). Therefore, qualitative research plays a crucial role in exploring the personal narratives, lived experiences, and the intricate web of social and cultural influences surrounding Orthorexia. This approach is indispensable for gaining a nuanced understanding of the condition and is instrumental in informing the development of interventions.

Mindfulness and self-compassion have been extensively researched within the problematic eating literature, with its concepts being successfully applied to interventions (e.g., Mantzios & Giannou, 2014; Mantzios & Wilson, 2015). According to Kabat-Zinn (2003), mindfulness is a psychological construct which is centered around conscious awareness of external and internal experiences such as emotions, thoughts and bodily sensations. Furthermore, self-compassion is a component often associated with mindfulness, which involves treating oneself with self-kindness and understanding that suffering and failure are all part of the human experience (Neff, 2003). These concepts have been explored in association to Orthorexia (Barlow et al., 2024; Kalika et al., 2022, 2023; Strahler, 2021) but the literature is still limited. Kalika et al. (2023) found that self-compassion moderated

the relationship between orthorexia nervosa and quality of life, and suggested that individuals with elevated orthorexic tendencies and high self-compassion may exhibit a lower quality of life. The findings in that study go against what is known in terms of self-compassion as research demonstrated that self-compassion acts as a protective factor against eating disorders (Braun et al., 2016); therefore, this needs to be explored qualitatively to gain further understanding of self-compassion in terms of orthorexia nervosa. Mindfulness and self-compassion have been utilised as treatment options in individuals with problematic eating behaviours (e.g., Godsey, 2013; Kelly & Carter, 2015; Yu et al., 2020) demonstrating effectiveness in reducing the problematic behaviours. This has also been highlighted by research in Orthorexia suggesting that high levels of mindfulness and self-compassion demonstrate lower levels of orthorexic tendencies (Kalika et al., 2022, 2023; Strahler, 2021).

To our knowledge, no qualitative study has investigated mindfulness and self-compassion in relation to Orthorexia. This study will contribute to the existing findings of Kalika et al. (2022) by investigating individuals showing elevated orthorexic tendencies by utilising the Orthorexia Nervosa Inventory (ONI) (Oberle et al., 2020) rather than self-diagnosed individuals (e.g., Cheshire et al., 2020). A consensus within the Orthorexia community has established that ONI is a good instrument to measure orthorexic tendencies. ONI focuses on the preoccupation with healthy food as well as physical, emotional and psychosocial impairments all central to the conceptualisation of Orthorexia Nervosa (Dunn & Bratman, 2016). The research questions that the present study aims to answer are (a) how people with orthorexic tendencies conceptualise and understand healthy eating behaviours and (b) how people with orthorexic tendencies engage in mindfulness and self-compassion-based practices in eating behaviours.

7.3. Method

Participants

One hundred and ten participants showed interest in participating for this study where they had to complete a pre-screening questionnaire that determined their eligibility for the study. The eligibility criterion for an invitation to participate in the interview was a score exceeding 72 on the Orthorexia Nervosa Inventory (ONI) (Oberle et al., 2020). Participants received a pre-screening questionnaire via Google Forms where they completed the ONI, they also provided an email address for researcher to contact if they met the eligibility criteria, a total of fifty-four invitations were sent to participants after meeting the eligibility criteria. Overall, seventeen participants (thirteen females, three males and one prefer not to say, age range between 18 and 68) agreed to take part in the interview after being sent an invitation via email to participate, the mean BMI for those participants was 23.60 ($SD= 3.28$). The eligibility criteria to take part in the interviews was to not be diagnosed with an eating disorder, good understanding of English and a score of over 72 on the pre-screening questionnaire. A summary of participant characteristics is presents in Table 1.

Table 7.1

Participant characteristics

Participant	Orthorexia score	Sex	Age	Diet	Ethnicity	BMI
Sara	72	Female	36	Omnivore	African	29.1
Peter	72	Male	28	Omnivore	White	23.8
Monica	73	Female	23	Omnivore	Chinese	23.7
Dan	78	Male	40	Omnivore	White	25.9
Chloe	74	Female	25	Lacto-ovo-vegetarian	White	23.8
Linda	80	Female	31	Lacto-ovo-vegetarian	White	17.9
Tom	75	Male	18	Omnivore	White	22.4
Amy	72	Female	43	Omnivore	White	25.2
Lacey	74	Female	38	Omnivore	White	23.4
Alex	89	Prefer not to say	21	Vegan	White	20
Christy	73	Female	38	Omnivore	White	22.2
Jane	90	Female	33	Omnivore	White	19.5
Anne	73	Female	37	Omnivore	White	31.5
Olivia	72	Female	20	Occasional Omnivore	Asian	23.4
Jessica	74	Female	35	Omnivore	White	22.8
Emma	72	Female	25	Semi-vegetarian	White	25.6
Lauren	75	Female	21	Occasional Omnivore	White	22.3

Semi-structured interviews

This study utilised semi-structured interviews with individuals who scored highly on ONI. Semi-structured interviews were used as it allows for the individual's perspective to be explored rather than generalising an understanding of Orthorexia Nervosa (Adeoye-Olatunde & Olenik, 2020). The semi-structured nature of the interviews provided flexibility in exploring key topics surrounding eating behaviours. Such flexibility is particularly beneficial considering the sensitive and personal nature of the topic for some participants, and employing semi-structured interviews made it easier to incorporate follow-up questions and tailor inquiries to individual needs. The interviews explored participants' experiences, thoughts and beliefs around healthy eating and then became more specific by exploring the

concepts of mindfulness and self-compassion. Previous literature (Kalika et al., 2022; 2023) has explored the concepts of mindfulness and self-compassion in terms of quantitative data where mindfulness and self-compassion had mediated relationships in terms of Orthorexia suggesting that mindfulness and self-compassion could potentially create needed interventions for individuals with orthorexic tendencies. Some examples of the questions asked during the interview are “Do you find that your mind wanders off to other things when you are eating?”, “What do you say to yourself if or when you do not follow your usual eating pattern?” and “Could you tell me a little bit about how other people have reacted to your eating behaviours?”. One pilot interview was conducted, during which the interview schedule was refined. The order of some interview questions was adjusted to allow for a better flow. For full interview schedule please see Appendix C. The interview schedule was informed by existing literature on Orthorexia Nervosa by utilising the diagnostic criteria (e.g. Cena et al., 2019; Dunn & Bratman, 2016; Donini et al., 2022) to identify the key concepts of Orthorexia Nervosa, it allowed for further understanding of participant’s beliefs and attitudes as well as adding to existing knowledge on Orthorexia Nervosa.

Procedure

The data collection took place from May 2023 to December 2023 and participants were invited to take part in a pre-screening questionnaire which assessed their eligibility to take part in the study. The pre-screening questionnaire consisted of consent form, demographic information (age, gender, weight, height, and type of diet) and Orthorexia Nervosa Inventory; this took about 5 minutes to complete. If the participant was eligible, the researcher contacted them via email provided by the participant to arrange the interview via MS Teams. Before the interview, the participant was asked if they had any questions and were asked to provide additional verbal consent. The interviews lasted between 25 and 35

minutes with a mean of 27 minutes. Upon completion, the participant was debriefed about the aims of the study.

Ethical approval was obtained from the Faculty Ethics Committee at a West Midlands University in the United Kingdom. Written informed consent was obtained from all participants included in the study, all participants were provided with a participant number by the researcher.

Data analysis

The recordings of the interviews were transcribed verbatim by the author. The data in the present study was analysed using Thematic Analysis (Braun & Clarke, 2009). The use of TA was considered suitable as the data was driven by experiences, perceptions and influencing factors (Herzog et al., 2019). TA provided both a flexible (Terry et al., 2017), and inductive approach in the data analysis in addition to enabling small data sets to be analysed (Cedervall & Aberg, 2010). An experiential approach was used to understand the lived experiences of participants who scored high and above the cut-off of the ONI. This approach prioritised the authenticity of the participants' voices, providing rich, descriptive accounts of their experiences. Exploring and justifying the personal perspectives and meanings that participants attach to their behaviours and thoughts surrounding food and health in depth through this method aligned with phenomenological traditions. Such an approach ensured that the unique and nuanced experiences of those affected by Orthorexia Nervosa are pragmatically and empathetically represented, highlighting their daily challenges, motivations and the impacts on their overall well-being.

In the initial stages of data analysis, the researcher individually reviewed interview transcripts to acquaint themselves with the data and identify prominent narratives. This process facilitated an examination of participants' thoughts, feelings, and experiences

regarding healthy eating. The author highlighted key phrases and annotated them with initial thoughts. Extraction of codes was carried out using Microsoft Word, with a focus on participants' expressions in describing their experiences with healthy eating. Subsequent discussions within the research team occurred, and the data was re-examined to ensure comprehensive coding and thematic exploration with all co-authors.

Reflexivity

Reflexive practice in qualitative research refers to the self-critique and self-appraisal where the researcher acknowledges their own personal experience and how that could be translated to their findings (Dowling, 2006). By practicing reflexivity, researchers aim to enhance the rigor, credibility, and validity of qualitative research by acknowledging and addressing their own subjectivity and biases. This approach promotes transparency, critical inquiry, and a deeper understanding of the complexities of the research phenomenon.

The present reflexivity will focus on the two main components of reflexivity which are personal and interpersonal reflexivity. Personal reflexivity focuses on the researchers own personal experiences, biases, beliefs and values (Palaganas et al., 2017). I am a female who has been interested in disordered eating. I share some characteristics with participants in terms of trying to follow a healthy diet, and avoiding meat products. However, I do not share a lot of other characteristics that might be displayed by individuals with orthorexic tendencies therefore at times during the interview process I had to ask for clarification of certain elements and what they mean. Participants generally expressed that they were happy to speak with someone who wanted to listen to their experiences which allowed me to gain deeper insight into their thoughts and feelings as they felt comfortable to speak about a sensitive topic with me.

7.4. Results

Three themes with eight codes were constructed that aimed to answer the research questions (see Table 7.2). The themes and codes have been conceptualised using a thematic analysis approach where codes were placed into themes, which allows for an exploration of participants' experiences and beliefs regarding healthy eating. The first theme “Foundation of “healthy eating”: Motivation, structure, and outcomes” focuses on participants' motivations for engaging in healthy eating as well as exploring their conceptualisation of what healthy eating might consist of. Furthermore, this theme looks at physical and emotional outcomes that participants have experienced since starting their journey with healthy eating. The second theme “Discipline and Emotional coping: A cycle of caring for the body but not the mind” portrays a high level of discipline in which participants must engage to eat healthily, this theme also explores the emotional struggles that participants face when deviating from their eating patterns. The final theme “The Ripple Effect of External Judgement on “Healthy Eating” Journeys and Internal Evaluations: Potential avenues for mindfulness-based constructs” explores the external judgment that participants report experiencing and an exploration of how mindfulness-based concepts might offer an insight or coping mechanism for individuals who struggle with external judgement. The themes and codes are outlined in Table 7.2.

Table 7.2

Development of themes and codes.

Theme	Code
Foundation of “Healthy Eating”: Motivation, Structure and Outcomes	Motivation and Health Goals Structured Meal Planning Outcomes and Reflections
Discipline and Emotional Coping: A cycle of caring for the body but not the mind	Discipline and Control Emotional Responses and Coping
The Ripple Effect of External Judgement on “Healthy Eating” Journeys and Internal Evaluations: Potential avenues for mindfulness- based constructs.	Recommendations for healthy eating Social Impact and Isolation Support system and Challenges

Foundation of “Healthy Eating”: Motivation, Structure and Outcomes.

The first theme looks at a general conceptualisation of healthy eating in individuals who display high orthorexic tendencies. Across this theme, three codes were developed which looked at the motivations of why individuals engaged in healthy eating and the health goals they were trying to achieve. The theme of structured meal planning was strong, where participants highlighted strict food rules such as specific food categories, portion control and attention to the nutritional contents of their food. Participants reported several positive outcomes since engaging in healthy eating but also highlighted some of the challenges they have faced since starting their diet.

Most participants discussed having several motivations for starting their journey with healthy eating. The most common motivating factor for participants was to improve overall health. Dan has described his consumption of food to be very natural with avoidance of

highly processed foods. He discussed how his family history of medical issues has contributed to him adopting a healthier lifestyle.

[Dan, Male, 40 years old] *“So I've tried to adopt a healthier lifestyle to avoid a lot of the issues that my families had with heart attacks and strokes. So I try to eat better and stay a lot more active to keep my cardiovascular health better.”*

There is a sense of personal responsibility evident in this participant's actions as they are taking proactive steps to reduce health risks that might have a genetic predisposition, such actions may help to gain a sense of control over their health outcomes. The goal of wanting to not only live longer, but to live well, was voiced by other participants, and healthy eating was understood to be a way of having agency to affect this desired outcome.

[Linda, Female, 31 years old] *“If we wanna continue to live longer and that's one of the goals of mine, I'd like to continue living a healthy life and one that isn't plagued with chronic illness and disease and cancer and things like that. And so if I if there are things I can do to avoid that sometimes it's just you get unlucky, but if there are things that I can do, I really don't see a reason why not.”*

In this quote, the participant shows a desire for a long and healthy life, where they want to take care of their only body. There is a strong desire to reduce the risk of chronic illness and diseases through personal actions whilst acknowledging the element of 'luck' in health status Linda is engaging in a vegetarian diet with specific calorie goals of 1300

calories a day, she has described having reduced sugar, fats, and carbohydrate intake with focus on vegetable and fruit consumption. Linda has weighed up the benefits of adopting what she believes to be healthy eating behaviours and that outweigh the perceived costs such as time consumption of preparing food or cost of food. Therefore, she does not see a reason why she should not be adopting a healthier lifestyle as that will only improve the health outcomes. Some participants had secondary reasons for following a particular healthy eating plan, for Amy the desire to become pregnant was the motivating factor for healthy eating.

[Amy, Female, 43 years old] *“I am on a fertility journey and have been for 2-3 years. So it means like healthy eating for me means like I am supporting fertility and I'm being like the healthiest version of myself possible, because once I do that, like, fertility is sort of the icing on that healthy cake. So I can't, like, eat crap and then expect to get pregnant so I have to like eat healthy.”*

Here Amy presents healthy eating not as a choice, but rather a necessity if she is to optimise her chances of conception. Her commitment to this is sustained over a long period demonstrating her strong motivation and belief that healthy eating will bring about the desired goal of conceiving a child. Some motivations for healthy eating were not influenced by improvements in health but rather by weight management and appearance. This was expressed by several participants such as Alex where weight management measures such as counting calories, weighing out food and restricting calorie intake were described by participants. This was an interesting finding as literature in Orthorexia Nervosa suggests that

Orthorexia is manifested by the means of improving general health or as preventative measures.

[Alex, Prefer not to say, 21 years old] *“It’s also for my appearance...a lot of it is my appearance. I do tend to um when I don't eat the way that I do, um, I have a tendency to develop love handles, and that doesn't make me feel very attractive. I'd like to be lean like to be small. And I don't want any sort of deviation from that.”*

Alex has adopted a very strict vegan diet which consists of around 300 calories a day and eliminated all sugars, fats or any vegan substitutes and only focuses on whole foods.

Alex also talks about a family history of health issues related to being overweight, but they are clear that their focus on eating behaviours is around appearance and weight management.

The quote hints that there might be an emotional struggle when the participant deviates from their diet stating that they feel unattractive when deviating from a particular view of what is desirable to them in terms of body shape and size, indicating that appearance plays a central role in their self-perception and confidence and is the main motivation for healthy eating.

The second code reflects on diet rules to which individuals adhere, this mainly revolves around structured meal planning, only consuming specific food groups, attention to nutritional content of food as well as portion control. For example, Chloe has indicated that she likes to have a balance within her diet as that is what she considers to be healthy, however the main focus tends to be on protein consumption.

[Chloe, Female, 25 years old] *“I probably eat like 3 or 4 times a day. I start everyday with breakfast at around 7:00am lunch would be around 12:00pm then dinner around 6pm and a snack in between whenever I feel hungry. My calorie goal is like 1800 a day so I tend to stick with it most of the time.”*

Chloe demonstrates a structured meal timing by eating three meals a day with specific timing, this structured approach to eating demonstrates a high level of organisation and routine when it comes to their eating. There is a conscious effort to adhere to a specific calorie goal every day which highlights weight management reasons for adhering to healthy diet, however there is some flexibility as the participant stated that they do adjust their eating with snacks in accordance with physiological hunger cues highlighting the role of mindfulness as the participant is being in the present moment. Nevertheless, other individuals do not rely on hunger cues, for example, Linda expresses that she only consumes one meal a day and would not consume anything else other than what she prepared.

[Linda, Female, 31 years old] *“I eat one meal a day and I do meal prep, so I have, like regularly sampled portions throughout the week and I consume about 1200 to 1300 calories per day.”*

Linda has adopted the vegetarian lifestyle for moral rather than health reasons however Linda has noticed that her mental clarity has peaked since starting to eat one meal a day. Linda follows a rigid eating pattern with a reduction of certain food groups indicating that consuming 1300 calories a day was for weight maintenance. Linda has highlighted the

importance of calories which signifies a conscious effort to restrict calories for weight-management reasons, consuming only one day a meal the individuals demonstrate a high level of self-regulation and discipline highlighting a strong commitment to achieving specific goals. However, this could cause challenges in terms of hunger management and meal satisfaction as experienced by Jane:

[Jane, Female, 33 years old] *“I mean, so there's definitely calorie counting, making sure that, you know, I'm kind of staying within my daily calorie intake daily recommended calorie intake... And and then the yeah, I guess the amount I'm eating, making sure that kind of it's I guess I'd fall into a lot of starved slash binge patterns where I don't really know if I'm doing the right thing and then I kind of just end up bingeing.”*

Jane is an omnivore who adopted this lifestyle as a means of improving weight, health, body image and feeling clean. This quote sheds light on the challenges individuals encounter when they engage in calorie counting. Jane did not express how many calories a day she consumes, however, she did mention that a lot of the time she does end up feeling starved and ends up bingeing. She has also expressed that she has emotional pleasure from consuming her ‘junk’ food such as dark chocolate which makes it difficult for her to stop eating hence leading to the binge eating episodes. This highlights that orthorexia nervosa might have clear similarities to other eating disorders such as Binge Eating Disorder and Anorexia Nervosa. Restricting calories is one of the aspects of Jane’s eating behaviours, and

she also describes a strong focus on nutritional content and quality of foods but expresses some uncertainty around how best to achieve her goals.

[Jane, Female, 33 years old] *“There's the actual health of what I'm eating. There's the micro nutrients and macronutrients. The quality of the ingredients that I'm eating, the time that I'm eating. I mean, I'm constantly kind of toying between, you know, should we intermittent fast, should we not?”*

This quote summarises a differing, and sometimes competing considerations individuals with high orthorexic tendencies may experience, descriptive of struggles related to what they put into their bodies. Jane has mentioned that she is constantly toying around with different ideas regarding eating suggesting that there is a clear amount of time and effort put in by Jane that is required to maintain this eating behaviour. The participant emphasizes the importance of nutrients as well as the quality of ingredients which reflects their focus on the overall healthfulness of their diet. Jane self-reflects on the eating patterns and there is uncertainty of whether they are doing the right thing in the concern over episodes of starvation and bingeing. There is a clear dichotomy around the perception of healthy eating, between the actual consumption of healthy food, in this case, Jane has mentioned that she eats food in the purest form, and the eating behaviours including restrictive eating, starvation, binge eating and constant thinking about eating which are clearly problematic.

Participants also talked about the positive outcomes of engaging in healthy eating and these included both physical and perceived psychological benefits. Sara portrays this clearly here in terms of physical and mental well-being. Sara has adopted her healthy lifestyle as her

doctor recommended lifestyle changes to improve her chronic condition. Her eating focuses on increased consumption of fresh produce and dairy and elimination of any processed foods such as carbonated drinks and sweets. However, Sara has mentioned that she occasionally breaks her eating patterns when experiencing stress.

[Sara, Female, 36 years old] *“I'm in good health now. I'm no longer sick as often as before and my weight is in good control. I feel so much better physically and mentally. And I feel good about myself now. I'm no longer ashamed about what people say when I'm wearing dresses or people don't say it doesn't suit me because of me being obese. All those things are no longer my concern.”*

This quote looks at the positive outcomes that the participant has experienced from changing their eating patterns suggesting an improved quality of life as there is a reduction of illness frequency, weight loss and improvement in mental health. Sara also expressed how good they feel now and no longer experience shame related to their appearance which contributed to self-worth and confidence. They no longer feel burdened by judgements of others indicating that Sara might have developed self-acceptance due to lifestyle changes. However, this can also be viewed that the acceptance is from others due to weight loss, and a regaining of weight might lead to experiencing feelings of low self-worth and feeling ashamed. For others, the positive outcomes of eating healthily exceeded their expectations. For example, Peter's meals focus purely on protein as well as fruit and vegetables, and he tries to avoid carbs and fats. However, he will substitute it with a healthier option, for example, uses brown rice instead of white rice.

[Peter, Male, 28 years old] *“But then I guess like after I started eating healthily, I noticed like, ohh wow everybody, this is how they feel after they changed their diet. They weren't all lying. Like there's something there and, you know.”*

Peter expresses a personal revelation after he changed their eating patterns and there is a shift in their own perception as they have realised that the experiences of others were not exaggerated. The positive changes that the participant has noticed such as weight loss and improved health might motivate them to maintain these eating habits and explore further reductions and eliminations of food in their diet. Some participants were open about the difficulties they experienced following their diets and acknowledged negative or problematic aspects of their eating patterns. As previously mentioned, some individuals might not have control over their bingeing because of starvation due to calorie counting, obsessive thoughts about eating and others might face challenges from their social circles such as a lack of support.

[Jane, Female, 33 years old] *“ You know, like we were shopping, we were group grocery shopping and he wanted to buy pre marinated chicken and I kind of I really had an issue with it because of the ingredients in that marinated chicken it was just there were E numbers, there was sugar, there was a lot of like things that I wouldn't eat. And I kind of acknowledged that it was going out of my comfort zone, but I still went ahead with it.”*

This quote highlights the worries and pressure the participants might face from peers and family suggesting that their opinions and behaviours about food might have become part of their social interactions. The impact of participants eating behaviours socially and in personal relationships was evident, and the struggle for some participants to 'let go' of some of their eating rules to reduce this tension was described clearly. This master theme highlights the conceptualisation of healthy eating in individuals who display high orthorexic tendencies. An interesting finding was that participants had the need to calorie count, this is a new discovery in the orthorexic literature, the diagnostic criteria states that there is no focus on calorie counting or weight management which contradicts the current finding.

Discipline and Emotional Coping: A cycle of caring for the body but not the mind.

The focus of the second theme is looking at the interconnectedness between the discipline about their eating behaviours and emotional coping mechanisms. Participants discussed a number of struggles they faced in following their chosen diet, including societal pressures from family and friends and uncertainty about the appropriateness of their diet therefore it was essential to understand how these individuals cope with those emotional burdens. The main focus that individuals with high orthorexic tendencies report is on the quality and nutritional content of food. This has been highlighted through the data that individuals spend a significant amount of time researching and preparing their food. Lacey has specific meals that she sticks to, for example, she will not consume red meat, only uses avocado oil as a source of fat, and avoids processed sugars and will only consume it in fruit form.

[Lacey, Female, 38 years old] *“I don’t um experiment with products as I’ve taken a lot of time to research products and their nutrition values so I go for products that I know Um yeah so my meal planning is quite strict. I have like about 20 recipes that I alternate for like dinner same with breakfast and lunch. I don’t like trying new things”.*

This quote provides a significant insight into individuals-controlled approach to their eating where they do not deviate from meals which have been carefully selected for best quality and nutritional value. Adherence to their selection of meals might imply a sense of stability and gaining control through their eating; however, the limited number of meals eaten suggests inflexibility, which is likely to influence their social life and their health. Lacey suggests that she has researched the nutritional values implying healthy food however inflexibility to try other food might limit their exposure to other nutrients that she might be missing from her diet. Other individuals will also place significant emphasis on the quality of products which is highlighted from Jane who has searched 6 weeks to find purest form of sherry vinegar.

[Jane, Female, 33 years old] *“I it took me 6 weeks to buy Sherry vinegar because I couldn't find it in the normal supermarkets a Sherry vinegar that didn't have preservatives in it. And I refused to buy the one. That was kind of sold in every single shop I went to every single supermarket and it took me a whole six weeks to find a Sherry vinegar without preservatives.”*

Jane demonstrates a commitment to purchasing a food product which meets their standards for quality highlighting the need for food to be in the purest quality no matter how long it will take them to find the product. Jane has refused to compromise and get a food product that might not meet her standards, they are willing to invest time and effort to ensure that the foods that they buy align with their strict dietary rules.

[Anne, Female, 37 years old] *“I think I just generally like it's food, it kind of is a bit of an emotional head thing you know it's it's some people drink, some people smoke whatever I kind of tend to tend to turn to eating when things get tricky. I feel like I gain control of my life.”*

In this instance, the participant speaks about their relationship with food as a means of coping mechanism and gaining control in challenging situations. When the participant faces emotional challenges, they turn to food stating that food plays a role in regulating their emotions and provides a sense of relief. This suggests that not only do individuals with orthorexic tendencies turn to food as a means of improving their health, but they can also rely on food as a coping mechanism signifying an overlap with existing eating disorders.

[Lauren, Female, 21 years old] *“I think there are days. Occasionally, where, like maybe something's upset me or I just. I don't know. Something's has happened and maybe I will overeat... Not great. Both mentally and physically, because like physically, obviously, if you're overeating,*

you're just gonna feel a bit gross. You're gonna feel overly full and it's just not fun. But mentally, it's it's a bit distressing and a bit. I guess it's sad because. You know, you put all this effort into doing something and then if you have an off day, you just you feel like you've like Got taken like 12 steps backwards and you just it doesn't feel great.”

Lauren has also described instances when they might overeat or indulge in something they might consider unhealthy, highlighting the importance of food might have as a coping mechanism. However, Lauren acknowledges that she experiences mental and physical consequences where they experience being uncomfortable as well as being disappointed by the setbacks after putting effort into their eating, suggesting that overeating and indulging in unhealthier choices triggers feelings of distress and highlights the internal struggles and self-criticism. Tom described himself as a health freak who puts a focus on achieving a well-balanced diet who does not restrict their diet but tries to avoid eating unhealthy foods and substituting it with healthier alternatives.

[Tom, Male, 18 years old] *“Like I would also say there is a lot of guilt and self-hatred because I know I’m capable of achieving my goals and eating the way I eat all of the time so that deviation would like deflate me a lot like I know I mentioned that at the moment I do not eat the way I always eat because a lot is going on and most of the time I feel shit about myself because even though I do eat healthily*

according to people but according to myself I don't and it's really deflating"

This quote highlights the strong emotions of guilt and self-hatred that the participant encounters when deviating from their dietary practices. This is in accordance with the diagnostic criteria of orthorexia proposed by the researchers. However, there is an acknowledgement where Tom talks about external factors beyond their control that have an impact on them not adhering to their food rules as well as acknowledging that they are capable of achieving their goals and getting back on track once their circumstances improve. There is also a discrepancy between internal and external standards where the participant holds themselves to a higher standard than others as they consider the participant's eating patterns already healthy however the participant holds themselves to a higher standard and they are currently not meeting those self-imposed goals. Lacey discusses strong feelings and behaviours of self-punishment after breaking her diet which are exacerbated by a feeling of failing to live up to the view that she understands others' hold of her:

[Lacey, Female, 38 years old] *"But after I ate that crap the feeling of guilt self-hatred and like shutting myself from others because I knew they admired me for changing my lifestyle I felt like a failure and I felt dirty and I wanted to punish myself so I would exercise for like 4 or 5 hours straight to feel a little bit cleaner... That I failed like at some point I was contemplating on self-harm that's how crazy these thoughts were when I didn't eat healthily"*

Lacey also highlights the strong feelings of guilt and self-hatred when deviating from their eating suggesting that they believe that their self-worth is tied to their adherence to eating patterns. There is pressure from other people who admire the participant for the healthy lifestyle however this contributes to the participant's isolation when deviating from the eating patterns. Furthermore, there is a desire for punishment in the form of excessive exercise and self-harm which highlights the severity of the issue suggesting a need for professional support. Exercise and self-harm act as maladaptive coping strategies in response to self-hatred and guilt therefore there is a need for healthier alternatives. Sara and Peter have provided some of the coping strategies they engage in:

[Sara, Female, 36 years old] *"I make myself to vomit but if my feelings are so overwhelming, eating unhealthy foods makes me feel dirty and I hate feeling that. If vomit then I feel like I have regained control of my life."*

[Peter, Male, 28 years old] *"If I feel like I'm if if the numbers are telling me I'm I'm actually overweight or something like then maybe I'll do like a a 24 hour fast or something."*

Both Sara and Peter use different coping strategies as a result of consuming unhealthy foods hence resulting in weight gain. Fasts often result as a strategy to control weight as well as self-induced purging. This highlights an overlap with other eating disorders suggesting that individuals with high orthorexic tendencies might utilise those coping strategies in the same

context that individuals with eating disorders would, highlighting the potential of classifying orthorexia nervosa as an eating disorder.

The Ripple Effect of External Judgement on “Healthy Eating” Journeys and Internal Evaluations: Potential avenues for mindfulness-based constructs.

The third theme focuses on individuals’ internal evaluations and external judgement which could be alleviated with mindfulness-based interventions. The first code looks at the recommendations that individuals give on their eating patterns and how satisfied they feel with their eating patterns. The second code looks at the social implications that individual might experience based on their eating choices. The final code acknowledges the lack of support participants might face from society as well as judgements around their eating choices. Participants talked extensively about the beneficial impact that the change of diet had had on their lives. However, despite this assertion, many participants explained that they would not recommend their specific eating patterns to other people as it was individual to them. Monica has expressed that for her, a healthy diet consists of having a variety of foods and not eliminating anything but finding healthier alternatives. The focus of Monica’s diet is to hit the nutritional goals that she has set. However, Monica would not recommend her specific eating pattern.

[Monica, Female, 23 years old] *“I wouldn't recommend my exact diet for everyone because I don't. I don't think it'll work for everyone, but I would recommend like the general principles like eating more whole foods, eating more vegetables and fruits and nuts.”*

This suggests that Monica acknowledges that there are strict restrictions on their lifestyle that might not be conceptualised as healthy. They recommend the general principles that everyone is aware of what makes eating healthy such as the consumption of fruit and vegetables however no personalised recommendations are made such as elimination of specific food groups or priority of organic produce which is what conceptualised orthorexia nervosa. Jane also makes the point about general healthy eating being desirable, but draws a similar distinction between healthy eating and obsessive healthy eating:

[Jane, Female, 33 years old] *“I'm so yes and no. Yes, in the sense that. And I think we could do a lot more with cleaning up our diets, but no, in the sense that it's really difficult to know where to draw that line of what's, what's healthy eating versus what's obsessive healthy eating.”*

This quote highlights the hesitating nature when it comes to recommendations of their eating patterns, there is that general acknowledgement of everyone needing to clean up their diets and eat healthily however Jane demonstrates an awareness towards their fixation and preoccupation with food and acknowledges that healthy eating can turn into an obsession which could affect the quality of life of the individual. With obsessive eating, individuals might introduce more restrictions based on external circumstances such as social media, peer influence and health initiatives. This has been suggested by Dan who slowly has reduced consumption of different foods such as sweets and chocolate as his preference for food has changed since making changes to his eating.

[Dan, Male, 40 years old] *“Now because my body has changed, my tastes have changed. I couldn't enjoy that typical junk food. So now for me it's It's enjoyable to have a really good apple or a slice of watermelon, or, you know Asparagus, whatever. Like I enjoy the taste of those foods and knowing that it's doing my body good rather than doing damage like some of the other stuff.”*

Even with such an individualised approach to the consumption of food, Dan expresses actual enjoyment of consuming healthy foods rather than consuming healthy foods for the sake of being healthy. Enjoyment also serves as a positive reinforcement for the consumption of foods, no matter what external pressures they might face, they will continue to do so due to the joy that healthy food brings them. Furthermore, this quote reflects a shift in perspective of food, moving away from unhealthy foods to healthy implying that there is a change in taste preferences due to a change in their health. This indicates that healthy food can act as self-care by promoting well-being through the consumption of foods. Chloe has also highlighted that healthy eating can act as a form of self-care.

[Chloe, Female, 25 years old] *“I can see the changes in myself so definitely it is much kinder to do that than eat like shit and suffer from depression. Healthy lifestyle is a form of self-care now for me which I never thought I would consider that.”*

Chloe affirms that healthy eating is seen as a form of self-care, highlighting the importance of prioritising nutrition and healthy lifestyle choices, even if the eating is

problematic, they do not view it as that. Those individuals view eating as something that has helped them overcome obstacles in this instance depression. This quote also demonstrates that they view healthy eating as being kind to themselves utilising the components of self-compassion. Healthy eating is seen as a positive thing in the eyes of participants for example they have seen improvements in work life due to feeling energised, and saving money due to meal planning; however, there are some challenges that they face as a result of changing their dietary patterns that affects their internal evaluations. For example, several participants have mentioned that their dietary patterns affect their free time due to extensive research and meal planning, finances as organic products are more expensive as well as buying supplements needed for optimum health, but the most common reply was that it affects their social life. The next quote indicates that the changes in eating patterns can also affect friendships as illustrated by Dan.

[Dan, Male, 40 years old] *“Friendship wise you know It it may have Hurt some of that... Almost like I'm disrespecting my friend a little bit. You know, if they're offering me food that they prepared, but it's something that I don't wanna put in my body.... I just feel bad if I know that They're offering me something that I don't really wanna eat, and sometimes I do. You know, I don't eat a lot of pizza. But you know, they're come on, have have a piece of pizza and so OK, you know, I will but Uh I sometimes feel more forced into it rather than wanting to have it.”*

There are a lot of challenges that participants face in social situation where food is involved. Dan expresses that some of the friendships he had were hurt in the process as he feels that he is disrespecting his friends by refusing foods that do not meet their dietary standards. There seems to be a conflict between Dan's dietary rules and upholding societal norms and expectations therefore Dan seems to have an internal struggle when it comes to doing what they think is right and upholding their personal values. There is also the aspect of isolation which was common in all participants. This was because they might not be invited to events, they have no one to share their experiences and they prefer to eat alone due to external judgement. Christy has acknowledged that she tends to avoid social situations as she does not feel that she can express herself through eating.

[Christy, Female, 38 years old] *“And then it sometimes affects my relationships with other people because um If people have a different belief system around food or values around food and they start saying it. I sometimes feel like I'm not able to joining a conversation with them in a natural way, I feel a bit I'm I I have some emotions coming up and then I often don't know how to continue the conversation. Like do I Just agree with them while not thinking that do I tell them anything about my alternative beliefs and it causes some little bit of stress socially... I sometimes get people commenting like ohh you're so healthy. Ohh you must be so healthy. Ohh, I bet you don't eat this or I bet you don't eat that things like that. So unsolicited comments. That a speculative about what I might or might not eat.”*

Christy has voiced frustration with the unsupportive comments about her food choices as people speculate about what Christy consumes when in reality she does consume 3 meals a day as well as snacks. Christy also experiences stress in social situations as she holds different beliefs about food to her peers meaning she cannot express herself through her food or even conversation with peers as it might cause disagreements. There is also fear of not fitting in or being judged for her dietary choices which leads to severe social anxiety. The next quote highlights the shift in the support that Jessica has experienced from her family and friends since starting her journey.

[Jessica, Female, 35 years old] *“At the beginning everyone was supportive like how are you doing this you look amazing I could not have the will power to do what you’re doing. But after the years have progressed the comments changed and they are more like you’re not going to eat this are you, you don’t eat anything, you’re so fussy and so on. So I guess that’s why I tend to eat by myself now like I avoid socialising with people just to avoid those comments... I value the opinion of people who have the same values more than I do of my family and friends which says a lot.”*

This quote highlights that at the beginning of their dietary journey, family and friends were supportive however this outlook has now changed. Jessica avoids socialising with people and prefers to eat in isolation to avoid negative comments from other people. Jessica highlights that she values the way she eats and the opinion of people who share similar values

and beliefs to their own opinions and comments of family and friends, indicating that she has a desire for validation and support from those who understand her dietary patterns and lifestyle.

[Lacey, Female, 38 years old] *“Even though my parents always told us not to fill my body with complete crap, I’m not doing it but it’s almost like anger directed at my eating that I’m not eating what they want me to eat. So I just avoid it and I don’t have to argue my point. I guess they are worried I get that but worried of what I’m not drinking myself to death or being obese where it will impact my quality of life so I don’t get what they are worried about.”*

There is a perceived conflicting message that Lacey experiences from their parents as they are the ones who introduced Lacey to healthy eating. When looking closely at Lacey’s eating patterns, she has acknowledged that her eating patterns are restrictive as she will only consume certain things such as avocado oil or white meat, but she believes that it is best for her body. Therefore, it would be suggested that she might not eat healthily therefore she sees the conflict as she believes that she is following a healthy diet. Despite the negative connotations surrounding the eating that comes from other people, a lot of participants feel like there are more goals to be achieved or they are not hitting the targets they should be. Therefore, there is a constant need to update their diets which could be through the elimination of certain foods and increasing consumption of others due to individualised needs. For example, Monica has stated that she is not hitting her fibre goal.

[Monica, Female, 23 years old] *“I’ve been trying to eat more like legumes and I’ve been training more so need to consume more fibre and it’s been like, I think I’m like low on a fibre or I’m not hitting my targets. I guess like I think it should be eating more fibre.”*

Monica mentions incorporating more legumes and including more fibre into their current diet which reflects that they are constantly seeking to improve their eating habits no matter how healthy their eating behaviours are, there is always room for improvement. In addition, Monica is mindful of the relationship between increased physical exercise and eating behaviours, indicating that they need to adjust their targets accordingly. However, the fact that Monica mentions that she is not hitting their targets suggests that she is actively monitoring her eating indicating a preoccupation with nutrition. The self-awareness can be a positive thing; however, in terms of orthorexia nervosa it means that there can be a preoccupation with hitting nutritional targets.

[Chloe, Female, 25 years old] *“Overall I feel great there are definitely areas where I can improve for example saying no to people who force me to eat something outside of my comfort zone. I can definitely reduce my fat and sugar intake more and I need to work on my fibre intake but it’s so hard sometimes.”*

This quote highlights the satisfaction that Chloe expresses since starting their journey with healthy eating, however there is an acknowledgement that there are areas which the

participant needs to improve on for example further reduction of fat and sugar and increasing fibre. There is also recognition of setting boundaries and saying to no people who put pressure on them to eat foods they are not comfortable with, suggesting that participant wants to prioritise their eating behaviours over societal pressures from family and friends. Chloe understands that their eating behaviours are difficult at times, suggesting that this might impact the individual's mental well-being due to the challenges and obstacles they face when it comes to their diet. This also links to the previous themes where participants voiced that they feel guilt and shame if they do not adhere to their rules.

Overall, the themes provide a conceptualisation of what health and healthy eating means to individuals with high orthorexic tendencies. The analysis conceptualised three different themes to orthorexia and it provides an understanding of what struggles individuals might face such as self-criticism and societal pressures. However, it also provided a further understanding of how people with orthorexic tendencies behave in terms of their eating patterns and conceptualisation of what healthy eating means. As well as understanding the potential role of mindfulness and mindfulness-based interventions and how it could lead to alleviation of orthorexic symptoms. The findings hold theoretical implications for orthorexia nervosa, for example theme 1 looked at how individuals with high orthorexic tendencies conceptualise healthy eating. Three sub-themes have emerged which were motivations for health eating, structure of eating and health outcomes (Naughton et al., 2015). This theme both aligns and contradicts the existing theoretical frameworks on orthorexia (Dunn & Bratman, 2016). While health related motivations and structures on what and how to eat are behaviours that have been observed in prior research (Depa et al., 2019), calorie restrictions and concerns around weight provide additional, more closely aligned layer of evidence that orthorexia may necessitate refinements in classification and treatment approaches (Dunn & Bratman, 2016). The second theme looks at the discipline and emotional coping where

individuals placed significant emphasis on caring for the body but not the mind. Koven and Arby (2015) stated that orthorexic tendencies can be linked to obsessive-compulsive behaviours and perfectionism, which demonstrates that individuals with ON tendencies might place significant emphasis on the quality and healthiness of the food. Nevertheless, the obsessive component might show reductions in mental health and quality of life as suggested in previous chapters. This theme suggests that not all is explained in relation to health motives as suggested in theme 1, the evidence suggests a more complex interaction with cognitive-behavioural mechanisms of control and maladaptive coping as seen in disordered eating literature (Fairburn et al., 2003). These results could feed into Koven and Arby's re-examination of orthorexia for emotional coping strategies in interventions. This is where mindfulness and self-compassion can be relevant concepts that could address the self-regulation for individuals with orthorexic tendencies. However, self-compassion and health behaviours are not corresponding to both physical and mental health, as seen in theory setting literature that is discussing body and mind self-care (Mantzios et al., 2017; Hussain et al., 2021) that self-kindness could correspond to unhealthy behaviours as stated by participants where they overeat or consume foods they deem unhealthy. The third theme focuses on the external judgment and internal evaluations on healthy eating. The results indicated that 'healthy eating' patterns lead to feelings of isolation, guilt, judgement from others, and that influence of external feedback on self-worth is critical which corresponds to literature on orthorexia (Dunn & Bratman, 2016). These evaluations can be alleviated through mindfulness-based interventions and self-compassion as it acts as a buffer for external judgement when external judgement impacts internal evaluations, responding to the suffering through self-compassion or by observing thoughts and emotions non-judgmentally which fosters a balanced self-view caused by external pressure (Kabat-Zinn, 1990; Neff, 2016). Preoccupation with achieving specific nutritional targets is a form of self-criticism which is

common in individuals with orthorexic tendencies that lead to negative emotions when these targets are not met (Bratman & Knight, 2000). Some mindfulness-based interventions are specifically designed to address such internal conflicts with eating and reduce eating specific self-judgement (Kristeller & Wolever, 2011).

7.5. Discussion

The present study aimed to explore the experiences and perceptions of eating behaviours in individuals who have high orthorexic tendencies. Past qualitative research on orthorexia nervosa was limited with the populations being self-diagnosed individuals with orthorexia. This study addressed this challenge by incorporating a pre-screening questionnaire based on the Orthorexia Nervosa Inventory (ONI). This innovative approach ensured that the selected population for the study exhibited high orthorexic tendencies, marking a unique contribution to the existing literature. While the overall outcomes of the study align with previous quantitative research and ON diagnostic criteria, noteworthy, unexpected findings emerged from this qualitative exploration, the themes and findings of the present study will be covered below. Firstly, according to previous quantitative and qualitative research on orthorexia, the main motivation for healthy eating was to improve general health and tackle pre-existing health issues (e.g., Greville-Harris et al., 2020). The present study has discerned that weight management and enhancing appearance emerge as prominent motivations for adopting a healthy diet. Other quantitative studies have indicated similar findings to the current research, where weight management was the primary goal (e.g., Brytek-Materna et al., 2020; Depa et al., 2019). The study by Depa et al. (2019) indicated a clear distinction in motives between Healthy Orthorexia and Orthorexia Nervosa. The motives for Healthy Orthorexia were primarily centred on the desire for optimum health, whereas motives for Orthorexia Nervosa were primarily for weight control. Those findings

support the present study, which identified two main motivations suggesting that there might be two different types of orthorexia. The proposed diagnostic criteria by Dunn and Bratman (2016) state that weight loss can occur as a result of a restrictive diet; however, it is not the primary goal of the individual with Orthorexia Nervosa, and the results of the present study, therefore, acknowledge and differentiating these two subtypes within the diagnostic framework to enhance the accuracy and comprehensiveness of identifying and addressing orthorexic tendencies.

Second, another significant result was that all participants still engaged in unhealthy eating practices, such as engaging in overeating or consumption of what the participants conceptualised as junk food for example protein bars, dark chocolate and sorbets. This is interesting as this suggests that individuals with orthorexia nervosa might not be able to self-regulate and display self-control, especially when it comes to emotions which overlap with symptoms of Binge Eating Disorder (Zeeck et al., 2011). The present findings also indicate that participants utilise compensatory methods after overeating such as excessive exercise, fasts and self-induced vomiting as a way to overcome their feelings of guilt and shame, which goes in accordance with past literature (Dunn & Bratman, 2016). However, this research marks the first instance of recognizing the use of self-induced vomiting as a compensatory method in the orthorexic population, underscoring a distinct overlap in symptoms between orthorexia and other eating disorders (e.g., Dalle Grave et al., 2009). As a potential intervention for these symptoms, the use of mindfulness-based interventions has shown promise in promoting awareness and fostering better emotional regulation, potentially contributing to the amelioration of these symptoms could alleviate symptoms such as overeating and emotional regulation. A study by Vanzhula and Levinson (2020) utilised the components of mindfulness in the treatment of eating disorders, which showed reductions in negative thoughts, emotion regulation and awareness of hunger and fullness cues. Therefore,

utilising the components of mindfulness and self-compassion could reduce the symptoms especially since these do overlap with other eating disorders. Furthermore, self-compassion has been shown to be a mediator and a moderator in relationships with eating pathology (e.g., Braun et al., 2016). Kalika et al., (2022;2023) have explored this in terms of Orthorexia Nervosa and have confirmed the mediation and moderation power of mindfulness and self-compassion in relation to Orthorexia. Therefore, further future experimental studies and qualitative user feedback should be utilised. An intriguing discovery in this study was that individuals with orthorexic tendencies hesitated to endorse their eating patterns to others. The rationale behind this reluctance was attributed to the highly individualized nature of their eating behaviours. This may suggest that there is a recognition amongst individuals with orthorexic tendencies that their dietary practices might not be suitable for everyone and might imply a certain level of self-awareness regarding the idiosyncratic nature of their approach to healthy eating. Thirdly, the impact of orthorexic tendencies on individuals' quality of life, as highlighted by Kalika et al. (2023) and confirmed in the present study, reveals multifaceted consequences. While positive physical outcomes like increased energy, weight loss, and health improvements are acknowledged, the primary finding underscores the profound social implications for people with high orthorexic tendencies. Individuals with orthorexic tendencies commonly experience a diminished social life, characterized by strained friendships, avoidance of social events due to negative comments about their eating habits, and an overarching sense of isolation. Such consequences align with broader research on eating disorders and social isolation, indicating potential risks for heightened depressive symptoms and loneliness anxiety (e.g., Makri et al., 2022; Marmorstein et al., 2008). Integrating mindfulness and self-compassion interventions, identified as closely connected with key social support pathways, could offer avenues to address these challenges and enhance psychological well-being in individuals with orthorexic tendencies. A model of

social support proposed by Feeney and Collins (2014) utilised eight pathways for promoting better well-being, the three of the pathways (i.e. emotional state, self-perception and appraisal of events) are closely connected with mindfulness and self-compassion. Some studies have shown that mindfulness and self-compassion contribute to the association between social support and better psychological well-being (Wilson et al., 2020), therefore these components could be utilised in the orthorexia population.

Overall, this qualitative exploration builds on the earlier research chapters with research that contextualises the role of motivation, emotional coping, and external pressures in ON. For example in Chapter 6 the Teruel Orthorexia Scale findings suggests that a healthy version of orthorexia exists, which is positively correlated with mindful eating and self-compassion. The qualitative study supports Themes 2 and 3 findings, and indicated potential methods for interventions utilising mindfulness and self-compassion. Additionally, ON can be understood through a structured eating framework, where motivations for consuming healthy foods might appear beneficial, particularly when not driven by excessive self-judgement or external pressures. Some individuals have adopted these patterns as a way of health promotion and well-being, while others have shown that weight loss has also been a motivating contributor for adopting such eating patterns. This pursuit can become problematic when compulsive behaviours and rigid dietary rules emerge, leading to severe distress when encountering foods deemed as 'impure' and 'unhealthy'. It is especially relevant when individuals struggle with conflicts related to palatable foods, which may trigger feelings of guilt, anxiety, or the need to compensate through further restriction or dietary control. ON is deeply tied to feelings of guilt, social isolation, and external judgment (Theme 3). Many individuals with ON experience intense anxiety and self-criticism when deviating from their strict dietary standards. This not only affects their personal well-being but also impacts their social relationships, as they may avoid shared meals or feel alienated

due to their dietary rigidity. Such emotional distress has significant implications for Quality of Life (QoL) and Emotional Well-Being, as individuals may struggle with heightened stress, decreased social engagement, and potential declines in mental health. The negative impact on QoL highlights ON as more than just a preference for healthy eating but rather a pathological fixation on food purity that disrupts daily life. Overall, the interplay between structured eating, perfectionism, and emotional distress underscores the complex nature of ON. Understanding these psychological mechanisms is crucial for developing effective interventions that balance healthy eating behaviours without reinforcing compulsive or rigid dietary patterns. Future research should further explore these relationships to inform therapeutic strategies that promote mindful and flexible eating behaviours, ultimately improving QoL and mental health outcomes for individuals struggling with ON.

7.6. Limitations and future directions

There are some limitations that are associated to this study. First, it is a female-dominated sample so the findings might not be replicable to male populations. Second, the use of ONI as a pre-screening questionnaire might be problematic as the present study shows that there could be a potential for two subtypes of orthorexia: Healthy Orthorexia and Orthorexia Nervosa. It is a necessity to conduct qualitative studies utilising further measures of Orthorexia Nervosa as a means of recruiting participants and propose clarity in the division of healthy eating and orthorexic tendencies, as those who self-diagnose might not truly reflect the tendencies, they display in terms of orthorexia nervosa. Recognizing that self-diagnosis may not always accurately reflect the nuanced manifestations of orthorexia nervosa, the present research is the first to conduct a qualitative study employing one of many comprehensive measures of Orthorexia Nervosa for participant recruitment, advocating for a clearer directive for mindfulness- and compassion- based practices.

7.7. Conclusion

Overall, the need for a more holistic approach to understanding and supporting people with orthorexia, and the incorporation of emotional and psychological factors alongside nutritional support is warranted. The findings of the present study give a unique contribution to the understanding of Orthorexia Nervosa, highlighting the need for qualitative research in this topic area. By gaining further insight into this eating behaviour, the findings emphasise the necessity for the classification of Orthorexia Nervosa as an Eating Disorder due to the overlapping symptoms with other Eating Disorders such as Binge Eating Disorder, Bulimia Nervosa and Anorexia Nervosa (e.g., Atchison & Zickgraf, 2022; Pontillo et al., 2022).

Chapter 8: General Discussion

8.1. Overview of the Current Thesis and Aims

The current thesis aimed to explore orthorexia nervosa with psychological constructs such as mindfulness, mindful eating, and self-compassion that have been previously explored in eating behaviour research (e.g., Moore et al., 2014; Strahler, 2020; Kalika et al., 2022; Katterman et al., 2014; Taylor et al., 2015; Sala et al., 2020). This creates a novel exploration in orthorexia nervosa research as previous research only explored mindfulness and mindful eating constructs (Strahler, 2020; Miley et al., 2022), with the present thesis overcoming previously reported limitations. Other constructs such as perfectionism, quality of life, mental health and disordered eating pathology (e.g., Miley et al., 2022; Brytek-Matera et al., 2020; Koven & Arby, 2015) have also been explored in the current thesis to extend the existing knowledge of orthorexia discussion and its association to mindfulness, mindful eating and self-compassion. The second aim of the thesis was to identify populations at-risk and predictive factors of ON such as perfectionism, quality of life, mental health and disordered eating. The inclusion of mindfulness, mindful eating and self-compassion in research chapters served as a guide to building potential paths to symptom reduction, and body-mind interventions that are founded in self- and emotion-regulation principles. In the next section of the thesis, the findings from each Chapter will be summarised, emphasising how each chapter contributes to the primary aims of the thesis and how it relates to previous research. The discussion will move on to the limitations of the thesis as well as the future directions of the outlined research. The potential clinical and non-clinical implications will also be discussed, leading to a conclusion of this thesis.

8.2. Review of study findings

Chapter 2 looked at associations between orthorexia nervosa, mindfulness, self-compassion and perfectionism. The findings from Chapter 2 suggested that mindfulness and self-compassion both had a significant negative relationship with ON. Furthermore, the chapter also revealed a positive relationship between orthorexia nervosa and perfectionism. The findings support prior research, confirming a consistent negative relationship between mindfulness, self-compassion, and orthorexia nervosa (Kalika et al., 2022; Stahler, 2021). Specifically, individuals with higher orthorexic tendencies show lower levels of self-compassion and mindfulness. This aligns with existing literature on eating behaviours and mindfulness, where mindfulness is linked to lower levels of disordered eating (Beshara et al., 2013; Dutt et al., 2019; Mantzios & Wilson 2013, 2014, 2015; Mantzios et al., 2018; Mantzios et al., 2019). Three mindfulness subscales—non-judgment, acting with awareness, and describing—were negatively correlated with ON, consistent with recent findings (Kalika et al., 2022). Unsurprisingly, individuals with orthorexic tendencies exhibit high levels of self-judgment, as previous research indicates that breaking food rules often results in distress, self-judgment, and self-punishment (Bratman, 2017; Koven & Abry, 2015). Perfectionism was another central focus of this chapter where the findings support the relevance to ON when conceptualised as multidimensional construct. The findings reveal that individuals with higher orthorexic tendencies also display higher levels of perfectionism, which is consistent with previous research (e.g., Merhy et al., 2023; Miley et al., 2022; Novara et al., 2021). When examined perfectionism dimensions, both PS and PS were positively associated with ON, however PC has demonstrated a stronger association with ON. All subscales of FMPS were positively correlated with ON except Organisation. The strongest association was observed for Concern over Mistakes and Doubts which is the core component of PC. The strong association with PC aligns with the existing research linking maladaptive

perfectionism to anorexia nervosa, bulimia nervosa (e.g., Boisseau et al., 2013; Bulik et al., 2003), and eating pathology (Davies et al., 2009; Egan et al., 2011). Moreover, this study conducted four mediations where self-compassion and mindfulness acted as mediators between perfectionism (PS and PC) and orthorexia nervosa. Both were significant mediators, a novel finding in the context of orthorexia research. Findings revealed that there are distinct patterns for PC and PS. Self-compassion mediated the relationship between PS and ON, suggesting that striving for high personal standards is not inherently maladaptive but becomes associated with orthorexic tendencies when accompanied by reduced self-compassion. In contrast, PC showed a strong direct association with orthorexia, with mindfulness partially mediating this relationship, while self-compassion did not emerge as a significant mediator. This indicates that concern-driven perfectionism contributes to orthorexia both directly and indirectly through reduced mindful awareness. These findings align with previous research demonstrating mindfulness as a mediator between perfectionism and social anxiety (Manove & Khoury, 2023) and negative cognitions (Short & Mazmanian, 2013), both of which are relevant to orthorexia nervosa, where distress and rigid, self-critical thought patterns are common (Dunn & Bratman, 2016). Similarly, prior work identifying self-compassion as a mediator between restrictive eating and orthorexia (Kalika et al., 2022) supports its central role in buffering the effects of striving-oriented perfectionism. Overall, the present findings highlight the importance of distinguishing between PC and PS when examining orthorexia, as these dimensions operate through different psychological mechanisms.

Chapter 3 assisted with the discovery of new insights into the interplay between ON and Motives to eat palatable foods, mindfulness, and self-compassion. The findings suggest that individuals with ON are more inclined to be motivated to consume palatable foods. The findings suggest that individuals with ON, despite exhibiting strong self-control and

adherence to rigid dietary rules (Tabri et al., 2022), display a heightened motivation to consume palatable foods. This paradox may be explained by the fact that the study assessed the desire for, rather than the actual consumption of, palatable foods (Boggiano, 2016). Therefore, those with strong orthorexic tendencies may have a desire and craving to consume palatable foods, yet they may avoid doing so as it contradicts their self-imposed dietary rules or self-views of advocates of healthy eating.

People with ON often experience high anxiety due to their strict food rules and obsession with food purity and health (Cena et al., 2018; Rangel et al., 2012). This strictness creates a complex relationship with palatable foods. These individuals might use palatable foods as a coping mechanism to manage stress, anxiety, or negative emotions related to their rigid diets (Bilici et al., 2020). The sensory pleasure and comfort from palatable foods (Gibson, 2006) may provide a temporary escape from their obsessive thoughts and the pressure to adhere to strict rules, offering a sense of normalcy. This can be seen as a form of emotional regulation through palatable foods (Vuillier et al., 2020), leading to a cycle of indulgence and restraint. However, relying on palatable foods as a coping mechanism can have negative consequences. After indulging, individuals with ON may experience guilt, shame, and self-criticism for breaking their food rules (Dunn & Bratman, 2015). These negative emotions can worsen their distress, perpetuate the restrictive eating cycle, and intensify their struggles with ON. While palatable foods may offer temporary comfort, they can also contribute to a cycle of emotional turmoil and worsen disordered eating behaviours (Schnepper et al., 2020).

Chapter 3 also found negative correlations between self-compassion and mindfulness with both ON and motives for palatable food consumption. This aligns with previous research (Boggiano et al., 2023; Kalika et al., 2022; Mantzios & Egan, 2018), suggesting that higher levels of these qualities are associated with lower ON and reduced cravings for

palatable foods. Mindfulness and self-compassion have been linked to healthier eating habits (Beshara et al., 2013; Dutt et al., 2019; Mantzios & Wilson, 2013-2015; Mantzios et al., 2018, 2019) and reduced symptoms in eating disorders (Frenches et al., 2019), indicating their potential as protective factors against ON. The chapter conducted two mediation analyses with mindfulness and self-compassion acting as mediators between palatable food motives and ON. Both mediators were significant, suggesting their potential role in the relationship, and proposing future exploration of mindfulness and self-compassion-based interventions for ON, particularly targeting palatable food motivations.

Chapter 4 presented two studies that examined different associations to eating-related and generic psychopathology. Study 1 set out to determine the associations between ON, Eating Attitudes, Mindfulness and Self-compassion. The study showed negative relationships between ON and both mindfulness and self-compassion, as well as a positive relationship with eating attitudes when exploring the primary goal of interrelations. This suggested that individuals with higher orthorexic tendencies display lower levels of mindfulness and self-compassion and higher levels of disordered eating. These findings support the hypothesis that disordered eating are positively related to ON, whereas mindfulness and self-compassion would be negatively related to orthorexia, findings are consistent with previous research (e.g., Kalika et al., 2022; Stahler, 2021). Study 1 is the first study in the literature that investigated all of the concepts together, other studies only looked at disordered eating and orthorexia (e.g., Dunn et al., 2019). The secondary goal of Study 1 was to explore the mediating role of mindfulness and self-compassion in the relationship between disordered eating and orthorexia nervosa. Both variables were found to be successful mediators, suggesting that they could play a significant role in mitigating the symptoms of ON by addressing risk factors.

Study 2 focused on the associations between ON, Mindfulness, Self-compassion and Depression, Anxiety and Stress (DASS). The current findings support the hypothesis that ON is positively linked to DASS suggesting that individuals with orthorexic tendencies may experience increased mental health problems. Study 2 found that individuals with higher orthorexic tendencies reported lower levels of mindfulness and self-compassion. Mental health is an important component in the development as well as maintenance of eating disorders, where mental health problems such as depression and anxiety are more prevalent (e.g., Tan et al., 2023). Study 2 has found a positive relationship between ON and mental health problems such as depression, anxiety and stress. The negative association between mindfulness/self-compassion and ON tendencies in both studies aligns with the known characteristics of ON. Individuals with ON often experience heightened stress and anxiety when they deviate from their strict dietary rules or face social situations involving food (Koven & Arby, 2015). This research reinforces the potential for mindfulness and self-compassion interventions to address these underlying emotional aspects of ON, potentially leading to improved well-being. If the individual with orthorexia is constantly worrying about their health as well as eating behaviours, then the levels of stress and anxiety could be much higher in comparison to other EDs, signifying that implications of ON may have more of a detrimental impact on individuals well-being.

The primary aim of Chapter 5 was to explore the associations between ON, mindfulness, mindful eating, self-compassion and eating disorder quality of life, with emphasis on the potential moderating effects of self-compassion, mindfulness, and mindful eating. Previous research such as Strahler (2020) highlighted a negative correlation between ON and mindfulness, the findings of this chapter confirmed that relationship. The results align with previous research on eating behaviours and mindfulness, as mindfulness is associated with healthier eating (Beshara et al., 2013; Dutt et al., 2019; Mantzios & Wilson

2013, 2014, 2015; Mantzios et al., 2018; Mantzios et al., 2019) and protective values against the development of disordered eating (Moore et al., 2014). Two of the subscales were related negatively to orthorexia; non-judgement and acting with awareness. Research showed that individuals with orthorexic behaviours display high levels of distress, self-judgement, and self-punishment when dietary violations occur (Bratman, 2017; Koven & Abry, 2015). Interestingly, individuals with high orthorexic tendencies demonstrated lower levels of acting with awareness, which contradicts previous findings. Typically, orthorexic individuals are thought to be hyper-focused on food preparation and quality (Koven & Abry, 2015). This discrepancy may be explained by recent research suggesting a separation between decision-making about food and mindful eating behaviours (Mantzios, 2020), where food preparation does not necessarily reflect mindfulness in the present moment.

Self-compassion and mindful eating have also been investigated in the present chapter. Consistent with past research (Kalika et al., 2022), a negative relationship was found between self-compassion and ON. However, this study also found a significant association between mindful eating and ON, which contradicts Kalika et al.'s findings. Thorne et al. (2022) similarly identified negative relationships between ON and certain aspects of mindful eating, further supporting the idea that mindful eating should be considered separately from decision-making processes. Chapter 5 also looked at the constructs of mindful eating and there were three significant relationships with orthorexia. The subscales of *eating with awareness*, *focused eating* and *hunger and satiety* were all negatively associated with ON. As previously mentioned, only three other studies looked at mindful eating, Kalika et al. (2022) found no associations between ON and mindful eating whereas Thorne et al. (2022) found negative relationships between ON, hunger and satiety, eating with awareness and eating without distractions. This study replicated the findings of Thorne et al. (2022), however, in the current study eating without distractions was non-significant. A reason for contradicting

findings of Kalika et al. (2022) was that they have investigated vegan-only population; therefore, this could explain the variation in the results regarding mindful eating. It is interesting that ON has been negatively associated with eating with awareness as individuals with orthorexic tendencies focus on the quality of their food (Koven & Abry, 2015). Hunger and satiety subscale was negatively associated with ON, suggesting that individuals high with ON respond to external food cues, like other EDs such as BED (Meule et al., 2018) and not rely on hunger and satiety. Findings related to the focused eating subscale are interesting as studies on orthorexic tendencies suggests that those with high orthorexic tendencies spend a significant amount of time preparing their meals and researching (Koven & Arby, 2015) thus higher focus on the eating related behaviours however the present study suggests that those with high orthorexic tendencies in fact have a low focused eating.

Past research has demonstrated that individuals with eating disorders display poor quality of life (Agh et al., 2016; DeJong et al., 2013; Jenkins et al., 2011; Winkler et al., 2014), this is demonstrated in the present study as individuals with higher scores on ONI displayed lower levels of quality of life. The findings indicate that higher scores on ONI have an impact on all the subscales of the EDQOL such as the psychological, physical/cognitive, financial and work/school aspects; therefore, demonstrating that orthorexia could significantly impact individuals' quality of life, affecting physical, psychological, financial and work aspects. This highlights that higher orthorexic tendencies have a significant impact on individuals' quality of life just like other ED such as AN, BN and BED (e.g., Bamford & Sly, 2010; Jenkins et al., 2011; Mason et al., 2018). In addition, several moderation analyses were conducted between orthorexia and eating disorder quality of life with moderators being mindfulness, self-compassion and mindful eating. The current study found significant moderators to be self-compassion and the awareness aspect of mindfulness. The findings in the present study showed that self-compassion is a moderator at all levels with higher levels

of self-compassion having a higher moderating effect on the relationship between ON and EDQOL. This suggests that higher levels of self-compassion strengthen the relationship between orthorexia and quality of life.

The goal of Chapter 6 was to explore the associations between different orthorexia scales such as ONI, DOS and TOS in relation to mindfulness, self-compassion and mindful eating. This study is the first of its kind to explore these associations using multiple orthorexia measures in a comprehensive analysis. ONI was negatively associated with mindfulness and self-compassion, the findings are in line with previous findings (Kalika et al., 2023; 2024). It was also stated that mindful eating would be negatively associated with ONI; however, the present findings indicate that there is no association between mindful eating and ONI. The second hypothesis stated that the DOS will be positively associated with mindfulness and self-compassion (Barlow et al., 2023) whereas only some facets of mindful eating could be significant (Miley et al., 2023). The present findings are contradictory of the past research, the present study found no associations with mindful eating and mindfulness and a negative relationship with self-compassion. The third hypothesis stated that Healthy Orthorexia (TOS) will be positively associated with mindfulness, self-compassion and mindful eating (Strahler, 2020; Barlow et al., 2023) whereas Orthorexia Nervosa (TOS) will be negatively associated with mindfulness, self-compassion and mindful eating (Strahler, 2020; Kalika et al., 2022). The present study has supported the previous findings in terms of Healthy Orthorexia, where mindfulness, mindful eating and self-compassion had a positive strong association with healthy orthorexia. Whereas Orthorexia Nervosa had negative relationship with mindfulness and self-compassion but there were no significant associations with mindful eating.

Chapter 7 aimed to explore the experiences and perceptions of eating behaviours in individuals who have high orthorexic tendencies. Past qualitative research on orthorexia

nervosa was limited with the populations being self-diagnosed individuals with orthorexia. This study addressed this challenge by incorporating a pre-screening questionnaire based on the Orthorexia Nervosa Inventory (ONI). This innovative approach ensured that the selected population for the study exhibited high orthorexic tendencies. While the overall outcomes of the study align with previous quantitative research and ON diagnostic criteria, noteworthy, unexpected findings emerged from this qualitative exploration. Three themes were explored “Foundation of “Healthy Eating”: Motivation, Structure and Outcomes”, “Discipline and Emotional Coping: A cycle of caring for the body but not the mind” and “The Ripple Effect of External Judgement on “Healthy Eating” Journeys and Internal Evaluations: Potential avenues for mindfulness-based constructs.”

Firstly, according to previous quantitative and qualitative research on orthorexia, the main motivation for healthy eating was to improve general health and tackle pre-existing health issues (e.g., Greville-Harris et al., 2020). The present study has discerned that weight management and enhancing appearance emerge as prominent motivations for adopting a healthy diet. Other quantitative studies have indicated similar findings to the current research, where weight management was the primary goal (e.g., Brytek-Materna et al., 2020; Depa et al., 2019). The study by Depa et al. (2019) indicated a clear distinction in motives between Healthy Orthorexia and Orthorexia Nervosa. The motives for Healthy Orthorexia were primarily centred on the desire for optimum health, whereas motives for Orthorexia Nervosa were primarily for weight control. Those findings support the present study, which identified two main motivations suggesting that there might be two different types of orthorexia. Second, another significant result was that all the participants still engaged in unhealthy eating practices, such as engaging in overeating or consumption of what the participants conceptualised as junk food for example protein bars, dark chocolate and sorbets. This is interesting as this suggests that individuals with orthorexia nervosa might not be able to self-

regulate and display self-control, especially when it comes to emotions which overlap with symptoms of Binge Eating Disorder (Zeeck et al., 2011). The present findings also indicate that participants utilise compensatory methods after overeating such as excessive exercise, fasts and self-induced vomiting as a way to overcome their feelings of guilt and shame, which goes in accordance with past literature (Dunn & Bratman, 2016). However, this research marks the first instance of recognizing the use of self-induced vomiting as a compensatory method in the orthorexic population, underscoring a distinct overlap in symptoms between orthorexia and other eating disorders (e.g., Dalle Grave et al., 2009).

An intriguing discovery in this chapter was that individuals with orthorexic tendencies hesitated to endorse their eating patterns to others. The rationale behind this reluctance was attributed to the highly individualized nature of their eating behaviours. This may suggest that there is a recognition amongst individuals with orthorexic tendencies that their dietary practices might not be suitable for everyone and might imply a certain level of self-awareness regarding the idiosyncratic nature of their approach to healthy eating. Thirdly, the impact of orthorexic tendencies on individuals' quality of life, as highlighted by Kalika et al. (2023) and confirmed in the present study, reveals multifaceted consequences. While positive physical outcomes like increased energy, weight loss, and health improvements are acknowledged, the primary finding underscores the profound social implications for people with high orthorexic tendencies. Individuals with orthorexic tendencies commonly experience a diminished social life, characterized by strained friendships, avoidance of social events due to negative comments about their eating habits, and an overarching sense of isolation. Such consequences align with broader research on eating disorders and social isolation, indicating potential risks for heightened depressive symptoms and loneliness anxiety (e.g., Makri et al., 2022; Marmorstein et al., 2008).

Overall, all of the research chapters add novel knowledge to the existing findings in the field of Orthorexia Nervosa. Chapter 2,3,4 and 5 have all investigated the interrelations between mindfulness, self-compassion and mindful eating to orthorexia nervosa and potential risk factors. All of the studies replicated similar findings to past research with a novel contribution of mindfulness-based constructs. Several moderations and mediations that were explored in those chapters suggest that mindfulness, self-compassion, and mindful eating could potentially be explored in terms of designing interventions for orthorexic populations. Self-compassion was explored within Chapter 2, 3 and 4 utilising the Self-Compassion Scale (SCS) which demonstrated similar findings across the studies. Chapter 2 demonstrated negative significant correlations with all of the subscales of SCS, whereas Chapter 3 and 4 only demonstrated negative significant correlations with the negative subscales of SCS. The difference in these findings could be that Chapter 2 only recruited female participants whereas Chapter 3 and 4 had larger samples and more balanced gender ratio. Two other chapters implemented the use of shorter version of the SCS, due to the low Cronbach's alpha the subscales were not investigated in Chapter 5 and 6. Chapter 6 and 7 utilised both qualitative and quantitative measures and produced unexpected and unique contributions. Importantly, chapter 6 explored three different measures of ON in relation to mindfulness, self-compassion and mindful eating. Findings were also replicated from the previous chapters however it is noteworthy that HeOr is a unique construct especially in relation to mindful eating that should also be explored in terms of ON. The main contribution of Chapter 7 highlighted that there are differences between HeOr and OrNe especially in terms of motivations for implementing healthy diet, coping with distress, quality of life and overall well-being of the individuals who have scored highly on the orthorexia measure.

8.3. Overall Findings and Contributions

The findings across Chapters 2 to 7 provide a comprehensive and novel contribution to the understanding of Orthorexia Nervosa (ON) by consistently demonstrating that mindfulness and self-compassion are negatively associated with orthorexic tendencies. These results extend previous literature by confirming and deepening the understanding of these relationships using a variety of validated ON measures, including the Orthorexia Nervosa Inventory (ONI), the Düsseldorf Orthorexia Scale (DOS), and the Teruel Orthorexia Scale (TOS). The consistent negative correlations suggest that both mindfulness and self-compassion may function as protective factors against the development or intensification of ON. Furthermore, several studies identified mindfulness and self-compassion as mediators or moderators in the relationship between ON and key risk factors such as perfectionism, palatable food motivation, mental health, and quality of life. These mediation and moderation effects highlight the potential for these constructs to be targeted in mindfulness-based interventions specifically tailored for individuals with high orthorexic tendencies. Additionally, Chapter 6 introduced important distinctions between Healthy Orthorexia (HeOr) and Orthorexia Nervosa (OrNe), showing that mindfulness and self-compassion were positively associated with HeOr but negatively associated with OrNe, emphasizing their differential roles in adaptive versus maladaptive eating behaviours. Chapter 7 further supported these findings through qualitative insights, revealing how individuals with high ON tendencies use mindfulness and self-compassion to manage distress and regulate emotions, reinforcing the therapeutic potential of these constructs. Collectively, the results offer a strong empirical foundation for integrating mindfulness and self-compassion into future preventative and clinical interventions for ON. See Table 8.1 for summary of findings.

Table 8.1

Summary of findings between Mindfulness, Self-Compassion, and Orthorexia Nervosa Across Studies (Chapters 2–7)

Variable Pair	Chapter	r (Correlation Coefficient)	Significance Level (p)	Notes
Mindfulness & Orthorexia Nervosa	2	-0.43	< .01	Higher mindfulness linked to lower ON. Partially mediated the relationship of PC on ON.
Self-Compassion & Orthorexia Nervosa	2	-0.47	< .01	Higher self-compassion linked to lower ON. Mediated the relationship of PS on ON.
Self-Compassion & Orthorexia Nervosa	3	-0.14	< .05	Slightly stronger effect than mindfulness
Mindfulness & Orthorexia Nervosa	3	-0.12	< .05	Both variables acted as mediators in palatable food–ON link
Mindfulness & Orthorexia Nervosa (Study 1)	4	-0.17	< .01	Higher levels of mindfulness linked to lower levels of ON
Self-Compassion & Orthorexia Nervosa (Study 1)	4	-0.19	< .01	Higher levels of self-compassion linked to lower levels of ON Both variables acted as mediators in disordered eating and ON link
Mindfulness & Orthorexia Nervosa (Study 2)	4	-0.15	< .01	Replicated negative associations
Self-compassion & Orthorexia Nervosa	4	-.12	<.05	Replicated negative associations. Both variables acted as mediators in mental health and ON link
Mindfulness & ON	5	-0.15	< .05	Facets of mindfulness moderated ON–Quality of Life relationship
Self-Compassion (Short Form) &	5	-.16	< .01	Moderated impact of ON on Quality of Life

Variable Pair	Chapter	r (Correlation Coefficient)	Significance Level (p)	Notes
Orthorexia Nervosa				
Mindful Eating & Orthorexia Nervosa	5	Significant negative correlations (Focused Eating, Hunger & Satiety, Eating without distraction)	<.01	
Mindfulness & Orthorexia Nervosa	6	Negative (ONI, TOS-OrNe) Positive (TOS-HeOr)	< .01	Stronger for ON than Healthy Orthorexia
Self-Compassion (Short Form) & Orthorexia Nervosa	6	Negative (ONI, DOS, TOS-OrNe) Positive (TOS-HeOr)	< .01	Positive correlation for Healthy Orthorexia (TOS)
Mindful Eating & Orthorexia Nervosa		Positive (TOS-HeOr)	<.01	Positive correlation for Healthy Orthorexia (TOS)
Mindfulness & Self-Compassion (Qualitative Insight)	7	Thematic (non-numeric)	N/A	Individuals reported use in emotion/self-regulation; distinction between HeOr and OrNe

8.4. Theoretical Implications

Orthorexia Nervosa (ON) can be understood through its nomological network, which situates it within a broader psychological framework of related constructs and behaviours (Cronbach & Meehl, 1955). An overview of the observable indicators, empirical relationships and related constructs can be found in Chapter 1. Building on this, Figure 8.2 demonstrates an updated version of the nomological network developed throughout this thesis. Findings from this thesis suggest that mindfulness and self-compassion may serve as key mechanisms – either as mediators or moderators – in problematic relationships between orthorexic tendencies and behavioural/psychological outcomes. These constructs appear to influence how individuals engage with dietary behaviours, potentially buffering against or amplifying maladaptive patterns. Furthermore, insights from the qualitative analysis support the growing distinction in the literature between Healthy Orthorexia and Orthorexia Nervosa, reinforcing

the need to differentiate between health-motivated, adaptive eating patterns and those driven by rigid, obsessive, or harmful motives. Such distinction provides a momentum for deeper exploration into mindful eating, and potentially the explorations of self-efficacy and self-kindness, where the directionality between constructs may propose a clear directive for future mindfulness-based interventions. Understanding these dimensions fully would allow to distinguish ON from adaptive dietary practices and underscore the potential mental and physical health risks associated with its extreme manifestations. Establishing the validity of orthorexia as a psychological construct requires mapping its position within this nomological framework, where theoretical constructs (such as perfectionism, self-compassion, and mindfulness), observable behaviours, and empirical relationships converge. By examining the role of mindfulness and self-compassion as potential mediators or moderators and outlining their relationships with orthorexic tendencies in Figure 8.1, the framework contributes to clarifying conceptual boundaries, guiding the development of reliable assessment tools, and informing targeted psychological interventions.

Figure 8.1. Updated nomological network (Cronbach & Meehl, 1955) for Orthorexia Nervosa



8.5. Limitations and Future Directions

Building upon the findings of this thesis, several important future directions can be pursued to strengthen the field of orthorexia nervosa (ON), further test theoretical assumptions, and overcome the current research limitations. The studies conducted across Chapters 2 to 7 collectively underscore the promising role of mindfulness, self-compassion, and mindful eating in understanding ON, both as potential protective factors and as mechanisms that could be targeted in interventions. However, future research must address methodological and theoretical challenges to more fully realize the potential of these findings.

There are several limitations within the current research chapters that need addressing. Firstly, the samples in the research chapters consist of predominantly female and student populations, while this aligns with many previous studies in the field, it poses challenges to generalisability. For example, Chapter 5 only consisted of a female sample therefore it restricts the ability to generalise the findings to male populations. Gender differences in eating pathology are well-documented (Blashill, 2011; Striegel-Moore et al., 2009), with some studies indicating that orthorexia nervosa (ON) symptoms may be more pronounced in men than women (e.g., Fidan et al., 2010). However, research on ON is inconsistent with some studies highlighting that greater symptomology is in fact found in women population (e.g., Donini et al., 2004) and others suggest no significant gender differences (e.g., Brytek-Matera et al., 2015b; Dunn et al., 2017; Herranz Valera et al., 2014). Whilst the current thesis aimed to recruit equal number of participants from each gender, it was still predominantly a female sample as well as Chapter 2 only recruited a female sample. Given emerging evidence that men may display ON symptomology differently, future research should ensure that recruitment is more balanced as well as conducting male-only research to close the current gap in the literature.

Furthermore, the current chapters utilised the university recruitment scheme therefore the samples in the thesis were mostly based on student population suggesting that the age range of the sample is not inclusive. Previous studies have utilised student samples (e.g., Parra-Fernandez et al., 2018; Brytek-Matera et al., 2015; Grammatikopoulou et al., 2018) due to young adulthood being an important development period for body image development as well as establishing a relationship with food (Nelson et al., 2008). It has been recognised that eating pathology also occurs in older populations (Midlarsky et al., 2018) and can influence the effectiveness of interventions (Rohde et al., 2017). Therefore, extending research to include a wider age ranges and non-student populations will allow for more inclusive understanding of ON across lifespan. Investigating age-related differences in how constructs like mindfulness and self-compassion impact ON could inform the design of treatment approaches.

While all chapters in this thesis employed the short version of the Five Facet Mindfulness Questionnaire (FFMQ-SF), the use of the Self-Compassion Scale (SCS) varied across studies. Specifically, three chapters utilised the full version of the SCS, allowing for a comprehensive exploration of self-compassion and its subcomponents, whereas two chapters employed the short form (SCS-SF). However, the internal consistency of the subscales in the short form was found to be low, as indicated by unsatisfactory Cronbach's alpha values. As a result, subscale-level explorations were not conducted in these chapters, limiting the depth of the analysis. Given these limitations, it is recommended that future research investigating self-compassion in relation to orthorexic tendencies prioritise the use of the original full-length SCS, as it offers more reliable measurement of both the overall construct and its individual dimensions.

Another limitation of the thesis is that each research chapter, except Chapter 7 has utilised a cross-sectional methodology. This provided useful insights into the relationship

between orthorexia nervosa and psychological constructs that have not been previously explored, such as mindfulness, mindful eating and self-compassion, as well as recreating findings from other constructs such as mental health and perfectionism. This provided a basis for understanding if these constructs could be applicable in orthorexic populations. However, the data is limited as it only acknowledges the relationships between constructs rather than cause and effect. Chapter 7 sheds light on the findings from the previous chapters; however, further qualitative exploration needs to be conducted in future research, especially in terms of Healthy Orthorexia (HeOr) and Orthorexia Nervosa (OrNe). The differences between the two dimensions of orthorexia have been highlighted in Chapters 6 and 7 and it is important to explore findings further in qualitative and experimental research. Future studies would benefit from adopting longitudinal and experimental designs to assess how mindfulness, self-compassion, and mindful eating influence ON symptom development or reduction over time. For example, randomised controlled trials (RCTs) could test the efficacy of mindfulness-based interventions (MBIs) tailored specifically to individuals with orthorexic traits, comparing outcomes across groups with high scores in Healthy Orthorexia (HeOr) versus Orthorexia Nervosa (OrNe). Doing so would allow researchers to determine whether these constructs serve merely as correlates or have an active, therapeutic role in shaping eating behaviours and emotional well-being. Additionally, qualitative research, as conducted in Chapter 7, should be expanded to gain deeper insight into the lived experiences of individuals with orthorexic tendencies. The rich narratives revealed distinctions between HeOr and OrNe, especially in terms of motivations, well-being, and emotion regulation strategies. Future qualitative work could explore these dimensions further across different demographic groups to determine how contextual, cultural, and gender-related factors shape the manifestation and meaning of orthorexic behaviours.

Another future direction is to refine and test theoretical models that differentiate between adaptive (HeOr) and maladaptive (OrNe) forms of orthorexia. As highlighted in Chapters 6 and 7, these constructs are not only distinct in definition but also in their psychological correlates and behavioural consequences. Future work should further develop theoretical frameworks that can account for this dichotomy, integrating insights from mindfulness theory, emotion regulation, and health psychology. Moreover, challenges remain in standardising measurement tools across ON research. The use of multiple scales (e.g., ONI, TOS, DOS) revealed inconsistencies and unique findings, pointing to the need for consensus in operational definitions and greater psychometric validation across diverse populations.

8.6. Practical Implications and Recommendations

The present thesis provides insight and understanding of orthorexia nervosa, mindfulness, self-compassion and mindful eating, which informs our understanding how these psychological constructs might aid in alleviating orthorexic symptomology. The overall findings of the thesis found in chapters 2,3,4,5,6 and 7 support that mindfulness-based constructs could be utilised in orthorexic population as a basis for interventions. Mindfulness-based interventions have been successful with problematic eating as well as eating disorders (e.g., Atkinson & Wade, 2014, 2015) and the present thesis informs future clinical practice and guidance in utilising mindfulness-based constructs in alleviating the symptoms of orthorexia nervosa, although further research would allow for more definitive suggestions.

Indeed, Chapter 6 produced interesting findings in relation to mindful eating as they have implications for future research. It was highlighted that instead of sensory attention, quality attention during eating might be a more relevant element that needs to be assessed in terms of ON as quality and purity of food might be the decision-making factor of food

selection, and this was highlighted in Chapter 7 via qualitative investigation. It is known that quality and purity of the food is an important aspect of ON as it has formed the basis of diagnostic criteria (Donni et al., 2004; Dunn & Bratman, 2016; Mathieu, 2005; Varga et al., 2014). Mindful eating scale in Chapter 6 purely focuses on sensory attention, when combining that with the quality it will create a different dimension that may be used in conjunction with sensory attention and potentially provide a separation and identification of eating that is fuelled with attentive properties that may not be helpful in everyday eating. Furthermore, items that are measuring non-judgemental results might yield different results if the items were mentioning purity or quality, and following up on those results is something that may make a difference in assessing symptom severity in more depth. In Chapter 6, participants may have understood the items in terms of taste, smell and texture, therefore there is an opportunity to develop a scale that deviates from what is known about mindful eating and apply it to orthorexic population is a post-doctoral future direction.

Individuals with high orthorexic tendencies experience excessive negative emotions such as guilt and shame as highlighted in Chapter 7. Emotional regulation and self-regulation are concepts which have been explored in eating disorders (e.g., Meule et al., 2021) and ON literature (e.g., Strahler et al., 2022). Chapter 7 explored that individuals face every day struggles with rigid food rules, anxiety around eating and social isolation all of which may affect the emotional regulation and self-regulation of the individuals when faced with food-related decisions as this is driven by the excessive need for control and fear of imperfection. Mindfulness and self-compassion have also been utilised in emotional and self-regulation in different populations (e.g., Hill & Updegraff, 2012; Inwood & Ferrari, 2018). By implementing these constructs and helping orthorexic population with emotion and self-regulation, it will allow for a degree of flexibility to move from Orthorexia Nervosa to Healthy Orthorexia. Chapter 7 has highlighted the two dimensions are present in individuals

with high orthorexia score however it is essential to differentiate between the two. Therefore, if the emotion and self-regulation in those individuals is improved, we can move them from a pathological obsessive state to a healthy interest in healthy foods.

8.7. Conclusion

The current thesis aimed to explore the relationships between orthorexia nervosa, mindfulness, self-compassion, mindful eating and risk factors such as perfectionism, disordered eating and mental health. Findings highlighted that higher orthorexic tendencies imply lower levels of mindfulness, self-compassion and mindful eating in general population, replicating these findings across all chapters. Further exploration of feelings and experiences in individuals who experience high orthorexic tendencies provided insight into the struggles and impact orthorexic tendencies have on the individual. Considering the importance of research in the area of orthorexia nervosa, the current thesis adds valuable insight into unique elements of perfectionism, disordered eating, mental health and quality of life in relation to ON and offers guidance on potential mindfulness-based/self-compassion-based intervention for orthorexic population. Furthermore, exploration of different orthorexic measures as well as utilising qualitative methodology provided knowledge in terms of Healthy Orthorexia and Orthorexia Nervosa suggesting that ON is a two-dimensional construct, and in association to appropriate measurement tools such as the self-compassion scale and the mindful eating behaviour scale, the present thesis provides a platform for future prevention, prediction and treatment of ON.

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Appendices

Appendix A: Copies of Published Manuscripts

Appendix A1: Chapter 2 publication

Original Research Article

Exploration of the Mediating Role of Self-Compassion and Mindfulness on Orthorexia Nervosa and Perfectionism

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Abstract

Orthorexia Nervosa (ON) is characterized by an excessive preoccupation with healthy eating, accompanied by increasingly restrictive dietary practices over time. In light of the increased attention to ON, it is noteworthy that the existing body of research, specifically with regard to mindfulness and self-compassion remains constrained in scope and depth. A total of 151 participants over the age of 18 completed scales measuring Orthorexia, Self-Compassion, Mindfulness, and Perfectionism. The findings revealed that individuals exhibiting high levels of ON tended to have low levels of self-compassion and mindfulness, along with high levels of perfectionism. Furthermore, the results indicated that self-compassion and mindfulness acted as mediators in the relationship between perfectionism and orthorexia nervosa. These findings deepen our comprehension of orthorexia and underscore the role of self-compassion and mindfulness, or their absence, as mediating factors in this context. The implications of these results and potential future directions are discussed.

Keywords

Orthorexia nervosa, perfectionism, mindfulness, self-compassion

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Data Availability Statement included at the end of the article

Introduction

Healthy diets have become increasingly popular in recent years as means of achieving optimal health and a desire to improve current health or as a preventative measure however these are common underlying features which may lead to orthorexic tendencies (Dunn & Bratman, 2016). Orthorexia nervosa (ON) was first introduced by Bratman in 1997 (Bratman, 2017), who described ON as an obsessive fixation on healthy eating. While healthy eating is a desirable health behaviour for some individuals the drive for healthy eating may include obsessive thoughts, compulsive behaviours and self-punishment and these are symptoms which collectively have been defined as ON (Bratman, 2017). Individuals with orthorexic tendencies focus purely on food quality and purity (Koven & Abry, 2015) and spend significant time planning and preparing meals that adhere to their food rules. Many individuals who display ON eliminate specific food groups which they consider unhealthy (Dunn & Bratman, 2016). Over time, these restrictions become more extreme resulting in the lack of enjoyment of food, as well as potentially resulting in malnutrition and further medical complications (Brytek-Matera et al., 2017; Cena et al., 2018; Dunn & Bratman, 2016).

The clinical recognition of Orthorexia Nervosa (ON) as an eating disorder remains debated despite the proposal of multiple diagnostic criteria; its absence in the DSM-5 is noteworthy (Donini et al., 2004; Koven & Abry, 2015). ON shares characteristics with established eating disorders (Bartel et al., 2020), and research indicates a link between prior eating disorders and ON development, manifesting as a shift from quantity to quality of food obsession, serving as a socially acceptable weight control strategy for those with disordered eating histories (e.g. Hanganu-Bresch, 2019; McComb & Mills, 2019). Considering the common characteristics between eating disorders and orthorexia, it is important to explore factors that have led to the development and maintenance of eating disorders. One of these factors is perfectionism, perfectionism is a construct with multiple components including high personal standards, excessive concern over mistakes, fear of negative evaluations and self-criticism (Frost et al., 1990). It has been extensively researched in the development and maintenance of eating disorders (e.g., Bardone-Cone et al., 2007; Brown et al., 2012; Franco-Paredes et al., 2004; Rand-Giobannetti et al., 2022), as well as treatment of eating disorders (Bardone-Cone et al., 2009; Egan et al., 2011; Goldstein et al., 2014). A recent systematic review has suggested that perfectionism interventions have been shown to reduce disordered eating and Bulimia Nervosa (Robinson & Wade, 2021). One of the main features of ON is the strict adherence to dietary rules and experiencing self-criticism when deviating from these rules (Bratman, 2017; Mathieu, 2005), this aligns with the components of perfectionism outlined earlier (Frost et al., 1990).

Several researchers have investigated ON and perfectionism (e.g., Barnes & Caltabiano, 2016; Miley et al., 2022; Pratt et al., 2023; Yung & Tabri, 2022). Barnes and Caltabiano (2016) found that elevated levels of perfectionism have been associated with greater orthorexic tendencies. These findings were corroborated by Novara and colleagues (2022) who conducted a cross-sectional study investigating

perfectionism and orthorexia and found that individuals classified under a high orthorexic group demonstrated higher levels of perfectionism compared to those in a lower orthorexic group, individuals with orthorexic tendencies scored highest on the subscales of personal standards and organisation. Additionally, they found that those higher in the orthorexic group displayed higher levels of depression (Novara et al., 2022) suggesting that individuals could experience compromised social functioning and depressive mood, which is central to ON (Oberle et al., 2020). This suggests that perfectionism influences orthorexia. However, research has also suggested that the relationship between orthorexia and perfectionism is weaker compared to other eating disorders (Bartel et al., 2020). Given that perfectionism is a significant factor in eating disorders, and considering that orthorexia shares similar characteristics with such eating disorders, it becomes essential to explore perfectionism further within the context of orthorexia.

Mindfulness and self-compassion are closely correlated constructs that have been extensively researched in the context of eating disorders, disordered eating and perfectionism (e.g., Braun et al., 2016; Ferreira et al., 2014; Manova & Khoury, 2023; Tobin & Dunkley, 2021). According to Kabat-Zinn (2003), mindfulness is a psychological concept that entails paying conscious attention to both internal and exterior phenomena such as feelings, thoughts, and bodily sensations without passing judgment. Neff (2003a) has defined self-compassion as understanding that suffering and failure are all part of the human experience, with three key components of self-kindness, shared humanity and mindfulness. As these are closely related there are key differences between the constructs, self-compassion is utilised when facing challenges, personal failures, inadequacies and alleviating suffering (Neff & Knox, 2017) whereas mindfulness is about all experiences and not just the challenging ones in the present moment (Siegel et al., 2009). In other words, self-compassion measures mindfulness in response to suffering, while mindfulness is a more holistic measurement tool that explores both positive and negative experiences. Also, the self-compassion scale fails to capture the facets of mindfulness, such as the ability to observe, describe, and act with awareness in the present moment. Research on ON, mindfulness and self-compassion is limited with only three studies (Kalika et al., 2022, 2023; Stahler, 2020). Results from these studies demonstrated that self-compassion and mindfulness are negatively correlated to ON suggesting that those with high orthorexic tendencies display lower levels of mindfulness and self-compassion. These results align with research on perfectionism and mindfulness where those who score highly on perfectionism are in the state of mindlessness which prevents them from being aware of the present moment (Flett et al., 2020), suggesting merit in further exploring the link between orthorexia, perfectionism and mindfulness. Furthermore, James and Rimes (2017) showed that students who experienced difficulties with perfectionism and were placed in mindfulness-based cognitive therapy showed higher levels of mindfulness and self-compassion post-treatment. Previous studies (Kuyken et al., 2010; Manova & Khoury, 2023) found mindfulness and self-compassion to act as mediators between perfectionism and social anxiety and depression, which provide empirical support for

investigating similar relationships in the context of orthorexia. Social anxiety, depression, impaired social functioning, and impaired mood are mentioned as key concepts that are predictive of orthorexia (e.g., Awad et al., 2021; Baracat et al., 2024; Barlow et al.). Investigating the mediating role of self-compassion and mindfulness is paramount as it allows for a thorough exploration of mental health factors and quality of life, crucial elements in understanding orthorexia (Kalika et al., 2023). This approach recognizes the intricate connections among these variables and their potential impacts on the development or exacerbation of orthorexia. Given the central emphasis on the challenges and human suffering associated with orthorexia, the potential significance of self-compassion, particularly in comparison to mindfulness, in mediating present and future relationships, holds promise for offering practical solutions to individuals exhibiting high orthorexic tendencies.

The primary objective of this investigation was to examine the connections between orthorexia nervosa (ON), mindfulness, self-compassion, and perfectionism. Notably, no prior research has explored the interrelationships among all of these constructs. Based on existing literature, it is hypothesized that ON will exhibit negative correlations with mindfulness and self-compassion (Kalika et al., 2022, 2023), while showing positive correlations with perfectionism (e.g., Merhy et al., 2023; Miley et al., 2022; Novara et al., 2021). The secondary goal of this study was to investigate the mediating power of mindfulness in the association between perfectionism and orthorexia nervosa. The final objective was to investigate self-compassion as the potential mediator of the relationship between perfectionism and orthorexia nervosa. The complex connections between perfectionism, orthorexia, mindfulness, and self-compassion warrant thorough examination. This study represents the inaugural exploration of these interconnected concepts which will aid in further understanding of orthorexia nervosa.

Methods

Participants

The present study looked at the general population in terms of orthorexia nervosa. A total of 224 participants were initially recruited for the study. However, 73 participants who did not complete the entire study were excluded from the final sample. The sample ($n = 151$) for the present study consisted of 116 females, 31 males, 2 prefer to self-describe as non-binary and 2 participants who preferred not to say, who were all adults (18 years- 67 years; $M = 30.47$, $SD = 10.84$ with a mean Body Mass Index (BMI) of $M = 23.40$ kg/m² ($SD = 4.73$). Correlation with 4 variables based on a power of .8 for medium effect size and set with the significance of .05 comes to a minimum of 118 participants (Cohen, 1992). A total of 111 participants identified as White, 27 as Asian, 5 as Black, 7 as Mixed and 1 as Other. Furthermore, the type of diet was also collected, the sample consisted of 82 Omnivores, 20 occasional omnivores, 16 semi-vegetarians, 6 pescatarians, 10 lacto-ove-vegetarians, 7 lacto-vegetarians and 10 as

vegans. Participants were recruited through volunteering sampling by advertising the study on several social media platforms and forums such as Facebook, Instagram, Twitter and LinkedIn. The advertisement on Facebook has been posted in eating groups requesting individuals to participate in the study. Individuals were also recruited through the university's Research Participation Scheme. Those who participated in the scheme were rewarded with research credits upon completion of the study. Participants were informed via the information sheet that the inclusion criteria for this study required them to be over the age of 18, have good knowledge of the English language and not be diagnosed with an eating disorder.

Materials

Demographic information: a set of questions designed to collect general information about participants. Participants were required to report their age, gender, ethnicity, weight, height and type of diet e.g., omnivore, occasional omnivore, semi-vegetarian, pescatarian, lacto-ove-vegetarian, lacto-vegetarian, vegan.

Orthorexia Nervosa Inventory (ONI). The scale was developed by [Oberle et al. \(2020\)](#). It is a measure of ON symptomatology which includes 24 items assessing 3 factors of orthorexic behaviours such as impairments, behaviours and emotions. It utilises a 4-point Likert scale with the following responses: 1 (not at all true) to 4 (very true). The higher total score indicates a greater severity of ON, [Oberle et al. \(2020\)](#) has suggested a score of minimum of 72 to indicate orthorexic tendencies. Sample question are "My healthy eating is a significant source of stress in my relationships" and "I follow a healthy diet with many rules". The Cronbach alpha for the present study was .97. Additionally, the Cronbach alpha was calculated for the subscales; impairments was .94, behaviours was .92 and emotions was .89. Previous studies have looked at psychometrics of this scale indicating good convergent and criterion validity ([Oberle et al., 2020](#); [Zagaria et al., 2023](#)) with [Messer et al. \(2023\)](#) utilising this scale for further validation of orthorexia nervosa symptoms.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). This is a shorter version of the original 39-item FFMQ. This scale was developed by [Baer et al. \(2008\)](#) and includes 15 items that measure five facets Observing, Describing, Acting with Awareness, Non-Judging and non-reactivity. This scale utilises a 5-point Likert scale with the following responses: 1 (never true) to 5 (always true). A score is combined for each facet of the scale, with no minimum threshold. Sample questions include "I do jobs or tasks automatically without being aware of what I'm doing" and "I find myself doing things without paying attention". The Cronbach alpha for the present study was .67. Additionally, the Cronbach alpha was calculated for the subscales; observing was .56, describing was .73, acting with awareness .80, non-judging of inner experience was .86 and non-reactivity was .67. The convergent and discriminant validity of the scale was established in previous research ([Bohlmeijer et al., 2011](#)).

Self-Compassion Scale (SCS). This is the original 26-item SCS, it was developed by [Neff \(2003b\)](#) to measure self-compassion. The items are rated on a 5-point Likert scale with the following responses, 1 (never) to 5 (always). This scale includes three compassionate components and three uncompassionate components; the uncompassionate components are reversed scored, these components are self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification. Sample questions include “When I fail at something important to me I become consumed by feelings of inadequacy” and “I try to be loving towards myself when I’m feeling emotional pain”. The Cronbach alpha for the present study was .93. Additionally, the Cronbach’s alpha was calculated for the subscales; self-kindness was .83, self-judgement was .84, common humanity was .81, mindfulness was .75 and over-identified was .71. This scale is a valid measure of self-compassion as research indicates strong predictive validity such as group validity ([Neff, 2003b, 2015; Neff & Pommier, 2013](#)) and good convergent validity ([Neff et al. 2007](#)).

Frost Multidimensional Perfectionism Scale (FMPS). This scale was originally developed by [Frost et al. \(1990\)](#), however, the current study is looking at [Stöber \(1998\)](#) version which contains four subscales instead of six. There are 35 items measuring perfectionism. The subscales are Concern over Mistakes and doubts about actions, Excessive concern with parents’ expectations and evaluations, Excessively high personal standards and Concern with precision, order and organisation. Each item is scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample questions include “My parents wanted me to be the best at everything” and “I am very good at focusing my efforts on attaining a goal”. The Cronbach alpha for the present study was .95. Additionally, the subscales were calculated Concern over Mistakes and doubts about actions had .93, Excessive concern with parents’ expectations and evaluations had .93, Excessively high personal standards had .83 and Concern with precision, order and organisation had .88. The validity of the measure was tested by [Hewitt et al. \(1991\)](#) indicating that the scale has good validity.

Procedure

The study received Ethical approval from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited through social media groups and were encouraged to share the study with their connections. They were provided with information about the study, including the criteria for inclusion and exclusion, and the hyperlink to Qualtrics where they could access the questionnaire. Additionally, the university’s Research Participation Scheme was employed offering research credits to individuals who participated. Participants were given a Participant Information Sheet to read, prior to consenting. Participants consented and created a unique code for identifying data in the event of withdrawal. Participants were asked to complete demographic information, ONI, FFMQ, SCS-SF and FMPS. After completion, participants were provided with a debrief form

explaining the objectives of the study and the withdrawal process. The study consisted of a single 20-minute online session.

Data Analysis

Prior to conducting the analysis of the data, assumptions were tested, although options such as bootstrapping and heteroscedasticity-consistent inference can bypass the necessity for normality and homoscedasticity (e.g., Preacher & Hayes, 2008). Firstly, the data was checked for outliers. Cook's distance was used, and the range was between 0 and .104 which indicated that there were no outliers. According to Hair et al. (2010) the values between 2 to -2 for Skewness and 7 to -7 for Kurtosis are normal. The assumptions for normality were examined using the Skewness and Kurtosis. Skewness scores for ONI, SCS, FFMQ and FMPS were .82, -.08, -.61 and .05. Kurtosis scores for ONI, SCS, FFMQ and FMPS were -.39, -.62, .94 and -.61. So, the data met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 2.7 which is below the value of 5 (Tabachnick & Fidell, 2007) meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0; IBM Corp., 2017). Pearson's bivariate correlations were conducted to assess the associations between Orthorexia (ONI), Mindfulness (FFMQ), Self-compassion (SCS) and Frost Multidimensional Perfectionism Scale (FMPS). (see Table 1).

Furthermore, mediation analysis was used to evaluate the indirect effects (via self-compassion and mindfulness) of perfectionism on orthorexia nervosa (see Figure 1 and 2). Hayes' (Preacher & Hayes, 2008) PROCESS macro (v3.3) was installed on SPSS (version 25.0) and was used to conduct mediation analyses (model 4) using 10,000 bootstrapping resamples to generate 95% bias-corrected confidence intervals for the indirect effect (Preacher & Hayes, 2008). According to specified guidelines using mediation analyses, Fritz and MacKinnon (2007) suggested that a sample size of 148 participants would enable research to observe an indirect effect of a small-medium sized alpha pathway coefficient (i.e. predictor to mediator) and a small-medium sized beta pathway coefficient (i.e. mediator to criterion) at 80% power using bias-corrected bootstrapping estimating procedures.

Results

A multiple correlation analysis has been used to identify which scales (BMI, SCS, FFMQ and FMPS) relate to ONI.

Inter-correlations between ONI, BMI, SCS, FFMQ and FMPS, are presented in Table 1 with $r < 0.3$ indicating a weak correlation, $0.3 \leq r < 0.5$ indicating a moderate correlation and $r \geq 0.5$ indicating a strong correlation (Ratner, 2009). Findings indicate that there are significant negative relationships between ONI and FFMQ ($p < .001$), SCS ($p < .001$) and FMPS ($p < .001$) Only BMI was not significant concerning ONI. In

addition, correlational analysis on the subscales of ONI was performed results are presented in [Supplementary Table 2](#) found in supplementary materials. A further correlation analysis has been conducted between the ONI, and subscales of FFMQ, SCS and FMPS, the findings are presented in [Supplementary Table 3](#) found in supplementary materials.

The mediational model analyses (see [Figure 1](#)) used orthorexia as the dependent variable, perfectionism as independent variable, and self-compassion as potential mediator. The c indicated a significant relationship between perfectionism and orthorexia $b = .428, p < .001, 95\%CI [.309, .548]$. Pathway a showed that perfectionism predicted self-compassion $b = -.022, p < .001, 95\%CI [-.027, -.018]$, however for

Table 1. Bivariate Correlations Between ONI, BMI, FFMQ, SCS and FMPS and Descriptive Statistics.

	1	2	3	4	M	SD
(1) ONI					46.66	19.05
(2) BMI	.001				23.38	4.72
(3) FFMQ	-.427**	.178*			45.56	7.35
(4) SCS	-.470**	.179*	.663**		2.74	.83
(5) FMPS	.490**	.019	-.382**	-.648**	92.40	23.79

Note. ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS-SF: Self-Compassion Scale. FMPS: Frost Multidimensional Perfectionism Scale.

*Correlation is significant at the .05 level.

**Correlation is significant at the .01 level.

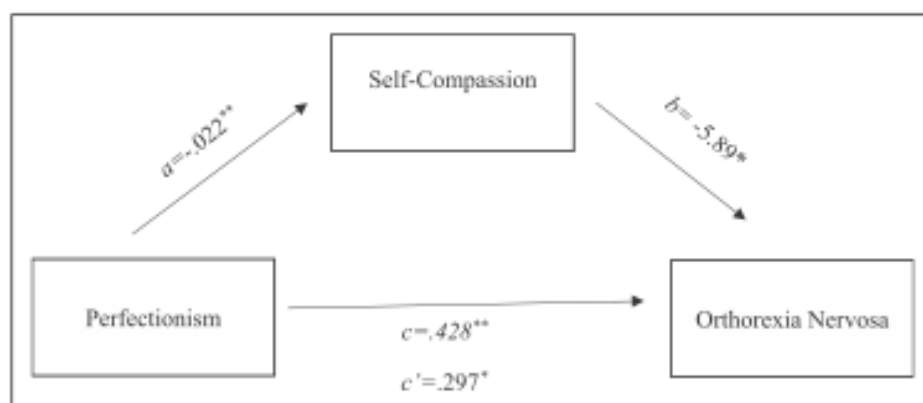


Figure 1. Parallel mediation using standardized regression coefficients to examine the interaction of self-compassion in the relationship between a) Perfectionism and b) orthorexia nervosa. Notes: a is the effect of perfectionism on self-compassion; b is the effect of self-compassion on orthorexia nervosa; c is the effect of perfectionism on orthorexia nervosa; c' is effect of perfectionism on orthorexia nervosa with self-compassion in the model.

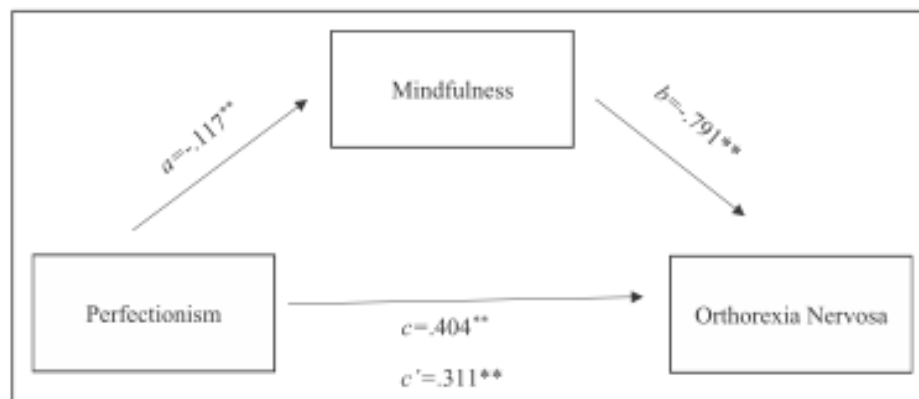


Figure 2. Parallel mediation using standardized regression coefficients to examine the interaction of mindfulness in the relationship between a) Perfectionism and b) orthorexia nervosa. Notes: *a* is the effect of perfectionism on mindfulness; *b* is the effect of mindfulness on orthorexia nervosa; *c* is the effect of perfectionism on orthorexia nervosa; *c'* is effect of perfectionism on orthorexia nervosa with mindfulness in the model.

pathway b self-compassion did predict orthorexia $b = -5.89$, $p < .05$, 95%CI [-10.37, -1.42]. When self-compassion was included in the mediation model, it remained significant $b = .297$, $p < .005$, 95%CI [.143, .451], this therefore suggests that the relationship between restrained eating and orthorexia is mediated by self-compassion.

The second mediational model analyses (see Figure 2) used orthorexia as the dependent variable, perfectionism as an independent variable, and mindfulness as potential mediator. The *c* indicated a significant relationship between perfectionism and orthorexia $b = .404$, $p < .001$, 95%CI [.284, .523]. Pathway a showed that perfectionism predicted mindfulness $b = -.117$, $p < .001$, 95%CI [-.166, -.069], however for pathway b mindfulness did predict orthorexia $b = -.791$, $p < .005$, 95%CI [-1.19, -.389]. When mindfulness was included in the mediation model, it remained significant $b = .311$, $p < .001$, 95%CI [.187, .434], this therefore suggests that the relationship between perfectionism and orthorexia is mediated by mindfulness.

Discussion

This study represents the inaugural exploration of the connections between orthorexia nervosa, perfectionism, mindfulness and self-compassion, with the potential to develop further relevant research and interventions. The results of this study corroborate prior findings demonstrating a consistent negative relationship between mindfulness and self-compassion and orthorexia nervosa (Kalika et al., 2022, 2023; Stahler, 2020). Findings suggest that individuals who display higher levels of orthorexic tendencies display lower levels of self-compassion and mindfulness. These results also align with existing research on eating behaviours and mindfulness, as mindfulness has been linked

to lower levels of disordered eating (Beshara et al., 2013; Dutt et al., 2019; Mantzios et al., 2018, 2019; Mantzios & Wilson, 2013, 2014, 2015). Three of the subscales were negatively correlated with ON, these were *non-judgement*, *acting with awareness* and *describing*, which follows recent findings (Kalika et al., 2022). Unsurprisingly individuals with orthorexic tendencies display high levels of judgement as research has shown that those who violate their food rules display elevated levels of distress, self-judgement and self-punishment (Bratman, 2017; Koven & Abry, 2015).

A key concept of self-compassion is self-kindness (Neff, 2003a), the present study has found that the self-kindness subscale had the lowest levels in relation to orthorexia. Having lower levels of self-compassion might indicate that individuals with orthorexic tendencies will not view orthorexic eating as a way of being kind to themselves as research suggests that they engage in their eating as a means of improving their health (which could be viewed as an act of self-kindness. A qualitative study done by Lewthwaite and LaMarre (2022) supports these findings as they have found that orthorexic individuals acknowledged that restrictive eating was not viewed as an act of self-kindness. However, others recognised that having dietary flexibility where they consumed treats and occasional unhealthy foods was an act of self-kindness as it allowed them to become more healthful individuals. This could potentially mean that there is a distinctive difference between healthy orthorexia and orthorexia nervosa proposed by Roncero et al. (2021). Healthy orthorexia refers to non-pathological healthy eating and interest in nutrition, whereas orthorexia nervosa refers to disordered eating that is characterised by obsessive preoccupation with healthy eating (Zickgraf & Barrada, 2021). Therefore, those who display healthy orthorexia could have higher levels of self-compassion and mindfulness as they acknowledge that there needs to be flexibility in terms of eating (Lewthwaite & LaMarre, 2022) whereas those with orthorexia nervosa could potentially have low levels of self-compassion and mindfulness.

Investigating perfectionism was also one of the main aims of this study. The present study reveals that individuals with higher orthorexic tendencies display higher levels of perfectionism. The findings are replicated in accordance with findings in past literature (e.g., Merhy et al., 2023; Miley et al., 2022; Novara et al., 2021). Furthermore, the subscales are also positively correlated with ON except for the *Organisation* subscale, which is no surprise as the *Organisation* subscale is removed from the total score (Stöber, 1998) due to not being problematic and a subscale designed for the assessment of constructive qualities. *Concern over mistakes and doubts subscale* had the highest positive correlation out of all of the subscales followed by the *Excessive concern with parent's expectations* which is an unexpected finding. High levels of *Concern over mistakes and doubts* have been associated with higher levels of anorexia nervosa and bulimia nervosa (e.g., Boisseau et al., 2013; Bulik et al., 2003) and eating pathology (Davies et al., 2009; Egan et al., 2011). Due to ON having similar characteristics to other eating disorders, this relationship aligns with past literature. Furthermore, individuals with high orthorexic tendencies set themselves strict dietary rules that require them to spend a significant amount of time researching to choose the most appropriate foods according to their rules (Bratman, 2017). If they do not adhere to their rules then

the individual experiences self-hatred, self-criticism and guilt (Bratman, 2017; Mathieu, 2005). High scores on *Excessive concern with parental expectations* subscale is an unexpected finding. Research has suggested that ON is mostly influenced by desire to achieve optimal health, improving general health (Bratman, 2017; Dunn & Bratman, 2016) and social media exposure (Turner & Lefevre, 2017). However, a qualitative study done by Cheshire and colleagues (2020) highlighted that parental influences emerged as significant in the development of orthorexia, this could either be the extreme religious beliefs in the family, parental dietary choices or challenging relationships with parents thus expressing themselves through eating. However, the sample of this study included health care professionals and those who self-diagnosed with orthorexia nervosa, potentially suggesting that the sample might not entirely reflect a true representation of orthorexia nervosa. Additionally, majority of the sample was female therefore the findings could potentially not be replicated in a male sample. This is the only study that has highlighted a link between parental expectations and orthorexia, therefore further explorations should be conducted in a sample that consists of individuals who score highly on diagnostic measures of orthorexia nervosa.

Additionally, the present study has conducted two mediations where self-compassion and mindfulness acted as mediators in the relationship between perfectionism and orthorexia nervosa. Both self-compassion and mindfulness were significant mediators, which is a novel finding in relation to orthorexia research. Based on the past literature both of these concepts have been successful mediators where perfectionism was one of the variables. For example, Manove and Khoury (2023) found that mindfulness was a successful mediator between perfectionism and societal anxiety, according to the diagnostic criteria distress or impairment of social functioning is a characteristic of orthorexia nervosa (Dunn & Bratman, 2016) Furthermore, mindfulness was also a successful mediator between perfectionism and negative thoughts (Short & Mazmanian, 2013), highlighting that mindfulness could be a significant mediator as orthorexic individuals experience negative thoughts when deviating from their dietary rules (Dunn & Bratman, 2016). Additionally, self-compassion was a successful mediator in the relationship between restrictive eating and orthorexia nervosa (Kalika et al., 2022). The significant mediating roles of self-compassion and mindfulness underscore their potential importance in understanding the mechanisms underlying orthorexia, and the alignment with prior research on perfectionism.

Limitations

The present study has a number of limitations. There is a debate in terms of which orthorexia measure seems more viable. The current study has used the Orthorexia Nervosa Inventory (Oberle et al., 2020) which is the newest measure of orthorexia, therefore, has been used a limited amount in the research (Kalika et al., 2022; Kaya et al., 2021; Oberle et al., 2020). As previously discussed, there could be differences between mindfulness and self-compassion if other measures of orthorexia are used. For example, Kalika et al. (2023) demonstrated that there was no association between

mindful eating and orthorexia when using the Dusseldorf Orthorexia Scale; however, [Kalika et al. \(2022\)](#) used the ONI which demonstrated a positive correlation with mindful eating. Therefore, future research into self-compassion and mindfulness should utilise other measures of orthorexia to establish if the findings are replicated. A prospective avenue for further exploration lies in examining the ramifications of healthy orthorexia and the dual capacity of mindfulness-based constructs to both foster and undermine manifestations of both constructive and detrimental forms of orthorexia.

A caution should be taken when interpreting the results due to the small number of participants in this study as well as ratio between the genders. Future studies should utilise higher sample size as well as making sure that the gender ratio is equal as these are important for the generalizability of the study.

Future Directions

As demonstrated by the present study, self-compassion and mindfulness have a mediating capacity with orthorexia. Future research should look into experimental approaches utilising mindfulness and self-compassion-based interventions to determine their effectiveness in reducing orthorexic tendencies. Orthorexia nervosa has gained a lot of popularity with research looking at cross-sectional data, therefore utilising an experimental approach will add further insight into many much-needed interventions for orthorexia.

Furthermore, there is a need for qualitative research when it comes to mindfulness and self-compassion in the orthorexic population. Currently, there is limited literature that explored orthorexia qualitatively (e.g., [Cheshire et al., 2020](#); [Valente et al., 2020](#); [White et al., 2021](#)) and to date, no one looked at mindfulness, self-compassion and ON specifically. Gaining a deeper understanding of those concepts would allow further development of potential interventions for the orthorexic population.

Conclusion

In conclusion, ON is positively correlated with perfectionism and negatively correlated to mindfulness and self-compassion. The present study has also conducted a mediation analysis which revealed that mindfulness and self-compassion can successfully mediate the relationship between perfectionism and orthorexia nervosa. The study offers a novel approach to understanding perfectionism with orthorexia, highlighting that self-compassion and mindfulness can be used as key components in much-needed interventions for orthorexia nervosa. Further research needs to explore these concepts further, especially experimentally and qualitatively as this would aid in further understanding of orthorexia nervosa.

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Author Contributions

Eliza Kalika designed the study, collected data, conducted data analyses, and wrote the manuscript. Michail Mantzios, Helen Egan and Misba Hussain supported the study and critically reviewed the manuscript. All authors read and approved the final manuscript.

Declaration of Conflicting Interests

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Ethical Statement

Ethical Approval

The study was approved by the ethical review board of the University and was in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments. This article does not contain any studies with animals.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

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Data Availability Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Supplemental Material

Supplemental material for this article is available online.

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Helen Egan is a Professor in Health Psychology at Birmingham City University, her research areas include Mindfulness and Self-compassion and their influence on Health Behaviours, especially eating behaviours. She has a particular interest in the health and

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Dr. Michail Mantzios is a distinguished academic and researcher in the fields of health psychology and mindfulness. He was given the title of Professor of Applied and Experimental Psychology at Birmingham City University, where his work focuses on exploring the intersections of mindfulness-based constructs, and the impact of related interventions, such as mindful eating and mindful self-compassion, with eating behaviours and health outcomes. In addition to his research, Dr. Mantzios is dedicated to teaching and mentoring students, fostering the next generation of scholars in psychology.



Exploring the moderating role of mindfulness, mindful eating, and self-compassion on the relationship between eating-disordered quality of life and orthorexia nervosa

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Abstract

Orthorexia nervosa (ON) is characterised by an obsessive focus on healthy eating, following restrictive dietary practices and dietary restrictions escalating over time. The aim of this study was to explore mindfulness, mindful eating, self-compassion and quality of life in a female population. Two hundred eighty-eight participants completed Orthorexia, Self-Compassion, Mindful eating, Mindfulness and Eating Disorder Quality of Life scales. The results indicated that there was a negative relationship between ON and mindfulness, self-compassion and mindful eating. Furthermore, the present study found a positive relationship between lower quality of life and ON, while findings indicated that self-compassion and the awareness facet of mindfulness moderated the relationship between ON and QOL. The present results contribute to a better understanding of orthorexic eating behaviours in a female population, and identify the moderating capacity of self-compassion and mindfulness. Further implications and future directions are discussed.

Level of evidence Level V, cross-sectional descriptive study.

Keywords Orthorexia Nervosa · Mindfulness · Mindful eating · Self-compassion · Quality of life

Introduction

Research has shown that engaging in restrictive rituals for healthy eating can lead to the development of Orthorexia Nervosa (ON) (e.g., [14, 18]). ON was defined as an obsessive fixation on healthy eating [11]. Individuals who display orthorexic tendencies place significant emphasis on food quality and purity and spend a significant amount of time planning and preparing healthy meals [48]. The imposition of extreme restrictions can result in malnourishment and medical complications [15, 28], as well as severely reduce the enjoyment of food [18].

In social climates where engaging in extreme dieting restrictions is normalised and endorsed, distinguish between ON and healthy eating can be challenging. Bratman [11] proposes that symptomology including obsessive thoughts, compulsive behaviours, self-punishment and

extreme restrictions help to distinguish healthy eating from ON. Currently, there are no diagnostic criteria for ON in the classification system (American Psychological Association [APA], 2013), although some recent literature has proposed guidelines that meet consensus by researchers and clinicians [25], indicative of progress in the field to a universal definition and descriptive factors, which are to be translated to diagnostic tools and measurements through future research.

Currently, however, the lack of one universally accepted diagnostic tool contributes to widely varying prevalence rates between 1 and 82.7% (e.g., [16], Depa et al., 2017; [72, 75]). In addition, some researchers identified that the scales used in the past may have overestimated the prevalence of orthorexic eating behaviours (e.g., [73]), adding to the immense difference in prevalence rates. The present study utilised a new assessment tool referred to as the Orthorexia Nervosa Inventory (ONI) [72] to measure orthorexia, which met consensus in more closely measuring orthorexia by developers of other scales and pioneers in the field of orthorexia [25], Niedzielski & Kazmierczak-Wojtas, 2021). This tool takes into consideration the preoccupation with healthy food, physical and psychosocial impairments and emotional distress factors, which are all central to the conceptualisation

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of ON [72]. Significantly, elements that are accounted for in measuring ON propose implications for quality of life, especially when considered in parallel literature that has looked into disordered eating.

Quality of life (QoL) is defined as a patient-centred method of appraising the impact of symptoms on the individual's health [32]. Individuals with AN, Bulimia Nervosa (BN) and Binge Eating Disorder (BED) have reported worse QoL than the general population (e.g., Agh et al., 2016, [21, 22, 41, 61, 95]). Research has shown that people with ON also experience reduced QoL due to self-punishment following dietary violations (Koven & Arby, 2015), avoidance of social gatherings where food is involved leading to social isolation [28], depression and anxiety (Bosi et al., 2017). Individuals who have experienced an ED for several years may suffer from impairments in psychological, physical, and social aspects of life [41, 95], but no studies have examined the quality of life specific to eating disorders in individuals who display orthorexic symptoms. While targeting QoL directly is one option, another indirect method of potentially enhancing QoL, and eating regulation that remains healthy and steers clear of orthorexia symptoms may be through mindfulness-based traits and interventions.

Mindfulness is defined as a psychological concept that involves consciously attending to external and internal experiences such as emotions, thoughts, and bodily sensations in a non-judgmental way [42]. Reviews of empirical research have indicated that mindfulness-based interventions (MBI) have improved psychological and physical well-being [20, 45]. Numerous studies also show that mindfulness has a positive effect on the quality of life, including in healthy individuals, patients with ulcerative colitis, asthma, multiple sclerosis, depression, and schizophrenia [39, 47, 78], Rayan & Ahman, 2016; [81]. One form of mindfulness, directed specifically towards the eating process is mindful eating. Mindful eating is defined as sustained attention to a sensory element of the eating experience (e.g., taste) and a non-judgmental (or non-evaluative) awareness of thoughts and feelings that are incongruent with the sensory elements of the present eating experience [50]. Within explorations of eating behaviours, mindful eating has been shown to challenge motivations. Mantzios et al. (2019a, b) discovered that mindful eating interventions inspire a gradual shift from external motivations to internal motivations, which is linked to healthier eating behaviours [55, 57–59, 96]. Only one study has looked at mindful eating and self-compassion in relation to ON, and the findings suggested that mindful eating was not associated with ON, which was mostly attributed to the vegan population that was recruited and the naturally more restrictive diet, but self-compassion displayed a negative association with ON [43].

Another MBI that could be useful is founded in the theory of self-compassion, which is linked to mindfulness and

mindful eating, and the relation to eating behaviours and food consumption [53, 54]. The understanding that suffering, inadequacy, and failure are all part of the human experience is descriptive as self-compassion [68]. Self-kindness, shared humanity, and awareness are the three components of this concept, and higher levels of self-compassion are linked to higher levels of happiness, life satisfaction and lower levels of shame, depression, and anxiety [69, 70]. Furthermore, Ferreira et al. (2013) have found that lower levels of self-compassion are associated with higher levels of body dissatisfaction, drive for thinness and eating disorder pathology. The nature of self-judgement can evoke distress, which could result in disordered eating, serving as a coping strategy for managing internal and external threats by avoiding criticism due to body shape and weight [35]. However, this can ultimately result in worse negative emotional states. As self-compassion addressed one's thoughts, emotions and experiences with kindness and empathy, this can be used to regulate negative affect and threats (Meyer et al., 2018). A recent systematic review found evidence that self-compassion acts as a protective factor against body dysmorphia and eating disorders [12], whereas Adams and Leary (2007) found that utilising self-compassion intervention with restrictive eaters has reduced their distress-related eating. All these factors are associated with ON, such as restrictive eating [7] and self-judgement [19]. Therefore, utilising self-compassion may reduce the symptoms of ON, and improve the quality of life of an individual that displays orthorexic tendencies.

The first aim of this study was to explore mindfulness, self-compassion, mindful eating and orthorexia in the female population due to a greater prevalence of orthorexia in female samples (e.g., [23, 36], Parra Fernandez, 2018; [80]). The second aim of this study was to explore whether mindful eating, self-compassion and mindfulness moderate the relationship between ON and QoL. To our knowledge, only one study looked at mindfulness [84], and another study looked at mindful eating and self-compassion [43]. In accordance with previous literature, it is hypothesised that mindful eating, self-compassion and mindfulness will be negatively correlated with ON. Furthermore, the present study aimed to investigate eating disorder quality of life, which is based on the literature on quality of life in eating disorders and a novel investigation in the orthorexia literature, with a hypothesis that individuals with high orthorexic tendencies would demonstrate a lower quality of life. Additionally, the potential of mindfulness-based constructs moderating this relationship between orthorexia and QoL will be further explored.

Methods

Participants

The sample for the present study consisted of 288 female participants who were all adults (18 years or over; $M = 24.79$, $SD = 7.08$) with a mean Body Mass Index (BMI) of $M = 24.26$ kg/m^2 ($SD = 6.45$). A total of 69.1% of participants identified as White, 19.8% as Asian, 3.5% as Black, 2.8% as Mixed and 4.9% as Other. Furthermore, the type of diet was also collected, the sample consisted of 75.4% of Omnivores, 22.2% of vegetarians and 2.4% as vegans. Participants were recruited through volunteering sampling by advertising the study on several social media platforms and forums such as Facebook, Instagram, Twitter, LinkedIn and MiniMins. The advertisement on Facebook has been posted in healthy eating groups requesting individuals to participate in the study. Individuals were also recruited through the university's Research Participation Scheme. Those who participated in the scheme were rewarded with research credits upon completion of the study. Participants were informed via the information sheet that the inclusion criteria for this study required them to be over the age of 18, have good knowledge of the English language and not be diagnosed with an eating disorder.

Materials

Demographic information: a set of question designed to collect general information about participants. Participants were required to report their age, gender, ethnicity, weight, height and type of diet e.g., vegan, semi-vegetarian, omnivore etc.

Orthorexia Nervosa Inventory (ONI). Scale developed by Oberle et al. [72]. It is a measure of ON symptomatology which includes 24 items assessing 3 factors of orthorexic behaviours such as impairments, behaviours and emotions. It utilises a 4-point Likert scale with the following responses: 1 (not at all true) to 4 (very true). The higher total score indicates greater severity of ON. Sample questions include "Just the thought of me eating something unhealthy makes me very anxious". The Cronbach alpha for the present study was 0.947. Additionally, the Cronbach alpha was calculated for the subscales, impairments were 0.918, behaviours were 0.873 and emotions were 0.857.

Five-Facet Mindfulness Questionnaire- Short Form (FFMQ). This is a shorter version of the original 39-item FFMQ. This scale was developed by Baer et al. [5] and includes 15 items that measure five facets such as Observing, Describing, Acting with Awareness, Non-Judging of

inner experience and non-Reactivity. This scale utilises a 5-point Likert scale with the following responses: 1 (never true) to 5 (always true). A score is combined for each facet of the scale. Sample questions include "I find myself doing things without paying attention". The Cronbach alpha for the present study was 0.736. Additionally, the Cronbach alpha was calculated for the subscales, observing was 0.485, describing was 0.807, acting with awareness 0.714, non-judging of inner experience was 0.776 and non-reactivity was 0.637.

The Mindful Eating Behaviour Scale (MEBS). Scale developed by Winkens et al. [94], it contains 17 items that measures four components of mindful eating, these are focused eating, hunger and satiety cues, eating with awareness and eating without distraction. This scale utilises a 5-point Likert scale with the following responses 1 (never) to 5 (always). The higher the score the more mindful the individual. It is recommended by the author to use the four subscales separately rather than producing a total score. Sample questions include "I notice how my food looks". The Cronbach alpha for the present study was 0.790. Additionally, the Cronbach alpha was calculated for the subscales, eating while focusing on the food was 0.875, eating while paying attention to hunger and satiety cues was 0.894, being aware of eating was 0.907 and eating while not being distracted was 0.780.

Self-Compassion Scale-Short Form (SCS-SF). This is a shorter form of the original 26-item SCS, it was developed by Raes et al. [77] to measure self-compassion. The items are rated on a 5-point Likert scale with the following responses, 1 (never) to 5 (always). This scale includes three compassionate components and three uncompassionate components, these components are self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification. Sample questions include "I try to see my failings as part of the human condition". The Cronbach alpha for the present study was 0.814.

Eating Disorder Quality of Life (EDQOL). Scale developed by Engel et al. [33] and it measures the impact of eating disorder symptoms on the individual's quality of life. It includes 25-items which measure four domains: psychological, physical/cognitive, financial and school/work. Answers are given on a 4-point likert scale with the following responses, 0 (never) to 5 (always). The higher scores indicate the worse quality of life. Sample questions include "How often has your eating/weight made you feel lonely". The Cronbach alpha for the present study was 0.951. Additionally, the Cronbach alpha was calculated for the subscales, psychological was 0.947, physical/cognitive was 0.911, financial was 0.931 and work/school was 0.949. Some studies explored the QoL in EDs using generic QoL measures such as SF-36 Health Survey (e.g., [40]). In the present study, the Eating Disorder Quality of Life measure (EDQOL) was

used, which has been shown to be sensitive to the unique characteristics of ED. Engel et al. [32] indicated that QoL is an important element of ED assessment, and generic QoL measures needed to be adapted to account for the unique characteristics of ED.

Procedure

Ethical approval was obtained from the ethical committee of an institution based in the midland region of the United Kingdom. Participants were recruited via forums and social media groups and were asked to share the study with their contacts. They were presented with information about the study such as inclusion and exclusion criteria, and the hyper-link to Qualtrics that directed them to the questionnaire. Furthermore, the university Research Participation Scheme was utilised where individuals gained research credits for participation. Participants were asked to read the information about the research in a Participant Information Sheet, which appeared prior to consenting. Participants consented and created a unique code to identify data in case of withdrawal. Participants were then presented with demographic information, ONI, FFMQ, MEBS, SCS-SF and EDQOL. After completion, the participant was presented with a debrief form that explained the aims of the study and the procedure in case of withdrawal. The study consisted of one online session, which lasted approximately 30 min.

Data analysis

Prior to conducting the analysis of the data, assumptions were tested, despite bootstrapping and heteroscedasticity-consistent inference options eliminating the need for normality and homoscedasticity (e.g., [76]). First, the data were checked for outliers. Cook's distance was used and the range was between 0 and 0.115 which indicated that there were no outliers. According to Hair et al. [37] the values between 2 and - 2 for Skewness and 7 to - 7 for Kurtosis are considered to be normal. The assumptions for normality were examined using Skewness and Kurtosis. Skewness scores for ONI, EDQOL, SCS, FFMQ and MEBS were 1.5, 0.94, 0.16, - 0.08 and - 0.16. Kurtosis scores for ONI, EDQOL, SCS, FFMQ and MEBS were 2.3, 0.29, 0.16, 0.88 and - 0.22. So, the data met the assumption for normality. Multicollinearity was tested using the variance inflation factor (VIF) values, the highest value was 1.5 which is below the value of 5 [87] meeting the assumption. Additionally, P-P plots and residual scatter plots supported linearity and homoscedasticity assumptions. Data analysis was conducted using SPSS software (version 25.0, IBM Corp., 2017. Pearson's bivariate correlations were conducted to assess the associations between Orthorexia (ONI, Mindfulness (FFMQ, Mindful Eating (MEBS, Self-compassion (SCS and Eating Disorder

Table 1 Bivariate correlations between BMI, ONI, FFMQ, MEBS, SCS-SF and EDQOL and descriptive statistics

	1	2	3	4	5	6	7	8	M	SD
(1) ONI									36.25	11.96
(2) BMI	0.056								24.26	6.45
(3) FFMQ	-0.155*	-0.006							45.32	7.02
(4) MEBS- Focused Eating	-0.134*	0.002	0.183**						18.64	4.37
(5) MEBS- Hunger & Satiety	-0.243**	-0.197**	0.175**	0.452*					16.61	4.86
(6) MEBS- Eating with Awareness	-0.179**	-0.110	0.289**	0.214**	0.237**				10.93	3.36
(7) MEBS- Eating without distraction	-0.084	0.012	0.296**	0.058	0.124*	0.508**			12.75	3.48
(8) SCS-SF	-0.160**	-0.055	0.548*	0.078	0.146*	0.131*	0.180**		2.79	0.63
(9) EDQOL	0.605**	0.123*	-0.203**	-0.233**	-0.355**	-0.360	-0.244**	-0.208**	3.78	2.90

ONI Orthorexia Nervosa Inventory, BMI Body Mass Index, FFMQ Five-Facet Mindfulness Questionnaire, EDQOL Eating Disorder Quality of Life Scale, SCS-SF Self-Compassion Scale-Short Form, MEBS Mindful Eating Behaviour Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Table 2 Bivariate correlations between subscales of ONI, SCS, FFMQ, MEBS and EDQOL and descriptive statistics

	1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>
(1) Impairments (ONI)								14.15	5.06
(2) Behaviour (ONI)	0.828**							14.18	4.75
(3) Emotion (ONI)	0.657**	0.651**						8.55	3.47
(4) EDQOL	0.604**	0.461**	0.499**					3.78	2.90
(5) SCS-SF	-0.116	-0.038	-0.274**	-0.208**				2.79	0.63
(6) MEBS	-0.183**	-0.097	-0.342**	-0.442**	0.199**			59.15	10.82
(7) FFMQ	-0.118	-0.007	-0.276**	-0.203**	0.548**	0.345**		45.33	7.03

ONI Orthorexia Nervosa Inventory, FFMQ Five-Facet Mindfulness Questionnaire, EDQOL Eating Disorder Quality of Life Scale, SCS-SF Self-Compassion Scale-Short Form, MEBS Mindful Eating Behaviour Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Quality of Life (EDQOL (see Table 1). A further correlation analysis was conducted to examine the relationships between ONI, subscales of FFMQ and EDQOL (see Table 2).

Furthermore, moderation analysis was used to determine which variables moderated the relationship between orthorexia nervosa on quality of life in the female sample. Hayes' [76] PROCESS macro (v3.3) was installed on SPSS (version 25.0) and was used to conduct moderation analyses (model 1). No covariates were controlled for this moderation model. Participant's BMI has been calculated using the height and weight information provided by the participant.

Results

A multiple correlation analysis has been used to identify which scales (BMI, FFMQ, MEBS, SCS-SF, EDQOL) relate to ONI.

Inter-correlations between BMI, ONI, FFMQ, MEBS, SCS-SF and EDQOL, are presented in Table 1. Findings indicate that there is a significant negative relationship between ONI and Focused eating MEBS ($p=0.029$), Hunger and Satiety MEBS ($p<0.001$), Eating Awareness MEBS ($p=0.004$), FFMQ ($p=0.012$) and SCS ($p=0.008$). The only positive relationship was EDQOL ($p<0.001$). Only eating without Distraction subscale in MEBS was not significant as well as BMI. In addition, correlational analysis

on the subscales of ONI was performed results are presented in Table 2.

A further correlation analysis has been conducted between the ONI, and subscales of FFMQ, and EDQOL, the findings are presented in Table 3. For FFMQ, it showed negative associations with the Awareness subscale ($p<0.001$) and non-judging subscale ($p<0.001$). All other associations were non-significant for the FFMQ scale. Finally, the last scale of EDQOL showed all positive associations with Psychological, ($p<0.001$), Cognitive ($p<0.001$), Financial ($p<0.001$) and Work subscales ($p<0.001$).

The analysis also ran multiple moderation model analyses. The first moderation model analysis used ONI as the independent variable, EDQOL as a dependent variable, and SCS as a potential moderator (see Table 4). The ONI significantly predicted the EDQOL $b=0.15$, $p<0.001$, 95% CI [0.13, 0.18], whereas SCS did not $b=-0.38$, $p>0.05$, 95% CI [-0.84, 0.08]. However, there was a significant ONI x EDQOL $b=0.08$, $p=0.0027$, 95% CI [0.03, 0.13] indicating that there is evidence of SCS acting as a moderator. This has been explored with the use of simple slopes around the EDQOL mean, at the -1SD there was a significant relationship between ONI and SCS $b=0.11$, $p<0.001$, 95% CI [0.07, 0.14], while this remained significant at the EDQOL mean $b=0.15$, $p<0.001$, 95% CI [0.13, 0.18] the effect size has increased. At the +1SD the relationship was still significant $b=0.20$, $p<0.001$, 95% CI [0.16, 0.25] with the

Table 3 Bivariate correlations between ONI and subscales of FFMQ and EDQOL

	EDQOL- Psychological	EDQOL- Cognitive	EDQOL- Financial	EDQOL- Work	FFMQ- Observing	FFMQ- Describe	FFMQ- Awareness	FFMQ- Non- Judging	FFMQ- non- reactivity
ONI	0.481**	0.548**	0.451**	0.439**	0.102	-0.056	-0.210**	-0.335**	0.080

ONI Orthorexia Nervosa Inventory, FFMQ Five-Facet Mindfulness Questionnaire, EDQOL Eating Disorder Quality of Life Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Table 4 Results of moderation analyses using ONI to predict EDQOL with self-compassion as moderators

		SCS			
		<i>Model statistics</i>			
		<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>
Predictors	<i>Predictor statistics</i>				
	<i>b</i>			<i>p</i>	95% CI
ONI	0.15			< 0.001	0.12 to .18
SCS	- 0.38			0.11	- 0.84 to 0.08
Interaction	0.076			0.0027	0.027 to 0.13

SCS: Self-compassion scale. Bold figures indicate significant figures

effect size still increasing. Overall, this analysis suggests that SCS moderates the relationship at all levels between ONI and EDQOL.

The second moderation model analysis used ONI as the independent variable, EDQOL as a dependent variable, and FFMQ and components of FFMQ as potential moderators. The results indicated that the awareness subscale of FFMQ ($p=0.03$) acted as a moderator in the relationship between ONI and EDQOL. This has been explored with the use of simple slopes around the EDQOL mean, at the -1SD there was a significant relationship between ONI and acting

with awareness (FFMQ) $b=0.13$, $p<0.001$, 95%CI [0.10, 0.16], while this remained significant at the EDQOL mean $b=0.16$, $p<0.001$, 95% CI [0.14, 0.19] the effect size has increased. At the +1SD the relationship was still significant $b=0.19$, $p<0.001$, 95% CI [0.15, 0.24] with the effect size still increasing. The rest of the moderators were non-significant. The results are presented in Table 5.

Furthermore, the third moderation model analysis used ONI as the independent variable, EDQOL as a dependent variable, and the four components of MEBS as potential moderators. The results indicated that none of the MEBS components were significant moderators in the relationship between ONI and EDQOL. However, the subscale of Hunger and Satiety was close to the significance level with $p=0.053$. The results are presented in Table 6.

Discussion

The primary aim of the current study was to explore the associations between ON, mindfulness, mindful eating, self-compassion and eating disorder QoL, as well as the potential moderation of self-compassion, mindfulness, and mindful eating. Previous research into orthorexia and mindfulness has stated that there was a negative correlation between the two constructs [84]. The findings in the present study have

Table 5 Results of moderation analyses using ONI to predict EDQOL with mindfulness and constructs of mindfulness as moderators

FFMQ				Describing (FFMQ)				Non-Judgement (FFMQ)			
<i>Model statistics</i>				<i>Model statistics</i>				<i>Model statistics</i>			
<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>
0.61	0.38	50.78	<0.001	0.62	0.38	53.10	<0.001	0.63	0.40	56.59	<0.001
Predictors	<i>Predictor statistics</i>			<i>Predictor statistics</i>			<i>Predictor statistics</i>				
	<i>b</i>	<i>p</i>	95% CI	<i>b</i>	<i>P</i>	95%CI	<i>b</i>	<i>p</i>	95%CI		
ONI	0.15	< 0.001	0.13 to 0.18	0.16	< 0.001	0.13 to 0.18	0.15	< 0.001	0.12 to 0.18		
FFMQ	- 0.05	0.023	- 0.09 to - 0.01	- 0.11	0.052	- 0.22 to 0.001	- 0.18	0.0018	- 0.30 to - 0.07		
Interaction	- 0.001	0.76	- 0.005 to 0.004	- 0.01	0.053	- 0.02 to 0.0001	0.007	0.23	- 0.005 to 0.02		
Observing FFMQ)				Awareness (FFMQ)				Non-Reactivity (FFMQ)			
<i>Model statistics</i>				<i>Model statistics</i>				<i>Model statistics</i>			
<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>
0.61	0.37	49.27	<0.001	0.62	0.38	52.90	<0.001	0.61	0.37	50.07	<0.001
Predictors	<i>Predictor statistics</i>			<i>Predictor statistics</i>			<i>Predictor statistics</i>				
	<i>b</i>	<i>p</i>	95% CI	<i>b</i>	<i>P</i>	95%CI	<i>b</i>	<i>p</i>	95%CI		
ONI	0.16	< 0.001	0.13 to 0.19	0.16	< 0.001	0.14-0.19	0.16	< 0.001	0.13 to 0.19		
FFMQ	0.05	0.43	- 0.07 to 0.17	- 0.07	0.25	- 0.20 to 0.05	- 0.06	0.38	- 0.19 to 0.07		
Interaction	- 0.007	0.21	- 0.02 to 0.005	0.01	0.03	0.001-0.025	- 0.003	0.52	- 0.01 to 0.01		

FFMQ Five Facet Mindfulness Questionnaire. Bold figures indicate significant figures

Table 6 Results of moderation analyses using ONI to predict EDQOL with mindful eating and constructs of mindful eating as moderators

MEBS				Hunger and Satiation (MEBS)				Distraction (MEBS)			
<i>Model statistics</i>				<i>Model statistics</i>				<i>Model statistics</i>			
<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>
0.68	0.27	71.51	<0.001	0.65	0.42	61.63	<0.001	0.63	0.40	55.28	<0.001
Predictors	<i>Predictor statistics</i>			<i>Predictor statistics</i>			<i>Predictor statistics</i>				
	<i>b</i>	<i>p</i>	95% CI	<i>b</i>	<i>p</i>	95% CI	<i>b</i>	<i>p</i>	95% CI		
ONI	0.14	<0.001	0.11 to 0.16	0.14	<0.001	0.12–0.17	0.15	<0.001	0.13 to 0.18		
MEBS	– 0.08	<0.001	– 0.11 to – 0.06	– 0.14	<0.001	– 0.19 to – 0.08	– 0.15	0.001	– 0.24 to – 0.08		
Interaction	– 0.002	0.09	– 0.004 to 0.0003	– 0.004	0.053	– 0.009 to 0.0001	0.001	0.80	– 0.01 to 0.01		
Focused Eating (MEBS)				Awareness (MEBS)							
<i>Model statistics</i>				<i>Model statistics</i>							
<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>	<i>R</i>	<i>R</i> ²	<i>f</i>	<i>p</i>				
0.63	0.39	55.24	<0.001	0.66	0.43	64.50	<0.001				
Predictors	<i>Predictor statistics</i>			<i>Predictor statistics</i>							
	<i>b</i>	<i>p</i>	95% CI	<i>b</i>	<i>p</i>	95% CI					
ONI	0.15	<0.001	0.12 to 0.17	0.15	<0.001	0.12 to 0.17					
MEBS	– 0.11	0.002	– 0.17 to – 0.04	– 0.22	<0.001	– 0.30 to – 0.14					
Interaction	– 0.002	0.36	– 0.007 to 0.003	0.002	0.62	– 0.01 to 0.01					

MEBS Mindful Eating Behaviour Scale. Bold figures indicate significant figures

confirmed the same relationship between orthorexia and mindfulness, and are in line with eating behaviours research and mindfulness, as mindfulness is associated with healthier eating [8, 29, 52–54, 56–59] and protective values against the development of disordered eating [67]. Two of the subscales were related negatively to orthorexia, non-judgement and acting with awareness. Research showed that individuals with orthorexic behaviours display high levels of distress, self-judgement, and self-punishment when dietary violations occur [11, 48]. However, individuals with high orthorexic tendencies displayed low levels of acting with awareness. Such a relationship with acting with awareness goes against findings in the orthorexia literature, as research suggested that such individuals engage in obsessions with nutrition, where their entire focus is on the preparation of food and ensuring the quality of food before consumption [48], which may or may not be a different description of being aware that needs further exploration. Findings may be relevant to recent literature dictating a separation of decision-making around food from mindful eating behaviours [50], and food preparation would certainly not relate to decision-making in the present moment as described in both mindfulness and mindful eating.

Self-compassion and mindful eating have also been investigated in the present study. A previous study by Kalika et al. [43] showed a negative relationship between

self-compassion and ON, but no relationship between mindful eating and ON. The finding in the present study regarding self-compassion has been in accordance with past research [43]. However, mindful eating has also been significant in the present study, which contradicts the findings by Kalika et al. [43]. Thorne et al. [89] also investigated the role of mindful eating on ON and the findings showed that there was a negative relationship between some of the constructs of mindful eating, indicative of proposals for the separation of decision-making for mindful eating from the eating behaviour that occurs as a result of mindful eating guidance. Previous research has shown that self-compassion is associated with a variety of positive eating behaviours, individuals with higher levels of self-compassion tend to have lower levels of disordered eating, as well as more intuitive eating that relies on satiety cues and lower dietary restraint [82]. Furthermore, high self-compassion has been linked to more mindful eating, lower disordered eating, and lower BMI [53, 54, 88]. In addition, previous findings also demonstrated a clear link between self-compassion and mindful eating [31, 46], which was replicated by the findings in the current study.

The present study looked at the constructs of mindful eating and there were three significant relationships with orthorexia. The subscales of *eating with awareness*, *focused eating and hunger and satiety* were all negatively associated

with ON. As previously mentioned, only three other studies looked at mindful eating, Kalika et al. [43] found no associations between ON and mindful eating whereas Thorne et al. [89] found negative relationships between ON, hunger and satiety, eating with awareness and eating without distractions. This study replicated the findings of Thorne et al. [89], however, in the current study eating without distractions was non-significant. A reason for contradicting findings of Kalika et al. [43] was that they investigated vegan-only population, therefore, this could explain the variation in the results in regard to mindful eating. It is interesting that ON has been negatively associated with eating with awareness as individuals with orthorexic tendencies focus on the quality of their food [48]. Hunger and satiety subscale was negatively associated with ON, suggesting that individuals high with ON respond to external food cues, like other EDs such as BED [64, 65] and do not rely on hunger and satiety. Findings related to the focused eating subscale are interesting as studies on orthorexic tendencies suggest that those with high orthorexic tendencies spend a significant amount of time preparing their meals and researching (Koven & Arby, 2015) thus higher focus on the eating-related behaviours, however, the present study suggests that those with high orthorexic tendencies in fact have low focused eating. This confirms findings on restraint eaters and attention bias, where research suggests that individuals with restraint pathology have an increased attention bias for food cues, which results in increased food cravings and food intake [66]. These findings are very interesting, however, caution needs to be taken when interpreting the findings. Keyte et al. [46] have highlighted possible limitations of the MEBS scale that this scale focuses more on the attentive rather than mindful eating aspect of behaviour, which are two separate concepts of eating literature altogether. Furthermore, Mantzios [50] has suggested that hunger and satiety may in fact not relate to mindful eating, but to the decision-making prior to engaging in eating. While there are several limitations that have been highlighted in measuring mindful eating, and the choice of using the MEBS was the best choice available, future research should aim to develop and explore mindful eating through more valid and appropriate measures.

This is the first study that investigated the eating disorder quality of life in relation to ON. Past research has demonstrated that individuals with eating disorders display poor quality of life (Agh et al., 2016; [21, 41, 95], this is demonstrated in the present study as individuals with higher scores on ONI displayed lower levels of quality of life. The findings indicate that higher scores on ONI have an impact on all the subscales of the EDQOL such as the psychological, physical/cognitive, financial and work/school aspects, therefore, demonstrating that orthorexia could significantly impact individuals' quality of life, affecting physical, psychological, financial and work aspects. This highlights that higher

orthorexic tendencies have a significant impact on individuals' quality of life just like other ED that are presented in the DSM-5 such as AN, BN and BED (e.g., [6, 41, 61]. Exploring QoL is important, especially in association with ON, as there are no known interventions for orthorexia.

The current study has also utilised the use of ONI to assess the severity of ON in the current sample. Most of the research into ON has used scales such as Dusseldorf Orthorexia Scale and ORTHO-15 (e.g., [7, 86]. Only two studies to date have used ONI [44, 72] which showed a similar mean score as the present study. The current study showed a mean of 36.53 whereas Kaye et al., (2021) showed a mean of 39.03 in their female sample and Oberle et al., [72] showed a mean of 41.13 in their mixed sample. The present study had the lowest mean score compared to the other two studies, which could be a result of using specific populations such as nutrition and psychology students [72]

In addition, several moderation analyses were conducted between orthorexia and eating disorder quality of life with moderators being mindfulness, self-compassion and mindful eating. The current study found significant moderators to be self-compassion and the awareness aspect of mindfulness. The findings in the present study showed that self-compassion is a moderator at all levels with higher levels of self-compassion having a higher moderating effect on the relationship between ON and EDQOL. This suggests that higher levels of self-compassion in fact strengthen the relationship between orthorexia and quality of life. This is an unexpected finding as the associations in the present study showed that there was a negative relationship between self-compassion and orthorexia and quality of life. Taking into account what is known about self-compassion and the associations in the present study self-compassion should have weakened the relationship between orthorexia and quality of life. Past research has demonstrated that self-compassion in fact is interlinked with better quality of life in individuals who displayed anxious and depressive symptoms [91]. The findings of the present study go against this suggesting that individuals with high orthorexic tendencies and high self-compassion will demonstrate a worse quality of life. A reason for this could be that individuals with high self-compassion believe that engaging in healthy eating rituals and physical activity are means of improving their optimum health and a form of self-care [30, 49, 51], however, orthorexic tendencies have been shown to impact an individual in a social and psychological way resulting in lower quality of life. Another significant moderator was the awareness facet of mindfulness, acting with awareness suggesting that the individual is focusing all the attention on a current activity (Brown et al., 2015 such as food preparation or researching the organic and pure produce. Again, this goes against the associations presented in the present study as there were negative relationships between awareness and orthorexia and

quality of life. Research has shown that individuals with high orthorexic tendencies often obsess about their eating behaviours and regimen [11]. Acting with awareness was also a moderator at all levels with higher levels of awareness having a higher effect on the relationship between ON and EDQOL. The findings of the present study go against our understanding of utilising self-compassion and mindfulness concepts in populations with disordered eating, mindfulness-based interventions have been shown to be effective as a treatment for eating disorders (e.g., [92]). Research shows that self-compassion and mindfulness promote healthy eating (e.g., [4, 63, 92]), which could explain why self-compassion and awareness were moderators as individuals with high orthorexic tendencies believe that they are engaging in healthy eating behaviours and might be utilising these concepts as forms of self-care and promoting optimum health.

Limitations

A clear limitation of this study is the female-only sample, therefore the findings cannot be generalised to male populations. Gender differences are consistently observed in eating pathology [9, 85] and some studies into ON has shown that symptomology has been greater in men than women (e.g., [34]). However, findings into ON research are inconsistent as other studies in fact show that the symptomology is greater in women (e.g., [26]) and other studies suggest that there are no gender differences (e.g., [17], Dunn et al., 2017; [38]). Therefore, future research should focus on equal male recruitment and conducting studies with male-only populations as there is a lack of literature across the field.

Furthermore, the present study has utilised the ONI to measure the ON severity in this sample. This is a new measure of ON that has only been used in two previous studies [44, 72], even though this measure assesses physical impairments and emotional distress. Caution should be taken as the ONI should be used as a measure to assess the risk of ON development, rather than a diagnostic tool. Additionally, previous research that supports and contradicts the findings of the present study have used different measures of ON such as DOS and TOS (Kalika et al., 2021, Straus, 2020). For example, Kalika et al. (2021) showed that mindful eating was not related to ON whereas the present study showed a negative relationship between the two constructs. Therefore, future research should utilise the ONI as a measure of ON to further investigate concepts of mindfulness and self-compassion.

Another limitation is that only associations of EDQOL can be made to ONI due to the sample not having been diagnosed with ON. The conclusions drawn from this measure can only be that those with higher ONI had poorer ED quality of life, and conversely, those with lower or less

ON symptoms did not have better QOL, but that their eating or weight did not affect their quality of life. Therefore, future research using the EDQOL should use a sample that consists of individuals meeting the recent diagnostic criteria for ON.

Future directions

There is a need for qualitative research to be conducted on the ON populations. Exploring qualitative research will allow a further understanding of how self-compassion, mindfulness and mindful eating are utilised in this population. There is limited literature available that has explored ON qualitatively (e.g., [19, 90, 93]), and this could potentially lead to the official classification of ON, especially since the quality of life is an important aspect as individuals with a classified eating disorder display lower levels of quality of life (Agh et al., 2016, [21, 41, 61, 95]). There is also the question about the pleasure of eating, as suggested by Egan and Mantzios [31] in their qualitative study, where individuals could engage in unhealthy eating behaviours due to utilising the concept of self-kindness and treating themselves with unhealthy foods, which in turn, could lead to weight gain. Egan and Mantzios [31] further explained that social aspects rather than actual food are derivative of individuals finding pleasure in eating, and it would be beneficial to see whether that trend also occurs in orthorexic populations when past research has indicated that they usually avoid social situations [15], Sfeir et al., 2021).

Future research should investigate self-compassion, mindfulness, and orthorexia nervosa using an experimental approach with mindfulness-based and self-compassion-based interventions to help determine their effectiveness. As orthorexia research advances, developing interventions for this disorder will become increasingly important.

Conclusion

The present research offers novel insight into ON, mindfulness, self-compassion, and mindful eating. This study has demonstrated that there is a negative association between mindfulness and orthorexia, and this relationship was also replicated with self-compassion and two subscales of mindful eating. The potential benefits are apparent as these constructs could offer an effective tool in treating orthorexia in female populations. Furthermore, the present study is the first study that has explored eating disordered quality of life and orthorexia, potentially adding to the discussion of classification and addition to clinical disordered eating protocols.

What is already known on this subject?

Previous studies provided evidence that orthorexic eating behaviours have a relationship between mindfulness, mindful eating and self-compassion. However, the findings in relation to these constructs have been mixed, proposing the need for further research.

What does this study add?

This study explored orthorexic behaviours by using the new Orthorexia Nervosa Inventory (ONI) and its relationship to self-compassion, mindfulness and mindful eating. The results supported previous findings that indicated that there was a negative relationship between orthorexia and mindfulness, self-compassion and mindful eating. Furthermore, the present study found a positive relationship between lower quality of life and orthorexia. Moreover, the findings indicated that self-compassion and the awareness facet of the mindfulness questionnaire moderated the relationship between Orthorexia Nervosa and Quality of Life.

Author contributions EK designed the study, collected data, conducted data analyses, and wrote the manuscript. MM, MH and HE supervised EK, and supported the study and critically reviewed the manuscript. All authors read and approved the final manuscript.

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Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Ethics approval The study was approved by the ethical review board of the Birmingham City University Psychology Department Research Ethics Committee and was in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments. This article does not contain any studies with animals.

Statement of informed consent and consent to participate Informed consent was obtained from all individual participants included in the study.

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Appendix B: Ethics Approval Letter (from Chapter's 2-7)

Appendix B1: Chapter 5 Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
Curzon Building, 4 Cardigan Street
Birmingham
B4 7BD

BLSSethics@bcu.ac.uk;

03/Dec/2021

Miss Eliza Kalika

Eliza.kalika@mail.bcu.ac.uk

Re: Kalika /#9966 /sub2 /R(A) /2021 /Nov /BLSS FAEC - Exploring the role of mindfulness and self-compassion on orthorexic behaviours

Dear Eliza,

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSethics@bcu.ac.uk;

I wish you every success with your activity.

Yours Sincerely,

Dr. Kyle Brown

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix B2: Chapter 2 Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
Curzon Building, 4 Cardigan Street
Birmingham
B4 7BD

BLSSEthics@bcu.ac.uk;

18/Mar/2022

Miss Eliza Kalika

Eliza.kalika@mail.bcu.ac.uk

Dear Eliza ,

Re: Kalika /#10129 /sub2 /R(B) /2022 /Feb /BLSS FAEC - Exploring the role of personality on Orthorexia Nervosa

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSEthics@bcu.ac.uk;

I wish you every success with your activity.

Yours Sincerely,

Dr Stefania Paladini

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix B3: Chapter 3 Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
Curzon Building, 4 Cardigan Street
Birmingham
B4 7BD

BLSSethics@bcu.ac.uk;

18/Mar/2022

Miss Eliza Kalika

Eliza.kalika@mail.bcu.ac.uk

Dear Eliza ,

Re: Kalika /#10161 /sub2 /R(B) /2022 /Mar /BLSS FAEC - Exploring the impact of problematic eating behaviours on Orthorexia Nervosa

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSethics@bcu.ac.uk;

I wish you every success with your activity.

Yours Sincerely,

Dr Natalie Kelly

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix B4: Chapter 4 (Study 1) Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
 Curzon Building, 4 Cardigan Street
 Birmingham
 B4 7BD
 BLSSEthics@bcu.ac.uk;

18/Mar/2022

Miss Eliza Kalika
 Eliza.kalika@mail.bcu.ac.uk

Dear Eliza ,

Re: Kalika /#10207 /sub2 /R(B) /2022 /Mar /BLSS FAEC - Exploring the impact of disordered eating on Orthorexia Nervosa

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSEthics@bcu.ac.uk;

I wish you every success with your activity.

Yours Sincerely,

Dr Natalie Kelly

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix B5: Chapter 4 (Study 2) Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
Curzon Building, 4 Cardigan Street
Birmingham
B4 7BD

BLSSethics@bcu.ac.uk;

18/Mar/2022

Miss Eliza Kalika

Eliza.kalika@mail.bcu.ac.uk

Dear Eliza ,

Re: Kalika /#10208 /sub2 /R(B) /2022 /Mar /BLSS FAEC - Exploring the impact of anxiety, depression and stress on Orthorexia Nervosa

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSethics@bcu.ac.uk;

I wish you every success with your activity.

Yours Sincerely,

Dr Natalie Kelly

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix B6: Chapter 6 Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
Curzon Building, 4 Cardigan Street
Birmingham
B4 7BD

BLSSEthics@bcu.ac.uk;

02/Feb/2024

Miss Eliza Kalika

Eliza.kalika@mail.bcu.ac.uk

Dear Eliza,

Re: Kalika /#12640 /sub2 /R(A) /2024 /Jan /BLSS FAEC - Investigation into the Healthy vs Unhealthy orthorexia nervosa

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSEthics@bcu.ac.uk.

If you would like to provide feedback on the ethics process, please complete the feedback form using [this link](#).

I wish you every success with your activity.

Yours Sincerely,

Dr Angela Hewett

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix B7: Chapter 7 Ethical Approval Letter



Faculty of Business, Law & Social Sciences Research Office
Curzon Building, 4 Cardigan Street
Birmingham
B4 7BD

BLSSEthics@bcu.ac.uk;

18/Feb/2023

Miss Eliza Kalika

Eliza.kalika@mail.bcu.ac.uk

Dear Eliza ,

Re: Kalika /#11453 /sub2 /R(A) /2023 /Feb /BLSS FAEC - An investigation into the experiences of individuals with high orthorexic tendencies about utilizing on self-compassion and mindful practices using semi-structures interviews.

Thank you for your application and documentation regarding the above activity. I am pleased to take Chair's Action and approve this activity.

Provided that you are granted Permission of Access by relevant parties (meeting requirements as laid out by them), you may begin your activity.

I can also confirm that any person participating in the project is covered under the University's insurance arrangements.

Please note that ethics approval only covers your activity as it has been detailed in your ethics application. If you wish to make any changes to the activity, then you must submit an Amendment application for approval of the proposed changes.

Examples of changes include (but are not limited to) adding a new study site, a new method of participant recruitment, adding a new method of data collection and/or change of Project Lead.

Please also note that the Business, Law and Social Sciences Faculty Academic Ethics Committee should be notified of any serious adverse effects arising as a result of this activity.

If for any reason the Committee feels that the activity is no longer ethically sound, it reserves the right to withdraw its approval. In the unlikely event of issues arising which would lead to this, you will be consulted.

Keep a copy of this letter along with the corresponding application for your records as evidence of approval.

If you have any queries, please contact BLSSEthics@bcu.ac.uk;

If you would like to provide feedback on the ethics process, please complete the feedback form using [this link](#).

I wish you every success with your activity.

Yours Sincerely,

Dr Natalie Kelly

On behalf of the Business, Law and Social Sciences Faculty Academic Ethics Committee

Appendix C: Interview Schedule for Chapter 7

Healthy eating

What does healthy eating mean to you?

How would you describe the main features of your eating pattern?

Decision Making

Do you plan your meals in advance? For example, what to eat, **how much to eat** and when you are going to eat? (If no, go to Qx)

What things do you consider when planning your meals or snacks? What's the most important thing for you to consider in this?

Qx How do you decide when to eat? (Time of day, hunger levels)

How do you decide when to stop eating at each meal/snack? (eaten all the food you planned to eat, when you feel full)

Do you eat more if you are still hungry when you have finished your meal or snack?

Mindful Eating

Could you tell me about how you usually eat, for example, where do you eat and what do you do when you are eating?

When you are eating, how attentive are you to your food and your eating?

Do you find your mind wanders off to other things when you are eating? How easy or difficult is it to stay attentive to the meal?

Do you always eat in this way or are there times when you eat differently?

Do you enjoy eating your meals/snacks?

Self-compassion/Self-kindness

Can you tell me a little bit more about your reasons for eating the way that you do? To improve your health e.g., physical/mental?

Is the way you eat a way of being kind to yourself? Can you tell me a bit more about this?

Do you have foods that you only eat occasionally? When would you eat those foods? (prompt, treat/reward) Are those foods part of being kind to yourself?

Are there times when you do not follow this eating pattern? Could you tell me a little but more about that?

How do you feel when you do not eat in this way?

What do you say to yourself if or when you do not follow your usual eating plan?

Impact of eating behaviours

Overall how do you feel about the way you eat?

Can you tell me a little more about why you started eating the way you do now?

Do your eating behaviours have an impact on your everyday life? School, work, friendships/relationships, finances? Time

Perception of others

Could you tell me a little bit about how other people have reacted to your eating behaviours?

How do you feel about their views on your eating?

Would you recommend your pattern of eating to others? Why/why not?

Is there anything that you would like to add that we have not covered so far?

Thank you for taking part.

Supplementary Materials

Supplementary Materials D1: Table 2.3 Correlations (Chapter 2)

Table 2.3. Bivariate correlations between ONI and subscales of FFMQ, SCS and FMPS and descriptive statistics (n=151).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	M	SD
(1) ONI																46.66	19.05
(2)FR - Mistakes	.534**															41.18	11.84
(3)FR-Expect	.419**	.688**														25.64	9.66
(4)FR-Standards	.244**	.662**	.507*													25.15	5.62
(5)FR-Organization	.148	.206*	.207*	.387*												22.01	4.96
(6)SCS-Kindness	-.234**	-.400**	-.271*	-.299*	.004											2.22	.98
(7)SCS-Judgment	-.369**	-.663**	-.461*	-.516*	-.200*	.555**										2.97	1.16
(8)SCS-Humanity	-.296**	-.411**	-.280*	-.201*	.098	.600**	.383*									2.38	1.03
(9)SCS-Isolation	-.487**	-.716**	-.493*	-.437*	-.185*	.427**	.755*	.361*								3.18	1.19
(10)SCS-Mindfulness	-.200*	-.356**	-.295*	-.137	.023	.727**	.381*	.657*	.360*							2.61	1.01
(11)SCS-Identification	-.452**	-.674**	-.427*	-.393*	-.091	.345**	.749*	.290*	.735*	.318*						3.07	1.07
(12)FFMQ-Observ	.191*	.098	.177*	.111	.115	.214*	-.016	.158	-.106	.177*	-.071					9.35	2.72
(13)FFMQ-Describe	-.258**	-.091	-.086	.115	.137	.108	.124	.104	.117	.052	.136	.062				9.40	2.82
(14)FFMQ-Awareness	-.285**	-.355**	-.300*	.000	.181*	.071	.268*	.164	.358*	.123	.300*	.042	.126			8.99	2.66
(15)FFMQ-Judgment	-.544**	-.651**	-.482*	-.321*	-.137	.370**	.594*	.335*	.675*	.388*	.553*	-.189*	.109	.373*		9.31	3.28
(16)FFMQ-Reactivity	-.147	-.129	-.053	-.094	.055	.400**	.407*	.394*	.290*	.441*	.341*	.096	.172*	-.084	.075	8.53	2.59

Note: ONI: Orthorexia Nervosa Inventory.

FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. FMPS: Frost Multidimensional Perfectionism Scale

*Correlation is significant at the .05 level

Supplementary materials D2 : Table 3.3 Correlations Chapter 3

Table 3.3 Bivariate correlations between ONI and subscales of SCS and descriptive statistics.

	1	2	3	4	5	6	<i>M</i>	<i>SD</i>
(1) ONI							39.72	13.55
(2)SCS-Kindness	.045						3.02	.78
(3) SCS-Judgement	-.219**	.507**					2.84	.78
(4) SCS-Humanity	.038	.523**	.245**				3.13	.74
(5) SCS-Isolation	-.211**	.309**	.656**	.184**			2.82	.84
(6)SCS-Mindfulness	-.009	.704**	.342**	.526**	-.214**		3.19	.72
(7)SCS-Overidentification	-.217**	.364**	.721**	.207**	.709**	.386**	2.85	.81

Note: ONI: Orthorexia Nervosa Inventory. SCS: Self-Compassion Scale.

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Supplementary Materials D3: Table 4.5 and 4.6 Correlations (Chapter 4- Study 1)

Table 4.5.: Bivariate correlations between ONI, BMI, FFMQ, SCS and EAT and descriptive statistics for students.

	1	2	3	4	<i>M</i>	<i>SD</i>
(1) ONI					40.99	15.60
(2)BMI	.088				24.74	8.49
(3) FFMQ	-.115	-.018			35.07	5.72
(4) SCS	-.195*	-.016	.524**		2.75	.57
(5) EAT	.690**	-.006	-.197**	-.157*	14.31	14.39

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. EAT: Eating Attitude Test

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Table 4.6: Bivariate correlations between ONI, BMI, FFMQ, SCS and EAT and descriptive statistics for Prolific.

	1	2	3	4	<i>M</i>	<i>SD</i>
(1) ONI					37.69	11.44
(2)BMI	.123				24.74	8.49
(3) FFMQ	-.197**	.019			36.09	7.05
(4) SCS	-.157*	-.004	.615**		2.96	.62
(5) EAT	.621**	.005	-.324**	-.340**	12.23	11.47

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. EAT: Eating Attitude Test

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Supplementary Materials D4: Table 4.7 Correlations SCS (Chapter 4- Study 1)

Table 4.7 Bivariate correlations between ONI and subscales of SCS and descriptive statistics.

	1	2	3	4	5	6	M	SD
(1) ONI							38.88	13.16
(2)SCS-Kindness	-.038						2.94	.80
(3) SCS-Judgement	-.232**	.484**					2.74	.89
(4) SCS-Humanity	-.036	.577**	.221**				3.06	.78
(5) SCS-Isolation	-.232**	.242**	.715**	.178**			2.76	.94
(6)SCS-Mindfulness	-.029	.681**	.275**	.656**	.227**		3.11	.72
(7)SCS-Overidentification	-.204**	.296**	.748**	.190**	.741**	.348**	2.74	.86

Note: ONI: Orthorexia Nervosa Inventory. SCS: Self-Compassion Scale.

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Appendix D5: Correlations for Table 4.10 and 4.11 (Chapter 4- Study 2)

Table 4.10: Bivariate correlations between ONI, BMI, FFMQ, SCS and DASS and descriptive statistics for students.

	1	2	3	4	M	SD
(1) ONI					42.58	13.99
(2)BMI	.107				30.64	5.69
(3) FFMQ	-.147	-.054			35.69	6.61
(4) SCS	-.040	.008	.647**		73.79	15.50
(5) DASS	.413**	.068	-.340**	-.542**	20.46	13.54

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. DASS: Depression, Anxiety and Stress Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Table 4.11: Bivariate correlations between ONI, BMI, FFMQ, SCS and DASS and descriptive statistics for Prolific.

	1	2	3	4	M	SD
(1) ONI					37.37	12.28

(2)BMI	.022				22.07	2.35
(3) FFMQ	-.141*	.060			36.50	6.62
(4) SCS	-.148*	.055	.654**		75.81	16.06
(5) DASS	.317**	.008	-.555**	-.653**	18.75	13.28

Note: ONI: Orthorexia Nervosa Inventory. BMI: Body Mass Index. FFMQ: Five-Facet Mindfulness Questionnaire SCS: Self-Compassion Scale. DASS: Depression, Anxiety and Stress Scale

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Supplementary Materials D6: Correlations for Table 4.13

Bivariate correlations between ONI and subscales of SCS and descriptive statistics.

	1	2	3	4	5	6	M	SD
(1) ONI							38.88	13.16
(2)SCS-Kindness	.065						2.94	.80
(3) SCS-Judgement	-.178**	.361**					2.74	.89
(4) SCS-Humanity	.061	.561**	.023				3.06	.78
(5) SCS-Isolation	-.162**	.250**	.753**	-.009			2.76	.94
(6)SCS-Mindfulness	-.002	.683**	.086	.652**	.084		3.11	.72
(7)SCS-Overidentification	-.225**	.249**	.814**	.022	.766**	.153**	2.74	.86

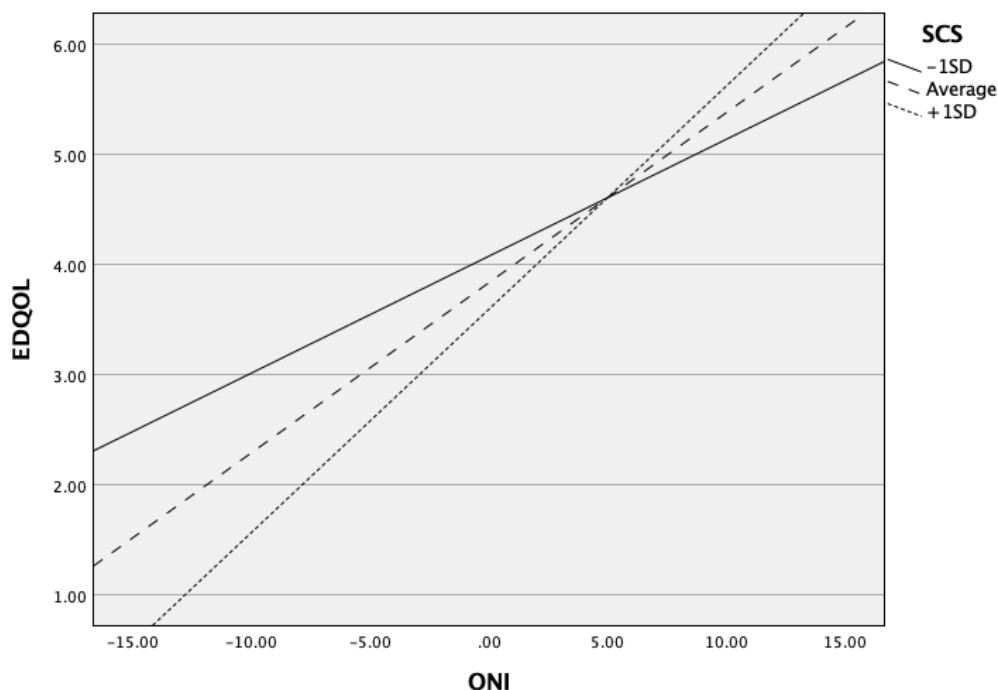
Note: ONI: Orthorexia Nervosa Inventory. SCS: Self-Compassion Scale.

*Correlation is significant at the .05 level

**Correlation is significant at the .01 level

Supplementary Materials D7 : Simple slopes plot- Chapter 5

Simple slopes plot for moderation between EDQOL and ONI with SCS as a moderator.



Supplementary Materials D8 Table 6.3 correlations – Chapter 6

Bivariate correlations between subscales of ONI, DOS, TOS, and MEBS and descriptive statistics. (n=476).

	1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>
(1) Imp- ONI								18.54	4.89
(2)beh- ONI	.877**							17.67	4.40
(3) Emo- ONI	.818**	.787**						9.35	2.69
(4) DOS	.697**	.692**	.641**					19.18	5.38
(5) HeOR- TOS	.487**	.487**	.392**	.635**				21.30	4.53
(6)OrNe- TOS	.601**	.599**	.611**	.767**	.544**			14.61	4.49
(7)Sens- MEBS	.005	-.007	-.061	.007	.082	-.038		11.97	2.09
(8)Awar- MEBS-T	.112*	.108*	.074	.132**	.161*	.128**	.422**	9.65	2.43

Note: ONI: Orthorexia Nervosa Inventory (Imp- Impairments; Beh- Behaviour; . DOS: Dusseldorf Orthorexia Scale. HeOR (TOS): Healthy Orthorexia (Turnel Orthorexia Scale). OrNe (TOS): Orthorexia Nervosa (Turnel Orthorexia Scale) MEBS-T: Mindful Eating Behaviour Scale- Trait (Awar- Awareness; Sens-Sensory)