

**Investigating the Similarities and Differences Between Orthorexia Nervosa
and Eating Disorders Using Implicit and Explicit Measures**

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Declaration

This thesis is submitted to the Australian National University (ANU) in fulfilment of the Doctor of Philosophy (PhD) in Psychology. The work presented in this thesis is original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for another degree at this or any other institution and is in accordance with the ANU guidelines for higher degree research.

Rosemary Clifford

21 October 2024

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Abstract

The term Orthorexia Nervosa (ON) emerged in the 1990s to describe a condition characterised by an obsessive preoccupation with healthy/pure eating that leads to physical and psychological impairment. Since its inception, there have been several debates regarding ON, including questions about where it is best categorised in diagnostic manuals, whether it represents a new eating disorder (ED) or a subtype of a currently recognised ED, and whether body image concerns are a feature. The current research aimed to inform such debates through three studies comparing participants with elevated ON symptoms and ED symptoms (ED/ON), participants with elevated ED symptoms (ED), and healthy comparison (HC) participants (i.e., an absence of ON or ED symptoms and no history of shape/weight concerns).

Study 1 investigated the presence of ED symptomatology, body image concerns (appearance focus and appearance satisfaction), psychological distress, ED-specific impairment, and general mental and physical health in those with elevated ON symptoms compared to those without. Results indicated that higher levels of ED symptomatology, appearance focus, and ED-specific impairment were found among those in the ED/ON group relative to the ED and HC groups. The ED/ON group was comparable to the ED group, but higher than the HC group, in terms of appearance satisfaction, psychological distress, and general mental and physical health.

Study 2 investigated the implicit associations to food and body stimuli of those with ON compared to those without. This study compared the implicit associations of the same three groups of participants as Study 1 utilising three Implicit Association Tests (IAT) assessing attitudes towards health- versus appearance-based stimuli. These included two picture-based IATs (one assessing attitudes towards healthy/average-weight female bodies

versus thin/unhealthy female bodies, and one assessing attitudes towards healthy/high-calorie foods versus low-calorie/unhealthy foods) and one questionnaire-based IAT (assessing attitudes towards health- versus appearance-focused statements). Results indicated that participants across all groups exhibited a more favourable view towards the health-based stimuli than the appearance-based stimuli, with the ED/ON participants exhibiting the least favourable view towards the health-based stimuli among the three groups, and the ED and HC participants exhibiting comparable attitudes.

Finally, Study 3 investigated the cognitive processing of those with ON compared to those without by focusing on attentional bias towards food and body stimuli. Utilising the same participant sample and stimuli image sets as Study 2, attentional biases towards healthy/average-weight bodies, thin/unhealthy bodies, healthy/high-calorie food, and low-calorie/unhealthy food images were assessed using a series of Visual Probe Detection Tasks (VPDTs). Results indicated that the ED/ON group demonstrated greater attentional bias towards thin/unhealthy bodies, healthy/high-calorie, and unhealthy/low-calorie food compared to the ED and HC groups, but not for healthy/average-weight bodies.

Overall, the current research indicated that ON symptoms in the context of an ED were associated with a greater focus on appearance and more elevated levels of ED-specific impairment, a less favourable view of health-based stimuli, and a greater attentional bias to food and body stimuli. If replicated, the findings suggest that the additional presence of ON symptoms in those with an ED signifies a more severe presentation, which has both diagnostic and treatment implications.

Table of Contents

Declaration	2
Acknowledgements	3
Abstract	5
Chapter 1: An Introduction to Orthorexia Nervosa	7
Chapter Overview	14
Origins of the Orthorexia Nervosa Construct	14
Current Conceptualisations of Orthorexia Nervosa	18
Obsession with Healthy Eating	19
Food Preferences	20
Food-Related Rituals.....	21
Food-Related Emotions and Cognitions	22
Healthy Orthorexia.....	23
Proposed Diagnostic Criteria for Orthorexia Nervosa.....	24
Reported Prevalence Rates of Orthorexia Nervosa	29
Consequences of Orthorexia Nervosa	31
Potential Aetiological Factors for Orthorexia Nervosa.....	32
Qualitative Research.....	33
Demographic Factors.....	34
Psychological Factors.....	39
Sociocultural Factors	46
The Measurement of ON.....	47
Bratman Orthorexia Test (BOT)	48
ORTO-15.....	48
Eating Habits Questionnaire (EHQ)	50
Eating Habits Questionnaire Revised (EHQ-R).....	51
Dusseldorf Orthorexie Scale (DOS).....	51
Teruel Orthorexia Scale (TOS)	53
Orthorexia Nervosa Scale (ONS)	53
Barcelona Orthorexia Scale (BOS)	54
Orthorexia Nervosa Inventory (ONI).....	54
Test of Orthorexia Nervosa (TON-17)	55
Burda Orthorexia Risk Assessment (B-ORA).....	56

Summary	56
Chapter Summary	57
References	59
Chapter 2: The Status of Orthorexia Nervosa and the Current Research Program	86
Chapter Overview	86
Is Orthorexia Nervosa an Eating Disorder.....	86
Overview of Eating Disorders	87
Types of Eating Disorders	88
Impact of Eating Disorders	92
The Relationship Between Orthorexia Nervosa and Eating Disorders	94
Orthorexia Nervosa and Eating Disorders in General	94
Orthorexia Nervosa and Anorexia Nervosa	95
The Relationship Between Orthorexia Nervosa and Obsessive-Compulsive Disorder	97
Is Orthorexia Nervosa as a Distinct Disorder.....	99
Defining a Disorder.....	101
Differentiating Orthorexia Nervosa from Other Eating Disorders	104
The Current Research Program.....	108
Chapter Summary	110
References	111
Chapter 3: A Comparison of Eating- and Body-related Symptomatology, Distress, and Impairment in Adults with Orthorexia Nervosa and Eating Disorders	124
Abstract.....	125
Introduction	1266
Method	135
Participants.....	135
Measures.....	142
Procedure	147
Statistical Analysis	148
Results.....	149
Discussion	160
References	169

Chapter 4: Identifying Differential Attitudes Regarding Health versus Appearance in Individuals with Orthorexia Nervosa and Eating Disorders Using the Implicit Association

Test.....	185
Abstract.....	186
Introduction	187
Method	196
Participants.....	196
Measures.....	200
Procedure	207
Statistical Analysis	209
Results.....	210
Discussion	214
References	225

Chapter 5: Selective Attention for Food and Body Stimuli in Individuals with Orthorexia Nervosa and Eating Disorders: The Use of a Visual Probe Detection Task

Abstract.....	232
Introduction	233
Methods	242
Participants.....	242
Measures.....	242
Procedure	244
Statistical Analysis	245
Results.....	246
Discussion	251
References	259

Chapter 6: General Discussion

Chapter Overview	269
Rationale and Aims of the Current Program of Research.....	269
Main Findings of the Current Research Program	269
Study 1	269
Study 2	270
Study 3	271
Clinical Implications of the Current Research.....	272
Strengths, Limitations and Future Directions	280

Strengths	280
Limitations	282
Future Directions	285
Conclusion	286
References	286
Appendix A.....	231
Appendix B.....	310

List of Tables

Table 1.1 <i>Orthorexia Nervosa Proposed Criteria and Expert Agreement From Donini et al., 2022</i>	26
Table 3.1 <i>Categorisation of Participants Into ED Groups and ED Type in the ED/ON and ED Groups</i>	136
Table 3.2 <i>Participant Demographics Across Groups</i>	140
Table 3.3 <i>Number (and Percentage) of ED Type in the ED/ON and ED Groups</i>	141
Table 3.4 <i>Means, Standard Deviations and Analysis of Variance Results for the EDE-Q, MBSRQ, CIA, K-10, and SF-12 Across Groups</i>	150
Table 3.5 <i>Means, Standard Deviations and Analysis of Variance Results for the EDE-Q, MBSRQ, CIA, K-10, and SF-12 Across ED Types Within Each Group</i>	151
Table 4.1 <i>Participant Demographics Across Groups (n = 267)</i>	198
Table 4.2 <i>Proportion of ED Type in the ED/ON and ED Groups</i>	200
Table 4.3 <i>Questionnaire-Based IAT Statements</i>	204
Table 4.4 <i>Block Design of the Picture-Based Food Implicit Association Test</i>	205
Table 4.5 <i>Block Design of the Picture-Based Body Implicit Association Test</i>	206
Table 4.6 <i>Block Design of the Questionnaire-Based Implicit Association Test</i>	207
Table 4.7 <i>Mean (Standard Deviation) D Scores for Those with Eating Disorders with ON Symptoms (ED/ON), Those with Eating Disorders Without ON Symptoms (ED) and Healthy Controls (HC)</i>	210
Table 4.8 <i>Mean (Standard Deviation) D Scores for Those with Eating Disorders with ON Symptoms (ED/ON) and Those with Eating Disorders Without ON Symptoms (ED) by ED Type</i>	211
Table 5.1 <i>Mean (Standard Deviation) Attentional Bias Indices for Those with Eating Disorders with ON Symptoms (ED/ON), Those with Eating Disorders Without ON Symptoms (ED) and Healthy Controls (HC)</i>	247

Table 5.2 <i>Mean (standard deviation) Attentional Bias Indices for Unhealthy/Low-Calorie Food Images for Those with Eating Disorders with ON Symptoms (ED/ON) and Those with Eating Disorders Without ON Symptoms (ED) by ED Type</i>	248
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List of Figures

Figure 5.1. <i>Visual Probe Detection Task (VPDT) Trial Sequence</i>	244
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Chapter 1: An Introduction to Orthorexia Nervosa

Chapter Overview

This chapter will begin by adopting a historical lens regarding the emergence of ideas linking eating practices and health, how these ideas have evolved over time, and the origins of the orthorexia nervosa (ON) construct. It will then provide a review of current conceptualisations of ON, including its key features, proposed diagnostic criteria, prevalence rates, and adverse consequences. This will be followed by an overview of research findings relating to the potential aetiology of ON. The chapter will conclude with a review of current ON measurement tools, which will inform the current program of research.

Origins of the Orthorexia Nervosa Construct

The origins of a focus on the pursuit of certain dietary practices to enhance health can be traced back at least as far as the ancient Greeks and the writings of Plato, Hippocrates, and Homer (Hwalla & Koleilat, 2004). For example, Plato was said to have suggested that disease should be treated with the regulation of diet, rather than medication. Scientific understandings of the health-enhancing properties of foods emerged in the 19th century as a result of the advances in chemistry. For example, the 19th and 20th centuries entailed the discovery of vitamins, the identification of ‘diseases of dietary origin’, and the study of dietetics and nutrition (Hwalla & Koleilat, 2004).

Restrictive eating has been a part of Western culture dating back to the early 1900s with the emergence of thermodynamics and physician-endorsed calorie counting under the banner of medicine and nutritional science. The knowledge that one’s weight could be managed through certain dietary practices was paired with the problematic, continually shrinking thin ideals, which contributed to the weight and body shape obsession characteristic of the diet culture that dominated the 20th and early 21st centuries (Austin,

1999; Turner 1982). Superimposed on this, the last few decades have witnessed an increased focus on food quality and nutritional value, with a further increase in the cultural emphasis on the health-nutrition nexus (Austin, 1999; Barker et al., 2014; Forgacs et al., 2018).

The modern focus on food quality and nutritional value can be linked to the work of Robert Crawford in the 1980s, who coined the term 'healthism'. Healthism describes society's preoccupation with the achievement of health as the defining feature of well-being and has become closely linked to one's dieting and exercise behaviour (Crawford, 1980). The idea of 'healthism' is said to have resulted in personal weight becoming synonymous with one's health and well-being, with good health supposedly requiring a conscious effort to control one's shape and size (Crawford, 1980; 2006). Additionally, there is a link between 'healthism' and moral obligation, such that it is the individual's responsibility to prevent disease and illness through their choices regarding diet and exercise, and that this pursuit of health is how one can elevate oneself in terms of purity. As a result, it has been argued that 'healthism' led to strict adherence to certain health regimens to demonstrate one's self-discipline and self-worth (Bhattacharya et al., 2022). In short, the shift in focus to health and nutrition found in modern societies could be argued to have stemmed from the concept of 'healthism', with the idea that each person has an individual responsibility to manage their health and the discouragement of unhealthy lifestyle practices in favour of more healthy ones (Valente et al., 2020).

There is no doubt that a focus on nutrition for health can be associated with numerous health benefits such as increased life expectancy, a reduction in lifetime risk for all chronic diseases, and improved quality of life (Katz & Meller, 2014). These benefits have contributed to the inundation in current-day Western societies of information describing

various diets and dietary guidelines regarding healthy nutrition. The interest in healthy eating has been steadily increasing in popularity over recent decades, emerging as a social trend, as evidenced by the fact that Google searches for 'how to eat healthy' and healthy things to eat' have nearly tripled in the last decade and a half (Douma et al., 2021; Google, 2022a; Google, 2022b). Additionally, with the growing popularity of social media platforms, this 'health' information is becoming so widely available as to be almost unavoidable.

Due to the vast amounts of nutrition and health food-related information available, understanding what 'healthy' means or looks like can be very confusing. This is further complicated by the fact that much of the information available is contradictory and endorses different health narratives while discouraging others (Valente et al., 2020). It is also the case that a large amount of information available is not based on sound empirical evidence. This can lead to the adoption of unhealthy and potentially dangerous dietary practices, masked under the guise of being 'healthy'. Despite the positive change an increased focus on health and nutrition might be for most, for some individuals, it can result in anxiety, confusion, and pressure to be healthy, and mark the beginning of unhealthy and potentially dangerous eating/dietary practices and behaviours (Douma et al., 2021; Ruani et al., 2023; Valente et al., 2020). Further still, for a select few, it can ultimately result in pathological eating behaviours and serious medical and psychological complications. Although an inclination to eat healthily is generally considered a desirable behaviour, when it reaches obsessive and pathological levels and prevents the individual from living a full and healthy life, it becomes problematic.

With the landscape of eating becoming more complicated and the differentiation between healthy and pathological eating not always clear, eating disorder (ED) researchers and clinicians are being confronted with new mental health risks (Missbach & Barthels,

2017). This poses challenges for clinicians in the conceptualisation, treatment, and prognostic outcomes for individuals struggling with conditions that are, as yet, not fully understood (Jenkins et al., 2021). Further, globally EDs are on the rise (having increased from 3.5% between 2000-2006 to 7.8% between 2013-2018; Galmiche et al., 2019) such that it is increasingly important to ensure that EDs are being conceptualised as accurately as possible so that this increase can be clearly understood (e.g., whether it represents an increase in the occurrence of currently recognised EDs or the emergence of new EDs). Over the last few years there has been an emergence of more and varying disordered eating behaviours, and several 'new' EDs have been proposed, all of which have no formal status or diagnosis among the global diagnostic manuals (Forgacs et al., 2018). One such pathological eating condition proposed to be a new ED that seems to have emerged out of the trends towards healthy eating and nutrition - and will be the focus of this thesis - is Orthorexia Nervosa (ON).

ON was originally introduced by Steven Bratman in 1997 and was described as a condition characterised by an obsession and preoccupation with healthy eating, health, and purity. The term Orthorexia comes from the Greek words "orthos" meaning straight, proper or accurate, and "orexia" meaning appetite or hunger (Dunn & Bratman, 2016; Varga et al., 2013). This term was first cited in an edition of *The Yoga Journal*, a mainstream magazine at the time. ON was a term Bratman developed to describe his own personal experiences and the experiences of a number of his patients who found themselves consumed by an obsessive focus on food and healthy eating practices. Bratman's conceptualisation of the condition was "100% unscientific" in nature, as stated by himself (Mathieu, 2005). Features of ON, as described by Bratman, included a perception of superiority due to his vegetarian diet, stating that his diet made him feel self-righteous, strong, and morally good, that he

looked down on others who were not following diets like his, and that he would lecture others on the dangers of chemicals such as fertilisers and pesticides and processed food. However, he also described this experience as isolating and controlling his life (Bratman & Knight, 2000). Bratman posited that ON normally starts innocently, with a desire to improve one's health, overcome a physical health problem, and/or to adhere to nutritional guidelines, that over time progresses into something more pathological (Varga et al, 2013; Zickgraf et al., 2019). This more pathological fixation on nutrition and healthy eating is proposed to result in several impairments, due to an associated rigid and restrictive diet. Specifically, it was proposed that ON is associated with detrimental physical, social, and psychological consequences (Dunn & Bratman, 2016). However, as many of the original descriptions of ON and the proposed consequences were based on Bratman's personal experiences, further research was clearly needed to determine what ON is beyond these anecdotal accounts. As Bratman's work began to gain some traction in the scientific literature, several case studies emerged describing the condition and, in the early 2000s, ON properly entered the scientific realm, wherein more scientific methods were applied to the study and understanding of the condition (Dunn & Bratman, 2016; Haman et al., 2015).

Current Conceptualisations of Orthorexia Nervosa

Since its introduction, over two decades of research has been conducted on this topic resulting in an emerging picture of ON as a condition. It should be noted, however, that while recent research has made important steps towards a universal definition and understanding of the condition, much of this is based on expert opinion and, as such, further research is needed to confirm whether the proposed characteristics are found to be empirically associated with the condition.

Obsession with Healthy Eating

Although there is no global definition for ON present within the literature, the majority of differences in definitions appear to reflect slight variations in adjectives and word choice rather than major differences in the core characteristics of the condition. Most definitions describe ON as encompassing an obsession with healthy eating and purity that results in a restrictive and/or rigid diet, compulsive dietary practices, and psychological distress associated with breaking dietary rules, with this constellation of symptoms resulting in distress and functional impairment. Some have defined it as ‘healthy-food dependence’, a ‘fixation on healthy food’, and/or an ‘obsession with healthy food and proper nutrition’, all of which point to a pathological preoccupation with, and an over-focus on, healthy food (Varga et al., 2013). This view is supported by the results of a modified Delphi study, which compiled the views from a global cohort of 47 eating disorder (ED) specialists (researchers and clinical professionals) to form the first standardised understanding of ON (Donini et al., 2022).

In line with most definitions of ON, Valente et al. (2020) concluded from their findings in those with self-diagnosed ON that ON was primarily described as an ‘obsession with healthy eating’, and that this obsession was also the most commonly occurring symptom. For this condition, food quality (i.e., whether a food is perceived as healthy and/or pure) is argued to be the focus of the obsessive cognitions driving food-based preferences and eating behaviours. This focus is considered to lead to the avoidance or removal of foods or ingredients from one’s diet that are believed to be unhealthy or impure, with the individual's diet becoming increasingly restrictive and exclusive (Donini et al., 2022; Valente et al., 2020). While the dietary theories or beliefs guiding the eating practices may vary from person to person, the diets of individuals with ON have been described as often being

ritualistic, strictly controlled, distorted, rigid, and complicated to follow, highlighting the potentially damaging and pathological nature of these eating practices (Cena et al., 2019; Mathieu, 2005). It has been suggested that for those with ON, the taste and enjoyment of the food is far less important than the perceived quality, healthiness, and purity of the food (Varga et al., 2013). The importance placed on the quality of the food has also been found to be more important than the individual's social relationships, interpersonal commitments, career, and other personal values (Barthels et al., 2024).

Some researchers have suggested that the preoccupation with healthy eating is only considered to be pathological if more than three hours per day is spent on healthy food-focused thoughts (Dunn & Bratman, 2016; Moroze et al., 2015). However, whether a time requirement is considered pertinent to differentiating the presence of pathological ON tendencies from a non-pathological healthy eating focus is still unresolved (as evidenced by its absence from the most recently proposed diagnostic criteria) (Donini et al., 2022).

Food Preferences

As the dietary theories/beliefs that guide the eating behaviours of those with ON vary from person to person, there are no specific dietary preferences upon which all individuals with the condition are considered to follow. Unlike with caloric content - where there are clear high- and low-calorie foods - whether a food is deemed healthy or unhealthy is far more subjective, as is the definition of health and purity itself, especially when what is defined as healthy can be tied to distorted cognitions about certain foods (Dunn & Bratman, 2016). Generally speaking, the diets of those with ON comprise foods deemed acceptable for consumption based on them being perceived as healthy, proper, and correct, which can often be assumed to be that which is biologically pure. The foods that are limited or excluded entirely are, thus, those perceived to be unhealthy or impure, often based on their

processing and production (Cena et al., 2019). Emphasising the varied nature of diets among those with ON, Mitrofanova et al. (2020) found that among their ON participants there was large variation in conceptualising 'pure' and 'healthy' foods and how these concepts were actioned in a diet. As a result, they found no single dietary pattern for those with ON.

Despite this, research has been able to identify some attributes of food that seem to be commonly restricted or avoided entirely by those with ON tendencies. These include, but are not limited to, foods treated with chemicals; those with a significant amount of fat, sugar, salt and other 'undesirable' nutrients; foods containing artificial substances; non-organic foods; and manufactured or processed foods (Alvarenga et al., 2012; Costa et al., 2017; Plichta et al., 2019). In terms of macronutrient composition, Dos Santos et al. (2020) found that the diets of those with high ON tendencies had higher amounts of protein and lower amounts of carbohydrates than those with no or few ON tendencies. These findings were comparable to those obtained in a study by Sultana et al. (2022) in a Bangladeshi university population, which found that those with high ON tendencies consumed more nuts, seeds, vegetables, and legumes than those with low or no ON tendencies. Some researchers have also identified certain diets to be more highly endorsed among those with ON compared to those without, such as the Mediterranean diet (known for the consumption of healthy fats, such as olive oil and nuts) (Strahler et al., 2018). Overall, while no clear ON-specific diet seems to exist, the research to date has found a number of characteristics and even diets that are more commonly endorsed among these individuals.

Food-Related Rituals

The rigid food-based cognitions, emotions, and behaviours of people with ON can often go beyond the food consumed to include where it is purchased and how it is prepared (Donini et al., 2022). In line with this view, although mostly anecdotally, individuals with ON

tendencies have been found to engage in time-consuming steps to prepare and cook their food, with food preparation rituals believed to be common. These food preparation rituals can take the form of spending an excessive amount of time planning, purchasing, preparing, and/or eating their meals, including an excessive focus on the techniques and materials used in the preparation of food (Alvarenga et al., 2012; Costa et al., 2017; Donini et al., 2022).

Food-Related Emotions and Cognitions

In addition to dietary behaviours, there are several emotional and cognitive features identified as being present in those with ON. Individuals with ON have been described as exhibiting extreme feelings of guilt, shame, and disappointment when they do not adhere to their ideal dietary practices, which often results in compensatory or penance behaviours in an attempt to cleanse or purify themselves for the dietary transgression (Donini et al., 2022; Oberle et al., 2021). The behaviours used to compensate for said transgressions may include further restriction or elimination of foods, as well as engaging in behaviours believed to be able to purify the body. Conversely, adherence to the individual's diet is suggested to lead to feeling a sense of comfort, purity, safety, and/or superiority (Varga et al., 2013). Regarding the latter, those with ON have been described as potentially having feelings of self-righteousness and superiority because of their perceived healthy eating habits, while being intolerant of others with contradictory health beliefs or dietary behaviours (Costa et al., 2017). Others have noted that individuals with ON may also try to 'convert' their family and friends to their chosen dietary practices as a result of their belief in the superiority of these practices (Varga et al., 2013).

Taken together, these emotional and behavioural sequelae suggest that the self-imposed dietary rules influence an individual's self-evaluation (Donini et al., 2022). Interestingly, in a study conducted by Steinmann et al. (2022), which investigated individuals'

beliefs about stress-relieving foods, those with higher ON tendencies believed that consuming commonly perceived 'healthy' foods (including soups, nuts, salad, vegetables, and fruits) helped to relieve stress. This is one of the first studies to investigate food-related beliefs in those with ON as it relates to an individual's psychological aspects as opposed to physical aspects. This could indicate that the preoccupation with healthy eating found in those with ON may be more than simply the achievement of physical health, but also in terms of regulating mood states, self-worth, and overall mental health.

Healthy Orthorexia

Further complicating the matter of defining ON is that over the last several years the concept of 'healthy orthorexia' (HeOr) has emerged. Barrada and Roncero (2018) first proposed that Orthorexia may be made up of two distinct constructs, rather than one as originally defined. These two distinct constructs encompass a pathological and non-pathological interest in healthy eating. 'Orthorexia nervosa' (OrNe) was the name given to the pathological construct characterised by an obsession/preoccupation with healthy eating that leads to distress and impairment. OrNe, as proposed by Barrada and Roncero, is consistent with researchers' understanding of ON as a single construct. HeOr was the name given to a second construct argued to be characterised by a fixation or interest in healthy eating that does not lead to impairment or distress and is argued by some to be protective in nature (Barrada & Roncero, 2018; Cosh et al., 2023). Some research on HeOr and OrNe has shown support for the notion of two distinct latent constructs, OrNe and HeOr, and that OrNe is related to elevated disordered eating and clinical impairment, while HeOr is associated with non-pathological behaviours (Zickgraf & Barrada, 2022). However, the findings obtained in a study by Cosh et al. (2023) contradict the notion that HeOr is non-pathological in nature as their results suggested its possible overlap with anorexia nervosa.

Despite there being some evidence to support the notion that there is a non-pathological form of healthy eating fixation/interest, not all researchers agree that Orthorexia comprises two distinct constructs. It could be argued that if there is a 'Healthy Orthorexia' and consequently 'Unhealthy Orthorexia', labelling the non-psychopathological construct with the moniker of orthorexia adds confusion given that the mental health field does not use pathological terms to describe otherwise healthy behaviour (e.g., there is no 'healthy anorexia' or 'healthy depression'). In short, it could be viewed as redundant and reduce clarity among researchers and mental health professionals to name healthy behaviour with a term otherwise associated with disordered behaviours. The focus of the current program of research is purely on pathological levels of orthorexia symptoms (i.e., ON).

Proposed Diagnostic Criteria for Orthorexia Nervosa

Until recently, there had been no global consensus regarding ON's core diagnostic criteria. Since its conception, four sets of diagnostic criteria have been proposed by four different research groups. Some of these were modelled on the ED criteria of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013)*, having been adapted to reflect characteristics associated with the proposed definition of ON (Barthels et al., 2015a; Cena et al., 2019; Dunn & Bratman, 2016; Moroze et al., 2015; Setnick, 2013). While each of the proposed criteria sets vary in structure, number of criteria, and the importance placed on suggested ON-related features, there are four components that they all share. These are (1) an obsessive preoccupation/pathological focus with healthy eating; (2) rigid and extensive avoidance of foods considered to be unhealthy according to the individual's dietary beliefs; (3) pronounced psychological distress in response to unhealthy foods or non-adherence to self-imposed dietary rules and consumption of

perceived unacceptable foods; and (4) behavioural and emotional characteristics that cause an interference with the daily life of the individual, including but not limited to, physically and nutritional consequences and complications and distress or impairment in emotional, psychological, occupational, and social areas (Cena et al., 2019). Where these criteria sets vary is in terms of the importance of time spent on related activities (Moroze et al. 2015), excessive money being spent on food (Moroze et al. 2015), intolerance of others' food beliefs (Moroze et al. 2015), escalation of dietary restriction over time (Dunn & Bratman, 2016), and the influence of compliance/non-compliance with healthy eating behaviours on body image, self-worth and identity, and life satisfaction (Dunn & Bratman, 2016). As expected, based on the claims made regarding the absent role of appearance-based shape and weight concerns in ON, a preoccupation with shape and weight is absent from all four proposed criteria. Three of the four criteria sets identify that the underlying motivation for the condition is a drive/desire to achieve optimal health rather than shape or weight as in currently recognised EDs (Barthels et al., 2015a; Dunn & Bratman, 2016; Setnick, 2013). The diagnostic criteria proposed by Moroze et al. (2015) alone include obsessive-compulsive disorder features but omit addressing the potential role of weight loss, which is included in the diagnostic criteria of Dunn and Bratman (2016).

Although each of these diagnostic criteria sets shows promise, none have been uniformly adopted. To move towards greater consensus, a modified Delphi study was conducted that brought together 47 experts and researchers from around the globe to produce a summary of the expert observations and research results regarding ON (Donini et al., 2022). The results of Donini et al.'s study not only attempt to resolve some of the debates regarding the nature of the condition but also endorse ON's standing as a real condition and utility as a diagnosis. This represents the "first-ever consensus-built proposed

diagnostic criteria and standard definition for orthorexia nervosa” and reflects agreement across international, multidisciplinary experts (Donini et al., 2022, p. 3706).

In Donini et al.’s study, 75% agreement was determined as the threshold for a statement to be included in the final consensus document. The process started with 67 statements about ON which fell into the following categories: definition, clinical aspects, duration, consequences, onset, and exclusion criteria. A total of 27 statements met or exceeded the consensus threshold and these were used to develop the proposed diagnostic criteria for ON. A summary of the proposed diagnostic criteria widely agreed upon and expert agreement can be found in Table 1.1. Although this is certainly a much-needed step in the direction towards a standardised definition of the condition, further research is needed to provide empirical support for the characteristics endorsed by relevant health professionals.

Table 1.1

Orthorexia Nervosa Proposed Criteria and Expert Agreement From Donini et al. (2022).

Criteria	Proposed Criteria Statements	Agreement (%)
Criteria A: Definition, Clinical Aspects and Duration		
Criterion A1:		
Definition		
1	ON is characterized by a strong preoccupation with one's eating behaviours and with self-imposed rigid and inflexible rules which are strictly controlled and include spending an excessive amount of time for planning, obtaining, preparing and/or eating one’s food.	93.3
2	The definition of “healthful eating” or “pure eating” includes a dietary theory or set of beliefs whose specific details may vary. Subjects with ON often refer to “healthy” food as pure,	96.7

clean, organic, right, correct, natural, safe; “unhealthy” food is often referred to as processed, with added ingredients, prepared, treated, toxic, contaminated such as to represent harmful consequences for the individual’s health. It might also include any other definition of healthy or unhealthy according to the affected individual (his/her background/culture/ knowledge/moment in life) or to dietary trends and cultures.

3	Orthorexia Nervosa (ON) is a mental health disorder associated with reduced well-being and falling within the DSM-5 category of “Feeding and Eating Disorders”.	93.3
4	Individuals with ON experience emotional distress, anxiety (if they are confronted with food they believe to be unhealthy and they fear they might be impaired by eating them), problems concerning attention and concentration (if an individual thinks about healthy eating all day) and a feeling of guilt as a consequence of not being able to eat healthy.	96.6
5	In ON, the adherence to self-imposed dietary rules has an undue influence on self-evaluation.	90

Criterion A2:

Duration

6	Symptoms should be present for at least the last 6 months. However, if there is a severe impairment of health (see Criterion B10) or psychosocial functioning, diagnosis can be given after only 3 months.	78.6
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Criteria B: Consequences

7	ON-related behaviours involve disturbances of eating habits that lead to a nutritionally unbalanced diet that negatively affects health status (both physical and mental health), and quality of life.	93.3
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8	ON includes emotional (e.g., feeling guilty after having eating food considered to be unhealthy), cognitive (e.g., problems concerning attention and concentration) and/or social (e.g., social exclusion) consequences, that have a negative effect on the individual's educational, work or social life.	96.6
9	As a result of the excessive amount of time devoted to their diet (reading about, acquiring and/or preparing food), ON has a negative impact on other important areas of psychosocial and personal functioning.	96.7
10	The food selectivity that characterizes ON individuals, can contribute to cause nutritional deficiencies (e.g., anaemia, extreme weight loss, global or selective malnutrition) and hormonal disturbances.	96.4
11	The rigid eating rules present in ON may result in low body weight that corresponds to sociocultural ideals of healthiness, at least in Western countries, or may overlap greatly with thin and muscular ideals. However, this low weight may be better conceived as a side effect or a consequence of ON instead of as the result of body dissatisfaction.	85.2

Criteria C:
Onset

12	ON seems to be associated with the development of other forms of F&EDs and/or with migration to other forms of F&EDs. It may precede other F&EDs, coexist with F&EDs (when an orthorexic attitude represents a more socially acceptable way of deploying the F&ED), follow other F&EDs (representing a faulty coping strategy when no longer able to practice other F&ED behaviours), or serve as a coping	87.3
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	strategy for individuals affected with AN to continue restricting their diet.	
13	People may develop ON as a consequence of prescribed or self-prescribed dietary rules related or not to clinical conditions (e.g., people with chronic/somatic diseases requiring specific restrictions; seeking food theories to adhere to cure a chronic disease such as fibromyalgia, food allergies or intolerances). ON may also represent in these cases a coping mechanism of chronic diseases in which strict dieting is needed (feeling of control).	87.3
Criteria D: Exclusion Criteria		
14	The food selection and/or exclusion from the diet is not attributable to a clinical dietary prescription (e.g., in renal insufficiency, obesity, food allergies and intolerances).	79.3
15	If clinical conditions are present and motivate food selection and/or exclusion, the onset of ON is characterized by a food selection and/or exclusion that is excessive, inappropriate, and goes beyond standard medical advice and practices.	79.3
16	The food selection and/or exclusion from the diet is not attributable to economic conditions, values, cultural, religious beliefs or delusional ideas.	96.7

Note: Relevant sections have been reproduced from Donini et al. (2022).

Reported Prevalence Rates of Orthorexia Nervosa

Until a valid way of measuring ON has been developed, it is not possible to properly determine prevalence rates for this condition. As such, the prevalence rates addressed will be those reported by studies based on the use of currently available measures. The prevalence rates for this condition are controversial and vary significantly across studies (ranging from 6% to upwards of 90%) based on sample populations and depending on the measurement tool and cut-off score used. The ORTO-15, a measurement of ON used in the

majority of studies to date, has been shown to have the largest variance in prevalence rates across the research. One of the first studies utilising this measure identified a 6.9% prevalence rate in an Italian university sample (Donini et al., 2005) compared to a later study, also using the ORTO-15 in an Italian sample of the general population, which found a prevalence rate between 21% to 57.6% (Ramacciotti et al., 2011). The reasons for this substantial discrepancy in prevalence rates are unclear but may have been due to the ORTO-15 more accurately detecting an interest in healthy eating as opposed to a clinical condition (Ramacciotti et al., 2011). Comparative prevalence rates utilising other measures have been more consistent, as demonstrated by studies conducted by Barthels et al. (2015a), Strahler et al. (2018), and Luck-Sikotski et al. (2019) who all found between 3% and 6.9% prevalence rate among a German sample of the general population when using the Dusseldorf Orthorexia Scale (DOS).

Further complicating the matter, most of the research assessing the prevalence rates of ON has been done in groups considered to be at high risk for the condition (Varga et al., 2013). The populations that have most been the subject of prevalence-based research are health professionals, dietitians, medical professionals, performance artists, athletes, those with previous EDs, and students in the nutrition, medicine, and sports science fields (Niedzielski & Kazmierczak-Wojtas, 2021; Novara, Maggio et al., 2021), while only a minority of studies provide data on the prevalence of ON from a representative community sample (Varga et al., 2013). Some have even gone so far as to argue that, since ON prevalence rates vary so much by sample population, measurement tool, and/or country-of-origin of research, no reliable data regarding the prevalence rate for ON currently exists (Niedzielski & Kazmierczak-Wojtas, 2021).

Consequences of Orthorexia Nervosa

Similar to currently recognised EDs, ON has been reported to result in several adverse physical and psychological consequences. Beginning with the former, research suggests that the diet of those with ON, despite their insistence on a strong motivation for healthy diets, often fails to meet the requirements of a healthy diet based on medically recommended nutritional components (McGovern et al., 2021; Mitrofanova et al., 2020; Moroze et al., 2015; Park et al., 2011). Examples of the potential physical impacts associated with ON can be found through case studies and reported by those recovered from the condition. Park et al. (2011) noted that their patient experienced metabolic acidosis, lung and breathing problems (emphysema and pneumothorax), and problems with blood (pancytopenia). McGovern et al. (2021) noted that all of their participants (self-described as having recovered from ON) expressed some form of physical health consequences from the condition, such as low energy, irritable bowel syndrome, and osteoporosis.

The psychosocial consequences of ON potentially include conflict with family members (e.g., over food choices) and social isolation (Koven & Abry, 2015; Zickgraf et al., 2019). This isolation can be self-imposed due to a belief that their eating habits cannot be maintained in social environments, due to not wanting to interact with those who do not share their views, or due to others not wanting to interact with them as a result of undesirable behaviours (e.g., controlling behaviour, moral superiority, and judgement of others) (Koven & Abry, 2015; Zickgraf et al., 2019). Those with ON are also suggested to experience reduced enjoyment in social events that involve communal eating. It could be argued that this is due to the increased anxiety and stress experienced regarding food choices, which could subsequently lead to further isolation and feelings of alienation.

Additionally, cognitive inflexibility has been linked to ON as demonstrated by Koven and Senbonmatsu (2013), who found that ON was related to difficulties in set-shifting, emotional control, working memory, and self-monitoring. Hayatbini and Oberle (2019) also found evidence of cognitive inflexibility for those with higher ON tendencies compared to the control group, with this inflexibility specific to healthy eating thoughts and behaviours. While it is the belief that the increased cognitive inflexibility in those with ON is a result of the condition, further research is needed to determine whether this is the case.

Another suggested consequence of ON is diminished quality of life, which has been found to be lower in those with ON symptomatology. For instance, Kalika et al. (2023) found that those with higher ON symptoms had lower quality of life, including psychological, financial, work/school, and physical/cognitive aspects than those with no or low NO symptoms. It has been suggested that poorer quality of life is due to self-imposed punishment after violations of dietary rules, depression, anxiety, and the aforementioned isolation (Bagci Bosi et al., 2017; Koven & Arby, 2015). As with many aspects of ON, research on the consequences of ON is still lacking, such that more is needed across areas of biopsychosocial functioning to comprehensively understand the various impacts this condition has on those experiencing it.

Potential Aetiological Factors for Orthorexia Nervosa

While research into the development of ON is still very limited, several studies have suggested that ON tendencies can emerge out of a harmless and normal concern for one's health and an effort to improve, increase, or maintain one's health or to avoid illness through one's diet (Toth-Kiraly et al., 2021). This aligns with the first stage of Bratman's (2017) original two-stage model of the development of ON. He identified that the first stage, which he described as innocent, is where the individual chooses to eat a healthy diet. The

second stage is where the individual intensifies their engagement in an unhealthy pursuit of the healthy eating ideals originally adopted (Douma et al., 2021). Currently, the developmental pathway for progression to ON is still under investigation, with various factors implicated in qualitative and quantitative research, which will be reviewed in the following sections.

Qualitative Research

Based on interviews conducted with those who self-diagnosed as having ON, Valente et al. (2020) found that participants often pointed to two routes responsible for the onset of ON. One route was influenced by distal contextual factors, while the other was influenced by biological, psychological, and interpersonal factors. Regarding the first route, participants claimed that a variety of contextual factors interacted with each other to cumulatively contribute to the development of ON (Valente et al., 2020). For these individuals, a key contextual factor was exposure to Western sociocultural health and beauty ideals in childhood and adolescence where health and thinness were equated with success, paired with the amplification of this message by social media, which caused confusion around health and nutrition. This then resulted in individuals attempting to make sense of these messages by seeking out more and more information, which over time developed into an obsession and led to increasingly stricter and more restrictive diets. In terms of the second route, participants identified perceived pressure to eat healthily, along with perfectionism and anxiety as important underlying mechanisms for the onset of their ON. Additionally, these individuals were found to be more likely to report that a major life event, or the onset of psychological or physical illness, impacted their eating behaviours. These individuals were also found to be more likely to have food allergies and/or intolerances, a previous history of eating problems, psychological problems, and/or a family history of psychological/eating

problems. For several of the participants, it was the interaction between anxiety and/or perfectionism and life events that resulted in an over-focus on diet as a means of seeking control in their lives.

Complementing Valente et al.'s (2020) focus on lived experience perspectives, Douma et al. (2021) investigated the developmental pathways for ON by conducting semi-structured interviews with Dutch professionals working with patients with ON. Douma et al. identified several factors that they believed to play a role in the development of ON, including factors in the environment (e.g., excessive healthy eating habits conveyed by significant others and mainstream/social media/pseudoscientific nutritional experts), baseline factors (e.g., higher level of education and/or an active lifestyle), initiating stressful events (e.g., relationship termination and illness), and psychological difficulties (e.g., anxiety and depression). This view regarding the development of ON is nearly identical to that outlined by those self-diagnosed with the condition. The idea that one's sociocultural environment plays a role in the development of ON is consistent with the aforementioned emergence of 'healthism' and the belief in one's moral responsibility for their health.

Demographic Factors

Complementing qualitative studies seeking to shed light on the aetiology of ON is a larger and growing body of quantitative research. Spanning the last several decades, this research has focused on several demographic and psychosocial factors commonly associated with other conditions, specifically EDs, that may point to aetiological mechanisms in ON. This section will focus on demographic factors.

Gender. The research to date investigating ON and its relationship with gender has been inconsistent. Some studies have found a higher portion of ON among females, some a higher portion among males, and others have found no gender differences. These

contradictory results were evident in Oberle et al.'s (2017) review of 12 studies regarding ON and gender. There were no significant gender differences in seven of these studies (Aksoydan & Camci, 2009; Bagci Bosi et al., 2007; Brytek-Matera, Donini, et al., 2015; Herranz-Valera et al., 2014; Lewis, 2012; McInerney-Ernst, 2011; Ramacciotti et al., 2011). In contrast, five studies found some gender differences, although they were contradictory, with two finding a higher incidence in males (Donini et al., 2004; Fidan et al., 2010) and three finding a higher incidence in females (Arusoglu et al., 2008; Keller & Konradsen, 2013; Koven & Senbonmatsu, 2013; Oberle et al., 2017).

Thus, despite some studies showing higher prevalence rates of ON in males or females, the majority of the studies have not found a significant relationship between ON and gender. This absence of a significant relationship also appears to be occurring globally across various populations, including in Australia, Germany, Croatia, Greece, the United States (US), the United Kingdom (UK), and Poland, and holds for populations considered to be at a higher risk of ON. For example, no gender differences were found in Herranz Valera et al.'s (2014) study on yoga practitioners or in Aksoydan and Camci's (2009) study on artists. Given the mixed results, the current consensus regarding the relationship between ON and gender is that there is no consistent difference between the prevalence rates of ON in males compared to females. However, further research is needed to confirm this as well as research attempting to identify any moderators of the association between gender and ON in order to account for the discrepant findings.

Age. Age has been found to be associated with EDs, such as anorexia nervosa which is more prevalent in younger individuals (van Eeden et al., 2021). In contrast, the current research on age in ON has been mixed such that there is currently no consensus on whether a particular age group is associated with a greater occurrence of the condition. Several

studies have found that ON is more common among young adults compared to older adults, including in studies conducted among Turkish (Fidan et al., 2010), Italian (Dell’Osso et al., 2016), and Croatian (Livazovic & Mudrinic, 2017) samples of university students. ON was also more commonly found among younger adults when looking at the prevalence rate among athlete samples in Germany (Rudolph, 2017), Italy (Segura-Garcia et al., 2012), and Portugal (Almeida et al., 2018), although the effect sizes for these studies were small. Conversely, some studies have suggested that the prevalence of ON increases with age such as in Donini et al.’s (2004) study of 404 Italian university students. Others still have found no significant relationship between ON and age when investigated across populations from different countries (Depa et al., 2017; Grammatikopoulou et al., 2018; Reynolds, 2018; Turner & Lefevre, 2017). It is worth noting that the majority of studies conducted in this area have had a mean participant age of around 20-29 years, which could indicate a need to more comprehensively investigate ON in adolescent and older adult populations. As it stands, the relationship between ON and age remains unclear, with further research across the lifespan needing to be conducted on this.

Education Level. Research seems to suggest that higher levels of ON are associated with a lower level of formal education. This relationship was identified by Donini et al. (2004) in their study on a sample of Italian adults drawn from the general population. Arusoglu (2008) similarly found that ON tendencies were higher in those without a graduate level of education compared to those with a graduate degree. More recently, Gerges et al. (2023) found in their study of Lebanese participants that having a secondary level of education (compared to a university level of education) was associated with higher ON symptomatology. Additionally, King and Wengreen (2023) investigated the association between the level of interest in, and knowledge of, nutrition and ON, finding that an interest

in nutrition was associated with an increase in ON traits, but that higher levels of actual knowledge of nutrition were associated with a decrease in ON traits. Overall, the literature to date on education level and ON symptomatology seems to suggest that those with a lower level of education may be more at risk, and that this may in part be due to less accurate knowledge regarding nutrition.

Body Mass Index. Due to the established relationship between currently recognised *DSM-5-TR* (APA, 2022) EDs and body mass index ($BMI = kg/m^2$), it is reasonable to propose that BMI might be related to ON. However, the findings have been markedly inconsistent. Using different ON measures, the majority of studies have found no relationship between ON and BMI, including in samples from Spain (Barrada & Roncero, 2018; Herreanz Valera et al., 2014; Parra-Fernandez et al., 2018), Italy (Dell’Osso et al., 2017; Donini et al., 2004), Australia (Reynolds, 2018), Turkey (Aksoydan & Camci, 2009; Sanlier et al., 2016), Hungary (Varga et al., 2014), and the US (Oberle & Lipschuetz, 2018). It has been suggested that these results provide support for the notion that weight loss and thinness are not key concerns for those with ON.

Despite the large amount of research exhibiting no significant relationship between ON and BMI, several studies have found such a relationship but the nature of this association is inconsistent across studies. In a US sample, Oberle et al. (2017) found that a higher BMI was significantly associated with more ON symptoms for males, but not females. The researchers suggested that this result could be due to the higher BMI being associated with greater muscle mass. Fidan et al. (2010) among Turkish dietitians and Asil and Surucuoglu (2015) among Turkish medical students also found a positive correlation between BMI and ON tendencies. Fidan et al. (2010) proposed that this correlation could be because individuals who are overweight may be persuaded or humiliated into engaging in

healthy eating behaviours as a result of weight-based stigma. A similar relationship was found between BMI and ON by Bundros et al. (2016) among college students. They found that the majority of their participants in the overweight/obese BMI range (64%) were found to have ON tendencies, with less than half of their participants in the underweight/normal weight BMI range (48%) being found to have ON tendencies. This relationship between higher BMI and higher ON tendencies was also found among German samples (Luck-Sikorski et al., 2018; Missbach et al., 2015), Spanish samples (Roncero et al., 2017), Polish samples (Hyrnik et al., 2016), and Greek dietetic students (Grammatikopoulou et al., 2018). Likewise, investigating different sub-populations, Athanasaki et al. (2023) found a positive correlation between BMI and ON among professional dancers, while Levin et al. (2023) found that BMI was significantly higher in participants who had high levels of both ON and ED symptoms, compared to those with ON and ED symptoms other than shape/weight concerns and those with ON only.

The relationship found by the least number of studies to date is that between a lower BMI and higher ON tendencies, with only three studies reporting such a finding (Brytek-Matera et al., 2019; Dell’Osso et al., 2016; Tremelling et al., 2017). Overall, the marked inconsistencies across studies suggest a complex relationship between BMI and ON tendencies, that may be moderated by various factors requiring clarification in further research.

Profession. As noted when addressing ON prevalence rates, some populations have been deemed to present a higher risk for the development of the condition (Novara, Maggio et al., 2021). Specifically, higher rates of ON tendencies have been found in those in health and nutrition fields, including in 81.9% of Brazilian dietitians (Alvarenga et al. 2012); 74.2% of Turkish dieticians (Asil & Surucuoglu, 2015); 49.5% of American dietitians (Tremelling et

al., 2017); 36.9% of Turkish medical students (Fidan et al. 2010); 88.7% of Brazilian nutrition students (de Souza & Rodrigues, 2014); 59% of Polish nutrition students (Gubiec et al., 2015); 62.9% of Greek dietetic students (Gkiouras et al., 2018); 84.5% of Swedish students belonging to a health-related careers (Malmborg et al., 2017); and 74.5% of Libyan medical students (Farchakh et al., 2019). People in the performing arts or health and fitness roles also appear to have higher ON tendencies, with 56.4% in Turkish performing artists (i.e., opera singers, ballet dancers, and symphony orchestra musicians) (Aksoydan & Camci, 2009), 86% in Spanish Ashtanga yoga practitioners (Herranz Valera et al. 2014), and 75.4% in Turkish yoga practitioners (Erkin & Gol, 2019).

Various factors have been proposed to account for the higher risk in these professions for developing ON symptoms. For those studying or working in health and nutrition areas, the higher risk is considered to be due to their increased interest and awareness of healthy eating behaviours (Malmborg et al., 2017). In contrast, for those in the more arts-based areas, it is suspected that the risk for ON arises from the prioritisation of body image (Parra Carriedo et al., 2020).

Psychological Factors

In addition to demographic factors, a diverse range of psychological factors have been implicated as being of possible aetiological relevance for ON.

Prior History of an Eating Disorder and Restrictive Eating. To date, one of the most robust predictors of ON appears to be a history of an ED (Agger et al., 2020; Barnes & Caltabiano, 2017; Brytek-Matera, Rogoza et al., 2015; Foyster et al., 2023; Gramaglia et al., 2017; Mutluer & Yilmaz, 2023; Segura-Garcia et al., 2015). Barnes and Caltabiano (2017) found that ON was not only more likely among those with a history of an ED, but that this was also the strongest predictor of ON above an appearance orientation and weight

preoccupation. Gramaglia et al. (2017) reported ON comorbidity rates of 60-85% among their AN participants. Many clinicians have also acknowledged this relationship, noting that a pre-existing ED is common among those with ON tendencies (Vandereycken, 2011). This relationship between ON symptoms and a history of EDs is not surprising given that ON has been proposed to be an ED and research has continually found ON symptoms to be related to ED symptomatology (Cosh et al., 2023; Novara, Pardini, et al., 2021; Zagaria et al., 2021).

Although the research demonstrates a relationship between ON and a history of an ED, the exact nature of this relationship is still unclear. Unfortunately, as the previous research cannot conclude whether ON precipitated or followed the presence of a currently recognised ED, it is uncertain whether ON is a risk factor for experiencing an ED or the occurrence of an ED is a risk factor for ON. Longitudinal research is needed to properly understand this relationship and the developmental pathways for ON.

In addition to its relationship with EDs, it has been suggested that there is a relationship between ON and other forms of restrictive eating, in particular, vegetarianism and veganism as originally proposed by Bratman and Knight (2000). Views regarding the relationship between ON and vegan/vegetarian diets have also been informed by research indicating that vegetarian/vegan diets are a risk factor for currently recognised EDs (Novara, Maggio et al., 2021).

Brytek-Matera (2021a), in their literature review of the relationship between a vegetarian diet and ON, found that among 11 of the 14 studies reviewed, a vegetarian diet was associated with ON symptomatology. Four of the studies reviewed reported that those following a vegetarian diet exhibited more ON behaviours than those following an omnivore diet (Brytek-Matera et al., 2019; Barthels et al., 2018; Dittfeld et al., 2017; Heiss et al., 2019). Seven found those following a vegetarian diet among the general population to be more at

risk of developing ON (see Barnett et al., 2016; Chard et al., 2018; Dell’Osso et al., 2016; Dell’Osso et al., 2018; Missbach et al., 2015; Luck-Sikorski et al., 2019; Valera et al., 2014). Among those reviewed, only one study found that individuals following a vegetarian diet were *less* likely to engage in ON behaviours (Dunn et al., 2017) and only one study found no significant differences in the occurrence of ON behaviours between those who followed a vegetarian versus an omnivore diet (Cicekoglu & Tuncay, 2018). Thus, the majority of studies indicate an association between vegetarianism and ON.

Anxiety and Depression. In addition to EDs, several studies have found a relationship between ON and both anxiety and depression (Katar et al., 2023; Kiss-Leizer et al., 2019; Strahler et al, 2018; Toth-Kiraly et al., 2021). Anxiety might be a maintaining factor in ON due to the anxiety and worry that can be associated with the consumption of unhealthy foods and physical health concerns. This health-specific anxiety has been found to be associated with ON in two studies to date. Toth-Kiraly et al. (2021) found health anxiety to be positively related to ON, which was taken to suggest that the more someone worries about their health and body the more likely they are to focus on the adherence to a strict diet and physical activity regimen. They also found that ON might be a coping mechanism against a preoccupation with physical symptoms and excessive worry about physical illness. Similarly, Kiss-Leizer et al. (2019) found that health anxiety was one of the strongest predictors of ON among their Hungarian sample. This was in addition to social desirability and guilt over skipping training, which could also be related to heightened anxiety. This relationship between ON and anxiety seems to be consistent across various populations and ON measures, since, using different ON measures, Yilmaz and Dundar (2022) found a significant relationship between ON and anxiety in their sample of Turkish university faculty, while

Awad et al. (2021) found anxiety to be positively correlated with ON among their Lebanese sample.

Similarly, several studies have demonstrated significant positive associations between depression and ON. As with the relationship between anxiety and ON, these associations were found to be consistent across populations and ON measures (Awad et al., 2021; Barlow et al., 2023; Strahler et al., 2018). Awad et al. (2021) suggested that the higher levels of depression they found among participants with higher ON symptoms could be due to the excessive focus on healthy food causing impairments to social functioning, which in turn results in reduced mood.

The relationships between ON and both anxiety and depression are perhaps not surprising given that the association between these two conditions and EDs has been well-established (Garcia et al., 2002; Godart et al., 2002; 2007; Sander et al., 2021). However, whether depression and anxiety are risk or maintaining factors for ON or are precipitated by ON is unclear and more longitudinal research is needed to tease out this relationship.

Personality Factors. A very limited number of studies have examined the Big Five personality traits and ON. Strahler et al. (2020) found in their German sample that higher neuroticism was related to higher ON symptoms. Gleaves et al. (2013) also found a positive relationship between ON and neuroticism in an American sample. Roncero et al. (2021) found that ON was associated with several personality factors, specifically those associated with difficulties in regulating emotions and negative affect, such as ‘negative affectivity’ (similar to neuroticism) and those associated with eccentricity (i.e., holding beliefs outside the norm and feeling special, such as ‘psychoticism’). Similar results were also found by Novara et al. (2022) who found that those with higher ON symptoms also scored higher on ‘negative affectivity’, ‘psychoticism’, ‘detachment’ (i.e., avoidance of socioemotional

experiences, poor interpersonal relationships, and difficulties with empathy), ‘antagonism’ (i.e, grandiosity, attention-seeking, and an exaggerated sense of self-importance), and ‘disinhibition’ (i.e, an orientation towards immediate gratification). More recently, Katar et al. (2023) looked at associations between personality traits and both HeOr and OrNe in a Turkish community sample, finding that HeOr was positively related to extraversion, agreeableness, and conscientiousness, whereas OrNe was not significantly associated with any of the personality traits assessed, contrary to the bulk of other research. In short, ON is most likely related to personality traits associated with negative affect given this was most consistently found in the literature and is consistent with the aforementioned research on anxiety and depression.

Perfectionism. Given its role in EDs, the personality aspect of perfectionism is of particular interest in ON. A handful of studies have investigated the relationship between ON and perfectionism as a personality trait, and have found consistent support for its potential role as a risk factor for the condition (Koven & Arby, 2015), including in samples of American (Hayes et al., 2017; Oberle et al., 2017), Spanish (Barrada & Roncero, 2018; Parra-Fernandez et al. 2018), and Australian university students (Barnes & Calabiano, 2017).

In terms of potential mechanisms linking perfectionism and ON, Yung and Tabri (2022) found support for the supposition that perfectionism may promote ON via a health-focused self-concept. Finding stronger evidence for the causal role of perfectionism, Pratt et al. (2023) investigated the relationship between trait perfectionism and ON, finding trait perfectionism (specifically other-oriented and socially prescribed perfectionism) predicted an increase in ON symptoms among regular exercisers over time.

Self-Esteem. Bratman and Knight (2000) originally proposed that individuals with ON utilise their diet as a way of boosting their self-esteem given the social value accorded

healthy eating, and that the maintenance of extreme healthy eating behaviours creates a superior attitude over others. This proposal suggests that the relationship between self-esteem and ON may change over its developmental course, with low self-esteem acting as a risk factor for ON but engagement in ON behaviours serving to increase self-esteem over time. If low self-esteem is a predisposing factor for ON and that individuals gravitate towards an ON-related diet to increase their self-esteem, this mechanism is comparable to what has been proposed for EDs (Fairburn et al., 2003; Krauss et al., 2023).

The research to date on the relationship between self-esteem and ON is mixed, with some studies finding no significant relationship (Barnes & Caltabiano, 2017; Oberle et al., 2017) whereas others have found that lower self-esteem is associated with higher ON symptoms (Bona et al., 2021; Yilmaz & Dundar, 2022). This inconsistency in the findings may reflect the changing nature of the relationship between self-esteem and ON over time.

Body Image. Despite Bratman and Knight (2000) originally proposing that individuals with ON do not experience negative body image in the form of shape or weight appearance concerns, the relationship between body image and ON is still unclear and represents one of the main debates around the condition. If such concerns are unrelated to ON, this comprises a significant area of divergence from currently recognised EDs and would speak to its status as a distinct disorder. However, yet again, the data to date has shown highly variable results.

Supporting the notion proposed by Bratman and Knight (2000), several studies have found no significant relationship between ON symptoms and body dissatisfaction, including in American university students (Ambwani et al., 2019), Italian university students (Novara, Pardini et al., 2021), Spanish and Polish university students (Brytek-Matera, 2021b; Brytek-Matera, Onieva-Zafra et al., 2020), Lebanese university students (Al Kattan, 2016), and the Canadian general population (Pauze et al., 2021). However, other research has found that

higher ON symptoms were related to higher body dissatisfaction (Barthels et al., 2020; Yakin et al., 2022).

Results are more consistent regarding the relationship between drive for thinness and ON, with several studies finding a positive association including in Italian undergraduate students (Novara, Pardini et al., 2021), in European university students (Brytek-Matera, 2021b; Brytek-Matera, Onieva-Zafra et al., 2020), and in a German general adult sample (Barthels et al., 2020). Barthels et al. (2017) investigated drive for thinness among participants with AN, AN and ON symptoms (ANO), and healthy controls, finding that drive for thinness was comparable in the AN and ANO groups, who were both significantly higher than the healthy controls. Interestingly, the ANO group exhibited significantly higher scores on the indices of body contact and self-aggrandisement (the enjoyment of one's own body) than the AN-only group, but comparable to the healthy controls. The authors posited that this might suggest that those with AN and ON symptoms are more confident with their bodies and that the presence of ON symptoms in addition to AN could play a role in the reduction of at least some aspects of the body image disturbance in those with AN. Researchers have similarly found a positive relationship between shape, weight, and/or overweight preoccupation and ON symptoms (Ambwani et al., 2013; Barnes & Caltabiano, 2017; Brytek-Matera, Donini, et al., 2015; Brytek-Matera, Rogoza, et al., 2015; Pauze et al., 2021; Reynolds; 2018). In addition to positive associations between body preoccupation and ON symptoms, Messer et al. (2022) also found positive associations with body over-evaluation, checking, and avoidance. Contrary to these studies, Strahler et al. (2018) and Stutts (2020) did not find a relationship between higher ON symptoms and weight concerns.

Although some of the inconsistencies in the ON research are likely due to differences in the measurement of ON and the study samples, at least some of the discrepant findings

could be due to the failure in almost all studies to account for the potential contribution of ED symptoms, which could be confounded with ON. A study by Yakin et al. (2021) assessed body image attitudes in those with ON, ED or obsessive-compulsive (OC) behaviours, and those low on each of these behaviours. They found those with ON behaviours had lower overweight preoccupation than those with ED behaviours, but greater than those low on ON/ED/OC behaviours. Further, their ON participants exhibited better self-classified weight, body satisfaction, and appearance evaluation than those with ED behaviours. Thus, the elevated overweight preoccupation in those with ON may be of a different nature to that with EDs, with the authors suggesting that the overweight preoccupation in those with ON could be explained by fitness and health-related concerns rather than body image concerns. As such, a critical step for future research is to more clearly delineate between participants with ON, ED, and combined symptoms so that the differential motivations and correlates of these symptom clusters can be discerned.

Sociocultural Factors

Social media, as a pervasive transmitter of sociocultural values, has been identified as playing a role in the development of disordered eating. Social media platforms have become very powerful mediums for the dissemination of dietary trends and diet culture, especially the emerging 'clean eating' trend. Continual exposure to images and content that conflates the 'perfect body' and success with these dietary trends works to normalise and reinforce the adherence to these diets among receptive consumers (Horovitz & Argyrides, 2023; Scheiber et al., 2023). The influence of social media on EDs and body image concerns is well-established (Cohen & Blaszczynski, 2015; Saunders & Eaton, 2018). As such, it seems logical to assume that this relationship also exists for ON symptoms given the alignment between social media content and the behaviours characterising this condition.

Despite the seemingly logical relationship between social media use and risk for ON, to date the role that social media plays in ON is under-researched and therefore not entirely understood. However, a recent study conducted by Scheiber et al. (2023) investigated the role of social media in ON, finding that participants' involvement with health and fitness accounts on social media was positively associated with ON tendencies. They also noted that higher thin-ideal and muscular-ideal internalisations were found in those who had greater involvement in health and fitness social media accounts and that this contributed to higher ON tendencies. Preliminary research suggests that there may be differences across social media platforms in terms of ON risk, with Turner and Lefevre (2017) finding that greater Instagram use in particular was associated with an increased tendency toward ON, but this was not the case for other social media platforms (i.e., Facebook, Pinterest, Google+, Tumblr, and LinkedIn).

The Measurement of ON

It is clear that diverse factors are potentially implicated in the development of ON but that the findings to date are often characterised by a high level of inconsistency. At least some of these discrepant findings likely stem from the use of diverse instruments to assess ON symptomatology given that a large number of ON measures have been developed. Indeed, there are at least 10 such instruments. While some measures show promise, the psychometric properties of the majority are problematic or unclear due to inadequate validation research. As such, it is important to understand the psychometric properties, strengths, and weaknesses of the measures available to ensure that understandings of ON are not compromised by the use of problematic instruments. The following section will evaluate each of the currently available instruments developed to measure ON.

Bratman Orthorexia Test (BOT)

The first measurement tool seeking to measure ON was developed by Bratman in partnership with Knight, which was initially described in 2000 (Meule et al., 2019). The Bratman Orthorexia Test (BOT) is a self-report measure consisting of 10 items, scored using a dichotomous response of 'yes' or 'no', with individuals having four or more 'yes' responses being considered at risk for ON. To date, the BOT has been translated into several languages and adapted for use in various countries including Germany, Sweden, and the US.

Unfortunately, the psychometric properties of this measure are largely unknown, with some results calling into question its validity, such as its failure to differentiate between ON and EDs, including anorexia nervosa and bulimia nervosa (Meule et al., 2019). This measure was subsequently revised to an eight-item version, called the rBOT (Haeberle-Savard, 2015).

Researchers have reported good internal consistency for the rBOT (Cronbach's $\alpha = .85$) as well as convergent validity (Bartel et al., 2020). Bratman (2017) also revised the BOT in the form of the Authorised Bratman Orthorexia Self-Test (ABOST). The psychometric properties of the ABOST were evaluated by Rogowska et al. (2021b), finding that when utilising a dichotomous response type (yes/no) it did not meet reliability and validity criteria, but when utilising a continuous response type (five-point rating scale) it was found to have good internal consistency (Cronbach's $\alpha = .80$), content validity (against Dunn & Bratman's [2016] diagnostic criteria), structural validity, and construct validity.

ORTO-15

Based on the BOT, Donini et al. (2004) developed another self-report questionnaire for measuring ON called the ORTO-15. This is a 15-item measure with responses ranging from 1 (*always*) to 4 (*never*). The ORTO-15 is considered to tap into three dimensions

(cognitive-rational, clinical, and emotional), however, it is worth noting that this is despite the absence of any factor analysis being conducted on the measure (Roncero et al., 2017).

For some time, the ORTO-15 and the BOT were the only measures available for ON, with the ORTO-15 quickly becoming the standard. As such, most of the research on ON for almost the last decade and a half has been done using these two measures, most prominently the ORTO-15, which was created in Italian and has since been translated into various languages, including English, Turkish, Portuguese, Hungarian, Polish, German, and others. This poses a problem since the ORTO-15 has demonstrated poor psychometric properties (i.e. concerns with reliability and internal consistency) and has been consistently criticised in the literature for not being evaluated through appropriate factor analytic work (Missbach et al., 2017; Roncero et al., 2017). Variability has also been found across studies, with various items deleted due to problematic loadings of the items, which has resulted in several shorter versions of the ORTO-15 being developed, ranging from nine to 12 items, with only one adaptation showing good internal consistency (Missbach et al., 2017; Roncero et al., 2017).

Concerningly, the ORTO-15 has also been criticised for not adequately tapping into the condition. During a validation done by the developers, it was found that the target group did not have the most ON-indicative scores, and it was actually those with 'healthy eating behaviours' that scored the lowest on the ORTO-15 (indicating higher levels of ON tendencies). As opposed to those who had a combination of healthy eating behaviour and pathological aspects (as determined by the Minnesota Multiphasic Personality Inventory; MMPI), which was the group the researchers had intended the measure to classify with lower scores (Niedzielski & Kazmierczak-Wojtas, 2021). Despite poor psychometric properties being found continuously throughout the literature for the ORTO-15 (see also

Missbach et al., 2017; Valente et al., 2019), Meule et al. (2019) once again put its psychometrics to the test (among other ON measures). They found that the ORTO-15 had an unacceptable model fit when factor analysis was conducted and had low internal consistency, as well as only having medium size correlations with other ON measures, which further suggests that it may be measuring a different construct or does not capture ON tendencies as precisely as the other measures.

Eating Habits Questionnaire (EHQ)

Gleaves et al. (2013) developed the Eating Habits Questionnaire (EHQ) in the US, which comprises a 21-item self-report questionnaire designed to measure pathological ON tendencies. It uses a **four-point rating scale** ranging from 'false/ not at all true' to 'very true'. It was developed with a three-factor structure, consisting of subscales assessing problems associated with healthy eating, feelings about healthy eating, and knowledge of healthy eating. On initial assessment, the measure has shown good internal consistency, with Cronbach's alphas of .82, .86, and .90 for the Problems, Emotions, and Knowledge subscales, respectively.

To date, the majority of studies utilising the EHQ have been conducted in the US, although it has also been studied in Australia (Halim et al., 2020) and psychometric support has been found for its Polish (Brytek-Metera, Plasonja et al., 2020), Italian (Novara et al., 2017), and French (Godefroy et al., 2021) translations. In a systematic review conducted by Opitz et al. (2020), consistent support was found for the EHQ's internal consistency and test-retest reliability. The three-factor structure has generally been supported, with three out of four studies in the review replicating this structure.

Although its promising psychometric properties suggest the EHQ comprises a more suitable alternative to the ORTO-15, it has been criticised for not adequately covering the

pathological aspects of ON including emotional distress, compulsive behaviours, and physical impairment (Roncero et al., 2017). Thus, improvements may be warranted.

Eating Habits Questionnaire Revised (EHQ-R)

Seeking to improve the EHQ based on critiques regarding its limited inclusion of pathological aspects, a revised version has been developed (Glen, 2018). The EHQ-R has 30 items and is comprised of five subscales (rigidity, healthy body image, violation of dietary rules, negative emotionality, and time impairment) measured on a four-point rating scale response type, ranging from 'not true at all' to 'very true'.

The EHQ-R is still in the early stages of evaluation, such that there is limited information regarding its psychometric properties. Studies that have assessed its psychometric properties have reported good internal consistency, with acceptable Cronbach's alphas for the total scale and five subscales (total scale = .81-.96; rigidity = .81-.89; healthy body image = .82-.86; violation of dietary rules = .83-.89; negative emotionality α = .83-.89; time impairment = .75-.86) (Bona et al., 2021; Glen, 2018; Opitz et al., 2020). It was also found to exhibit good convergent validity with the Eating Attitudes Test ($r = .78$) and the original version of the measure ($r = .80$). Preliminary results have indicated discriminant validity between the EAT-26 Oral Control subscale and the EHQ-R healthy body image factor ($r = .18$) and the negative emotionality factor ($r = .38$) (Glen, 2018). Although there is further evaluation required, the findings to date indicate that this is a promising measure.

Dusseldorf Orthorexia Scale (DOS)

Another measure showing potential is the Dusseldorf Orthorexia Scale (DOS), which was developed by Barthels et al. (2015b) originally for German-speaking countries. It has two versions, a 10-item and a 21-item version. The longer version has three subscales

consisting of orthorexic eating behaviour, avoidance of additives, and supply of minerals. The shorter and more prominent version is unidimensional. The DOS utilises a four-point rating scale ranging from 'this does not apply to me' to 'this applies to me'. Both versions of the DOS showed good internal consistency, with Cronbach's alphas of .91 for the 21-item version and .84 for the 10-item version.

Since its original development, the DOS has been translated into several other languages, including English, Chinese, Polish, and Arabic, and has shown good psychometric properties throughout its translations (Brytek-Matera, 2021b; Chard et al., 2018; He et al., 2019; Rogoza et al., 2021). For example, in Rogoza et al. (2021) study, where the 10-item DOS was translated into Arabic and used among Lebanese adolescents, it was found to have internal consistency with a Cronbach's alpha of .85 and correlated well with other measures of orthorexic behaviours (such as the TOS with $r = .71$ for the 'Orthorexia Nervosa' subscale and $r = .75$ for the 'Healthy Orthorexia' subscale).

Some researchers have questioned the psychometric properties of the DOS-10 in particular. A meta-analysis conducted by Opitz et al. (2020) found that research has generally, though not uniformly, found the DOS to have acceptable internal consistency (Cronbach's alphas between .69 and .93) and test-retest reliability (correlations ranging from .67-.79). It has also shown variable dimensionality, with single-factor, three-factor, and five-factor structures being found across studies (Chard et al., 2018; He et al., 2019; Rogoza et al., 2021). Additionally, it has been shown to be highly correlated with Drive for Thinness scales (Opitz et al., 2020). Relatedly, the DOS has been criticised for being unable to differentiate between individuals with anorexia nervosa alone and those with anorexia nervosa combined with ON features (Hessler-Kaufmann et al.; 2021; Valente et al., 2019).

Thus, while preferable to the ORTO-15 for the measurement of ON, the DOS has not received uniform support.

Teruel Orthorexia Scale (TOS)

The Teruel Orthorexia Scale (TOS) is a 17-item self-report questionnaire developed by Barrada and Roncero (2018) as a bi-dimensional measure of ON, conceptualising the condition as including pathological and non-pathological healthy eating. Accordingly, it comprises a two-factor structure, corresponding to two subscales assessing 'Healthy Orthorexia' (HeOr) and 'Orthorexia Nervosa' (OrNe). The HeOr subscale assesses an interest in healthy eating that is not associated with psychopathology while the OrNe subscale assesses the negative impacts of a pathological focus on 'healthy' eating. Items are rated using a **four-point rating scale** ranging from 'I definitely disagree' to 'I definitely agree'.

Both factors of the TOS have been found to have good internal consistency, with a Cronbach's alpha of 0.85 for the HeOr factor and 0.81 for the OrNe factor, as well as evidence of acceptable 18-month test-retest reliability of $r > .70$ (Barrada & Roncero, 2018). Subsequent research on the TOS indicates that it generally demonstrates good psychometric properties, including translations of the original Spanish version into various languages such as Arabic (Mhanna et al., 2022) and English (Zickgraf & Barrada, 2022). Based on the research to date, the TOS has shown to be a promising measure for ON if understood as a dichotomous construct.

Orthorexia Nervosa Scale (ONS)

Other measures of ON have been developed but have been used to a more limited degree and, for some, have yet to be thoroughly evaluated in terms of their psychometric properties. These will be addressed briefly.

The original version of the Orthorexia Nervosa Scale (ONS) was developed by Kramer (2016) using an initial pool of 160 items derived from items from the ORTO-15, EHQ, and the BOT. Items are scored using a **five-point rating scale** ranging from 'strongly disagree' to 'strongly agree'. Exploratory and confirmatory factor analyses resulted in a 47-item scale with a 10-factor structure and showed acceptable to excellent internal consistency (Cronbach's alphas = .70-.92). A subsequent study identified a six-factor structure (social concerns, knowledge/superiority, fulfillment/control, pureness/natural quality of food, detox, online forums/blogs) using a 38-item measure (Kramer, 2019). Since only one study has attempted to validate the measure since the original was developed, which found good internal consistency (Conrad, 2019), the ONS requires further research.

Barcelona Orthorexia Scale (BOS)

The Barcelona Orthorexia Scale (BOS) was developed in Spain by Bauer et al. (2019) based on the diagnostic criteria proposed by Dunn and Bratman (2016). The final version of this measure comprised 64 items with six dimensions (emotional, cognitive, negative health consequences, negative consequences for social or academic functioning, behavioural, and differential diagnosis) using a **five-point rating scale** ranging from 'totally disagree' to 'totally agree'. Navarro et al. (2023) concluded that a 35-item version of the BOS seems to show adequate psychometric properties with a five-factor structure and internal consistency Cronbach's alphas ranging from .80 to .90.

Orthorexia Nervosa Inventory (ONI)

A newly emerging measurement tool, the Orthorexia Nervosa Inventory (ONI), is a 21-item self-report questionnaire designed to assess the four aspects of the currently agreed-upon diagnostic criteria from Dunn and Bratman (2016) (Oberle et al., 2021). It is based on two other ON measures (i.e., the EHQ and the DOS), with items scored on a **four-**

point rating scale ranging from ‘not at all true’ to ‘very true’. Original factor analysis found it to have three-factor structure comprised an emotional distress factor, a physical and psychosocial factor, and a behaviours and preoccupation factor. The ONI is one of the first ON measures where physical impairment is measured. Given that this has been identified by clinicians and researchers as a key factor of the condition, its inclusion is a noteworthy advantage.

The developers of the ONI found very good internal consistency, with a Cronbach’s alpha of .94 and good test-retest reliability with a correlation of .91. The internal consistency and test-retest reliability for the ONI were found to be greater than several previously used ON measures including the ORTO-15 (Cronbach’s alpha = .14-.83), DOS (Cronbach’s alpha = .80-.88), EHQ (Cronbach’s alpha = .81-.92), and the BOT (Cronbach’s alpha = .60-.67) (Oberle et al., 2021). Psychometric support has also been found for the ONI’s Turkish translation (Kaya et al., 2021). While still in its infancy, the ONI shows strong promise as a measure of ON.

Test of Orthorexia Nervosa (TON-17)

Rogowska et al. (2021a) developed the Test of Orthorexia Nervosa-40 (TON-40) based in part on interviews with people at risk of the condition. The TON-17 comprised 17 items rated on a **five-point rating scale** ranging from ‘strongly disagree’ to ‘strongly agree’ that load onto three lower-order factors (control of food quality, disorder symptoms, and fixation on health and healthy diet) and one general higher-order factor (Orthorexia). Support for the scale’s internal consistency is evident in Cronbach’s alpha ranging from .75 to .79, with validity support found in positive relationships with the ORTO-15 and a measure of disordered eating (the Eating Attitudes Test; EAT-26) (Rogowska et al., 2021a). The TON-17

has shown to be a promising tool for assessing ON which awaits further research to verify the findings from the original validation study.

Burda Orthorexia Risk Assessment (B-ORA)

Developed by Burda (2018), the Burda Orthorexia Risk Assessment (B-ORA) is a 27-item self-report measure that includes 21 ON-related items and six control items scored using a **four-point rating scale** ranging from 'I strongly disagree' to 'I strongly agree'. The items in this measure were based on the diagnostic criteria proposed by Dunn and Bratman (2016), in addition to ON-specific features identified in the literature. The proposed aim of this self-report measure was to provide clinicians with the information needed to detect unhealthy eating behaviours and traits associated with ON. The B-ORA requires further evaluation beyond its original development study which indicated strong internal consistency (Cronbach's $\alpha = .97$) (Burda, 2018; Opitz et al., 2020).

Summary

Over the last decade in particular there has been a surge of instruments developed to measure ON globally. The large variety of measures available presents challenges when attempting to compare results across studies, especially when the psychometric properties of a measure being used are questionable. This is a particular concern as the majority of the research to date has utilised the ORTO-15, which has a number of reliability and validity issues. As such, when interpreting results throughout ON literature, an appropriate level of consideration and care needs to be taken when extrapolating from studies where a potentially problematic measurement tool was used.

The potential problems with certain ON measures further pose challenges when determining the most appropriate measure to use when conducting research into ON and one that was addressed when determining the measurement tool to be utilised throughout

this thesis. Although many of the newer instruments have shown promise as measures of ON, the majority of these have been developed in non-English speaking countries and only some have been validated cross-culturally. The EHQ and its most recent revision, the EHQ-R, is among the few measures to have been developed in English and, based on studies to date, has been shown to have good reliability and validity. Given the sample populations for the studies included in this thesis were expected to comprise mostly English as a first language, the EHQ-R was deemed as the most suitable measures to assess ON. By selecting a measure that was developed in a similar country in regard to language and culture, it ensured, as much as possible, that it would be reliable and valid for the study populations and was, therefore selected for use as the ON measure across this thesis.

Chapter Summary

This chapter provided a brief historical overview of the emergence of the ON construct and a review of the literature to date, including current understandings of ON's key features and their relatively recent synthesis in formal diagnostic criteria, prevalence rates, and adverse consequences. Since its entrance into the scientific world, several factors have been argued to be associated with ON. Consistent relationships between ON and a prior history of an ED, anxiety, depression, perfectionism, and health/medicine or arts-based professions have been found. Comparatively, there are inconsistencies in ON's association with age, gender, BMI, and personality factors. Of particular importance, the research to date has been inconsistent and inconclusive regarding the role of body image or appearance-related concerns in ON. As body image concerns have been highlighted as a significant point of divergence between ON and other EDs, determining their role in ON is highly pertinent in understanding this condition. Before researching this area, it is important to ensure that the measurement tools utilised are psychometrically sound. As many ON

measures currently exist, each with their own profile in terms of strengths and limitations, a comprehensive overview of these was provided to inform measure selection in the current research program. To provide an outline of the key focus of this research, the next chapter will focus on providing a review of the major debates about the nosological status of ON, particularly in relation to its similarities and differences from currently recognised EDs.

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Chapter 2: The Status of Orthorexia Nervosa in Relation to Eating Disorders and as a Mental Disorder

Chapter Overview

This chapter will introduce two of the most prominent debates about Orthorexia Nervosa (ON) and which have direct relevance to the current program of research. The first debate to be addressed pertains to the nature of the symptoms characterising ON, and specifically, whether ON is best conceptualised as an eating disorder (ED). Accordingly, the relationship between ON and currently recognised EDs will be explored. An understanding of the core symptoms of ON then leads on to the second debate, namely, whether the ON symptom cluster comprises a mental disorder, particularly in terms of eliciting significant distress and/or impairment as is required by the definition of a mental disorder. Because both of these debates have informed the current program of research, the chapter will conclude by providing an overview of this research program.

Is Orthorexia Nervosa an Eating Disorder?

Although ON was originally proposed by Bratman to represent a new ED, as indicated by the name chosen which he modelled after formally recognised EDs, agreement as to whether it represents a disorder, and specifically an ED, has not been reached. Despite originally being introduced over two decades ago, the research on ON is still very much in its infancy. Further, several features proposed by Bratman to characterise ON have been heavily debated in the literature since his original description, with evidence to date being mixed.

Among the most prominent debates regarding ON is *where* ON, as a condition, should be classified in diagnostic manuals. To date, research has identified similarities between ON and various other currently recognised disorders, including several EDs, obsessive compulsive disorder (OCD), obsessive compulsive personality disorder (OCPD),

and some somatic symptom disorders, leading to questions as to where ON fits. The main two diagnostic categories claiming ownership of this condition are EDs and obsessive compulsive and related disorders as ON has shown to share similarities with the disorders that belong to these categories more so than any others. Since more recent studies have concluded that ON is a better fit within the ED versus the OCD spectrum (Bartel et al., 2020; Lucka et al., 2019), the next section will focus on providing an overview of EDs before re-visiting the categorisation of ON debate.

Overview of Eating Disorders

Everyone's eating behaviour and diets fall somewhere along a spectrum. At one end is 'normal eating', which can be thought of as the presence of biologically productive and supportive eating behaviours/practices. At the other end is 'eating disordered', which could be considered to encompass eating behaviours that are biologically maladaptive and result in a diminished capacity of the individual (American Psychiatric Association [APA], 2022). Individuals on the eating-disordered end of the spectrum experience disturbances in thoughts, emotions, and behaviours regarding food and eating, resulting in problematic diets and other body shape- and weight-related behaviours. These problematic eating patterns include eating that is restrictive, inflexible, irregular, and/or compulsive. Should these disordered eating patterns occur to a significant degree and result in severe outcomes in terms of substantial disruptions in people's lives, they are considered to constitute an ED (APA, 2022). For these individuals, their eating and other shape- and weight-related behaviours are maladaptive in nature, leading to a loss of, or severely diminished capacity to, function across various domains, including most prominently social, psychological, occupational, and medical domains (APA, 2022).

EDs are a recognised category of mental disorder, present in the current versions of the two major global diagnostic manuals, namely, the text revised fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR; APA, 2022)* and the 12th edition of the *International Classification of Diseases (ICD-12; World Health Organization, 2022)*. While debated, it is commonly understood that at least some EDs are a phenomenon of the 20th century, with the societal and sociocultural changes of this century (such as the emergence of the thin ideal in Western culture) dramatically contributing to the development and presence of abnormal eating habits and behaviours (Forgacs et al., 2018).

EDs represent a complex and multifaceted category of mental disorders, often requiring a multidisciplinary approach to treatment. As such, defining EDs can be a complicated task, due in part to the wide variety of human food preferences and practices surrounding food consumption and the continuous changes in what are deemed 'healthy' eating behaviours or patterns (Evans et al. 2005). In addition to this, understandings of this category of disorders evolve as research continues to unpack their complexity. For example, over the last 15 years, significant changes were made in how EDs were diagnosed with the introduction of the fifth edition of the *DSM* (APA, 2013). This process underscores the need to refine ED categorisation and diagnostic processes as research expands our knowledge of them.

Types of Eating Disorders. The Feeding and Eating Disorder diagnostic category in the *DSM-5-TR* encompasses a diverse range of disordered eating behaviours that diverge in terms of symptom clusters, prevalence rates, age of onset, aetiological models, risk factors, and treatment methods (APA, 2022). The eight *DSM-5-TR* recognised EDs are estimated to affect over one million people in Australia (approximately 4.45% of the population) (Deloitte, 2024), and globally affect over 9% of the population, with this number increasing (Galmiche

et al., 2019). The estimated lifetime prevalence for EDs globally is 8.4% (3.3-18.6%) for women and 2.2% (0.8-6.5%) for men (Galmiche et al., 2019). In Australia, the point prevalence rate of threshold and subthreshold *DSM-5* Feeding and Eating Disorders is approximately 16-18% (Hay et al., 2017; Le et al., 2019). The most thoroughly researched EDs in the *DSM-5-TR* are anorexia nervosa (AN), bulimia nervosa (BN), and binge-eating disorder (BED), which are discussed in turn below.

Anorexia Nervosa. AN, identified in 1873, was the first formally recognised ED, with the term meaning a ‘neurotic loss of appetite’ (Moskowitz & Weiselberg, 2017). It was formally recognised in the first edition of the *DSM* in 1952. AN is a severe mental health condition that is characterised by a low body weight accompanied by an intense fear of weight gain, distorted beliefs and cognitions regarding weight, shape and being overweight, a distorted body image, and a drive for thinness. These distorted cognitions lead to the engagement of several problematic behaviours, which can include severe restrictive eating practices and weight control behaviours aimed at preventing weight gain such as the misuse of laxatives, self-induced vomiting, or excessive exercise (Bora & Kose, 2016; Heaner & Walsh, 2013; Zipfel et al., 2015). The diagnosis of AN requires the “restriction of energy intake” (suggesting voluntary caloric restriction) which leads to “a significantly low body weight” (Criterion A), an “intense fear of weight gain or becoming fat, behaviours that interfere with weight gain” (Criterion B), and a disturbance in “the way in which one’s body weight or shape is experienced” (Criterion C) (APA, 2022, p. 382). The estimated lifetime prevalence for AN has been suggested to be up to 4% in females and 0.3% in males (van Eeden et al., 2021). AN is considered to have the highest mortality rate of all psychiatric disorders, has an exceptionally high relapse rate, and presents a uniquely problematic condition as it includes physical and psychological consequences that contribute to the

extreme disability and mortality rates found (Gorwood et al., 2016; Kan & Treasure, 2019).

The average estimated duration for AN is eight years (Vos et al., 2001).

Bulimia Nervosa. BN was formally recognised in the 1980s when it entered the revised third edition of the *DSM*, formally known as bulimia in the third edition (Heaner & Walsh, 2013). BN is characterised by recurrent episodes of binge eating (consuming a large amount of food in a two-hour period) (Criterion A), accompanied by compensatory behaviours (vomiting, use of diuretics/laxatives, excessive exercise, fasting etc.) (Criterion B) (APA, 2022, p. 388). The compensatory behaviours used by individuals with BN are intended to result in weight loss and/or prevent weight gain due to binge eating. Other key aspects of BN include a distorted body image (similar to AN) in the form of self-evaluation that is ‘unduly influenced by body shape and weight’ (Criterion D) (APA, 2022). For a diagnosis, binge eating episodes and compensatory behaviours are both required to be present at least once a week for a three-month period (Criterion C). Lifetime prevalence estimates for BN range from 0.3% to 4.6% for females and 0.1% to 1.3% for males, with an average duration of five years. It is most common among young adults, peaking during adolescence and adulthood (van Eeden et al., 2021; Vos et al., 2001).

Binge Eating Disorder. BED is characterised by recurrent episodes of binge eating, occurring at least once a week for three months (Criteria A and D), accompanied by symptoms of a sense of a loss of control (Criterion B) and an experience of marked distress over the binge eating episodes (Criterion C) (APA, 2022, p. 393-394). While several of the criteria are similar/identical to those of BN, the body image disturbance feature of BN is a specifier rather than a requirement in BED, and BED does not include the regular occurrence of compensatory behaviours. The lifetime prevalence of BED has been estimated to range from 1.5% to 2.8% for females and 0.8% to 1% for males (Hay et al., 2023).

Avoidant Restrictive Food Intake Disorder (ARFID). Introduced in the *DSM-5*, ARFID is characterised by a disturbance in one's feeding or eating associated with significant nutritional deficiency, weight loss and/or significant changes in psychosocial functioning (Criterion A). These disturbances are not due to religious, cultural or availability factors (Criterion B) and are not the result of another ED (Criterion C) (APA, 2022, p. 377). Food avoidance/restriction in ARFID is not considered to be associated with shape or weight concerns, but is instead due to factors such as a lack of interest in eating, an attempt to avoid food due to sensory characteristics, or fears of adverse consequences of eating (e.g., choking or becoming unwell). Most commonly developing in early childhood, the estimated prevalence rate of ARFID is thought to range from 0.3% to 15.5% depending on the population (APA, 2022; Archibald & Bryant-Waugh, 2023).

Additional ED Diagnoses. One of the main intentions of the revisions made to the *DSM-5* (APA, 2013) was to reduce the number of catch-all diagnoses, namely, eating disorder not otherwise specified (EDNOS), which had previously been the most frequently diagnosed ED (Dahlgren et al., 2017). As such, the *DSM-5* included the addition of several new EDs (notably, BED and ARFID) and the removal of the heterogeneous diagnostic category of EDNOS, which was revised into two diagnostic categories, that is, other specified feeding and eating disorders (OSFED) and unspecified feeding and eating disorder (UFED). Research has demonstrated that the changes to the ED section of the *DSM-5* resulted in the desired changes in the relative prevalence rates, with decreased prevalence rates for the previous EDNOS. Yet, despite the reductions seen in the number of unspecified or 'other' ED cases, these categories still represent a large portion of the individuals exhibiting ED symptoms (Dahlgren et al., 2017). Recent research has suggested that OSFED, a diagnostic category indicating the presence of symptoms similar to recognised EDs but that are not exactly the

same (e.g., atypical AN and subthreshold BN and BED) might represent the ED with the highest prevalence rates among adolescents and adults (Galmiche, et al., 2020), with a large percentage of those with an ED receiving an OSFED diagnosis (40-60%). For example, a study conducted in the United Kingdom found OSFED to have the highest lifetime prevalence rate (of 7.64% of women in their lifetime) and 12-month prevalence rate (of 1.65% of women in a 12-month period) of the *DSM-5* EDs (Micali et al., 2017). Thus, their inclusion in research is strongly justified.

Impact of Eating Disorders. EDs carry a large national and global health and economic burden. They are known for both their severe and disabling psychological and physical impacts, which put a tremendous strain on healthcare systems and economies on a global scale. In Australia in 2023 the estimated cost to society due to EDs, which included the cost of care and productivity, was estimated to be \$66.9 billion (Deloitte, 2024). Of this total cost, 69% could be attributed to impacts on an individual's wellbeing (accounting for \$46.1 billion). This impact equates to 30,000 years of life lost and 136,700 years lived with disability across those with an ED in Australia. In that same year, the estimated death toll for EDs was 2278 people (Deloitte, 2024).

Due to the level of care required to treat and care for individuals experiencing EDs and the resistance to treatment, these disorders do not just have a severe impact on the individuals themselves but also on their families and friends (Erskine et al., 2016). Gatt et al. (2014) looked at the household economic burden of EDs in Australia and found that where the treatment and management of an ED is required, households experience a significant burden, with high rates of hardship and high out-of-pocket expenditure. Economic hardship was reported by 96.7% of study participants and around 40% of participants reported that they spent more than 10% of their household income on illness-related costs. A systematic

review of the cost of illness across several Western countries found that the average cost of treating BN could be up to \$6,000 and up to as much as \$84,000 for AN (Stuhldreher et al., 2012). This is in line with recent data on treatment costs in Australia which found that residential care could cost up to \$83,000 per person, with most residential patients being those with a diagnosis of AN (Deloitte, 2024).

Health-Related Quality of Life (HRQoL) is a useful measure to determine the impact of EDs and have shown to have a significant impact on HRQoL, with the degree of impairment increasing as the severity of the ED increases (Hay et al., 2017; Le et al., 2019). Compared to the general population, individuals with EDs have been shown to have lower scores on all areas of HRQoL, including social, emotional, mental health (particularly), and pain subscales (Baiano et al., 2014; Winkler et al., 2014). Those with EDs also appear to have poorer HRQoL compared to those with other mental health conditions, such as depression (Winkler et al., 2014). EDs have also been associated with lower Health State Utility Values (HSUVs), ‘a qualitative measure of how strongly a person values a certain health state’, (Chang et al., 2020, p. 1085), with the level of HSUV impairment being associated with ED severity (Le et al., 2019). Some of the physical impacts and consequences associated with EDs include malnutrition, amenorrhoea, gastrointestinal disturbance, cardiac irregularities, fertility issues, and poor bone health (Feng et al., 2023). In terms of psychological impacts, these can include suicidal ideation, withdrawal, isolation, low mood, depression, and anxiety (Bulik, 2002). The profound and diverse adverse impacts of EDs clearly mark them as serious mental disorders, an issue that will be re-visited later in this chapter when considering the status of ON as a mental disorder.

The Relationship Between Orthorexia Nervosa and Eating Disorders

Support for the notion that ON is an ED stems from research that has identified several shared features between ON and currently recognised *DSM-5-TR* disorders, most notably, its similarities with restriction-based EDs. It is not surprising that ON would share more similarities with the restriction-based EDs (especially AN) given that current conceptualisations of ON have continued to highlight the restrictive nature of the condition as opposed to those associated with a lack of control around eating such as BN and BED. Given this, the relationship between ON and AN, as well as EDs in general, will be discussed. Additionally, as ON has been linked to OCD in the literature as a possibly related condition, this relationship will also be addressed.

Orthorexia Nervosa and Eating Disorders in General. The consensus among most researchers and clinicians in the area is that ON can be best understood as fitting within the ED category of mental illnesses. This view stems from the overlap in symptomatology found between ON and several currently recognised *DSM-5-TR* EDs (Walker-Swanton et al., 2020). Studies have also shown that ON shares several characteristics with both general and specific EDs, including negative affect, guilt associated with transgressions, cognitive rigidity, high anxiety, a need for control, a predisposition to perfectionism, excessive preoccupation with food, dietary restriction, the presence of obsessions and compulsions, and rigid and ritualistic eating habits (Barnes & Caltabiano, 2017; Barthels et al., 2015; Carriedo et al., 2020; McComb & Mills, 2019; Oberle et al., 2017; Plichta et al., 2019; Strahler & Stark, 2020; Zickgraf et al., 2019). Furthermore, researchers have found that difficulties considered to be a major contributor to the development and maintenance of EDs, such as emotion regulation, are correlated with ON tendencies in a similar magnitude to the correlations found between emotion regulation difficulties and other EDs (Obeid et al., 2021).

Researchers have also found that a history of an ED is the strongest predictor for ON (Barnes & Caltabiano, 2017; Walker-Swanton et al., 2020), with one study reporting that over 50% of participants with an ED had comorbid ON symptoms (Segura-Garcia et al., 2015). Overall, the link between ON symptoms and currently recognised *DSM-5* EDs appears to be stronger than the link between ON symptoms and other disorders for which it shares similarities, specifically, OCD (Bartel et al., 2020). Further support that ON is best suited within the ED spectrum of mental disorders comes from a meta-analysis which found that the higher the rates of ON symptoms the higher the rates of ED symptoms (Zagaria et al., 2021).

Additionally, individuals with ON tendencies have been found to score within the ED sub-clinical or clinical ranges on several ED pathology measures, including the Eating Attitudes Test 26 (EAT-26) and the Eating Disorders Examination Questionnaire (EDE-Q) (Atchison & Zickgraf, 2022; Dunn et al., 2019; Strahler et al., 2018). Dunn et al. (2019) found that those with self-reported ON scored no differently than those reporting other EDs but did differ significantly from those without an ED. These converging lines of diverse research suggest that ON and currently recognised EDs may indeed occupy the same group of disorders.

Orthorexia Nervosa and Anorexia Nervosa. Despite originally being proposed by Bratman (1997) to represent a new ED differing from currently recognised EDs based on a focus on the quality of food, research has shown that there is some notable overlap between ON and AN. Of all the *DSM-5-TR* EDs, ON is considered to be most similar to AN, which has led many researchers to argue that it should be recognised as a subtype or precursor to it, even positing that it may represent a less severe version of this ED (Segura-Garcia et al., 2015). In support of this, it has been found that among those with a diagnosis of AN, ON tendencies are more likely to be reported during and after treatment (Segura-Garcia et al., 2015).

Several traits have been identified that appear to be shared between ON and AN, which include high amounts of anxiety, obsessive-compulsive tendencies, strict control over diet, restrictive diets, feeling guilt over food transgressions, heightened need to exercise self-control, history of affective symptomatology, impairments in psychosocial functioning, and malnutrition (Bhattacharya et al., 2022; Koven & Abry, 2015; McComb & Mills, 2019; Zickgraf et al., 2019). Additionally, a study investigating executive functioning in ON and those with AN found that those with higher ON tendencies scored worse on set-shifting, which is a cognitive deficit commonly seen in those with AN (Bhattacharya et al., 2022; Koven & Senbonmatsu, 2013).

Researchers have found mixed results in terms of the relationship between ON and typical AN-associated characteristics such as perfectionism, drive for thinness, shape and weight concerns, restraint, and negative body evaluation. That is, while some researchers have found an association between ON and these characteristics (Barnes & Calabiano, 2017; Parra-Fernandez et al., 2018), others have not (Barthels et al., 2017; Strahler et al., 2018; Stutts, 2020). Further still, researchers using newer measures have found that while ON may be associated with drive for thinness and restraint - key characteristics in AN - it may diverge in terms of shape and weight concerns (Atchison and Zickgraf, 2022).

Body mass index (BMI), age, and potentially gender also seem to differ between the two conditions. While significantly low weight is a diagnostic feature of AN in the *DSM-5-TR*, no such clear relation has been found between BMI and ON (McComb & Mills, 2019). While there are mixed results regarding the role of age and ON, research has suggested that the mean age of onset in ON is higher than that of AN (childhood/adolescent onset) (Ellis et al., 2020; Volpe et al., 2016). There also appear to be differences between the conditions in terms of gender, where research has found a consistent female dominance for AN, while

there are inconsistent results regarding gender for ON (van Eeden et al., 2021; McComb & Mills, 2019) (see Chapter 1 for a more detailed review of the association between ON and BMI, age, and gender).

Arguably the most important distinguishing factor between ON and AN (and other EDs such as BN) is the proposed overarching motivation for the disordered eating behaviours. The eating behaviours of AN are motivated by a focus on the quantity of the food consumed in terms of its caloric content (APA, 2013). This focus on food quantity is accompanied by a preoccupation with body image, drive for thinness, and fear of weight gain, which guide the eating-related behaviours present in this disorder. In contrast, and consistent with Bratman's (1997) original description, researchers have suggested that the overarching motivation for the disordered eating in ON is related to the quality of the food consumed. That is, the eating behaviours of individuals with this condition are aimed at improving health and purity, with the motivation to become healthier through one's food choices and associated behaviours (Dunn & Bratman, 2016).

It is clear from a review of the literature that there are some clear similarities between ON and AN, as well as some noteworthy differences. Taken together, available evidence suggests that the two conditions are likely related, but could represent two distinct patterns of disordered eating. Further research is needed to more clearly determine the nature and relationship of these conditions.

The Relationship Between Orthorexia Nervosa and Obsessive-Compulsive Disorder

Bratman and Knight (2000) initially observed that there were some overlaps between ON and OCD. As research on this condition expanded, several similarities between ON and OCD were identified (Cosh et al., 2023). Specifically, both ON and OCD feature recurrent and intrusive thoughts, an inflated concern over contamination and impurity, and a strong need

to ritualise food and eating (Koven & Abry, 2015). For those with ON, these recurrent and intrusive thoughts are focused on food and health and the concern with contamination and impurity is grounded in an overfocus on health and purity (Koven & Abry, 2015). Similar to those with OCD, the obsessions in ON result in compulsions and ritualised behaviour that may result in limited time for other activities and interfere with one's normal daily routine (Koven & Abry, 2015). Other similarities included perfectionism, overcontrol, and high anxiety traits, which are also traits shared between ON and EDs (Bhattacharya et al., 2022; Koven & Abry, 2015; McComb & Mills, 2019). In addition, researchers have found that a higher number of obsessive-compulsive symptoms were related to a higher likelihood for ON tendencies (Arusoglu et al., 2008; Costa & Hardan-Khalil, 2018; Varga et al., 2013).

However, although there is some symptom crossover between ON and OCD, there are major areas in which they diverge. In particular, the relationship between the content of the obsessions and compulsions and the individual's sense of self. More specifically, OCD is considered to be ego-dystonic in nature, meaning that the content of the thoughts, obsessions, compulsions, and associated behaviours are inconsistent with the individual's wants/desires and personality, and they often perceive these as inappropriate, distressing, and unacceptable (Koven & Abry, 2015). On the other hand, ON - as with some EDs - could be considered to be an ego-syntonic condition, whereby there is consistency/continuity between the content of the thoughts, obsessions, compulsions, and associated behaviours and the individual's personality, wants/desires, ideal self, and current self-images. As a result, there is generally less perceived distress associated with these aspects than with OCD. This also means that individuals with ON are less likely to consider and desire a change, whereas in OCD there is a desire to remove the obsessions, compulsions, and associated behaviours (Donini et al., 2022).

Some of the most compelling evidence that ON is more aligned with an ED than OCD and related disorders comes from research comparing ON to OCD and EDs. Bartel et al. (2020) conducted a study to further investigate the relationship between ON, EDs, and OCD to inform the diagnostic category best suited for ON. They found that ON did correlate with OCD symptoms and OC disorders moderately. However, this relationship was negligible when controlling for ED symptoms. Thus, while ON and OCD may share symptoms, this may be reflecting the high rates of crossover and comorbidity historically seen between EDs and OCD, rather than indicating that ON is an OC spectrum disorder (Bartel et al., 2020; Zickgraf et al., 2019). Additionally, Zagaria et al. (2021) conducted a meta-analysis of the magnitude of the association between ON and both ED and OCD symptom groups, and found that ON symptoms were more associated with EDs than OCD. In a more recent study, Levin et al. (2023) investigated the relationship between ON and related symptoms of psychopathology, and found that ON had the most overlap with ED pathology compared to OCD or obsessive compulsive personality disorder. Overall, there is substantial research supporting the view that ON is more closely aligned with ED psychopathology than with OCD. Whether ON represents a distinctly separate diagnosis, however, is still being heavily debated.

Is Orthorexia Nervosa a Distinct Mental Disorder?

A second, related debate pertaining to ON is its status as a distinct mental disorder. Since its emergence as a condition in the 1990s, it has been heavily debated as to whether it represents a discrete new ED or reflects a subtype, precursory state or post-treatment state of a currently recognised ED. Over the last several decades several conflicting views regarding what ON is have emerged. Some researchers have argued that it is a subtype of a currently recognised ED, and some have suggested it may precede the development of an ED as opposed to being an ED itself. Others have proposed that it may evolve out of the ED

remission or rehabilitation phase, allowing individuals with previous ED diagnoses to continue with their controlling behaviours around food in a more socially accepted manner (i.e., it is more socially acceptable to focus on healthy food than the symptoms associated with other EDs such as a drive for thinness) (Parra Carriedo et al., 2020).

Despite the continued debate regarding the nature of ON, a large percentage of mental health professionals in the ED field globally are aware of or familiar with the condition and many believe it to represent a distinct ED (Gramaglia et al., 2022; Reynolds & McMahon, 2019; Sanzari & Hormes, 2023; Vandereycken, 2011). Specifically, among European mental health professionals, Vandereycken (2011) found that 66% of respondents ($n = 111$) were aware of ON as a condition and had observed it in their practice. Gramaglia et al. (2022), among their Italian sample of healthcare professionals, also found that the majority of respondents (58.9%) had encountered ON features among their patients and around 68.6% thought ON should be included as a specific diagnostic category in the next version of the *DSM*. A study in Australia that surveyed health professionals composed of dietitians and psychologists found that around 71% of their sample ($n = 52$) believed that ON should be considered a distinct clinical ED and have a separate clinical diagnosis (Reynolds & McMahon, 2019). Among 100 health professionals from the United States with experience working clinically with EDs, the majority (71.9%) agreed that ON should be a distinct clinical diagnosis. Interestingly, those who endorsed ON as a valid diagnosis were those who spent more time in clinical work and less in research (Sanzari & Hormes, 2023). Of note is that across all of the studies mentioned, there were mixed views regarding whether ON was believed to be a variant of another disorder, with 30.6% of respondents in Vandereycken's (2011) study, 68.2% in Gramaglia et al.'s (2022) study, and 21% in Reynolds and McMahon's (2019) study believing it to be a variant of a currently recognised disorder. Ryman et al.

(2019) collected data from 160 health professionals, with 78% reporting that ON should be considered a separate diagnosis and 74% reporting that they believed it to fit within the 'Eating and Feeding Disorders' *DSM* category. Interestingly, this study found that dietitians and physiotherapists were more likely to endorse ON as a distinct disorder compared to psychologists and psychiatrists. Further, some have noted the lack of complete overlap between ON and EDs, given that the relationship between ON and other ED symptoms has only yielded a moderate effect size, suggesting that the two clinical entities are related but distinct (Zagaria et al., 2021; Zickgraf et al., 2019).

Despite the debate regarding its status, most professionals surveyed across the studies noted above considered ON to be present in clinical settings and across various populations in a noteworthy and recognisable capacity and believed it to be deserving of more attention. While the general perception of healthcare professionals that ON should have its own diagnosis supports the notion that such a diagnosis would be useful in the mental health vernacular, there is still much debate about the utility of a diagnostic category.

Defining a Mental Disorder

The *DSM-5-TR* defines a mental disorder as “a syndrome characterized by clinically significant disturbance in an individual’s cognition, emotion regulation, or behaviour that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning. Mental disorders are usually associated with significant distress or disability in social, occupational, or other important activities” (APA, 2022, p. 14).

Based on the *DSM* definition, what constitutes a mental disorder can be broken down into four criteria: (1) it is a behavioural/psychological syndrome/pattern; (2) these represent an underlying disturbance in mental functioning; (3) the consequences of which are clinically significant distress or impairment; and (4) they must not simply be an expected

response to common stressors/losses or culturally sanctioned and not be a result of social deviance or conflict with society. As reviewed in the previous section, there continues to be debate as to whether or not ON represents a unique syndrome/pattern that can be meaningfully differentiated from currently recognised EDs (criterion 1). There is preliminary support for an underlying disturbance in mental functioning (criterion 2), such as a weakness in certain areas of executive functioning (Hayatbini & Oberle, 2019; Koven & Senbonmatsu, 2013). However, further research is still needed to confirm this. For criterion 4, it has been argued that the extreme and/or distorted behaviours characterising ON are deviations from normal/culturally accepted behaviours in relation to health and nutrition (Donini et al., 2022; Dunn & Bratman, 2016).

Of these criteria, criterion 3 (i.e., whether clinically significant distress or disability is experienced as a result of the condition) is arguably the most important when determining whether a condition is a disorder. This criterion emerged as the main condition for a mental disorder in the *DSM-III* revision (where it justified the removal of homosexuality as a mental disorder diagnosis) and has remained, taking precedence in all subsequent variations, including the *DSM-5-TR*, where the distress and disability component appears at the beginning of the definition of a mental disorder. Some have taken this to indicate that this aspect constitutes the main criterion of a mental disorder. This focus on the significant and harmful impact of the disorder on an individual's functioning is also echoed in the work of others such as Wakefield (1992) who described mental disorders as "harmful dysfunction" (p. 373). As such, this criterion is arguably the most pertinent to address when determining whether ON should be classified as a disorder (He et al., 2020).

The adverse consequences of ON have been documented over the last several decades of research. The distress and impairment attributed to this condition is considered

so integral to understanding it that it has been included in the proposed diagnostic criteria for ON (Bratman & Dunn, 2016; Moroze et al., 2015). Documented consequences include both physical and psychosocial, and many stem from what is already known about the consequences of selective and restrictive eating, including malnutrition, rapid weight loss, electrolyte imbalances, functional impairment, pancytopenia, social isolation, reduced quality of life, decreased wellbeing and satisfaction with life, and increased perceived stress and levels of depression (Dunn & Bratman, 2016; He et al., 2020; Park et al., 2011; Plitcha et al., 2019; Rui et al., 2020).

Some researchers have considered this to provide sufficient support that the distress and impairment criterion for a mental disorder has been met. However, to date, only a limited number of studies have investigated whether these impacts are consistently present among individuals with high ON tendencies. Generally, the research in this area has derived its findings from limited or single-participant case studies, has utilised a measure of ON that has been shown to have psychometric problems (i.e., the ORTO-15, which may not measure pathological condition) (Koven & Senbonmatsu, 2013; Mitrofanova et al., 2020; Moroze et al., 2015; Rania et al., 2021) or has focused on a particular population (e.g., those aged over 50) (He et al., 2021; Strahler et al., 2018; Strahler & Stark, 2020). Each of these aspects reduces the external and/or internal validity of the results, thus complicating the matter of determining whether clinically significant distress and disability are present in individuals presenting with high levels of ON symptoms.

Furthermore, despite many researchers and clinicians agreeing that ON constitutes a disorder, specifically an ED, only limited research has investigated whether individuals presenting with high levels of ON tendencies score similarly to those diagnosed with a *DSM-5-TR* ED on measures of clinical impairment or distress. Of the studies that have, general

distress or physical impairment has not been investigated (Zickgraf et al., 2019; Zickgraf and Barrada, 2022). Despite the limitations of the currently available research investigating distress and impairment in individuals with ON, they do provide preliminary evidence for the significant impact the condition could have on an individual and that this aspect should be further investigated. Given that a core criterion of all *DSM* disorders is that the symptoms result in clinically significant distress and disability (impairment) to the individual, research needs to determine whether the impacts of this condition are comparable in severity to the clinical distress and impairment present in current *DSM* EDs.

Differentiating Orthorexia Nervosa from Other Eating Disorders

Another very important aspect when determining whether ON is a discrete disorder is whether it is distinctly different from currently recognised disorders. In order for a diagnosis to have value and utility it needs to demonstrate that it meaningfully differs from other similar conditions and that these aid in responding appropriately to the condition.

If, as some researchers and/or clinicians have speculated, ON is not distinctly different from currently recognised disorders then it may instead represent a subtype or developmental stage of another disorder. An argument against ON as a distinct disorder has come from Barthels et al. (2015) who suggested that the eating behaviours considered to typify ON are associated with a level of recovery of other EDs, representing a change to what is considered a less serious pattern of eating behaviours (Parra Carriedo et al., 2020). The relationship between ED recovery and ON symptoms was also found in a study by Segura-Garcia et al. (2015). They found that almost a third (28%) of their participant sample with AN and BN also had ON tendencies and that this number increased to the majority of the sample (53%) at the time of the termination of their ED treatment (cited in Parra Carriedo, et al., 2020). Some researchers/clinicians have taken this to suggest that ON is associated

with clinical improvements in disorders such as AN and a move toward a less severe ED. However, this increase in ON behaviours post-treatment may serve as a compensatory behaviour (where individuals are still attempting to find a way to continue exerting control over food but have shifted the core focus from the quantity to quality of the food consumed) rather than an indication of a less severe condition. This view was supported by Bartel et al. (2020) with their suggestion that ON may be a coping strategy.

A further complicating factor in this debate pertains to all EDs, namely, the fluidity and crossover among EDs. There is a large degree of overlap and crossover between *DSM-5-TR* EDs (Miskovic-Wheatley et al., 2023), and this is also the case for ON. As noted in the previous sections, ON shares a large degree of similarities with several *DSM-5-TR* EDs. Given the degree of crossover, it is not unreasonable to take this to suggest that ON may be more a precursor of an ED (beginning as an innocent interest and then morphing into an obsession), a recovery stage of a currently recognised ED (wherein a shift from quantity to quality occurs), a risk factor for future EDs, or a variation of a currently recognised ED with an additional health-related concern as it is supposedly too similar to recognised EDs (Bhattacharya et al., 2022). Alternatively, the similarities and overlap of ON with other EDs could also simply be demonstrating that ON has the same high rates of diagnostic crossover found among many EDs (Bartel et al., 2020). It could be argued, given the consistent demonstration in research of the crossover among *DSM-5-TR* EDs, that it should come as no surprise that ON would share features with currently recognised EDs (Mortimer, 2019). In fact, this would be expected to be the case if ON is truly an ED. Moreover, these shared features and temporal crossover do not diminish the status of other EDs as separate disorders.

Thus, to determine whether ON represents a separate disorder, research is needed to focus on the degree and way in which it differs from currently recognised disorders. At the forefront of these differences is the motivation driving the restrictive eating behaviours and practices and, relatedly, the suggested absence of shape/weight concerns (over-evaluation of self-worth based on shape/weight is suggested to not be present in ON) (Bratman & Dunn, 2016). The difference in the underlying motivation behind disordered eating behaviours is not a new argument used to justify the consideration of separate diagnostic categories for ON and other EDs. For example, the ED diagnostic category of ARFID has been differentiated from AN despite numerous similarities (such as restrictive/selective food intake behaviours, low weight, several physical complications, young age of onset and shared comorbidities with anxiety and depression), seemingly based on the absence of the underlying driving force of weight and shape concerns which are at the core of the restrictive behaviours seen in AN (Becker et al., 2019; Bhattacharya et al., 2022; Canas et al., 2020). Additional support for the separation between ARFID and AN has come from differences found in other aspects, such as population demographics (i.e., age and gender), low body weight (low weight could be present as an outcome of AFRID but not required, is required in AN), and the absence of certain personality traits and characteristics (Canas et al., 2020). If ON differs from AN and other *DSM-5-TR* EDs on the basis of its underlying motivation for the disordered eating behaviours (among other features), there would be justification for ON comprising a distinctly different ED.

To add to this ongoing debate are the results of a study aimed at developing a consensus among ED researchers and treatment specialists regarding the clinical description and diagnostic criteria of ON (Donini et al., 2022). Among the proposed diagnostic criteria were differential diagnosis characteristics for how to differentially diagnose ON from other

psychiatric conditions such as AN, ARFID, and OCD. While this does point to a belief that ON can be differentiated from conditions such as other EDs, this matter is still contentious as there are still inconsistencies in the research as to whether ON is different in kind from currently recognised *DSM-5-TR* EDs, and how best to classify the condition (e.g., precursor, separate condition or subtype).

Another important aspect to consider regarding whether a separate diagnostic category is suitable is the notion of clinical utility. To date, researchers have yet to find a consensus on the clinical utility of an ON diagnosis. Clinical utility in this sense relates to a diagnosis' ability to assist and aid health professionals in determining prognosis, the development of treatment plans, and the outcomes of treatment (APA, 2013; Kendell & Jabensky, 2003).

Regarding ON, there is still debate regarding the clinical utility of this diagnostic category. While some researchers have claimed that a diagnosis of ON does not provide clinical utility (Lucka et al. 2019) and cautioned against labelling ON as a disorder (Strahler & Stark, 2020), others have noted that there may be clinical relevance to certain aspects of a diagnosis of ON but not as a distinct disorder (Goutaudier & Rousseau, 2019; Strahler et al., 2018), the recent consensus regarding distinct diagnostic criteria for ON suggests that a distinct ON diagnosis may have clinical utility (Donini et al., 2022), and others still have argued that further research is still needed to determine whether a separate diagnosis of ON is of clinical relevance (Bartel et al. 2020).

The main arguments against ON's clinical utility relate to whether the disordered eating patterns can be better accounted for by an existing diagnosis such that its clinical utility rests on whether it constitutes a meaningful difference from currently recognised EDs. For example, if someone presents for an assessment who had rapid weight loss resulting in

the individual being underweight, even if the weight loss is due to rigid clean and healthy eating, it can (and in most cases will) lead to them to receiving a diagnosis of AN (Bhattacharya, et al., 2022). This kind of situation has led some to believe that the focus on quality rather than quantity of food is simply a new manifestation of AN in line with shifts in sociocultural factors that influence ED presentation and as such ON does not present clinical utility due to a current diagnosis being able to be applied. However, it should be noted that even though a diagnosis of AN in this situation may align with some of the presenting symptoms, it would not appropriately account for the disordered eating behaviours exhibited as it neglects the driving force/motivation behind the pattern of behaviour, which could indicate that an alternative diagnosis may add clinically valuable information to be targeted in treatment.

Even with the debates around the clinical utility of an ON diagnosis, the findings from a modified Delphi study suggest that many prominent researchers and clinicians in the field believe ON necessitates its own set of diagnostic criteria (Dononi et al., 2022). The criteria presented not only outline the clinical characteristics of the condition but also include differential diagnosis aspects. Taken together, this seems to demonstrate that there is a belief among a large portion of ED experts that there is some clinical utility to a diagnosis of ON. Overall, the diverse perspectives indicate that further research is clearly needed to determine if meaningful differences differentiate between ON and currently recognised disorders, notably *DSM-5-TR* EDs.

The Current Research Program

Despite the continued controversies, gaps, and inconsistencies in our current understanding of ON, it has garnered significant attention in the popular literature, media, and social media landscape. In the early 2010s, there were already claims of a ‘new eating

disorder’ both in print and online media. There is now an abundance of books, information articles, documentaries, and websites discussing ON as if it were a formal condition. In the social media space, interest in ON has been soaring; as of 2019 there were over 150,000 pictures shared on Instagram using the hashtag #orthorexia (Valente et al., 2020).

Research on ON has not kept pace with this public interest. Even though the research interest in ON has been increasing over the years, it is still very much in its infancy as indicated by the substantial gaps in knowledge regarding ON identified in Chapter 1 and some of the key debates highlighted in the current chapter. It is these key controversies and questions that have provided the foundation of the current program of research and will be addressed in some capacity in the series of studies conducted. Through the utilisation of novel research methodologies, this body of work aims to provide greater insight into ON’s similarities and differences from current ED diagnostic categories to better inform the scientific and public discourse on ON and the treatment of people experiencing the negative impacts of a maladaptive focus on healthy eating.

The current research program aims to contribute to our understanding of ON, specifically whether it can be differentiated from current EDs in terms of its health versus appearance (shape/weight) concerns, and whether it is associated with comparable levels of distress/impairment to current mental health disorders. Both of these aims seek to contribute to greater understanding regarding the nosological status of ON. The specific aims of the research are as follows:

1. To investigate the presence of shape/weight concerns in those with ON compared to those with an ED and healthy comparisons (Study 1, Chapter 3).
2. To investigate the levels of distress and impairment in those with ON compared to those with an ED and healthy comparisons (Study 1, Chapter 3).

3. To investigate health- and appearance-related cognitive content among those with ON compared to those with an ED and healthy comparisons (Study 2, Chapter 4).
4. To investigate health- and appearance-related cognitive processing among those with ON compared to those with an ED and healthy comparisons (Study 3, Chapter 5).

It is clear from the literature that there remain several conflicts and gaps in our current understanding and conceptualisation of ON. By focusing on under-researched aspects of this condition, the current research will help to further our understanding of ON in meaningful ways. The findings of this research are expected to have clinical implications for the classification, identification, and treatment of this condition, as well as providing a foundation for various lines of future research. These will be addressed in the General Discussion (Chapter 6).

Chapter Summary

This chapter provided an overview of the most prominent debates regarding the nosological status of ON. This overview encompassed questions regarding whether ON is best conceptualised as falling along the ED spectrum of conditions, as well as whether it represents a distinctly different disorder from currently recognised *DSM-5-TR* EDs and is associated with substantial distress and functional impairment to justify its conceptualisation as a distinct mental disorder. Informed by these two key debates, the chapter concluded by outlining the aims of the current research program.

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**Chapter 3: A Comparison of Eating- and Body-related Symptomatology, Distress, and
Impairment in Adults with Orthorexia Nervosa and Eating Disorders**

Abstract

It has been proposed that orthorexia nervosa (ON), a pathological condition associated with a preoccupation with healthy eating, warrants recognition as a distinct disorder within the eating disorder (ED) spectrum given its overlapping but unique features compared to currently recognised EDs. However, the distinctive features of ON, and its associated level of distress and impairment, relative to currently recognised EDs remain unclear. Thus, the present study sought to gain a clearer understanding of ED symptomatology and body image concerns, and distress and impairment, in ON. Adult participants ($n = 741$) completed measures assessing ON and ED symptomatology, appearance orientation and evaluation, distress, and impairment. Participants were categorised into three groups: those with an ED and ON symptoms (ED/ON; $n = 164$), those with an ED only (ED; $n = 317$), and a healthy comparison group (HC; $n = 260$). Controlling for ED type, the ED/ON group exhibited significantly higher levels of ED symptomatology, appearance orientation, distress, and impairment compared to the ED and HC groups. The ED/ON group exhibited comparable levels of physical impairment and appearance evaluation as the ED group, but significantly higher than the HC group. The presence of elevated ON symptoms appears to be associated with increased levels of eating- and body image-related symptoms, distress, and impairment in adults with EDs. Further research is needed to determine levels of body image disturbance, distress, and impairment among those with ON without an accompanying ED.

Introduction

Orthorexia nervosa (ON) is a proposed pathological condition characterised by an obsessional preoccupation with healthy eating, and rigid, compulsive eating behaviours that can result in physical and psychosocial impairment. As originally conceptualised by Bratman (1997), ON-based eating can begin as a well-meaning effort to eat healthily to improve physical health and prevent illness that, over time, develops into an excessive preoccupation with healthy eating, resulting in strict and rigid adherence to dietary rules.

Argued by many in the literature to mark a newly emerged eating disorder (ED) (e.g., Dunn & Bratman, 2016; Strahler & Stark, 2020), ON is not formally recognised as a disorder or a specifier in current mental health diagnostic manuals, namely, the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR)* (American Psychiatric Association, 2022) and the *International Classification of Diseases and Related Health Problems (ICD-11)* (World Health Organization, 2021). Nevertheless, since its conception, research and interest in relation to ON has continued to rise over the last 25 years. To date, no agreement has been reached as to its place as a formal diagnosis, with many aspects of this condition continuing to be heavily debated. Critical in making a case for ON as a distinct mental disorder is understanding (1) the overlap and distinguishing features of ON relative to currently recognised EDs and (2) the level of distress and impairment experienced by those with ON.

ON and the Spectrum of Eating Disorders

Most researchers and clinicians generally agree that ON is best understood as fitting within the ED spectrum of conditions, although there is continued debate as to how (Donini et al., 2022). Some argue that it represents a separate diagnostic category. However, others have argued that it represents (1) a risk factor for the development of eating disorders, or a

prodromal condition; (2) a postdromal condition that develops during treatment and out of the recovery phase of a currently recognised ED or as an evolution to accommodate a more socially acceptable way of restricting food intake; or (3) a subtype of a currently recognised ED (Barthels et al., 2017; Brytek-Matera, Rogoza et al., 2015; Gramaglia et al., 2022; Segura-Garcia et al., 2015; Zagaria et al., 2021).

Gramaglia et al. (2022) demonstrated this diversity of views regarding ON's status in their study conducted on 343 Italian healthcare professionals. The researchers found that the majority of participants (68.2%) considered ON to represent a variant of an ED and that the next *DSM* edition should include a diagnostic category specific to ON within the ED spectrum. Similar findings were reported in a study conducted on psychologists and dietitians involved in ED treatment in Australia, which found that around 70% of participants believed ON to be a separate disorder (Reynolds & McMahon, 2020). This same view was found in Ryman et al.'s (2019) study of Dutch clinical health professionals, with 78% of their participants agreeing that ON should have a separate diagnosis, and that a diagnosis for ON may have clinical utility in terms of increased research, the development treatment guidelines, insurance reimbursement, better clinical understanding and consistency, and validation of patients' experiences. Whether as a distinct disorder or existing as part of a currently recognised ED, findings of this kind are consistent with calls for ON to receive more attention by clinicians and researchers, rather than being subsumed within ED research generally (Vandereycken, 2011).

The Overlap Between Eating Disorder and Orthorexia Nervosa Symptomatology

The view that ON is best conceptualised as an ED (either as an independent ED or as a feature of a currently recognised ED) stems from the similarities and shared diagnostic

features that have been demonstrated in research comparing ON and currently recognised EDs, such as anorexia nervosa (AN), bulimia nervosa (BN), and avoidant restrictive food intake disorder (ARFID). These similarities, and the ability for ED symptoms to predict the development of ON, have been taken to demonstrate ON's place among the ED spectrum disorders (Cosh et al., 2023; Novara et al. 2021; Zagaria et al., 2021).

Research has consistently demonstrated overlap in the symptomatology and associated features of ON and EDs (Walker-Swanton et al., 2020). Individuals with ON have been shown to score within the ED sub-clinical or clinical ranges on several measures, such as the Eating Attitudes Test 26 (EAT-26) and the Eating Disorder Examination Questionnaire (EDE-Q) (Dunn et al., 2019; Zickgraf & Barrada, 2022). The finding that those with ON fall within or close to the pathological ED range on these measures provides support for its place on the ED spectrum.

Similarly, studies have shown that ON shares several characteristics (both general and ED specific) with AN and BN, specifically, excessive preoccupation with food, dietary restriction, the presence of obsessions and compulsions, rigid and ritualistic eating habits, high anxiety, a need for control, a predisposition to perfectionism, and emotion regulation difficulties (Obeid et al., 2021; Plichta et al., 2019; Zickgraf et al., 2019). Additionally, ON and EDs such as AN and BN are considered to be ego-syntonic in nature, such that their symptoms (or at least aspects of their symptoms such as the pursuit of thinness) are aligned with their ideal self. Another ED suggested to demonstrate similarities with ON is ARFID. Research has suggested that individuals with ON or ARFID experience similar physical consequences (e.g., nutritional deficiencies and weight loss) and both restrict intake of undesirable foods; conversely, those with these conditions are similar (but distinct from

other EDs) in that they are supposedly not associated with self-worth based on appearance (related to attractiveness or appeal) and are considered not to entail a drive for thinness (as present in AN and BN) (Dunn & Bratman, 2016).

It has also been shown that the strongest predictor for ON is a history of an ED (Barnes & Caltabiano, 2017), and that 53% of participants with an ED in one study reported comorbid ON symptoms (Walker-Swanton et al., 2020), thus further demonstrating the link between ON and EDs. Supporting the classification of ON as either a distinct ED or part of one of the existing ED diagnoses, researchers have found that ON symptoms are more strongly linked to ED symptoms than to the symptoms of other disorders for which ON shares similarities, namely, obsessive compulsive symptoms (Bartel et al., 2020).

For some researchers and clinicians, the similarities noted above provide the basis for the argument that ON represents a subtype, phase or risk factor for a currently recognised ED as it is supposedly too similar to already recognised EDs (Bhattacharya et al., 2022). It remains unknown as to whether ON constitutes a distinct ED, or a subtype, prodromal or evolutionary phase of one of the already recognised ED diagnoses. However, taken together, the research reviewed converges in placing ON within the ED spectrum of disorders in both its core and associated features, and its potential maintaining mechanisms.

The Distinction Between Orthorexia Nervosa and Eating Disorder Symptomatology

Meaningful differences between ON and currently recognised EDs have also been proposed, with some empirical support. Demographic differences include the fact that body weight has not been found to be significantly related to ON, whereas with AN significantly low weight is a diagnostic criterion of the disorder (McComb & Mills, 2019). There are mixed results regarding the role of age in ON. However, research has suggested that the age of

onset and mean age of individuals with the condition is higher than for those with AN, for whom onset is typically in adolescence (McComb & Mills, 2019). There may also be gender differences, with research suggesting generally equivalent rates between genders for ON (Barnes & Caltabiano, 2017; Reynolds, 2018; McComb & Mills, 2019), whereas there is a very clear predominance of females in AN and BN (van Eeden et al., 2021; Hay et al., 2023).

Yet at the forefront of differences is the theorised distinctive health motivation driving the restrictive eating behaviours and practices in ON, and hence the absence of appearance concerns stemming from the overevaluation of self-worth based on shape and/or weight characteristic of EDs such as AN and BN (Dunn & Bratman, 2016; Cena et al., 2019; Koven & Abry, 2015). For ON, the fundamental motivation driving eating behaviours is proposed to entail a desire to achieve optimum health and purity, whereas with AN and BN (and for some of those with BED), the underlying motivation is due to shape/weight (appearance) concerns, primarily in the form of an over-evaluation of self-worth based on shape/weight (appearance) as stated among the diagnostic criteria for AN and BN and included as a specifier for BED. Much like ON's divergence from other *DSM-5-TR* EDs, ARFID also lacks shape/weight overconcern. For those with ARFID, the restriction is due to wanting to avoid discomfort that results from intolerable sensory experiences or a traumatic event associated with food. In contrast, the restriction in those with ON is argued to be motivated by, as stated, a desire to enhance one's health and purity.

In terms of the proposed absence of a relationship between ON and appearance and body image concerns, the research to date is unclear. Some researchers have reported that there is in fact a relationship between ON and appearance and body image concerns, such as Barnes and Caltabiano (2017) who found that ON tendencies were related to an

overweight preoccupation and investment in appearance. Reynolds (2018) also found that among their study sample of university students, body shape preoccupation was related to the presence of more ON tendencies. Similarly, Pauze et al. (2021) found that ON symptoms (as measured by the Eating Habits Questionnaire) were positively associated with body image attitudes and distortion in their sample (measured by the Multidimensional Body-Self Relations Questionnaire). They found ON to be related to body fat dissatisfaction and muscularity dissatisfaction, such that elevated ON symptoms were associated with a desire to have less body fat and be more muscular (in the chest, breasts, and hips). Additionally, they found a positive association between ON symptoms and appearance orientation and weight preoccupation, but no relationship with appearance evaluation.

In contrast, other researchers have found evidence to support the notion that ON is not characterised by appearance concerns. For example, Brytek-Matera, Donini et al. (2015) in their study on female university students found that those with greater ON tendencies were *more* satisfied and *less* preoccupied with their appearance and body compared to those without ON tendencies.

In addition to inconsistencies in the literature, the research to date is limited in its reliance on a measure of ON that has been shown to have psychometric problems (i.e., the ORTO-15, which may not measure a pathological condition) (Koven & Senbonmatsu, 2013; Mitrofanova et al., 2020; Moroze et al., 2015; Rania et al., 2021). Thus, the relationship between ON and appearance and body image concerns requires further investigation.

Distress and Impairment in Orthorexia Nervosa

As well as a lack of clarity regarding the features that putatively distinguish ON from currently recognised EDs, the degree to which ON symptoms confer distress and impairment

relative to EDs is also unknown. The distress and impairment attributed to ON have been included in its proposed diagnostic criteria (Bratman & Dunn, 2016; Moroze et al., 2015). The physical and psychosocial functioning impacts of ON stem from well understood consequences of selective and restrictive eating, including malnutrition, rapid weight loss, electrolyte imbalances, functional impairment, social isolation, reduced quality of life, decreased wellbeing and satisfaction with life, and affective disturbance such as increased perceived stress and levels of depression (Dunn & Bratman, 2016; He et al., 2020; Park et al., 2011; Plitcha et al., 2019; Rui et al., 2020).

Studies to this point on the presence of these impacts in those with high ON tendencies have included only a limited number of participants (in some instances entailing single case studies), or they have utilised the ORTO-15 which has proven to be problematic (Koven & Senbonmatsu, 2013; Mitrofanova et al., 2020; Moroze et al., 2015; Rania et al., 2021). Others still have focused on a particular population (e.g., those aged 50 or over) (He et al., 2020; Strahler et al., 2018; Strahler & Stark, 2020). The results of these studies may lack internal and/or external validity due to these limitations.

Furthermore, despite many researchers and clinicians agreeing that ON constitutes a pathological condition, only limited research has investigated whether clinically significant distress and impairment is associated with ON symptoms, and at the time of this study, no published research has directly compared whether individuals presenting with high levels of ON symptoms score similarly to those diagnosed with a *DSM-5-TR* ED on measures of clinical impairment or distress. Zickgraf et al. (2019), utilising the Eating Habits Questionnaire (a measure of ON symptoms that has shown good psychometrics) and an ED-specific measure of clinical impairment, found that when controlling for other ED symptoms, ON symptoms

were not significantly related to ED-specific clinical impairment. This is perhaps not surprising as it has been established that ON shares symptoms with currently recognised EDs, those with ON have been found to score within the subclinical or clinical range on ED symptomatology measures, and ED symptoms are commonly found in those with elevated ON symptoms (Atchison & Zickgraf, 2022; Barnes & Caltabiano, 2017; Dunn et al., 2019; Walker-Swanton et al., 2020; Zickgraf & Barrada, 2022). As such, controlling for ED symptoms in their analysis could have removed impairment due to ON symptoms that may coincide with ED symptoms. Zickgraf et al. (2022) improved on their previous study by utilising a modified version of the same impairment measure (excluding reference to calorie restriction and compensatory behaviours). This time they found that higher ON symptoms were associated with elevated levels of clinical impairment. While these studies mark the first steps in determining whether the clinical impairment is associated with ON, neither of these studies directly compared individuals with ON and those with a currently recognised ED, or measured non-ED specific distress.

In contrast to the limited research on distress and impairment in ON, it is well known that EDs can have a profound and damaging effect on the physical and psychosocial functioning of the person experiencing them, with research demonstrating a range of impairments in several important life domains and functional limitations. The Clinical Impairment Assessment (CIA) was developed to measure and assess ED-specific functional impairment. It has been able to differentiate between those with an ED, those who are at a high risk of ED psychopathology, and those with a low risk (Vannucci et al., 2012). It is worth noting, however, that previous research has shown that the CIA may not be able to truly capture the impairment experiences of individuals with EDs not marked by appearance concerns. Specifically, one study found that participants with ARFID did not meet the cut-off

score of 16 for ED-specific impairment on the CIA. It was thought that this may have been due to the absence of shape and weight concerns in ARFID given that the CIA targets core symptoms of EDs, which are often shape and weight concerns (Becker et al., 2019). Since it has been proposed that the symptoms of ON are similarly devoid of appearance concerns, the CIA may not be sensitive to its functional impacts and thus an alternative measure of impairment may be needed in this context.

Aims and Hypotheses of the Present Study

In summary, further research is needed to gain a clearer understanding of ED symptomatology and body image concerns, and distress and impairment, among individuals with ON compared to those with a currently recognised ED. Accordingly, the aims of the present study were to investigate (1) areas of similarity and divergence in symptomatology and (2) levels of general and ED-specific impairment and distress between individuals with ON, individuals with a currently recognised *DSM-5-TR* ED with or without ON, and healthy comparison (HC) individuals. It was hypothesised that:

1. Participants with ON (with or without an ED) would be comparable to participants with an ED alone in terms of overall ED symptomatology, and that all three clinical groups would score higher than the HC group.
2. Participants with an ED (with or without ON) would score higher than participants with ON alone and the HC group on appearance dissatisfaction and appearance orientation. Given the theorised absence of appearance concerns in ON, it was further hypothesised that participants with ON alone would have comparable levels of appearance dissatisfaction and appearance orientation to the HC group.

3. Participants with ON (with or without an ED) would be comparable to participants with an ED alone in terms of distress and impairment, and that all three clinical groups would score higher than the HC group.

Methods

Participants

Participants who were aged 18-65 years and met inclusion criteria for one of the study groups (ED/ON; ON only; ED only; or HC) were eligible to participate in the study.

Participants were categorised in an ON group if they had a score on the revised Eating Habits Questionnaire (EHQ-R; Glen, 2018) of 82 or above. This cut-off score was the 90th percentile of the current sample as well as the mean 90th percentile score of samples from multiple datasets collected during the revision of the instrument (D. Gleaves, personal communication, December 19, 2019). Brytek-Matera et al. (2022) also used the 90th percentile to determine a cut-off score for their ON participants.

Participants were categorised in an ED group based on their responses to the Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 2008) utilising the recommendations of Berg, Stiles-Shields et al. (2012). Specifically, decisions regarding ED caseness were made based on EDE-Q items 13-18 (measuring binge eating and purging behaviours) and 22-23 (measuring shape and weight overvaluation), as well as Body Mass Index ($BMI = kg/m^2$), with the latter calculated using participants' self-reported height and weight. EDE-Q items 13-18 and 22-23, along with BMI, were also used to categorise participants into specific ED diagnostic groups, which was generally done in accordance with the work of Berg, Stiles-Shields et al. (2012). The sole exception related to one of the criteria for diagnosing AN. Specifically, in addition to shape/weight concerns and a low BMI, Berg

and colleagues also required the presence of a fear of weight gain as evidenced by a fear of weight gain score of four or more or the presence of compensatory behaviours once per week. We did not require this to categorise a participant in the AN group as we wanted to retain as many EDE-Q questions for analysis as possible and were of the view that shape/weight concern paired with a significantly low body weight was sufficient enough to differentiate AN from the other ED groups for this research. There were four ED diagnostic groups: AN, BN, BED, and OSFED/UFED. Table 3.1 outlines how participants were categorised.

Table 3.1

Categorisation of Participants Into ED Groups and ED Type in the ED/ON and ED Groups

EDE-Q Symptom	ED Type			
	AN	BN	BED	OSFED/UFED
Binge eating (questions 13+14 or 15)	N/A	≥ 4 instances of binge eating	≥ 4 instances of binge eating	< 4 instances of binge eating
Purging (questions 15-18)	N/A	≥ 4 instances of purging behaviours	< 4 instances of purging behaviours	< 4 instances of purging behaviours
BMI	< 17.5	N/A	N/A	< 18.5 + one other ED symptom
Shape/Weight Concerns (question 22/23)	≥ 4 on either measure	≥ 4 on either measure	N/A	< 4 on either + one other ED symptom or BMI < 18.5

Note. AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; OSFED/UFED = other specified feeding and eating disorder/unspecified feeding and eating disorder; BMI = Body Mass index

Consistent with the recommendations of Berg, Stiles-Shields et al. (2012), a cut-off of four was utilised. While this is higher than some other recommended cut-offs (Carey et al., 2019; Fairburn and Beglin, 2008; Mond et al., 2015; Velkoff et al., 2023), it was selected to ensure that participants categorised into one of the two ED groups were experiencing ED symptoms of clinical severity and is consistent with the approach of other researchers (e.g., Mond et al., 2006).

Participants were categorised into the HC group if they did not meet the criteria for the ON or ED groups, and were below the cut-offs for BMI and EDE-Q items 22 and 23 to ensure ED symptomatology was not present. Using these criteria, there were 164 participants in the ED/ON group, 317 participants in the ED group, and 260 participants in the HC group. Because only 10 participants were categorised in the ON-only group, no further analyses were undertaken with these participants. Thus, a total of 741 participants were included in the data analysis (those participants where questionnaires were completed). The responses from 1022 other participants were excluded from the analysis due to incomplete data (defined as those responses where not all of the questionnaires were completed). An *a priori* power analysis in G*Power (Faul et al., 2007) was performed, indicating a minimum sample size of 158 was needed to yield a statistical power of at least .80 with an alpha of .05 and a medium effect size ($f = .25$). Although only 158 participants were needed to yield this power, larger recruitment numbers were sought in an

attempt to collect adequate sample sizes for all research groups of interest (particularly the ON-only group).

Participants were recruited through social media platforms, the Australian National University online student research portal (SONA), snowballing methods, and Amazon's Mechanical Turk platform. Specific social media groups were targeted for recruitment, which included groups that corresponded to populations identified as being at a higher risk of ON and EDs (i.e., ED recovery groups and health and fitness groups). Of all those who accessed the study link, 186 were from Amazon's Mechanical Turk, 601 were from the ANU's student research portal, and 976 were from other participant recruitment methods.

Despite some concerns about the use of crowdsourcing websites (Mortensen & Hughes, 2018), Amazon's Mechanical Turk platform has been shown to produce high-quality data when certain considerations are made (Mortensen & Hughes, 2018) such as using high-reputation workers and quality checks (Peer et al., 2014), which were done for this study. Further, when compared to studies completed in a laboratory setting or on other online platforms, MTurk has been shown to be as valid as other data collection methods (Kees et al., 2017). MTurk samples have also been found to exhibit internal consistency and test-retest reliability on a variety of measures, including those on body dissatisfaction and general mental health (Gardner et al., 2012; Schleider & Weisz, 2015). In the present study, to further ensure the quality of participant responses collected from MTurk, participants with unrealistic completion times and/or conflicting responses across the study were removed. Unrealistic completion times were based on a piloted minimum completion time of 20 minutes. A participant was deemed to have conflicting responses if any reverse-scored items were inconsistent with other items or if responses across a single questionnaire were

inconsistent (i.e., stating the presence of something and then stating the absence of the same thing).

The majority (72.6%, $n = 538$) of participants identified as female, a quarter as male (25%, $n = 185$), and the remainder were made up of participants who identified as trans, non-binary or gender not listed (2.4%, $n = 18$). The majority of participants were aged 18-24 years (72.2%, $n = 535$), were not in a relationship at the time of participation (55%, $n = 406$, including divorced, widowed, separated and single), and had less than a Bachelor's degree of education (62.1%, $n = 461$). Approximately half of the participants were students (48.9%, $n = 362$). In terms of ethnicity, the majority of participants identified as either Caucasian (59%, $n = 437$) or Asian (31.8%, $n = 236$). Demographic characteristics of each of the three groups are shown in Table 3.2.

Crosstabs and Chi-square tests were conducted for each of the demographic variables across the three participant groups. No significant differences were found for gender, $\chi^2 (4, N = 741) = .308, p = .989$; ethnicity, $\chi^2 (10, N = 741) = 9.411, p = .494$; and sex, $\chi^2 (2, N = 741) = .063, p = .969$ across the three groups. However, a significant difference was seen across groups for age, $\chi^2 (2, N = 741) = 27.273, p < .001$; relationship status, $\chi^2 (2, N = 738) = 11.571, p = .003$; education, $\chi^2 (2, N = 740) = 16.999, p < .001$; and student status, $\chi^2 (4, N = 740) = 32.597, p < .001$. These findings revealed that participants in the ED/ON group had a higher proportion of older participants (56.1% <25, 43.9% $\geq$ 25) compared to the ED (76.3% < 25, 23.7% $\geq$ 25) and HC groups (77.3% < 25, 22.7% $\geq$ 25). The ED/ON participants on average had attained a higher level of education (BA or more = 51.5%, Less than a BA = 48.5%) than the ED (BA or more = 35%, Less than a BA = 65%) and HC groups (BA or more = 32.7%, Less than a BA = 67.3%). The ED (Student = 50.5%, Non-Student = 49.5%)

and HC (Student = 57.5%, Non-Student = 42.5%) groups were comprised of more students than the ED/ON group (Student = 32.3%, Non-Student = 67.7%). It was also the case that the ED/ON participants were, overall, more likely to be in a relationship (In a relationship = 56.4%, Not in a relationship = 43.6%) compared to the ED (In a relationship = 43%, Not in a relationship = 57%) and HC groups (In a relationship 40.2%, Not in a relationship = 59.8%).

Table 3.2

Participant Demographics Across Groups

Variable		ED/ON	ED	HC	Total
		<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Age					
(n = 741)	18 – 24 years	92 (56.1)	242 (76.3)	201 (77.3)	535 (72.2)
	≥ 25 years	72 (43.9)	75 (23.7)	59 (22.7)	206 (27.8)
Gender					
(n = 741)	Male	42 (25.6)	76 (24)	67 (25.8)	185 (25)
	Female	118 (72)	233 (73.5)	187 (71.9)	538 (72.6)
	Other	4 (2.4)	8 (2.5)	6 (2.3)	18 (2.4)
Ethnicity					
(n = 741)	Caucasian	104 (63.4)	178 (56.2)	155 (59.6)	437 (59)
	Asian	45 (27.4)	113 (35.6)	78 (30)	236 (31.8)
	Other	15 (9.2)	26 (8.2)	27 (10.4)	68 (9.2)
Education					
(n = 740)	Less than a BA	79 (48.5)	206 (65)	175 (67.3)	461 (67.3)

	BA or more	84 (51.5)	111 (35)	85 (32.7)	281 (32.8)
Relationship					
Status	Relationship	92 (56.4)	142 (43)	104 (40.2)	332 (45)
(<i>n</i> = 738)	No relationship	71 (43.6)	180 (57)	155 (59.8)	406 (55)
Student					
Status	Student	53 (32.3)	160 (50.5)	149 (57.5)	362 (48.9)
(<i>n</i> = 740)	Non-student	111 (67.7)	157 (49.5)	110 (42.5)	378 (51.1)

Note: % is the percentage of participants only for the relevant group

In terms of the proportion of specific EDs across the ED/ON and ED groups, a Chi-square test revealed that there was an effect of group on the type of EDs present, $\chi^2 (3, N = 741) = 52.162, p < .001$. Crosstabs revealed that the ratio of AN among the ED/ON and ED groups was similar (8.5% and 14.0%, respectively). The significant Chi-square result appeared to be due to the presence of a larger proportion of BN in the ED/ON group and a larger proportion of BED participants in the ED group. The higher proportion of BN versus BED in the ED/ON relative to the ED group may be due to the higher level of dietary restraint in BN versus BED (Wilfley et al., 2002), with this dietary restraint potentially driven by health concerns. The proportions of ED type per ED group can be found in Table 3.3.

Table 3.3

Number (and Percentage) of ED Type in the ED/ON and ED Groups

ED Type	Group		
	ED/ON	ED	Total
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)

AN	23 (14)	27 (8.5)	50 (10.4)
BN	91 (55.5)	99 (31.2)	190 (39.5)
BED	14 (8.5)	119 (37.6)	133 (27.7)
OSFED/UFED	36 (22)	72 (22.7)	108 (22.4)

Note. AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder;

OSFED/UFED = other specified feeding and eating disorder/unspecified feeding and eating disorder.

Measures

In addition to demographic questions, the following self-report questionnaires were administered.

Eating Habits Questionnaire-Revised (EHQ-R; Glen, 2018)

The EHQ-R is a 30-item self-report questionnaire that assesses the behaviours, feelings, and cognitions related to an extreme focus on healthy eating. The EHQ-R is the revised version of the original measure developed by Gleaves et al. (2013). It includes five subscales, including Rigidity (e.g., 'I must follow a strict method of food preparation'), Healthy Body Image (e.g., 'I feel like I must make my body look healthier'), Violation of Dietary Rules (e.g., 'I removed entire food groups from my diet because I needed to eat healthier'), Negative Emotionality (e.g., 'I loathe myself if I eat unhealthy foods not in my diet'), and Time Impairment (e.g., 'I spend more than three hours a day thinking about healthy food'). Items are measured using a four-point rating scale ranging from 1 (*false, not true*) to 4 (*very true*). Higher scores on this measure are indicative of more ON tendencies.

The EHQ-R has demonstrated good psychometric properties in terms of internal consistency with Cronbach's alphas ranging from .81 to .96 (Glen, 2018; Opitz et al., 2020). In the present sample, the subscales and total scale of the EHQ-R demonstrated good internal consistency, with a Cronbach's alpha of .91 for the Rigidity subscale, .84 for the Healthy Body Image subscale, .91 for the Violation of Dietary Rules subscale, .89 for the Negative Emotionality subscale, .82 for the Time Impairment subscale, and .97 for the total scale. The EHQ-R demonstrated good convergent validity with the previous version of the measures (EHQ) ($r = .80$) and the Eating Attitudes Test-26 (EAT-26) ($r = .78$).

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008)

The EDE-Q is a self-report questionnaire that measures ED symptomatology over the past 28-day period. It includes 28 items, 22 of which comprise the four subscales of Dietary Restraint (e.g., 'Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?'); Eating Concern (e.g., 'Have you had a definite fear of losing control over eating?'); Shape Concern (e.g., 'Have you had a definite desire to have a totally flat stomach?'); and Weight Concern (e.g., 'Has your weight influenced how you think about (judge) yourself as a person?'). A global EDE-Q score is calculated by summing the four subscale scores. These are scored using a **seven-point rating scale** ranging from 0 (*no days or not at all*) to 6 (*every day or markedly*). An additional six items assess the frequency of binge eating and compensatory behaviours. Higher scores are indicative of greater ED pathology. For this study, items 22 and 23 were excluded from the subscale and global score calculations as these two items were utilised to categorise participants into the research groups.

The psychometric properties of the EDE-Q have been supported in previous research. The EDE-Q subscales and global score have shown good internal consistency with Cronbach's alpha ranging from .78 to .93., as well as demonstrating strong test-retest reliability (Luce & Crowther, 1999; Reas et al., 2006; Rose et al., 2013). Additionally, the EDE-Q demonstrates satisfactory convergent validity (with good agreement with its interview equivalent) and discriminant validity (in accurately discriminating between those with and without an ED) (Aardoom et al., 2012; Mond et al., 2004; Mond et al., 2008). In the current study, the subscales and total scale of the EDE-Q demonstrated good internal consistency, with a Cronbach's alpha of .89 for Dietary Restraint, .88 for Eating Concern, .93 for Shape Concern, .89 for Weight Concern, and .97 for the total scale.

Multidimensional Body Self Relations Questionnaire Appearance Subscale (MBSRQ-AS; Brown et al., 1990; Cash, 1990)

The MBSRQ-AS is one of the subscales comprising the 69-item MBSRQ self-report questionnaire developed to provide a multidimensional assessment of self-attitudinal aspects of body image. The MBSRQ-AS consists of 34 items, divided into five subscales. Only the Appearance Evaluation and Appearance Orientation subscales were used in the present study. The Appearance Evaluation subscale measures feelings of physical attractiveness (or unattractiveness) and satisfaction (or dissatisfaction) with one's looks (e.g., 'I like my looks just the way they are'), while the Appearance Orientation subscale assesses an individual's investment in their appearance (e.g., 'It is important that I always look good'). Subscales are scored on **five-point rating scales** ranging from 1 (*definitely disagree or very dissatisfied*) to 5 (*definitely agree or very satisfied*).

Research has demonstrated generally good internal consistency of these subscales, ranging from .66 to .88, and good test-retest reliability, which has ranged from 0.75 to 0.86 (Argyrides & Kkeli, 2013; Brown et al., 1990). In this study, these subscales also showed good internal consistency, with a Cronbach's alpha of .88 for the Appearance Evaluation subscale and .87 for the Appearance Orientation subscale.

Clinical Impairment Assessment (CIA; Bohn & Fairburn, 2008)

The CIA is a 16-item self-report measure created to assess the severity of psychological impairment associated with eating disorders. Items assess impairment in life domains that are typically impacted by EDs, including mood and self-perception, interpersonal functioning and work performance, and cognitive functioning over the previous 28 days. The CIA has three subscales including the Personal subscale (e.g., '...made you feel ashamed of yourself?'), the Social subscale (e.g., '...stopped you going out with others?'), and the Cognitive subscale (e.g., '...made you absent-minded?'). Items are rated utilising a four-point rating scale, with responses ranging from 0 (*not at all*) to 3 (*a lot*), with a higher global CIA impairment score indicating a higher level of ED-related impairment. A global score of 16 represents clinically significant impairment (Bohn et al., 2008).

The CIA has demonstrated good internal consistency (Cronbach's alpha = .97), test-retest reliability ($r = .86$), construct validity in terms of significant associations with the EDE-Q, clinician ratings of impairment, and self-reported ED psychopathology, as well as discriminant validity in discriminating between recovered and non-recovered patients (Bohn et al., 2008; Maraldo et al., 2021; Vannucci et al., 2012). In the present study, the subscales and total scale of the CIA demonstrated good internal consistency, with a Cronbach's alpha

of .93 for the Social subscale, .92 for the Cognitive subscale, .95 for the Personal subscale, and .97 for the total scale.

Kessler Psychological Distress Scale (K10; Kessler et al., 2002)

The K-10 is a brief, 10-item self-report measure developed to assess global psychological distress for the prior four-week period. It includes two subscales: the Anxiety subscale (e.g., 'In the past 4 weeks, about how often did you feel restless or fidgety?') and the Depression subscale (e.g., 'In the past 4 weeks, about how often did you feel hopeless?'). Items are rated using a **five-point rating scale**, ranging from 1 (*none of the time*) to 5 (*all of the time*). Higher scores indicate higher levels of psychological distress. Four score categories have been suggested by the 2001 Victorian Population Health Survey: 10-19 (individual is likely well), 20-24 (indicates mild mental disorder), 25-29 (indicates moderate mental disorder), and 30-50 (indicates severe mental disorder) (Australian Bureau of Statistics [ABS], 2001).

The K-10 has shown good internal consistency across various studies and samples, with Cronbach's alphas ranging from .83-.91 (Milkiyas et al., 2022; Sampasa-Kanyinga et al., 2018; Searle et al., 2015). In the current study, the subscales and total scale of the K-10 demonstrated good internal consistency, with a Cronbach's alpha of .86 for the Anxiety subscale, .92 for the Depression subscale, and .93 for the total scale.

Short Form Health Survey - 12 Version 2 (SF-12V2; Ware, Kosinski, Turner-Bowker, & Gandek, 2002)

The SF-12 is a 12-item self-reported outcome measure that is commonly used to measure general health and functioning. It is the shorter version of the SF-36. The SF-12

utilised a mixture of dichotomous ('Yes'/'No') and multiple response (e.g., 'Yes, limited a lot', 'Yes, limited a little', 'No, not limited at all'; 'Excellent', 'Very good', 'Good', 'Fair', 'Poor') scoring scales across the 11-items. The SF-12 comprises eight sub-domains including physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. From these sub-domains, two summary scores are yielded: the Mental Component score and the Physical Component score. Higher Mental Component and Physical Component scores indicate better mental and physical health, respectively. A Mental Component score of 42 or less has been recommended as a cut-off score for a mental health condition, and a Physical Component score of 50 or less may indicate a physical health condition (Ware et al., 1995, as cited in Soh et al., 2021).

The SF-12 has been found to be psychometrically sound in measuring health-related quality of life across various populations. Overall, the SF-12 has been shown to have good internal consistency (Cronbach's $\alpha = 0.85$). The Mental and Physical Components have also been found to have good internal consistency with Cronbach's alphas ranging from .79 - .87, and moderate to high test-retest reliability (PCS = .78 - .79 and MCS = .59 - .60) (Cheak-Zamora et al., 2009; Chum et al., 2016; Shah & Brown, 2020; Shah et al., 2018). In the present study, the overall scale demonstrated acceptable internal consistency, with a Cronbach's α of .78. However, the Physical Component exhibited only fair internal consistency with a Cronbach's α of .68 as did the Mental Component with a Cronbach's α of .63.

Procedure

Ethical approval was obtained by the Australian National University Human Research Ethics Committee (2018/299) (see Appendix 1 for documentation regarding the ethical

aspects of the study). Participants were recruited through advertisements circulated throughout various recruitment channels. Advertisements, which included an electronic link to access the study survey, referred to helping ‘those who are struggling with their eating and self-esteem’ and participating in ‘exciting new research looking at the difference between healthy eating habits and those that might be problematic’. The survey was run through Qualtrics, an online survey development and hosting platform (<https://www.qualtrics.com>). After providing informed consent, participants were asked to complete several demographic questions followed by the questionnaires in the following order: the EHQ-R, CIA, K-10, EDE-Q, and SF-12. In addition to the questionnaires, three validity check questions were included to ensure the integrity of participant’s responses (e.g. asking participants to select the correct number or confirm the effort put into the study).

Statistical Analysis

Data analysis was performed using the Statistical Package for Social Sciences, Version 29 (IBM-SPSS 29). For the main analyses, two and three-way ANOVAs and Bonferroni *post-hoc* analyses were performed to determine whether there were significant differences between the groups on the variables of interest. Due to significant Chi-square analyses suggesting associations between group membership and certain demographic variables, two- and three-way ANOVAs were conducted to control for those demographic variables found to significantly differ across the groups. Where demographic variables were found to be non-significant in the model, it was re-run with them removed and these results were reported. Given that certain EDs have been associated with worse outcomes and more severe symptoms than others, ED type was also included as an independent variable. This

was to ensure that the results could not be attributed purely to a higher proportion of EDs associated with more severe symptoms present in a particular group.

Two-way ANOVAs were performed when a demographic variable was found to be statistically significant and when determining the effect of ED type when no demographic variables were significant. Three-way ANOVAs were used when a demographic variable was found to be significant and when ED type was included in the model. Main effects, interactions, and simple effects are reported for each variable of interest when the results necessitated this and all non-significant interactions were removed from the final model. The significance level across all analyses was $p < .05$.

Results

Data Cleaning and Screening

It was determined that the data were missing at random (MAR) based on Little's Test of Missing Completely at Random (MCAR), $\chi^2(4860, 89) = 4860, p < .001$. Pairwise deletion ('available case analysis') was used to address missing data to retain as many participants as possible. This was deemed as a suitable option given the limited number of cases of missing data (< 5%) (Schafer, 1999, as cited in Dong & Peng, 2013). As less than 10% of the data of the 741 participants retained for data analysis were missing and the measures demonstrated good internal consistency, pairwise deletion was used (Tsikriktsis, 2005). In cases where there were missing data for variables where total scores required a value for all items, total scores were not included in the respective variable analysis.

Z-scores of ± 3 or more were deemed as constituting an outlier. These were reviewed to determine whether they should be retained or removed. Based on this, it was

deemed that the outliers identified should be retained in the analysis as it was determined that they did not meet any of the following: (1) due to measurement error, data entry error, or poor sampling, (2) significantly affected the results of the analysis, and (3) resulted in the violation of the assumption of the statistical method being used (Aguinis et al., 2013; Bobbitt, 2021).

Normality was assessed by fitting an intercept-only model to a variety of distributions (i.e., Poisson, Gamma, and Normal) and selecting the distribution based on the log-likelihood as a measure of Goodness of Fit. Based on the log-likelihood obtained for each variable, a normal distribution was deemed suitable to proceed.

A variance ratio was calculated for all variables to determine whether homogeneity of variance was violated. Homogeneity of variance was assumed if the variance ratio was less than four (Dean & Voss, 1999; Keppel et al., 1992; Kirk, 2013; Wuensch, 2017). Based on the variance ratios, homogeneity of variance was assumed for all variables.

Group Comparisons

The mean scores, standard deviations, and ANOVA results for each of the questionnaires across groups are shown in Table 3.4. This data is presented based on ED type in Table 3.5.

Table 3.4

Means, Standard Deviations, and Analysis of Variance Results for the EDE-Q, MBSRQ, CIA, K10, and SF-12 Across Groups

Measure	ED/ON	ED	HC
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	<i>df</i>	ANOVA	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
EDE-Q	<i>F</i> (2, 735)	266.35*	5.01 (1.15)	3.49 (1.34)	2.09 (1.01)
MBSRQ_AE	<i>F</i> (2, 285)	19.30*	2.66 (.84)	2.98 (.71)	3.40 (.77)
MBSRQ_AO	<i>F</i> (2, 285)	20.55*	4.08 (.62)	3.58 (.67)	3.329 (.67)
CIA	<i>F</i> (2, 735)	139.02*	33.87 (12.19)	21.17 (11.97)	14.42 (9.96)
K10	<i>F</i> (2, 737)	64.98*	29.66 (8.75)	26.99 (8.75)	21.27 (8.04)
SF12_Mental	<i>F</i> (2, 722)	37.85*	33.82 (9.80)	35.91 (10.84)	41.86 (11.69)
Component					
SF12_Physical	<i>F</i> (2, 720)	44.77*	46.40 (10.06)	49.11 (8.75)	53.15 (7.68)
Component					

Note. EDE-Q = Eating Disorders Examination; CIA = Clinical Impairment Assessment; K10 = Kessler Distress Scale; SF12 = Short Form Health Survey-12 Version 2; MBSRQ = Multidimensional Body-Self Relations Questionnaire-Appearance Scales; AE = Appearance Evaluation; AO = Appearance Orientation.

* $p < .001$

Table 3.5

Means, Standard Deviations and Analysis of Variance Results for the EDE-Q, MBSRQ, CIA, K10, and SF-12 Across ED Types Within Each Group

Measure		ED/ON	ED	
	<i>df</i>	ANOVA	<i>M (SD)</i>	<i>M</i>

EDE-Q	<i>F</i> (1, 471)	89.97*	5.01 (1.15)	3.49 (1.34)
AN			5.11 (1.10)	3.37 (1.19)
BN			5.13 (.97)	4.41 (.96)
BED			5.15 (.92)	3.29 (1.33)
OSFED			4.61 (1.59)	2.62 (1.14)
MBSRQ_AE	<i>F</i> (1, 151)	3.64	2.66 (.84)	2.98 (.71)
AN			2.79 (1.03)	2.84 (.76)
BN			2.50 (.79)	2.71 (.62)
BED			2.97 (.82)	3.00 (.76)
OSFED			2.73 (.89)	3.36 (.56)
MBSRQ_AO	<i>F</i> (1, 150)	17.49*	4.08 (.62)	3.58 (.67)
AN			4.19 (.59)	3.63 (.75)
BN			4.03 (.69)	3.80 (.64)
BED			4.35 (.33)	3.55 (.66)
OSFED			4.00 (.62)	3.33 (.66)
CIA	<i>F</i> (1, 471)	89.31*	33.87 (12.19)	21.17 (11.91)
AN			36.30 (10.53)	21.00 (11.20)
BN			33.12 (11.82)	26.01 (9.83)
BED			36.79 (10.60)	20.88 (12.80)
OSFED			33.08 (14.55)	15.68 (10.81)
K10	<i>F</i> (1, 465)	2.33	29.66 (8.75)	27.09 (8.46)
AN			30.26 (8.30)	30.56 (8.67)
BN			29.72 (8.49)	28.22 (6.85)

BED			27.91 (8.89)	26.69 (8.98)
OSFED			26.76 (8.93)	24.68 (8.99)
SF12_Mental Component	$F(1, 462)$	11.12*	33.82 (9.80)	35.91 (10.84)
AN			29.91 (8.76)	31.98 (11.81)
BN			34.96 (9.86)	35.23 (9.13)
BED			29.91 (7.75)	33.66 (10.83)
OSFED			35.37 (10.19)	41.89 (10.47)
SF12_Physical Component	$F(1, 465)$	0.40	46.40 (10.06)	49.11 (8.75)
AN			48.52 (9.40)	49.74 (9.16)
BN			44.60 (10.53)	46.61 (8.74)
BED			46.08 (10.63)	49.90 (8.93)
OSFED			49.84 (7.89)	50.94 (7.69)

Note. EDE-Q = Eating Disorders Examination; CIA = Clinical Impairment Assessment; K10 = Kessler Distress Scale; SF12 = Short Form Health Survey-12 Version 2; MBSRQ = Multidimensional Body-Self Relations Questionnaire-Appearance Scales; AE = Appearance Evaluation; AO = Appearance Orientation; AN = Anorexia Nervosa; BN = Bulimia Nervosa; BED = Binge Eating Disorder; OSFED = Other Specified Feeding and Eating Disorder.

* $p < .001$

Eating Disorder Examination Questionnaire (EDE-Q)

A two-way ANOVA examining the effect of group and age on EDE-Q scores revealed a significant main effect for group, $F(2, 735) = 266.35$, $p < .001$, $\eta^2 = .420$ (indicating a large

effect). Bonferroni pairwise comparisons revealed that EDE-Q scores were significantly higher in the ED/ON group than in the ED ($p < .001$) and HC ($p < .001$) groups. EDE-Q scores were also significantly higher in the ED than the HC group ($p < .001$).

A significant two-way interaction between group and age was also found, $F(2, 735) = 11.48, p < .001, \eta^2 = .030$ (indicating a small effect). Simple effects and pairwise comparisons revealed that among the ED group, but not the ED/ON and HC groups, there was a significant difference between the EDE-Q scores for those aged < 25 versus those aged ≥ 25 , $F(1, 735) = 24.55, p < .001, \eta^2 = .032$ (indicating a small effect), with those aged ≥ 25 exhibiting significantly higher EDE-Q scores than those aged < 25 . Importantly, pairwise comparisons indicated that the significantly higher EDE-Q scores in the ED/ON versus both the ED and HC groups, and the ED versus the HC group, remained in both age categories.

A three-way ANOVA was conducted to determine whether the differences between the ED/ON and ED groups in EDE-Q scores were influenced by ED type (when factoring in age). Results revealed that the significant main effect for group was retained, with higher EDE-Q scores in the ED/ON versus the ED group, $F(1, 471) = 89.97, p < .001, \eta^2 = .160$ (indicating a large effect). The significant two-way interaction between group and age for the ED group was also retained, $F(1, 471) = 13.51, p < .001, \eta^2 = .028$ (indicating a small effect). Additionally, a significant two-way interaction between group and ED type was found, $F(3, 480) = 5.82, p < .001, \eta^2 = .036$ (indicating a small effect). Simple effects and pairwise comparisons revealed that among the ED group, but not the ED/ON group, there was a significant difference in the EDE-Q scores for AN vs. BN ($p = .003$) (BN exhibiting higher EDE-Q scores), AN vs. OSFED ($p = .011$) (AN exhibiting higher EDE-Q scores), BN vs. BED ($p < .001$) (BN exhibiting higher EDE-Q scores), BN vs. OSFED ($p < .001$) and BED vs. OSFED ($p = .001$).

(BED exhibiting higher EDE-Q scores). Importantly, pairwise comparisons indicated that the significantly higher EDE-Q scores in the ED/ON versus the ED group remained in each ED type. No significant three-way interaction between group, ED type and age was found.

Appearance Evaluation (AE) and Appearance Orientation (AO) Scales

A two-way ANOVA examining the effect of group and age on AE scores revealed a significant main effect for group, $F(2, 285) = 19.30, p < .001, \eta^2 = .119$ (indicating a medium effect). Bonferroni *post hoc* comparisons revealed that AE scores were significantly lower (indicating worse appearance evaluation) in the ED/ON versus both the ED ($p = .044$) and HC ($p < .001$) groups, and between the ED versus the HC group ($p < .001$).

A three-way ANOVA was conducted to determine whether the differences between the ED/ON and ED groups in AE scores were influenced by ED type (when factoring in age). When accounting for the effect of ED type in the model, the main effect of group was no longer significant, $F(1, 151) = 3.64, p = .058, \eta^2 = .024$. No statistically significant two- or three-way interactions were found.

In terms of AO scores, a two-way ANOVA examining the effect of group and age revealed that there was a significant main effect of group, $F(2, 285) = 20.55, p < .001, \eta^2 = .126$ (indicating a medium effect). Bonferroni *post hoc* comparisons revealed that AO scores were significantly higher (indicating more appearance orientation) in the ED/ON versus both the ED ($p < .001$) and HC ($p < .001$) groups, and between the ED versus the HC group ($p = .026$).

When accounting for the effect of ED type and age in the model, a three-way ANOVA revealed that the main effect of group remained, $F(1, 150) = 17.49, p < .001, \eta^2 = .104$

(indicating a medium effect). A significant two-way interaction between group and age was found, $F(1, 150) = 6.15, p = .014, \eta^2 = .039$, with those aged < 25 exhibiting significantly higher AO scores than those aged ≥ 25 . However, Bonferroni pairwise comparisons revealed that there was no significant effect of age on the difference between the ED/ON versus the ED group. No significant two-way interaction was found between group and ED type, $F(3, 145) = 0.95, p = .420, \eta^2 = .019$. No significant three-way interaction between group, age, and ED type was found.

Clinical Impairment Assessment Scale

A two-way ANOVA examining the effect of group and age on CIA scores revealed a significant main effect of group, $F(2, 735) = 139.02, p < .001, \eta^2 = .274$ (indicating a large effect). Bonferroni pairwise comparisons revealed that CIA scores were significantly higher in the ED/ON group than in the ED ($p < .001$) and HC ($p < .001$) groups. CIA scores were also significantly higher in the ED than the HC group ($p < .001$).

A significant two-way interaction between group and age was found, $F(2, 735) = 10.25, p < .001, \eta^2 = .027$ (indicating a small effect), with those aged ≥ 25 exhibiting significantly higher AO scores than those aged < 25. Simple effects and pairwise comparisons revealed that there was a significant difference between CIA scores for those aged < 25 and those aged ≥ 25 for the HC group, $F(1, 735) = 5.01, p = .026, \eta^2 = .007$ (indicating a small effect), and the ED/ON group, $F(1, 735) = 39.00, p < .001, \eta^2 = .050$ (indicating a small effect). Importantly, pairwise comparisons indicated that the significantly higher CIA scores in the ED/ON versus both the ED and HC groups, and the ED versus the HC group, remained in both age categories.

A three-way ANOVA was conducted to determine whether the differences between the ED/ON and ED groups in CIA scores were influenced by ED type (when factoring in age). Results revealed that the significant main effect for group was retained, with higher CIA scores in the ED/ON versus the ED group, $F(1, 471) = 89.31, p < .001, \eta^2 = .159$ (indicating a large effect). The significant two-way interaction between group and age for the ED/ON group was also retained, $F(1, 471) = 13.23, p < .001, \eta^2 = .027$ (indicating a small effect). Additionally, a significant two-way interaction between group and ED type was found, $F(3, 471) = 4.04, p = .007, \eta^2 = .025$ (indicating a small effect). Simple effects and pairwise comparisons revealed that among the ED group, but not the ED/ON group, there was a significant difference in CIA scores for BN vs. OSFED ($p < .001$) (BN exhibiting higher CIA scores), BN vs. BED ($p = .002$) (BN exhibiting higher CIA scores), and BED vs. OSFED ($p = .002$) (BED exhibiting higher CIA scores). Importantly, pairwise comparisons indicated that the significantly higher CIA scores in the ED/ON versus the ED and HC groups, and the ED versus the HC group, remained across the four ED types. There was no significant three-way interaction between group, ED type, and age.

Kessler Psychological Distress Scale

A two-way ANOVA examining the effect of group on K10 scores revealed a significant main effect for group, $F(2, 737) = 64.98, p < .001, \eta^2 = .150$ (indicating a large effect). Bonferroni pairwise comparisons revealed that the K10 scores for those in the ED/ON group were significantly higher than the ED ($p < .001$) and HC ($p < .001$) groups. The ED group also had significantly higher K10 scores than the HC group ($p < .001$). Based on the 2001 Victorian Population Survey cut-off scores (Australian Bureau of Statistics [ABS], 2003), the HC group

had mean K10 scores within the ‘likely to have a mild disorder’ range, with the ED/ON and ED groups falling within the ‘likely to have a moderate disorder’ range.

A three-way ANOVA was conducted to determine whether the differences between the ED/ON and ED groups in K10 scores were influenced by ED type (when factoring in age). Results revealed that the significant main effect for group was not retained, $F(1, 465) = 2.33$, $p = .128$, $\eta^2 = .005$. A significant three-way interaction between age, group, and ED type was found, $F(3, 465) = 2.70$, $p = .045$, $\eta^2 = .017$ (indicating a small effect). Simple effects and pairwise comparisons revealed that the differences between the two age categories were primarily due to the BED participants. Specifically, for those aged < 25 , the ED/ON group had significantly higher K10 scores than the ED group among those with BED ($p = .007$). However, for those aged ≥ 25 , the ED/ON and ED groups had comparable K10 scores among those with BED ($p = .127$). In both age categories, those with AN (< 25 , $p = .840$; ≥ 25 , $p = .777$) and BN (< 25 , $p = .157$; ≥ 25 , $p = .931$) reported comparable K10 scores in the ED/ON and ED groups, while those with OSFED reported significantly higher scores in the ED/ON versus the ED group (< 25 , $p = .016$; ≥ 25 , $p = .008$).

Mental and Physical Components of the Short Form-12

A two-way ANOVA examining the effect of group and age on MC scores revealed a significant main effect for group, $F(2, 722) = 37.85$, $p < .001$, $\eta^2 = .095$ (indicating a medium effect). Bonferroni pairwise comparisons revealed that MC scores were significantly lower in the ED/ON group than in the ED ($p = .018$) and HC ($p < .001$) groups. MC scores were also significantly lower in the ED group than in the HC group ($p < .001$). The two-way interaction between group and age was not significant.

A three-way ANOVA was conducted to determine whether the differences in MC scores between the ED/ON and ED groups were influenced by ED type (when factoring in age). Results revealed that a significant main effect for group was retained, with lower scores in the ED/ON group versus the ED group, $F(1, 462) = 11.12, p < .001, \eta^2 = .023$ (indicating a small effect). There was no significant three-way interaction between group, ED type, and age.

In terms of PC scores, a two-way ANOVA examining the effect of group and age revealed a significant main effect for group, $F(2, 720) = 44.77, p < .001, \eta^2 = .111$ (indicating a medium effect). Bonferroni *post hoc* comparisons revealed that PC scores were significantly lower in the ED/ON group than in the HC ($p < .001$) but comparable to the ED group ($p = .325$). The ED group also had significantly lower scores than the HC group ($p < .001$).

A significant two-way interaction between group and age was also found, $F(2, 720) = 20.08, p < .001, \eta^2 = .053$ (indicating a small effect). Simple effects and pairwise comparisons revealed that there was no significant difference in PC scores between the ED/ON and ED groups in either age category. Among those aged ≥ 25 , PC scores were significantly lower in both the ED/ON ($p < .001$) and ED groups ($p < .001$) than in the HC group. For those aged < 25 , the ED group had significantly lower PC scores than the HC group ($p = .009$) but this difference was only marginally significant for the ED/ON versus the HC group ($p = .061$).

A three-way ANOVA was conducted to determine whether the differences between the ED/ON and ED groups PC scores were influenced by ED type (when factoring in age). Results revealed that the main effect for group was no longer present between the ED/ON and ED groups when the model was reduced to only significant interactions, $F(1, 465) = 0.40,$

$p = .530$, $\eta^2 = .001$. The significant two-way interaction between group and age for the ED group was not retained, $F(1, 461) = 2.18$, $p = .141$, $\eta^2 = .005$. There was no significant two-way interaction between group and ED type or three-way interaction between group, age, and ED type.

Discussion

The present study primarily aimed to investigate similarities and differences in ED symptomatology, body image (with a focus on appearance evaluation and orientation), distress, and impairment among individuals with ON symptoms versus those with currently recognised EDs. While the study originally intended to compare four research groups, encompassing three clinical groups (ON, ED/ON, and ED) and one healthy comparison group (HC), significant challenges were encountered in the recruitment of a pure ON group such that this group was excluded from the analyses.

Eating Disorder Symptomatology

The first hypothesis was that participants with ON would exhibit comparable levels of ED symptomatology to those with an ED alone and that these clinical groups would score higher than the HC group. As expected, those with an ED (both the ED/ON and ED groups) were found to exhibit significantly higher levels of ED symptoms than those without (HC). Unexpected, however, was the finding that those with ON symptoms (in addition to an ED) had significantly higher levels of ED symptoms than those with an ED only. Given that both ED groups comprised a mixed ED population (participants demonstrating symptoms from various *DSM-5-TR* EDs), further analysis was undertaken to ensure that the higher ED symptomatology in the ED/ON group was not a by-product of the types of EDs present among the ED/ON group versus the ED group, as opposed to the ON symptoms. The

significantly elevated ED symptoms among the ED/ON group remained when accounting for ED type, demonstrating that the presence of ON symptoms among those with an ED was associated with additional and/or more elevated ED symptoms.

Results revealed that the mean global EDE-Q scores of both clinical groups (ED/ON and ED) met several proposed cut-offs used to indicate the presence of an ED (Carey et al., 2019; Fairburn et al., 2008; Mond et al., 2015; Velkoff et al., 2023). Although previous research has found those with ON to score within the clinical range on measures of ED symptomatology (Dunn et al., 2019; Zickgraf & Barrada, 2022), this is the first study to find that those with additional ON symptoms exhibit higher ED symptomatology than those with an ED only. These results seem to contradict the arguments proposed by several researchers that ON may represent a less severe disordered eating condition and/or is associated with sub-clinical phases of an ED and associated with reduced clinical severity (i.e., a prodromal or postdromal condition) (Barthels et al., 2017; Brytek-Matera et al., 2015; Gramaglia et al., 2022; Segura-Garcia et al., 2015; Zagaria et al., 2021).

The current results could indicate that the EDE-Q measures some *features* of ON, despite not being designed to do so, such as items referring to the exclusion of certain foods to influence weight/shape (item 3) or a preoccupation with food or eating (item 7). It could also be that ON may result in increased *levels* of ED symptoms. Either of these is possible given the similarities proposed to be present between ON and certain EDs, especially given research reporting that ON is related to restrictive eating disorder symptoms and traits associated with AN and BN. Irrespective of these two possibilities, the higher EDE-Q scores found among ED participants with ON are consistent with previous research demonstrating a strong relationship between ON and ED symptoms and the presence of ED symptoms in

those who have elevated ON symptoms (Barnes & Caltabiano, 2017; Walker-Swanton et al., 2020), and lend further support to the notion that ON is best categorised among EDs (Bartel et al., 2020; Zagaria et al., 2021).

Body Image

Secondly, it was hypothesised that participants with an ED (with or without ON) would have comparable levels of appearance dissatisfaction and appearance orientation, while both ED groups would score higher than HCs. This hypothesis was partially confirmed by the results. Consistent with the hypothesis, those with an ED (with and without ON) were found to have a higher degree of body image concerns, as indicated by less appearance satisfaction and a higher focus on appearance, compared to the HC participants. For the clinical groups, participants with an ED with and without ON exhibited comparable levels of appearance satisfaction when accounting for ED type. However, for appearance focus, the ED/ON group were unexpectedly found to have a *higher* focus on their appearance than the ED group.

The elevated appearance focus found in the ED/ON versus the ED group is inconsistent with the original proposal of ON, which claimed that the condition is not associated with body image concerns (Dunn & Bratman, 2016). Furthermore, the comparable levels of appearance dissatisfaction in the ED/ON and ED groups also seems to be inconsistent with the work of Barthels et al. (2017) and Brytek-Matera, Donini et al. (2015) who found that ON was associated with more positive body areas satisfaction, which might be expected to provide some counter effect to the appearance dissatisfaction conferred by an ED. In contrast, the results from the present study are consistent with the work of Pauze et al. (2021) who also found appearance orientation to be positively related to

ON symptoms, but not appearance evaluation, as well as the work of several researchers who have found that ON may be related to overweight and body shape preoccupation and investment in appearance (Barnes & Caltabiano, 2017; Reynolds, 2018).

The most obvious explanation as to why greater appearance investment was found among those with ON (even when accounting for the presence of another ED) is that, contrary to Bratman's (1997) original proposal, ON is in fact associated with body image concerns. There seems to be hesitancy in the literature regarding this interpretation as it could be seen as posing a challenge to the contention that ON represents a distinctly different disorder from currently recognised EDs. This is because the lack of body image concerns was proposed to be one of the primary differences between it and currently recognised EDs.

However, when considering the role of body image concerns in those with ON tendencies, previous research has often failed to consider the underlying focus of the body image concerns. Research into body image concerns among EDs has generally focused on an individual's relationship to their appearance in the form of shape/weight preoccupation and overevaluation, with the shape and weight being associated with attractiveness. This does not take into account that an individual might focus on their appearance for other reasons. For example, body shape, weight, and appearance more broadly could also be perceived as indicators of health status and physical fitness. As such, it could be the case that the elevated focus on appearance in those with ON could arise from a health-based perspective. Thus, an appearance focus could emerge in those with ON for this reason and may still represent a divergence from currently recognised EDs where a focus on appearance for attractiveness reasons is present. Further research is needed to determine the underlying

motivation for the elevated appearance focus found in those in the ED/ON compared to the ED group.

Distress and Impairment

Finally, it was hypothesised that those in the ED/ON and ED groups would report comparable levels of distress and impairment, and that both clinical groups would score higher than the HCs. The results from this study partially confirmed this hypothesis, finding that the ED/ON and ED groups exhibited higher levels of general distress and impairment (as measured by the K10 and SF-12 mental and physical health components) and ED-specific impairment (as measured by the CIA) than the HCs. Even though the HC group scored significantly lower than both ED groups on the measure of general distress (K-10), they did score within the 'likely to have a mild disorder' range. Reasons as to why these results were found could include, the general age and gender of participants (most under 25 and females, both factors associated with more elevated levels of psychological distress) (Brennan et al. 2021, Butterworth et al. 2022; Dib et al. 2021; ...) and the time of data collection (during the COVID-19 pandemic, a time found to be associated with more negative on mental health and wellbeing across global populations at the time) (Butterworth et al., 2022; Robinson, et al., 2021; Xiong et al., 2020). Given these factors were relevant across all participant groups, it is not suspected that they had any notable influence on the group comparison results, it is worth noting possible explanations as to why the HC group exhibited these scores on general distress measure.

In terms of physical health impairment, the two ED groups were comparable when accounting for ED type. However, when accounting for differences in the distribution of ED types across groups, the ED/ON group exhibited significantly higher levels of ED-specific and

mental health impairment than the ED group. This was also partially the case for general distress, in that the elevated general distress in the ED/ON versus the ED group was only apparent among those with symptoms consistent with OSFED/UFED.

The results of this study are consistent with the study by Zickgraf et al. (2022) which found ON symptoms to be associated with elevated levels of ED-specific clinical impairment (as measured by the CIA). While these results are inconsistent with Zickgraf et al.'s (2019) study, which did not find ON to be associated with ED-specific impairment, it is worth noting that this study investigated the relationship between ON symptoms and impairment while controlling for ED symptoms. The present study did not control for ED symptoms in the analysis given research has established shared symptomatology among those with ON and those with currently recognised EDs. Thus, controlling for ED symptoms could have removed the impact of relevant shared symptoms from the analysis. Since the measure of ED-related impairment used in this study indexes impairment arising from shape and weight concerns (Becker et al., 2019), the finding of higher scores among those with ON provides additional support for the possible importance of body image concerns among these individuals.

The elevated levels of impairment and, at least for some ED types, of distress found among those with ON symptoms in this study again conflict with arguments proposed by several researchers and clinicians that ON should be conceptualised as representing a less serious type or stage of disordered eating (Barthels et al., 2017; Brytek-Matera et al., 2015; Gramaglia et al., 2022; Segura-Garcia et al., 2015). Instead, the present results suggest that the added presence of ON tendencies constitutes an additional burden on affected individuals that could further impact their levels of distress and impairment.

Limitations and Future Directions

Several key limitations of this study need to be noted when interpreting the findings and considering future research directions. The first and most notable limitation relates to the study's research groups. This study originally aimed to include an ON-only group, which would have allowed for an investigation of ED symptomatology, body image concerns, and distress and impairment in ON without the concurrent presence of a currently recognised ED. Unfortunately, this was not possible as a large enough group of participants with elevated ON symptoms without elevated *DSM-5-TR* ED symptoms was not found despite two years of intensive recruitment efforts through several public-facing ED organisations (i.e., Insideout and the Butterfly Foundation) and university dietetics, medical, and athletic departments (populations proposed to be at a higher risk of ON). Indeed, only 10 participants with elevated ON symptoms in the absence of elevated symptoms consistent with a *DSM-5-TR* ED diagnosis were found, which resulted in their exclusion from the data analysis. As direct comparisons between those with ON and those without was not statistically justified, it was not possible to make firm conclusions as to whether ON occurring in the absence of a currently recognised ED differs from that occurring with an ED. In contrast to the present study, the vast majority of previous research has not reported on the presence of *DSM-5-TR* EDs among their ON samples, such that it is unclear whether ON-only samples are consistently identifiable from the research conducted to date.

There are several potential reasons as to why a viable ON-only group was not found. Firstly, it is possible that, in most ON presentations, ED symptoms cannot be entirely excluded from ON symptoms. Given the view that ON is an ED, it is not surprising that those with ON would also be identified as having elevated ED symptoms on a validated measure of ED attitudes and behaviours. For example, ON has been suggested to be associated with dietary restriction, guilt regarding violations of dietary practices, and compensatory

behaviours, all of which are symptoms associated with currently recognised EDs and assessed via ED measures, such as the EDE-Q. Secondly, even though EDE-Q items might be endorsed by those with ON, they might be interpreted differently to those with an ED without ON. For instance, someone with ON might exhibit symptoms such as a definite fear of gaining weight or of losing control over eating, or a definite desire to have a totally flat stomach, due to health and fitness, as opposed to appearance, reasons. Thus, research is needed that taps into the motivation underlying endorsed symptoms on measures such as the EDE-Q. Finally, it is possible that a sizeable ON-only group could not be found because ON as a separate disorder does not exist, and that it primarily comprises a specifier in existing EDs (Bhattacharya et al., 2022; Depa et al., 2019). The task of determining whether ON represents a distinctly separate condition requires further research, particularly in terms of its theorised health versus appearance orientation.

A second notable limitation of the current study was the exclusive use of self-report questionnaires. This limitation includes the fact that the categorisation of participants into the two ED groups was not done via the use of a structured interview, such as the Eating Disorder Examination (Brennan & Shelton, 2020). Beyond this, previous research has outlined the limitations associated with self-report measures, especially among ED participants, including their susceptibility to socially desirable responding which can result in low accuracy, underreporting, and unreliable responses (Citrome & Grilo, 2021; Couturier & Lock, 2006; Fairburn, 2008; Faunce, 2002; Howard et al., 2022; Vandereycken & Van Humbeeck 2008; Vanderdeyken & Vanderlinden, 1983). Research is thus needed to supplement the current questionnaire data using alternative measures for understanding ON, such as implicit measures.

Conclusion

Overall, the current findings suggest that the additional presence of ON symptoms among those exhibiting *DSM-5-TR* EDs is associated with more severe pathology, including higher levels of overall ED symptoms, appearance orientation, ED-related and general impairment, and distress. These results are contrary to arguments that ON may represent a less severe constellation of symptoms than currently recognised EDs. The results also call into question the original conceptualisation of ON as being distinguishable from EDs by the absence of body image concerns. In combination, the findings cohere with previous research in suggesting that ON symptomatology is best conceptualised within the ED spectrum of disorders, but extend this research in uniformly indicating that the presence of ON in those with an ED comprises a more severe variant. Its severity underscores the need for research to further clarify the features and nosological status of ON, which could in turn assist in determining viable treatments for this condition.

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**Chapter 4: Identifying Differential Attitudes Regarding Health versus Appearance in
Individuals with Orthorexia Nervosa and Eating Disorders Using the Implicit Association
Test**

Abstract

Despite the surge in interest to better understand orthorexia nervosa (ON), the cognitive aspects of this condition, and whether they differ from currently recognised eating disorders (EDs), are not fully understood. To address this, the current study investigated whether ON could be distinguished from currently recognised EDs based on implicit health and appearance attitudes to food and body stimuli. Participants comprised 267 adults who were categorised into those with ED symptoms (ED: $n = 103$), those with ED and ON symptoms (ED/ON: $n = 43$), and healthy comparisons (HC: $n = 121$). Participants completed three Implicit Association Tests (IAT) consisting of one questionnaire-based test (health-based versus appearance-based statements), one picture-based body stimuli test (unhealthy/underweight versus healthy/average weight body images), and one picture-based food stimuli test (unhealthy/low calorie versus healthy/high-calorie food images). ANOVAs controlling for ED type revealed that all groups exhibited more favourable views of the health-based stimuli compared to the thinness-focused stimuli. Unexpectedly, the ED/ON group exhibited significantly less favourable views of the health-based statements, healthy/average-weight body images, and healthy/high-calorie food images than the ED and HC groups. Contrary to expectations regarding the health focus in those with the condition, the presence of ON symptoms among those with an ED was associated with a less favourable view of health stimuli and thus a greater positive view of appearance. If replicated, these findings would suggest that the presence of ON features in those with an ED accentuates (rather than diminishes) core ED symptoms.

Introduction

Orthorexia nervosa (ON) is characterised by an obsessive preoccupation with healthy food and eating, marked by a restrictive diet and a rigid avoidance of food deemed unacceptable, impure or unhealthy, resulting in physical, psychological, and social consequences. While the similarities present between ON and currently recognised eating disorders (EDs) in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR*; American Psychiatric Association [APA], 2022) have firmly placed ON as a condition lying on the ED spectrum, they also generate complexity as to whether or not ON comprises a distinct disorder. Several researchers have suggested that the similarities between ON and *DSM-5-TR* EDs, such as anorexia nervosa (AN), bulimia nervosa (BN), binge-eating disorder (BED), and avoidant restrictive food intake disorder (ARFID) demonstrate that ON is best understood as a risk factor, phase or subtype of a currently recognised ED (Barthels et al., 2017; Gramaglia et al., 2022; Segura-Garcia et al., 2015; Zagaria et al., 2021). In contrast, proponents of ON as a separate diagnostic category have argued that ON differs from these EDs in significant ways, most notably in the underlying motivation for the disordered eating that is proposed to entail a pursuit of health versus appearance in ON versus EDs, respectively.

Explicit versus Implicit Measures

Understanding the cognitive drivers of engagement in maladaptive eating behaviours poses an immediate challenge. As with the literature on EDs more broadly, ON research has been dominated by the use of self-report measures, that is, a type of explicit or direct measure that entails asking people to reflect and report on their internal states, such as their emotions, attitudes, and behaviours. While direct measures have proven to be effective in the measurement of psychological constructs, they have some important

limitations that can be particularly relevant to ED research. These include their susceptibility to being influenced by socially desirable response distortions arising from either impression management (i.e., concerns regarding judgement by others), poor self-awareness, recall bias, and/or cognitive distortions (such as self-serving biases) that can be exacerbated by clinical conditions (Paslakis et al., 2020). Of particular relevance to the study of ON is that it is not uncommon for those with an ED (including those recovered) to adjust their eating habits to align their pursuit of thinness with more socially acceptable forms of food avoidance, such as for health benefits (Dellava et al., 2010; Segura-Garcia et al., 2015). For example, Dellava et al. (2010) noted that their ED-recovered participants were more likely to base their food choices on putative health benefits while still maintaining lower BMIs when compared to the healthy participants. Further, given the stigma towards appearance-focused EDs (e.g., the belief that they are due to vanity or a desire for attention), it is reasonable that these individuals might express the motivations for their behaviours in terms of a focus on health as this is more socially desirable (Brelet et al., 2021).

In contrast, implicit or indirect measures are those that attempt to gather information about an individual's internal states without asking explicitly about them. Implicit responses can take both cognitive and affective forms, and by their nature occur without conscious awareness (Kinkel-Ram et al., 2021). Thus, the ushering in of implicit measures has provided a means to circumvent the limitations of explicit measures as they are able to capture data on the concept under investigation through automaticity conditions (Glashouwer et al., 2018). In addition, it is well known that unconscious cognitive processing plays an important role in one's behaviour, such as health-relevant behaviours (Sheeran et al., 2013), which further supports the use of implicit measures to complement the findings obtained through explicit measures.

In the last several decades implicit measures have become increasingly popular amongst ED researchers including to investigate various cognitive aspects relevant to EDs. The investigation of implicit cognitions has been found to be especially fruitful when researching ED-relevant stimuli such as food and body shape (Gallucci et al., 2023; Moussally et al., 2015). A notable strength of implicit measures is their ability to assist in distinguishing between those with and without EDs (Gallucci et al., 2023; Izquierdo et al., 2018; Smith et al., 2018). For example, Spring and Bulik (2014) found that implicit measures were better able to distinguish non-AN groups from AN groups when compared to explicit measures. In their study, the researchers examined implicit and explicit affect towards weight- and food-relevant images for individuals with acute AN, those recovered from AN, and a comparison group with no ED history. While the responses from the implicit and explicit measures were consistent, the implicit measure was better able to differentiate between the groups than the explicit measure as evidenced by its much larger effect sizes.

Implicit Associations

Given that studies investigating implicit attitudes and behaviours have been able to differentiate the various EDs from one another (Gallucci et al., 2023; Izquierdo et al., 2018; Smith et al., 2018) they could be potentially applied to differentiate ON from other EDs. In this regard, implicit associations might be particularly valuable in understanding the maladaptive cognitive content that underpins ON. Since ON is suggested to differ from currently recognised EDs in terms of the underlying motivations for the disordered eating behaviours, implicit associations may provide a fruitful avenue for yielding unique insight into the cognitions characterising ON, and help to determine whether they differ from those characterising currently recognised EDs.

Implicit associations refer to “representations in memory that link a stimulus and an involuntarily activated evaluative outcome, which do not require conscious reflection to influence affect, cognition, or behaviour” (Elran-Barak et al., 2020, p. 2). The utility of measures of implicit associations derives from the suggestion that they are insensitive to social desirability and other response biases and that they often have explanatory power that can surpass that of explicit measures (Elran-Barak et al., 2020).

The few studies that have investigated implicit responses in the ED literature have found that those with EDs have particular implicit response patterns and that these can differ between EDs. For example, Smith et al. (2018) conducted a study as part of larger longitudinal study utilising the Affect Misattribution Procedure to investigate whether individuals with ($n = 92$) and without EDs ($n = 85$) had different implicit affect toward ED-relevant stimuli. In this task, participants, who were mostly females (96.04%, $n = 170$) with a mean age of 34, were presented with one of the following stimulus sets: ED-relevant images (an emaciated person and a person engaging in binge eating, strenuous exercise or vomiting); images of average weight female bodies; images of women eating and words related to eating; positive images and words; negative images and words; and neutral images. Stimuli were shown for 75ms, followed by a blank screen for 125 ms and then an ambiguous Chinese character for 100ms. Participants were then asked whether they found this character more or less pleasant than average. The idea behind this procedure is that participants are expected to base their judgements of the pleasantness of the Chinese character on their current mental state, which is assumed to be influenced by the preceding image. Thus, Chinese characters following the presentation of negative stimuli should be evaluated as less pleasant, whereas Chinese characters following the presentation of positive stimuli should be evaluated as more pleasant. The researchers found that those

with AN and BN evaluated ED-relevant stimuli less favourably than those without an ED and that these evaluations were predictive of higher self-reported ED attitudes and behaviours one month later. Some differences between those with AN and BN also emerged.

Specifically, the researchers found that those with BN evaluated ED-relevant, eating, and average body stimuli less favourably than those without an ED, while those with AN were found to have a less favourable evaluation towards eating and average body stimuli compared to those without an ED. Overall, then, those with EDs showed different implicit responses to ED-related stimuli (food and body shape) than those without an ED, and different EDs seemed to have somewhat different implicit responses, given that the BN, but not the AN group, demonstrated less favourable attitudes towards ED symptom-relevant stimuli compared to those without an ED. This provides some support for the contention that the assessment of implicit responses may constitute an effective way to identify and understand how EDs may differ.

Implicit Association Tests (IATs), which are one of the most common implicit measures, have been shown to be a useful tool when investigating ED cognitions that are known to be susceptible to response bias when assessed through self-report measures. They have also been shown to assist in differentiating between different EDs, and in particular, those that are challenging to distinguish using explicit approaches (Izquierdo et al., 2018). As such, they hold promise for further understanding ON.

Developed by Greenwald et al. (1998), IATs are computer-administered tasks that use reaction time to assess the relative strength of an individual's association between two paired concepts. In an IAT, one of the concepts is a target category (e.g., high-calorie food) and one is an attribute (e.g., 'good'). Within each category are a set of words or images that map onto the category (e.g., an image of ice cream that maps onto the high-calorie food

category). In a typical IAT there are two categories and two attributes, which are combined to create four concept pairings. If the categories were high- and low-calorie food and the attributes were good and bad, the four concept pairings would be high-calorie + good, high-calorie + bad, low-calorie + good, and low-calorie + bad. Through the IAT, participants complete test trials for each of these concept pairings and need to classify the displayed stimuli on the basis of the concept pairing that is salient. The strength of the association between the paired concepts is determined by the speed at which participants correctly classify the relevant stimuli. For instance, faster responses to correctly pairing high-calorie with bad and low-calorie with good, than the opposite pairing, indicates a stronger association for high-calorie and bad than high-calorie and good. The IAT is a flexible paradigm and can be used to assess almost any type of association between paired concepts.

In recent years, IATs have been shown to successfully differentiate EDs that are explicitly very similar. **Notably, they have been used to determine whether there is an**

absence of drive for thinness in non-fat phobic AN at the level of implicit cognition.

Specifically, Izquierdo et al. (2018) investigated whether implicit attitudes toward dieting and thinness differed between those with ARFID, non-fat phobic AN, fat-phobic AN, and controls. This study utilised a statement-based IAT in which participants were required to sort a series of written stimuli - statements denoting true statements, false statements, pro-dieting statements, and non-dieting statements - into two paired categories (a combination of two categories) across several trials. This IAT included two conditions, corresponding to two paired categories which were 'pro-dieting + true/non-dieting + false' and 'non-dieting + true/pro-dieting + false'. The condition that elicited the faster response times was considered to indicate a stronger association between the category pairs presented in the

condition. For example, faster responses to the 'pro-dieting + true and non-dieting + false' condition were taken to indicate a stronger association for these category pairings, and hence endorsement of dieting. It was found that those with both types of AN were able to be differentiated from those with ARFID and healthy participants based on their implicit responses to the statement-based IATs investigating dieting attitudes. That is, the former groups evidenced a stronger association between pro-dieting and true statements, while the latter had stronger associations between pro-dieting and false statements. Thus, those with ARFID demonstrated consistency in their explicit disavowal of having a diet focus and their implicit responding on the IAT. Those with fat phobic AN similarly demonstrated consistency in their explicit and implicit responding in terms of endorsing pro-dieting across both. In contrast, those with non-fat phobic AN demonstrated an inconsistency between their implicit endorsement of dieting and explicit minimisation of pro-dieting. These results suggest that those with non-fat phobic AN may be particularly susceptible to socially desirable responding.

Izquierdo et al.'s study (2018) provides direction for advancing understandings of ON given that a focus on health, coupled with an absence of drive for thinness and appearance-based (shape and weight) concerns, are considered to be core aspects of what differentiates ON from currently recognised EDs. However, the explicit disavowal of shape and weight concerns among people presenting with ON symptoms may not accord with their implicit attitudes, akin to what has been found for people with seemingly non-fat phobic AN. Such a finding would argue against ON as distinct from other ED pathologies centred on shape and weight concerns.

Implicit Association Tests have also been successfully used to investigate differences in implicit attitudes towards different types of foods as demonstrated by the

aforementioned study by Spring and Bulik (2014) who found that individuals with AN had more pronounced negative implicit attitudes towards high-calorie food when compared to those without an ED and those in recovery from AN. Additionally, Elran-Barak et al. (2020) found that those with an ED and those who had a prior ED had stronger implicit associations between high-fat food and shame compared to a healthy comparison group.

Given that these two aspects - namely, appearance-based shape/weight concerns and food preferences - lie at the core of arguments regarding whether ON differs from currently recognised EDs, the IAT presents a promising paradigm through which to investigate whether ON diverts from currently recognised EDs and healthy comparisons on these dimensions.

Aims and Hypotheses of the Present Study

The primary aim of the present study was to determine whether ON could be distinguished from currently recognised EDs and healthy comparisons (HC) based on implicit associations regarding food and body stimuli. This was investigated using an implicit measure (the IAT) which has the distinct advantage of minimising the limitations of explicit measures (e.g., socially desirable responding). Participants of interest included individuals with ON, individuals with a currently recognised *DSM-5-TR* ED with or without ON (ED/ON and ED, respectively), and healthy comparisons (HC).

To address this aim, participants completed picture-based and questionnaire-based IATs whereby health-based stimuli (encompassing healthy/high-calorie food images, healthy/average-weight body images, and health-focused statements) and appearance-based stimuli (encompassing low-calorie/unhealthy food images, thin/unhealthy body images, and thin-focused statements) were paired with either positive or negative words and participants' reaction times to correctly identifying the pairs was measured.

Importantly, the stimuli used in the IATs made a clear distinction between (1) healthy versus dieting foods, (2) healthy versus thin bodies, and (3) health-aligned statements versus diet-aligned statements, to tap into the proposed health versus appearance orientations of those with ON versus those with an ED, respectively. For the picture-based IATs specifically, to ensure any positive or negative associations found were not due to healthy foods being conflated with low-calorie foods or unhealthy foods with high-calorie foods, all of the healthy foods were high in calories and all of the unhealthy foods were low in calories. Similarly, the images of the bodies were either thin and unhealthy or average-weight and healthy.

Should ON be associated with a focus on health, the presence of these symptoms would be expected to result in stronger positive perceptions of health-related versus appearance-related stimuli. It was therefore hypothesised that participants with ON (without a *DSM-5-TR* ED) would have stronger associations between positive words and the categories of healthy/high-calorie foods, healthy/average-weight bodies, and health-focused statements compared to those with an ED, and at least comparable, if not stronger, associations between positive words and the categories of healthy/high-calorie foods, healthy/average-weight bodies, and health-focused statements compared to the HCs.

In contrast, the value placed on a thin appearance in those with an ED should result in stronger positive perceptions of thin appearance-related versus health-related stimuli. Thus, it was hypothesised that participants with an ED (without ON symptoms) would have stronger associations between positive words and the categories of low-calorie/unhealthy foods, thin/unhealthy bodies, and thin-focused statements compared to those with ON and HCs.

Given the theorised value those with an ED and ON (ED/ON) place on both a thin appearance and health, it was unclear as to whether those with an ED and ON would exhibit a more favourable view towards the health-related or appearance-related stimuli. As such, it was speculatively hypothesised that participants in the ED/ON group would, due to the concurrent presence of ON symptoms, demonstrate significantly stronger positive perceptions for the health-related versus the appearance-related stimuli than the ED group, if a positive perception towards the health-related stimuli is present. Conversely, it was speculatively hypothesised that participants in the ED/ON group would, due to the concurrent presence of ON symptoms, demonstrate significantly weaker positive perceptions for the appearance-related versus the health-related stimuli than the ED group, if a positive perception towards the appearance-related stimuli is present. Finally, it was hypothesised that the ED/ON group would, due to the concurrent presence of an ED, demonstrate significantly weaker positive perceptions for the health-related versus the appearance-related stimuli than the HC group.

Method

Participants

Participants were aged 18-65 years and met inclusion criteria for one of the four groups (ON, ED/ON, ED or HC). Categorisation into the groups was done via the same process outlined in Study 1, Chapter 3. Forty-three participants were categorised into the ED/ON group, 103 into the ED group, and 121 into the HC group. Because only two participants were categorised into the ON group, these participants were excluded from further analyses.

A total of 461 participants clicked into this online study and gave consent to participate. Of these, a total of 289 completed the study. Of the 289 complete responses, 22

were excluded due to concerns regarding their responses across Study 2 and Study 3 (the specifics of this are noted in the Results section of this chapter and the Results section in Chapter 5). Thus, a total of 267 participants were included in the data analysis. G*Power (Faul et al., 2007) was used to conduct an *a priori* power analysis, which indicated that the minimum sample to yield a statistical power of at least .80 with an alpha of .05 and a medium effect size ($f = 0.25$) was 158.

Ethical approval was granted by the Australian National University Human Research Ethics Committee (protocol 2019/736). Ethics documentation for this study, including approval and the Participant Information Sheet, can be found in Appendix A. The recruitment of participants for this study was done through advertisements on social media platforms, the ANU's Student Research Scheme (SONA), and snowballing techniques. Advertisements described the study as 'exciting new research looking at the differences between healthy eating habits and those that might be problematic'. Interested participants were able to access the study via a link provided in the advertisement.

A demographic questionnaire collected basic demographic information, including gender, age, gender, marital status, ethnicity, education and employment. The majority of participants identified as female (76.8%, $n = 205$), 20.6% identified as male ($n = 55$) and the remaining 2.6% were made up of participants who identified as trans, non-binary or gender not listed ($n = 7$). The majority of participants were aged 18-24 years (10.9%, $n = 29$, 89.1%, $n = 238$ were aged > 25 years), were not in a relationship at the time of participation (64.4%, $n = 172$, including divorced, widowed, separated and single) and had less than a Bachelor's degree of education (77.2%, $n = 206$). Most participants identified as a student (56.9%, $n = 152$). In terms of ethnicity, Caucasian and Asian made up the majority of the participants'

ethnicity (58.8%, $n = 157$ and 32.2%, $n = 86$ respectively). The demographic characteristics of the participants are reported in Table 4.1.

Table 4.1

Participant Demographics Across Groups (N = 267)

Variables	ED/ON n (%)	ED n (%)	HC n (%)	Total n (%)
Age				
18 – 24	40 (93)	97 (94.2)	101 (83.5)	238 (89.1)
≥ 25	3 (7)	6 (5.8)	20 (16.5)	29 (10.9)
Gender				
Male	3 (7)	18 (17.5)	34 (28.1)	55 (20.6)
Female	40 (93)	80 (77.7)	85 (70.2)	205 (76.8)
Other	0 (0)	5 (4.9)	2 (1.7)	7 (2.6)
Ethnicity				
Caucasian	29 (67.4)	56 (54.4)	72 (59.5)	157 (58.8)
Asian	9 (20.9)	41 (39.8)	36 (29.8)	86 (32.2)
Other	5 (11.7)	6 (5.8)	13 (10.7)	24 (9)
Education				
Less than a BA	37 (86)	78 (75.7)	91 (75.2)	206 (77.2)
BA or more	6 (14)	25 (24.3)	30 (24.8)	61 (22.8)
Relationship				
Status				
Relationship	19 (44.2)	34 (35.8)	42 (34.7)	95 (35.6)
No relationship	24 (55.8)	69 (67)	79 (65.3)	172 (64.4)

Student					
Status	Student	19 (44.2)	60 (58.3)	73 (60.3)	152 (56.9)
	Non-student	24 (55.8)	43 (41.7)	48 (39.7)	115 (43.1)

Note: % is the percentage of participants for only the relevant group

Crosstabs and Chi-square tests were conducted for each of the demographic variables. No significant differences were found for ethnicity, $\chi^2 (10, N = 267) = 15.410, p = .118$, marriage, $\chi^2 (2, N = 267) = 1.726, p = .422$, work, $\chi^2 (4, N = 267) = 4.843, p = .304$, and education, $\chi^2 (2, N = 267) = 2.308, p = .315$, across the three groups. However, a significant difference was seen across groups for age, $\chi^2 (2, N = 267) = 7.383, p = .025$, and gender, $\chi^2 (4, N = 267) = 13.345, p = .010$. In terms of age, the HC group had a significantly higher proportion of participants 25 and older (16.5% compared to 7% and 5.8% and 7% for the ED/ON and ED participants, respectively). The HC group also had a larger proportion of male participants, accounting for almost 28.1% of individuals in this group compared to 7% and 17.5% for those in the ED/ON and ED groups.

The proportions of ED type per ED group can be found in Table 4.1. A Chi-square test revealed that there was an effect of group on the type of EDs present, $\chi^2 (3, n = 145) = 13.638, p = .003$. Crosstabs revealed that the ratio of AN among the ED/ON and ED groups was similar (14.0% and 9.8%, respectively). The significant Chi-square result appeared to be due to the presence of a larger portion of BN and OSFED/UFED participants in the ED/ON group and a larger proportion of BED participants in the ED group. This higher proportion of OSFED/UFED is to be expected with the ED/ON group since, by definition, ON entails fewer standard ED symptoms than those that are currently captured in the ED diagnostic sets.

Table 4.2*Proportion of ED Type in the ED/ON and ED Groups*

ED Type	Participant Group		
	ED/ON <i>n</i> (%)	ED <i>n</i> (%)	Total <i>n</i> (%)
AN	6 (14)	10 (9.7)	16 (11)
BN	19 (44.2)	26 (25.3)	45 (31)
BED	6 (14)	47 (45.6)	53 (36.6)
OSFED/UFED	12 (27.8)	20 (19.4)	31 (21.4)

Note: AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder;

OSFED/UFED = other specified feeding and eating disorder/unspecified feeding and eating disorder.

Measures

Images for the Picture-Based Food and Body IATs

Due to the absence of previous IAT research conducted in this area, there was a lack of ON-specific stimuli for use at the time the study was designed and implemented. As a result, the researchers developed study-specific image sets. The development of the image sets involved piloting images with participants from the general community. This data was then used to select images representative of the target image sets (as well as matched control images, which were used for the Visual Probe Detection Task addressed in Study 3, Chapter 5). There were four target image sets required: healthy/high-calorie foods (designed to assess the value of health over caloric content for people with ON); low-calorie/unhealthy foods (designed to assess the value of caloric content over health for people with an ED);

healthy/average-weight bodies (designed to assess the value of health over low body weight for people with ON); and thin/unhealthy bodies (designed to assess the value of low body weight over health for people with an ED).

The pilot images were rated by a sample of mixed-gender participants from the general population aged 18 years and over. Participants were deemed as suitable for this pilot study if they had normal to corrected to normal vision and no history of an ED or shape or weight problems as determined by self-identification. A total of 151 complete responses were obtained, which comprised predominantly females (69%, $n = 104$; 29%, $n = 44$ were male; and 2%, $n = 3$ were not binary or preferred not to say), with the majority being aged 18-24 years (76%, $n = 115$).

A large pool of target images (food and bodies) and control images (animals) were sourced from online search engines, totalling approximately 340 images. The images were piloted using a similar method to that used by the International Affective Picture System (Bradley & Lang, 2007), utilising a nine-point self-assessment Manikin scale for rating valence and arousal, with additional questions rated on a seven-point scale to categorise the images into the target groups. For the food images, three additional questions asked participants to indicate the perceived healthiness of the item, calorie content, and familiarity with the item (to ensure participants were not making health/calorie judgements about food items they were not familiar with). For the body images, two additional questions asked participants to rate the perceived healthiness of the bodies depicted and whether the bodies depicted over-, under- or average-weight individuals.

Each participant rater was shown only a portion of the total images across each of the five categories (four target and one control category), rating a total of 50-60 images

each. For the IAT, a total of five target images were selected for each of the four target image sets, accounting for 20 images in total.

Mean scores of participants' ratings were used to select the target images for the four categories and matched control images. Target images were those images most representative of the target group based on mean ratings for each of the seven-point rating scales. For the food and body images ratings of perceived healthiness/unhealthiness, mean scores of 1 to 3.5 were deemed to indicate that the image was rated as being unhealthy, while mean scores of 4.5 to 7 were deemed to indicate that the image was rated as being healthy. For the food images on the calorie content scale, mean scores of 1 to 3.5 indicated that the food image was rated as being low-calorie, while mean scores of 4.5 to 7 indicated that the food image was rated as being high-calorie. For the body images on the scale rating perceived weight, mean scores of 1 to 3.5 indicated that the body type was rated as being underweight, mean scores between 3.5 to 6 indicated that the body type was rated as being average/normal weight, and mean scores between 6 to 7 indicated that the body type was rated as overweight.

For food images to be categorised into the low-calorie/unhealthy category they needed to have a mean rating within the 'unhealthy' and 'low calorie' ranges on the respective rating scales (e.g., diet soft drink, coffee, and artificial sugar). For the healthy/high-calorie category, images needed to have a mean rating within the 'healthy' and 'high calorie' ranges on the respective rating scales (e.g., sweet potato, avocado, and hummus). Body images were categorised as thin/unhealthy if they had a mean rating within the 'unhealthy' and 'underweight' ranges on the respective rating scales (tested images included images of significantly underweight women in various types of outfits), and as healthy/average-weight if they had a mean rating within the 'healthy' and 'average weight'

ranges on the respective rating scales (tested images included images of women with BMIs in the normal range in various types of outfits). *T*-tests revealed that the two food stimulus sets were significantly different from one another in terms of health, $t(4) = 5.50, p = .003$, and calorie content, $t(4) = 3.94, p = .009$, while the two body stimulus sets were significantly different from one another in terms of health, $t(4) = 11.033, p < .001$, and weight, $t(4) = 26.05, p < .001$.

Matched control images were also piloted for use in the Visual Probe Detection Tasks for Study 3 and had the same valence and arousal categorisations as their respective target images. Scores between 1 to 3 were categorised as positive valence and high arousal; scores between 3 and 6 were considered to be neutral in both valence and arousal; and scores between 6 and 9 were considered to elicit negative valence and low arousal. Example images from each image set are shown in Appendix B.

The words for the two categories (positive and negative) required for the picture IAT were taken from Izquierdo et al. (2018). The positive words included 'glorious', 'happy', 'joy', 'love' and 'wonderful', while the negative words included 'agony', 'awful', 'hurt', 'terrible' and 'failure'. The positive and negative words were used across all both picture IATs.

Items for the Questionnaire-Based IAT

The statements required for the Questionnaire-Based IAT were derived from those utilised by Izquierdo et al. (2018) and modified to reflect statements that would be true and false to the participants taking part in this study. In addition to these 10 statements, five additional statements targeting ON and EDs were developed. These are displayed in Table 4.3.

Table 4.3*Questionnaire-Based IAT Statements*

Category	Statements
Health-Focused	I feel comfortable eating healthy fats I think a lot about my healthy nutrition I am proud of the way I nourish my body to support my health My eating habits are motivated by health and nutrition Being healthy is more important than being thin
Appearance-Focused	I think more about calories than nutrition I am more terrified of gaining weight than being unhealthy I often feel guilty about my eating habits My eating habits are motivated by physical appearance not health Being thin is more important than being healthy
True	I'm participating in research conducted by a university I'm in a room with a computer I'm participating in an online study I'm pressing buttons on a keyboard I'm sitting in a chair
False	I'm climbing a steep mountain I'm swimming in the ocean I'm playing my electric guitar I'm shopping at the mall I'm playing soccer outside

Implicit Association Test (IAT; Greenwald et al., 1998)

The IATs utilised in the current study were adapted from Izquierdo et al.'s (2018) questionnaire-based and picture-based IAT. A total of two Picture-Based IATs and one Questionnaire-Based IAT were utilised. The Picture-Based IATs comprised a food-based IAT utilising images of 'healthy/high-calorie' food and 'low-calorie/unhealthy' food, and a body-based IAT, utilising images of 'thin/unhealthy' and 'healthy/average-weight' women's bodies.

Picture-Based IAT. The parameters of this task were the same as those utilised by Izquierdo et al. (2018), utilising a seven-block structure as shown in Table 4.4 for the food-based IAT and Table 4.5 for the body-based IAT.

Table 4.4

Block Design of the Picture-Based Food Implicit Association Test

Block	No. of Trials	Items assigned to E key	Items assigned to I key
1 (target compatible practice)	20	Healthy/High-Calorie Food	Low-Calorie/Unhealthy Food
2 (attribute practice)	20	Positive words	Negative words
3 (test block hypothesis consistent pairing)	20	Positive words + Healthy/High-Calorie Food	Negative words + Low-Calorie/Unhealthy Food
4 (test block hypothesis consistent pairing)	40	Positive words + Healthy/High-Calorie Food	Negative words + Low-Calorie/Unhealthy Food
5 (target incompatible practice)	20	Low-Calorie/Unhealthy Food	Healthy/High-Calorie Food
6 (test block hypothesis inconsistent)	20	Positive words + Low-Calorie/Unhealthy Food	Negative words + Healthy/High-Calorie Food

7 (test block hypothesis inconsistent)	40	Positive words + Low-Calorie/Unhealthy Food	Negative words + Healthy/High-Calorie Food
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Table 4.5*Block Design of the Picture-Based Body Implicit Association Test*

Block	No. of Trials	Items assigned to E key	Items assigned to I key
1 (target compatible practice)	20	Healthy/Average-Weight Body	Thin/Unhealthy Body
2 (attribute practice)	20	Positive words	Negative words
3 (test block hypothesis consistent pairing)	20	Positive words + Healthy/Average-Weight Body	Negative words + Thin/Unhealthy Body
4 (test block hypothesis consistent pairing)	40	Positive words + Healthy/Average-Weight Body	Negative words + Thin/Unhealthy Body
5 (target incompatible practice)	20	Thin/Unhealthy Body	Healthy/Average-Weight Body
6 (test block hypothesis inconsistent)	20	Positive words + Thin/Unhealthy Body	Negative words + Healthy/Average-Weight Body
7 (test block hypothesis inconsistent)	40	Positive words + Thin/Unhealthy Body	Negative words + Healthy/Average-Weight Body

Questionnaire-Based IAT. The Questionnaire-Based IAT was designed to measure the association between health-focused/diet-focused statements and true/false statements. The parameters of this task were the same as those utilised by Izquierdo et al. (2018), utilising a seven-block structure as shown in Table 4.6.

Table 4.6*Block Design of the Questionnaire-Based Implicit Association Test*

Block	No. of Trials	Items assigned to E key	Items assigned to I key
1 (target compatible practice)	20	Health-Focused Statements	Diet-Focused Statements
2 (attribute practice)	20	Positive words	Negative words
3 (test block hypothesis consistent pairing)	20	Positive words + Health Focused Statements	Negative words + Diet Focused Statements
4 (test block hypothesis consistent pairing)	40	Positive words + Health Focused Statements	Negative words + Diet Focused Statements
5 (target incompatible practice)	20	Diet Focused Statements	Health-Focused Statements
6 (test block hypothesis inconsistent)	20	Positive words + Diet Focused Statements	Negative words + Health-focused Statements
7 (test block hypothesis inconsistent)	40	Positive words + Diet Focused Statements	Negative words + Health-focused Statements

Procedure

This study and Study 3 (Chapter 5) were conducted simultaneously utilising the same platform. As such, the procedure described was the same for both studies. Additionally, as the participants from this study and Study 3 are a portion of the participants included in Study 1 (Chapter 3), the procedure described here was that administered to 284 participants from Study 1.

This study (and Study 3) were conducted utilising two online platforms. The cognitive tasks, including the three IATs (and the Visual Probe Detection Tasks addressed in Study 3, Chapter 5), were conducted using Millisecond's Inquisit software/program (for creating and administering cognitive tasks) (Millisecond, 2021). Web-based cognitive testing for clinical and research purposes has been on the rise since COVID-19 to address the decreased capacity to conduct laboratory testing. Research on web-based cognitive testing, compared to laboratory testing, has shown that it incurs only a small loss of data quality (concerning reaction time, anomalous values, and accuracy) that has been deemed acceptable (Armitage & Eerola, 2019; Uittenhove et al., 2023). Additionally, Millisecond is a leading provider of software for the online administration of cognitive tests and assessments and has shown to produce data largely consistent with laboratory-based cognitive testing (Yaghoubi et al., 2022).

The surveys, which were utilised to categorise participants and analysed in Study 1 (Chapter Three), were run through the Qualtrics (www.qualtrics.com) survey development and hosting platform. The cognitive tasks were embedded in the Qualtrics survey so that only a Qualtrics link was needed to complete the study.

To participate, participants needed to access the link contained in the study advertisements to the Qualtrics survey and provide informed consent. All participants were provided with a copy of the Participant Information Sheet before being asked to provide informed consent. Participants were required to complete a basic demographic questionnaire and the ON categorisation questionnaire, followed by the cognitive tasks. The IATs were presented first, in randomised order, followed by the VPDTs, also in randomised order. Finally, participants completed the remainder of the questionnaires analysed in Study 1 (including the ED categorisation questionnaire) and the validity check questions.

Statistical Analysis

The relative strength of each participant's implicit associations was indexed by computing *D* scores using the improved scoring algorithm outlined by Greenwald et al. (2003). As the *D* score for each IAT is the average of two mean difference scores divided by their respective pooled SDs, the strength of the association as measured through the IAT *D* score can be interpreted in the same way as the well-known Cohen's *d* effect size (i.e., 0.2 is small, 0.5 is medium, and 0.8 is large; Cohen 1988).

Data analysis was performed using the Statistical Package for Social Sciences, Version 29 (IBM-SPSS 29). One-, two-, and three-way ANOVAs were performed for the main analyses to determine whether significant differences between the groups existed across their *D* scores. Due to significant Chi-square analyses suggesting associations between group membership and certain demographic variables (age and gender), two- and three-way ANOVAs were conducted to control for those demographic variables found to significantly differ across the groups. ED type was statistically controlled to ensure the results could not be attributed purely to the different proportions of ED types across the study groups.

Because no demographic variables were found to be significant, one-way ANOVAs were performed to determine the effect of group. Two-way ANOVAs were performed when determining the effect of ED type to control for these. Main effects, interactions, and simple effects were reported for each variable of interest when the results necessitated this, and all non-significant interactions were removed from the final model. The significance level across all analyses was $p < .05$.

Results

Data Cleaning and Screening

As recommended by Greenwald et al. (2003), participants were excluded if they had more than 10% of all response latencies faster than 300 ms. Based on these criteria, 17 participants were excluded from the analysis.

As with Study 1 (Chapter 3), variance ratios were used to determine whether homogeneity was violated for the study variables. Based on the variance ratios, homogeneity of variance was assumed for all variables and the main data analysis was conducted using ANOVAs (Dean & Voss, 1999; Keppel et al., 1992; Kirk, 2013; Wuensch, 2017). Utilising the same method as in Study 1, a normal distribution was also deemed suitable for the variables in this study.

Implicit Association Test Group Comparisons

Mean *D* scores for each of the IATs across the groups (ED/ON, ED, and HC) are shown in Table 4.7. Mean *D* scores for each of the IATs across both group (ED/ON and ED) and ED type (AN, BN, BED, and OSFED/UFED) are shown in Table 4.8.

Table 4.7

Mean (Standard Deviation) D Scores for Those With Eating Disorders and ON Symptoms (ED/ON), Those With Eating Disorders Without ON Symptoms (ED) and Healthy Controls (HC).

Stimulus Category	ED/ON	ED	HC
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Food Images	.47 (.40)	.61 (.36)	.66 (.37)
Body Images	.20 (.47)	.48 (.38)	.54 (.42)
Food/Body Questionnaire	.05 (.40)	.21 (.37)	.26 (.37)

Note: positive D scores indicate a more favourable view of the health-based stimuli compared to the shape-based stimuli and appearance-based stimuli.

Table 4.8

Mean (standard deviation) D Scores for Those With Eating Disorders and ON Symptoms (ED/ON) and Those With Eating Disorders Without ON Symptoms (ED) by ED Type.

ED Type		Food-Based	Body-Based	Questionnaire-Based
		<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Anorexia Nervosa				
	ED/ON (<i>n</i> = 6)	.37 (.40)	.16 (.40)	-.09 (.49)
	ED (<i>n</i> = 10)	.45 (.31)	.31 (.41)	.25 (.43)
Bulimia Nervosa				
	ED/ON (<i>n</i> = 19)	.62 (.36)	.26 (.52)	.10 (.34)
	ED (<i>n</i> = 26)	.59 (.38)	.49 (.40)	.14 (.29)
Binge Eating Disorder				
	ED/ON (<i>n</i> = 6)	.48 (.49)	-.10 (.55)	-.19 (.47)
	ED (<i>n</i> = 47)	.64 (.35)	.53 (.33)	.24 (.39)
OSFED/UFED				
	ED/ON (<i>n</i> = 12)	.47 (.40)	.42 (.38)	.13 (.40)
	ED (<i>n</i> = 20)	.61 (.40)	.50 (.37)	.24 (.42)

Note: positive D scores indicate a more favourable view of the health-based stimuli compared to the shape-based stimuli and appearance-based stimuli.

Picture Food-Based IAT

Positive D scores indicate a stronger implicit association between ‘positive’ words and healthy/high-calorie food (and ‘negative’ words and low-calorie/unhealthy food), whereas negative D scores indicate a stronger association between ‘positive’ words and low-calorie/unhealthy food (and ‘negative’ words and healthy/high-calorie food). As can be seen in Table 4.7, all groups displayed positive D scores for the food-based IAT. A one-way ANOVA revealed a significant main effect of group on these D scores, $F(2, 259) = 3.97, p = .020, \eta^2 = .030$ (indicating a small effect size). Bonferroni *post hoc* pairwise comparisons revealed that the ED/ON group displayed significantly lower positive D scores compared to the HC group ($p = .016$), indicating a weaker implicit association between ‘positive’ and healthy/high-calorie food in the ED/ON group. There were no significant differences between the ED/ON and ED groups ($p = .160$) or between the ED and HC groups ($p = .809$).

A two-way ANOVA was conducted to determine whether any differences emerged between the ED/ON and ED groups when accounting for ED type. Results revealed a significant main effect of group, with lower (but positive) D scores in the ED/ON versus the ED group, $F(1, 135) = 6.87, p = .010, \eta^2 = .048$. A significant interaction between group and ED type was also found, $F(3, 135) = 3.16, p = .027, \eta^2 = .066$. Simple effects and pairwise comparisons revealed that the ED/ON group had significantly lower (but positive) D scores than the ED group, but only for the BED, $F(1, 135) = 11.76, p < .001, \eta^2 = .080$, participants.

Picture Body-Based IAT

Positive D scores indicate a stronger implicit association between ‘positive’ words and healthy/average-weight bodies (and ‘negative’ words and thin/unhealthy bodies),

whereas negative D scores indicate a stronger implicit association between ‘positive’ words thin/unhealthy bodies (and ‘negative’ words and healthy/average-weight bodies). As can be seen in Table 4.7, all groups displayed positive D scores for the body-based IAT. A one-way ANOVA revealed a significant main effect of group on these D scores, $F(2, 258) = 10.81, p < .001, \eta^2 = .077$. Bonferroni *post hoc* comparisons revealed that the ED/ON group displayed significantly lower positive D scores compared to the ED group ($p < .001$) and the HC group ($p < .001$), indicating a weaker implicit association between ‘positive’ and ‘healthy/average-weight bodies in the ED/ON group. There was no significant difference between the ED and HC groups ($p > .999$).

A two-way ANOVA was conducted to determine whether the difference between the ED/ON and ED groups was influenced by ED type. The significant difference between the ED/ON and ED groups was still present when factoring in ED type, $F(1, 137) = 14.93, p < .001, \eta^2 = .098$, with the ED/ON group having lower (but positive) D scores than the ED group ($ED = .4995$; $ED/ON = .1989$). No additional significant two-way interactions were found.

Questionnaire-Based IAT

Positive D scores indicate a stronger implicit association between ‘true’ and health-based statements (and ‘false’ and thinness-based statements) whereas negative D scores indicate a stronger implicit association between health-based statements and ‘false’ (and shape-based statements and ‘true’). As can be seen in Table 4.7 all groups displayed positive D scores for the questionnaire-based IAT. A one-way ANOVA revealed a significant main effect of group on these D scores, $F(2, 255) = 4.83, p = .009, \eta^2 = .036$ (indicating a small effect size). Bonferroni *post hoc* comparisons revealed that the ED/ON group displayed significantly lower positive D scores than the HC group ($p = .007$), and marginally significantly lower positive D scores than the ED group ($p = .051$), indicating a weaker implicit association

between 'true' and health-based statements in the ED/ON group. There was no significant difference between the ED and HC groups ($p > .999$).

A two-way ANOVA was conducted to determine whether the difference between the ED/ON and ED groups was influenced by ED type. Results revealed a significant main effect of group, with lower scores in the ED/ON versus the ED group when factoring in ED type, $F(1, 137) = 5.02, p = .027, \eta^2 = .035$ (indicating a small effect), with higher positive scores indicating a more favourable view to the health-based statements. No additional significant two-way or three-way interactions were found.

Discussion

This is the first study to compare implicit associations regarding food and body stimuli in those with a *DSM-5-TR* ED with and without ON, with previous research focusing on the explicit cognitive content of people with ON. Specifically, this study aimed to investigate whether implicit associations could be used to differentiate ON from currently recognised EDs using food- and body-based images and statements.

Picture Food-Based IAT

For the picture food-based IAT, all groups exhibited a more favourable view of the healthy/high-calorie food compared to the low-calorie/unhealthy food as indicated by positive D scores. Positive scores reflect that the groups exhibited a faster response when healthy/high-calorie food was paired with 'positive' words and low-calorie/unhealthy food was paired with 'negative' words than the opposite pairing.

It was hypothesised that, despite the theorised health focus of those with ON, that the concurrent presence of an ED would diminish the positive value placed on healthy foods in the ED/ON group relative to the HC group. The results supported this hypothesis, with a significantly weaker implicit association between 'positive' and healthy/high-calorie food in

the ED/ON versus the HC group. However, whether the reduced value of healthy/high-calorie food found in the ED/ON group was due to the presence of an ED was challenged by subsequent findings suggesting that, if anything, the effect of ON on this finding was greater.

Specifically, while it was hypothesised that the ED/ON group would, due to the concurrent presence of ON symptoms, demonstrate significantly stronger positive perceptions of the health-related versus the thinness-related stimuli than the ED group, this was not found to be the case. Instead, the ED/ON and ED groups were found to be either comparable or, when accounting for ED type, the ED/ON group was found to have a significantly *less* favourable view of the health-based stimuli than the ED group (albeit only for those with BED symptoms).

This is a particularly interesting result as it is opposite to the expectation that the additional presence of ON in the context of an ED would confer greater positive associations with health-related stimuli when compared to the ED group. One possible interpretation is that the explicit attitudes regarding health as assessed via the self-report (EHQ-R) that were used to categorise participants in the ON group are not matched by implicit values for health, at least in those with a concurrent ED. An alternative possibility is that the 'healthy' food images were not necessarily perceived as such given that these images were also depicting high-calorie foods, and high-calorie foods might be viewed as synonymous with unhealthy. As such, the high calories of the healthy foods depicted in this task might have reduced the degree to which they were perceived as healthy by those with ON. It has been noted that the dietary theories/rules of those with ON do not follow a specific structure and can be quite varied (Dunn & Bratman, 2016; Mitrofanova et al., 2020). Thus, it may have been the case that, despite these images being deemed to be healthy by a sample drawn from the general population, the subjective nature of health perceptions among those with

ON influenced the health value they placed on high-calorie foods such as avocado and nuts relative to low-calorie foods such as coffee and soft drink. It should be noted, however, that if low-calorie processed foods were deemed to have healthy properties this in itself could reflect the type of preferencing of low caloric value over nutritional quality seen in those with an ED, thereby diminishing the distinction in the beliefs of those with EDs and ON.

The reason for the reduced favouring of the health-based images in the ED/ON group among those with BED (who differed significantly from their counterparts in the ED group) versus those with AN, BN, and OSFED (who did not differ significantly from their counterparts in the ED group) is unclear. It could be speculatively proposed that, for those ON participants with BED, the endorsement of health overconcern in the ON self-report measure is actually indexing shape/weight overconcern, which is a specifier for BED in the *DSM-5-TR* (APA, 2022). While the mechanisms driving these differences are unclear at this stage, the key findings are that, for those with AN, BN, and OSFED, the additional presence of ON was *not* associated with a greater positive value placed on health- versus appearance-based food as anticipated; even more unexpected was the finding that, for those with BED, the additional presence of ON was associated with a *less* positive value placed on health- versus appearance-based food.

Nor was the hypothesis that participants with an ED (without ON) would have stronger associations between positive words and low-calorie/unhealthy foods compared to HCs supported. Instead, the ED group was found to have a more favourable view of the healthy/high-calorie food images versus the low-calorie/unhealthy food images (as indicated by positive *D* scores), and were comparable in this regard to the HC participants. This result is inconsistent with the work of Spring and Bulik (2014) who found a greater negative implicit attitude towards high-calorie foods in their ED participants compared to those

without an ED. It is worth noting that the Spring and Bulik (2014) study, along with others investigating implicit associations in those with an ED (Elran-Barak et al., 2020; Khan & Petroczi, 2015), utilised high-calorie foods that were also typically high in fat and sugar. In contrast, the high-calorie foods in the present study were healthy. Since healthy foods are often associated with lower body weights and more ideal body shapes in the media, they may have elicited implicit positive connotations even among those with an ED.

Picture Body-Based IAT

As with the food-based IAT, the results from the body-based IAT showed that all groups exhibited a more favourable view towards the health-based stimuli than the appearance-based stimuli. This was indicated by positive *D* scores demonstrating that the groups overall exhibited a faster response when healthy/average-weight body images were paired with 'positive' words and thin/unhealthy body images were paired with 'negative' words.

The endorsement of more favourable views towards the health-based stimuli in the HCs is consistent with the work of Marini (2017) and Izquierdo et al. (2018) who have found the general population to have stronger implicit associations between pictures of normal-weight (versus underweight) people and positive words. Consistent with the food-based IAT results, the hypothesis that the ED/ON group would, due to the concurrent presence of an ED, demonstrate significantly weaker positive perceptions for the health-related versus the thinness-related stimuli than the HC group was supported for the body-based IAT. However, once again, other results challenged whether this finding was due to the presence of an ED but likely instead reflected the presence of ON.

Specifically, as with the food-based IAT results, the results for the ED/ON versus the ED group were inconsistent with, and indeed in the opposite direction of, the hypothesis.

That is, while it was hypothesised that the ED/ON group would, due to the concurrent presence of ON symptoms, demonstrate significantly stronger positive perceptions for the health-related versus the thinness-related stimuli than the ED group, the ED/ON in fact showed significantly *weaker* positive associations with healthy/average-weight versus thin/unhealthy body images than the ED group. This result was evident across all ED types. Thus, once again, there appears to be a discordance between explicit attitudes regarding health as assessed via the self-report instrument used to categorise participants in the ON group and implicit values for health, at least in those with a concurrent ED. Alternatively, it is possible that the less favourable view towards the healthy/average-weight bodies found among those with ON tendencies could, once again, have stemmed from the varied nature of what is defined as healthy among this population, with the images deemed to be healthy in a general population sample not equating to the definition of a 'healthy body' for those experiencing ON symptoms. As previously noted, however, if emaciated body images were deemed to have healthy properties this itself could reflect the value of the thin ideal seen in those with an ED, thereby diminishing the distinction between EDs and ON.

The hypothesis that the ED group would have stronger associations between positive words and underweight/unhealthy (versus healthy/average-weight) bodies compared to the HC group was also unsupported. Instead, the ED group evaluated the health-based body stimuli more favourably than the appearance-based body stimuli, as indicated by a positive association between positive words and the healthy/average-weight body stimuli, and did so to the same extent as the HC group. This conflicts with results found by Smith et al. (2018) regarding their AN and BN participants who were found to evaluate average body stimuli less favourably than non-ED participants. However, unlike the present study, the average body stimuli were not evaluated relative to underweight bodies, thus the Smith et al. (2018)

findings might reflect a tendency for people with EDs to rate body stimuli in general less favourably than those without an ED. Nevertheless, the current results are also inconsistent with the work of Izquierdo et al. (2018) who found that their HC group had an association between negative words and underweight bodies (akin to the current finding of an association between positive words and average-weight body stimuli) but that this was significantly stronger in the HCs than those with AN in a picture-based IAT. It may be the case that the lack of a significant difference between the ED and HC groups in the present study was due to the unhealthiness of the underweight images rendering them less attractive even for those with an ED.

Questionnaire-Based IAT

The results for the questionnaire-based IAT were similar to the picture-based IATs. That is, all groups exhibited a stronger positive association between health-focused statements and 'true', and thinness-focused statements and 'false', than the opposite pairings as evidenced by positive *D* scores.

The results were consistent with the hypothesis that the ED/ON group would, due to the concurrent presence of an ED, demonstrate significantly weaker positive perceptions for the health-related versus the appearance-related stimuli than the HC group. Specifically, the HC group exhibited a significantly more favourable view towards the health-related stimuli than the ED/ON group. However, subsequent results again suggest that this finding was more driven by the presence of ON than ED symptoms in the ED/ON group.

As with the picture-based IAT results, the findings for the questionnaire-based IAT were contrary to the hypothesis that the ED/ON group would, due to the concurrent presence of ON symptoms, demonstrate significantly stronger positive perceptions for the health-related versus the thinness-related stimuli than the ED group. Instead, the ED/ON

group displayed significantly *weaker* positive perceptions of the health-focused statements than the ED group across each ED type. The health-based statements in the questionnaire-based IAT (e.g., ‘I think a lot about my healthy nutrition’, ‘I am proud of the way I nourish my body to support my health’, and ‘my eating habits are motivated by health and nutrition’ and ‘being healthy is more important than being thin’) unambiguously indicated a prioritisation of health over thinness. Likewise, the thinness-based statements (e.g., ‘I think more about calories than nutrition’, ‘I am more terrified of gaining weight than being unhealthy’, ‘I often feel guilty about my eating habits’, ‘my eating habits are motivated by physical appearance not health’, and ‘being thin is more important than being healthy’) unambiguously indicated a prioritisation of thinness over health. As such, the current findings are unlikely to reflect those with ON interpreting these pro-diet statements as pro-health statements. Thus, yet again, the findings suggest a lack of correspondence between the explicit reporting of a health focus (as assessed via self-report in categorising ON participants) in those with ON and implicit values for health (as assessed via the questionnaire-based IAT), at least in those with a concurrent ED.

The ED and HC groups exhibited comparable patterns of positive associations with the health-related statements. This result was again inconsistent with the hypothesis that the ED group would (1) have stronger associations between positive words and appearance-focused statements than with health-focused statements, and that (2) these associations would be significantly stronger compared to the HC group. The results found in this study regarding the ED group are inconsistent with the work of Izquierdo et al. (2018) who found that their participants with AN exhibited a positive association between true and dieting statements (similar to the current study’s appearance-focused statements), and that they were significantly different in this regard from HCs. It is possible that the different

comparators used in these two studies contributed to these conflicting results. That is, the Izquierdo et al. (2018) study used non-dieting statements (e.g., 'If I gain a pound, it's not a big deal.') as the contrasting statements, compared to the current study, which utilised health-based statements (e.g., 'I think a lot about my healthy nutrition'). Thus, when faced with a positive (health-focused) alternative, this may have diminished the discrepancy in value between health- versus thinness-based statements in those with an ED in the present study. Moreover, the interpretations of health-based statements by those with an ED may have been influenced to some degree by shape and weight concerns (e.g., interpreting 'I think a lot about my healthy nutrition' as thinking about the weight impacts of dietary choices).

Summary of the IAT Results

The findings across the picture food-based, picture body-based, and questionnaire - based IATs were consistent. Specifically, across each IAT, those with ON symptoms in the context of an ED unexpectedly exhibited the least favourable attitudes towards the health versus the thinness-related stimuli relative to the ED-only group.

These results are surprising given that an obsessive/pathological preoccupation with healthy eating is considered to differentiate those with a *DSM-5-TR* ED from those with ON. While contrary to the expectation that the least favourable view towards the health-related stimuli would be in those with an ED (without ON), the results suggest that the presence of ON symptoms is associated with more elevated ED-relevant symptomatology. This interpretation is supported by the findings of Study 1 (Chapter 3), which found that those with additional ON symptoms had more elevated ED symptoms and exhibited worse distress and impairment than those with an ED alone. This could also be why those with ON symptoms exhibited a less favourable view towards healthy larger bodies and healthy high-

calorie food since a less favourable view for these types of stimuli could be perceived as being more in line with core ED features. The greater pathology conferred through the additional presence of ON was underscored by the fact that the ED/ON group was the only group to significantly differ from the HC group across all measures, whereas the ED and HC groups were indistinguishable; the comparable results between the ED and HC groups further suggest that it was the ON, and not the ED, symptoms that were driving these differences.

The study's findings fundamentally challenge previous conceptualisations of ON that query its severity, while also raising new questions regarding the degree to which, among people with ON and an ED, ON and EDs can be distinguished based on a putative drive for health versus a drive for thinness. It may instead be the case that the additional presence of ON in those with an ED increases the severity of thinness-related pathology.

Limitations of the Present Study and Directions for Future Research

Several limitations must be noted in interpreting the current findings. Similar to Study 1, the first and most notable limitation was the absence of an ON-only group of participants. One of the primary aims of this study was to directly compare those with and without ON in terms of their implicit cognitive content via IATs. Specifically, it sought to compare the implicit associations to food and body stimuli of those with ON-only and those with a *DSM-5-TR* recognised ED-only. However, the data did not yield a suitable ON-only participant group. Excluding a very small number of participants ($n = 2$), all participants in this study with ON tendencies also met the criteria for the ED group. As the only ON group was a combined ED/ON group, a direct comparison between those with ON-only to those without (ED-only or HC) was not possible.

It is noteworthy that the majority of research to date on ON has not attempted to include an ED comparison group. While many studies have assessed ED symptomatology in those with elevated ON or assessed ON symptoms in those with EDs, a very limited amount of research has attempted to provide provisional diagnostic groups (i.e., ON, ED, ED/ON, and HC) as the current study did. As such, this study may have identified an important consideration for future research on this condition since whether an ON-only participant sample is identifiable (at least when using measures designed for currently recognised EDs) is not clear.

It was not the focus of this study to investigate implicit associations by ED type and how these might differentially relate to ON symptoms. As such, the diagnostic configuration of the ED groups did not yield viable sample sizes for comparison, making this an area to be addressed in future research. While the transdiagnostic model of EDs suggests that the maintaining processes are similar across different ED types (Fairburn et al., 2003), there was some suggestion in the current study of differences across ED types in the context of ON, namely, the significantly reduced favouring of health-based food images in the ED/ON versus the ED group only among those with BED. Thus, understanding how ON symptoms interact with different ED symptom clusters requires further investigation.

Conclusions

Across each of the three IATs in the present study, the findings were largely consistent but unexpected in demonstrating that those with ON symptoms in the context of an ED had the least favourable implicit attitudes towards the health- versus the thin appearance-related stimuli compared to the ED group. While the ED/ON group also had significantly worse implicit attitudes to health-related stimuli than the HC group, the pattern

of results suggest that this is unlikely to have been due to the concurrent presence of an ED as hypothesised but instead likely reflected the presence of ON.

In combination, the findings from Study 1 (investigating self-reported symptomatology) and Study 2 (investigating implicit attitudes) converged to suggest that those with additional ON symptoms may be experiencing more severe ED-related pathology rather than experiencing a different type of ED. Additional research exploring different aspects of cognition, such as information processing, is needed to further explore this possibility.

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Chapter 5: Selective Attention for Food and Body Stimuli in Individuals with Orthorexia

Nervosa and Eating Disorders: The Use of a Visual Probe Detection Task

Abstract

Despite increasing research into orthorexia nervosa (ON) over the last two decades, its differentiation from currently recognised eating disorders (EDs) remains unclear. The current study aimed to determine whether ON can be distinguished from EDs based on aspects of cognitive processing, specifically, attentional biases to food and body stimuli. Adult participants ($n = 267$) were categorised into three groups: those with an ED and ON symptoms (ED/ON: $n = 43$), those with an ED only (ED; $n = 103$), and healthy comparisons (HC: $n = 121$). Participants completed two visual probe detection tasks assessing attentional biases to food and body stimuli. Controlling for ED type, the ED/ON group exhibited significantly greater attentional biases than the ED and HC groups for the unhealthy/underweight body stimuli and the healthy/high-calorie food stimuli. There was also some evidence of a significantly greater attentional bias for unhealthy/low-calorie food stimuli in the ED/ON versus both the ED and HC groups. No significant differences between groups were found for the healthy/average-weight body stimuli. Overall, the presence of elevated ON symptoms in those with an ED appears to be associated with greater attentional biases for unhealthy/underweight bodies, healthy/high-calorie food, and unhealthy/low-calorie food.

Introduction

Orthorexia nervosa (ON) has been described as an unhealthy obsession with healthy eating (Dunn & Bratman, 2016). It is differentiated in part from a general desire to observe a healthy diet by its negative impacts, which can include malnutrition, impairments in psychosocial and personal functioning, and/or marked levels of distress.

Since its identification and emergence into the scientific literature, there have been several debates regarding how to conceptualise ON, most notably whether it is best understood as representing a distinctly new eating disorder (ED) or an alternative version of a currently recognised ED. In attempting to discern whether such differences exist, researchers have sought to identify the cognitions characterising those with ON and how these differ from other EDs, such as the desire to maximise health and nutrition and magical thinking about the qualities of certain foods (Koven & Abry, 2015). Yet relative to the research focused on cognitive content, very few studies have investigated aspects of information processing in ON and whether the condition can be distinguished from currently recognised EDs on this basis.

Attentional Bias in Eating Disorders

This oversight is noteworthy given the longstanding centrality accorded the role of information processing biases and impairments in the aetiology and maintenance of maladaptive eating behaviours (Fairburn et al., 1999; Garner & Bemis, 1982; Vitousek & Hollon, 1990). Cognitive models suggest that the dysfunctional information processing (such as biases in attention) seen in EDs result from maladaptive schemas regarding appearance (body shape and weight) and food (Aspen et al., 2013; Lee & Shafran, 2004; Pona et al., 2019; Ralph-Nearman et al., 2019; Smeets et al., 2008; Stott et al., 2021). Schemas in this context were originally defined by Vitousek and Hollon (1990) as “organised cognitive

structures around the issues of weight and its implications for the self that influence their perceptions, thoughts, affect and behaviour” (p. 197).

Information processing biases, especially attentional biases, have been shown to play a role in a number of EDs and those with disordered eating, as supported by numerous studies over the last several decades summarised in several review papers (Aspen et al., 2013; Ralph-Nearman et al., 2019). Attentional bias refers to the preferential allocation of attention to “personally, motivationally and emotionally relevant stimuli” (van Ens et al., 2019, p. 86), and can be distinguished into three different components: vigilance/facilitation, avoidance, and difficulty in disengagement from relevant cues (Starzomska, 2017).

To date, studies have utilised diverse methodologies for investigating attentional biases regarding ED-relevant stimuli (food and body cues) among those with EDs. Paslakis et al. (2021) reviewed 29 studies investigating the implicit biases to food and body cues among those with EDs, and found differences between those with EDs and controls across the majority of studies reviewed. Moreover, the significant differences found between the ED and control participants for food stimuli were evident across most of the research investigating implicit biases among various EDs such as anorexia nervosa (AN), bulimia nervosa (BN), and/or binge eating disorder (BED) (Jauregui-Lobera, 2013; Paslakis et al., 2021; Stojek et al., 2018; Stott et al., 2021; Veenstra & de Jong, 2011). This was also the case for body stimuli, with the majority of studies finding significant differences in the implicit biases of those with an ED compared to those without (Jauregui-Lobera, 2013; Paslakis et al., 2021; Stojek et al., 2018; Stott et al., 2021).

Some research has also highlighted the utility of information processing methodologies in differentiating between different EDs (Blechert et al., 2010; Cooper &

Todd, 1997; Perpina et al., 1993; Ralph-Nearman et al., 2019). For example, Perpina et al. (1993), using a modified Stroop task, found that compared to healthy participants, their BN participants were slower in naming the colour of body words, while the AN participants were slower in naming the colour of food words. The researchers interpreted these results to indicate that those with BN are more concerned with weight and appearance, whereas those with AN are more concerned with food and eating. Blechert et al. (2010) also found a difference between the information processing of their AN and BN participants when using a modified dot probe task investigating attentional biases to pictures of the self versus others. Those with AN were found to have an attentional bias for pictures of themselves compared to others, while those with BN were found to exhibit the opposite (though the latter was not statistically significant). Ralph-Nearman et al. (2019) in their systematic and methodological review also noted that those with AN and BN differed in their attentional bias patterns, in that those with AN were more likely to avoid overweight bodies and food stimuli whereas those with BN were more likely to approach stimuli relating to food and other bodies. Collectively, findings such as these are suggestive of the potential for aspects of information processing to distinguish between different types of EDs.

Attentional Bias in Orthorexia Nervosa

As is the case with other EDs, those with ON may differ from those with currently recognised EDs in terms of their cognitive processes. To date, only two studies have investigated attentional biases in ON. Specifically, Albery et al. (2020) utilised a modified Stroop task in those with varying levels of ON tendencies. This task involves participants naming the colours of emotionally salient words and neutral words, and comparing the reaction times between them. Longer latencies in colour-naming reaction times are interpreted to indicate greater interference from the ‘task-irrelevant’ information, that is,

the meaning of the words, thereby indexing an attentional bias for the salient relative to the neutral words. Using healthy and unhealthy foods as the salient categories, the researchers found that increased ON tendencies were associated with increased attentional bias (i.e., longer colour-naming latencies) for healthy (but not unhealthy) food words relative to neutral words. They also found through hierarchical regression that this bias for healthy food words independently predicted ON tendencies, such that the greater the bias, the higher the ON tendencies. This study provides preliminary support that a specific attentional bias is present among those with higher ON tendencies.

However, this study has several limitations that hinder the interpretation of its findings. The first limitation, as identified by the researchers themselves, pertains to the instrument used to measure ON tendencies in that the psychometrics of the ORTO-15 have been consistently questioned, with researchers arguing that it measures an interest in healthy eating as opposed to a pathological obsession with healthy eating (Heiss et al., 2019; Rogoza & Donini, 2021).

Another limitation of the study is that no comparison was made regarding the attentional bias of those who have a currently recognised ED. Given the crossover consistently identified between ON and currently recognised EDs, comparing selective attention between these groups would allow researchers to determine whether the attentional bias towards healthy food stimuli is specific to ON and thus represents a distinct feature of the condition.

In a related limitation, the healthy and unhealthy food words used in this study confounded health and caloric content in that the healthy foods (e.g., vegetables and salad) were low in calories, whereas the unhealthy foods (e.g., fried foods) were high in calories. This issue is particularly relevant when attempting to determine if ON can be distinguished

from EDs centred on shape/weight concerns. The finding of an attentional bias for 'healthy' food words among those higher in ON tendencies may instead reflect selective attention for low-calorie foods stemming from the same shape/weight concerns characterising those with a currently recognised ED. Such a finding would challenge the notion that ON is distinct from other ED pathologies centred on shape and weight concerns.

Finally, Albery et al.'s study (2020) was limited by its use of the modified Stroop task to measure attentional bias. Researchers have raised the concern that the Stroop task may be poorly suited to measure this bias, given that the mechanisms responsible for the results on the Stroop are unclear (e.g., longer colour-naming latencies may indicate either selective attention towards or away from salient stimuli). Indeed, some have claimed that it is not even certain if Stroop interference is actually indicative of an attentional bias (Starzomska, 2017).

In a subsequent study, Albery et al. (2022) attempted to replicate and extend their original study. To do this, they utilised an alternative attentional bias measure (i.e., the dot probe task) and utilised an alternative ON measure (i.e., the Teruel Orthorexia Scale) which conceptualised Orthorexia as having two dimensions, namely, healthy preoccupation with healthy eating (HeOr) and a pathological preoccupation with healthy eating (OrNe). They found that OrNe was predicted by an increased attentional bias towards healthy-related food words but not unhealthy-related food words.

While Albery et al.'s (2022) study addressed several limitations of the Albery et al. (2020) study, some methodological concerns remain that need to be remedied in order to gain a better understanding of attentional biases in ON. The first is that the sample comprised self-identified vegans/vegetarians. While this population has been suggested to be at an increased risk of ON, investigating only this group excluded a large portion of the

population that may be experiencing ON symptoms, thereby questioning the generalisability of the findings. Additionally, much like the 2020 study, they did not categorise participants into distinct comparison groups based on the presence or absence of ON. Instead, they investigated the predictive determinants for healthy and pathological ON and the associated patterns of responding. So the researchers were again only looking at the results obtained from those with notable orthorexia symptoms (both ‘healthy’ and ‘pathological’). While they could compare the results of those with ‘healthy orthorexia’ and those with ‘orthorexia nervosa’, this does not provide insight into how these individuals compare to those with different EDs or healthy individuals.

Nevertheless, the use of a visual (dot) probe detection task (VPDT) in the Albery et al. (2022) study was a clear improvement to the modified Stroop task utilised in their 2020 study. In the VPDT paradigm, participants are presented with two stimuli (i.e., a disorder-salient versus a neutral stimulus) and then a visual probe appears in the position of one of the previously presented stimuli. Due to this task presenting two stimuli simultaneously and requiring participants to process them at the same time, researchers can detect which areas in the visual display are attended to versus those that are not. Attentional bias is measured by the relative response times to probes in the position of the salient versus neutral stimuli, with faster response times indexing such a bias. VPDTs were originally designed utilising word stimuli (e.g., ‘fat’ as the ED-salient word and ‘box’ as the neutral word). However, in order to increase ecological validity, researchers have increasingly utilised pictorial tasks in which images rather than words are presented. The use of pictorial stimuli has also been suggested to be more sensitive to detecting differences between clinical and non-clinical samples (Jiang & Vartanian, 2017; Pona et al., 2019).

Implicit Measures for Identifying Potential Differences Between Orthorexia Nervosa and Eating Disorders

Tasks assessing information processing such as the VPDT have the added advantage of offering an implicit measure of cognition. The bulk of research on EDs has focused on self-report methodologies (e.g., questionnaires and interviews), with these explicit measures having some notable limitations, including their susceptibility to forms of deception, whether intentional or unintentional (such as a lack of insight/awareness or problems in correctly identifying or articulating emotions/symptoms) (Borgers et al., 2021). For example, it is well known that denial, concealment, and secrecy are common among those with an ED, with some research finding that up to three-quarters of these individuals deny that anything is wrong in the initial months of their condition (Howard et al., 2022). The reasons for such concealment of disordered eating behaviours can vary, such as the egosyntonic nature of certain ED behaviours (e.g., providing a sense of achievement or affect regulation) and hence a desire to minimise detection and intervention from others, or to avoid stigma or judgement from others (Vanderycken, 2006; Vandereycken & Van Humbeek, 2008). This poses a challenge for ED researchers when utilising explicit measures and has spurred some to consider the use of implicit measures.

The issue of intentional deception among those with disordered eating becomes particularly pertinent when trying to determine whether ON differs in the underlying motivation from currently recognised EDs. Since dietary restriction for health reasons is often actively promoted across various platforms, it constitutes a more socially acceptable motivation for dietary restriction than the pursuit of thinness typifying ED-related shape/weight concerns. An explicit disavowal of a drive for thinness, and a reported drive for health, would thus be less likely to result in stigma, judgement or intervention from

others. Overall, then, an investigation of information processing in ON is not only helpful in expanding understandings of this condition, but it also avoids the limitations of explicit measures.

Aims and Hypotheses of the Present Study

To extend research on ON beyond the predominant focus on cognitive content, the primary aim of the present study was to determine whether ON can be distinguished from current EDs and healthy comparisons (HC) based on aspects of cognitive processing (i.e., attentional biases regarding food and body stimuli). A focus on information processing has the additional benefit of utilising implicit measures and thus reducing socially desirable responding, which is of particular concern when seeking to determine if differences exist between ON and currently recognised EDs. The study sought to include individuals with ON, individuals with an ED with or without ON (ED/ON and ED, respectively), and healthy comparisons (HC).

Attentional biases were investigated in the present study using the VPDT due to its ability to index attention both towards and away from disorder-salient stimuli. For the same reasons outlined in Study 2 (Chapter 4), the stimuli used in the VPDT paradigm made a clear distinction between healthy and dieting foods, and between healthy and thin bodies, to tap into the proposed health rather than appearance orientation of those with ON versus those with an ED. More specifically, the stimuli avoided confounding healthy with low-calorie foods by ensuring that healthy foods were all high in calories and unhealthy foods were all low in calories. As such, any attentional biases regarding healthy food stimuli could not be due to them being low in calories (and thus reflecting a drive for thinness rather than a drive for health). A similar approach was adopted for the body shape/weight stimuli which

consisted of images of bodies that were either healthy (and of average weight) or unhealthy (and thin).

For the food stimuli, it was hypothesised that each of the clinical groups (ON, ED, and ED/ON) would exhibit a greater attentional bias for these stimuli versus the control stimuli than the HC group, given that food is salient for each of the clinical groups. It was further hypothesised that the clinical groups would be differentiated from one another on the basis of differential attention to the health status of the foods. Specifically, based on previous findings on attentional bias in those with ON (Albery et al., 2020; Albery et al., 2022), it was hypothesised that those with ON (with and without an ED) would exhibit a greater bias for healthy/high-calorie foods compared to those without ON (ED and HC), but not for low-calorie/unhealthy foods (that were designed to capture the salience of thinness among those with an ED).

In the absence of previous research investigating attentional biases for body shape/weight stimuli in individuals with ON, the same rationale as used for the food stimuli informed the hypotheses for the body shape/weight stimuli. Specifically, it was hypothesised that each of the clinical groups (ON, ED, and ED/ON) would exhibit a greater attentional bias for the body stimuli versus the control stimuli than the HC group, given that body shape/weight is salient for each of the clinical groups. It was further hypothesised that the clinical groups would be differentiated from one another on the basis of differential attention to the health status of the body stimuli. Thus, it was hypothesised that those with ON (with and without an ED) would exhibit a greater attentional bias for the healthy/average-weight body stimuli compared to those without ON (ED and HC), but not for thin/unhealthy body stimuli (that were designed to capture the salience of thinness among those with an ED).

Method

Participants

Study 2 (Chapter 4) and Study 3 used the same sample. Thus, information regarding the participants and recruitment methods utilised in the present study can be found in Chapter 4. In brief, the final Study 3 sample comprised 267 participants. As with Studies 1 and 2, since there was no ON group, only the ED/ON ($n = 43$), ED ($n = 103$), and HC ($n = 121$) groups could be compared. An *a priori* power analysis in G*Power (Faul et al., 2007) was performed and indicated that the minimum sample to yield a statistical power of at least .80 with an alpha of .05 and a medium effect size ($f = 0.25$) is 158. Ethical approval was granted by the Australian National University Human Research Ethics Committee under the same Protocol as Study 2 (Protocol 2019/736).

Measures

Given the lack of previous VPDT research conducted in this area, there was a lack of ON-specific stimuli for use at the time of this study's design and implementation. As a result, the researchers developed study-specific image sets. The full procedure for the development of the images utilised in the VPDTs can be found in Study 2 (Chapter 4). The VPDTs utilised four target image sets: healthy/high-calorie foods (e.g., avocado and hummus); unhealthy/low-calorie foods (e.g., diet cola and coffee); healthy/average-weight bodies (e.g., women with BMIs in the normal range in various outfits); and unhealthy/thin bodies (e.g., significantly underweight women in various outfits). For the VPDT, a total of 20 target images and 20 control images were selected for each of the four target image sets, accounting for 160 images in total. The control images comprised animals. Example images from each image set are shown in Appendix B.

Visual Probe Detection Task (VPDT; MacLeod, et al., 1986)

The VPDTs used in the current study were administered through Millisecond's Inquisit (Millisecond, 2021) program via the personal devices of participants. The structure of each of the VPDTs was as follows. Each trial commenced with the 1,000 ms presentation of a fixation cross (+) in the centre of the screen. Next, the screen was cleared, and two images were displayed for 500 ms. On every trial, one of the images depicted a body/food and the other image depicted an animal, with these images appearing in the left and right screen locations, with equal frequency. Immediately upon termination of the two images, a small visual probe (i.e., a letter "p" or "q") appeared in the location previously occupied by either one of the images. Participants were instructed to identify the letter, by pressing the appropriate key on a keyboard, as quickly and accurately as possible. After a response was made, the next trial commenced.

The letter shown and the location of the probe was randomised with equal probability. The fact that participants were required to discriminate between two alternative probes (as opposed to detecting the presence or absence of a dot) was to ensure that attention was actually allocated to the probe location, rather than the presence of a probe (such as a dot) being detected peripherally. There were 20 trials for each of the four target-control category pairings, making a total of 80 trials. Trial order was randomised across participants. Additionally, there were 12 practice trials. An example of a VPDT trial is shown in Figure 5.1.

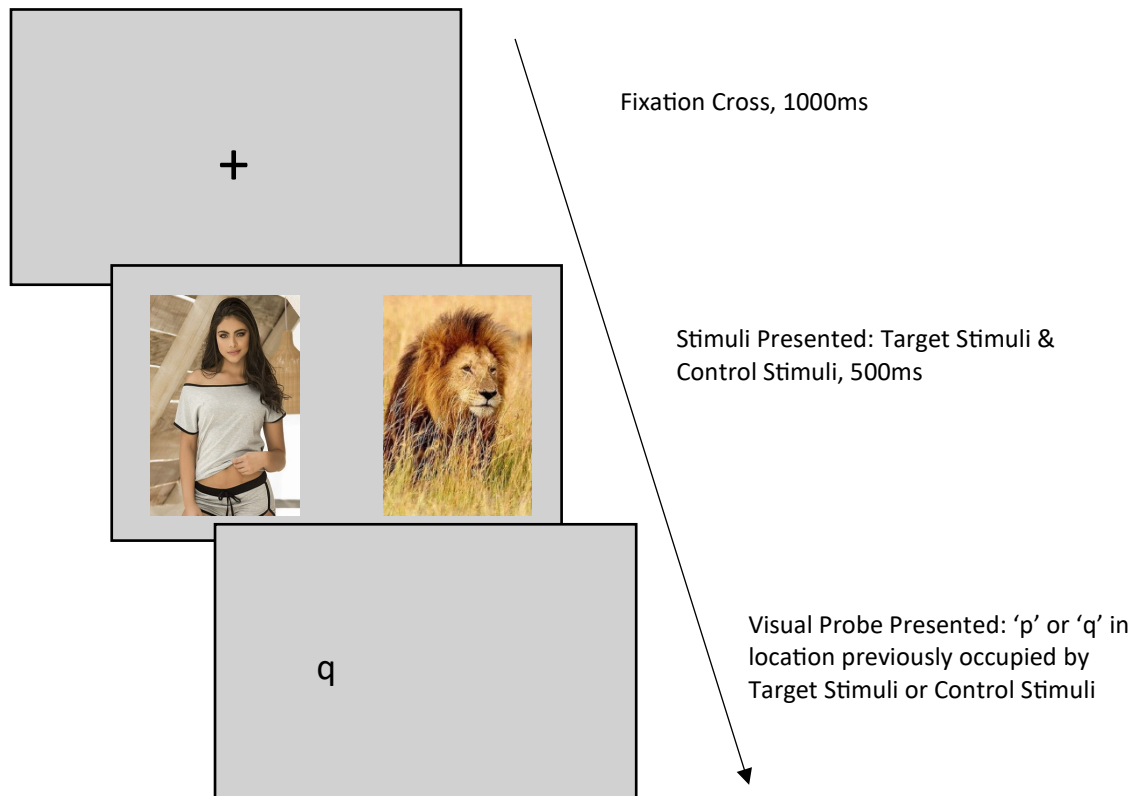


Figure 5.1 Visual Probe Detection Task (VPDT) Trial Sequence

Procedure

Study 2 (Chapter 4) and Study 3 were conducted simultaneously utilising the same platform. As such, the procedure was the same for both studies. To briefly reiterate, these studies were conducted utilising two online platforms. The surveys that were utilised to categorise participants and analysed in Study 1 (Chapter 3) were run through Qualtrics, an online survey development and hosting platform (www.qualtrics.com). The cognitive tasks, including the Implicit Attitude Tests (IAT) from Study 2 and the VPDTs of the current study, were conducted using Millisecond's Inquisit software/program (for creating and administering cognitive tasks (Millisecond, 2021) and were embedded in the Qualtrics survey so that only a Qualtrics link was needed to complete the study. To participate, participants needed to access the public link to the Qualtrics survey and provide informed

consent. All participants were provided with a copy of the Participant Information Sheet before being asked to provide informed consent. Participants were required to complete a basic demographic questionnaire, the ON and ED categorisation questionnaires, followed by the cognitive tasks and then the remainder of the questionnaires analysed in Study 1 and the validity check questions. The IATs were presented to participants first in a randomised order, followed by the VPDTs, also in a randomised order.

Statistical Analysis

VPDT responses were used to compute Attentional Bias Indices (ABIs). For the food-based VDPT, two separate ABIs, differing on the basis of food type, were computed utilising the following equation:

Attentional Bias Index (ABI) = mean response latency for probes replacing control images – mean response latency for probes replacing either healthy or unhealthy food images.

For the body-based VDPT, two separate ABIs, differing based on body type, were computed utilising the following equation:

Attentional Bias Index (ABI) = mean response latency for probes replacing control images – mean response latency for probes replacing either healthy or unhealthy bodies images.

Using these equations, positive ABIs indicated an attentional bias towards the target versus the control image. Conversely, negative ABIs indicated an attentional bias away from the target versus the control image.

Data analysis was performed using the Statistical Package for Social Sciences, Version 29 (IBM-SPSS 29). One-, two-, and three-way ANOVAs were performed for the main analyses to determine whether significant differences in ABI scores existed between the groups. Given significant Chi-square analyses suggested associations between group membership and both certain demographic factors and ED types, two- and three-way ANOVAs were

conducted to control for these. Where demographic variables were found to be non-significant in the model, they were removed and the analysis was re-run, with these results reported. In addition, ED type was statistically controlled for in the analyses comparing the ED/ON and ED groups. Main effects are reported for each ABI, with interaction effects and simple effects reported when present. All non-significant interactions were removed from the final reported model. The significance level across all analyses was $p < .05$.

Results

Data Cleaning and Screening

To control for outliers in reaction times during the VDPT across all tasks, latencies considered atypical of a participant's response were excluded as guided by prior studies using similar versions of the VPDT (Dondzilo & Basanovic, 2023; Dondzilo et al., 2017).

Specifically, latencies of incorrect responses and those below 200 ms or above 3000 ms were excluded as they were considered to reflect invalid responses (e.g., pre-emptive or distracted responding) and would impact the detection of atypical responses. Atypically long response latencies were also eliminated by removing latencies more than 2.5 standard deviations above each participant's mean response latency. Based on this, five participants' data met the criteria for exclusion.

Variance ratios were used to determine whether homogeneity was violated for the study variables. Based on this, homogeneity of variance was assumed for all ABIs (Dean & Voss, 1999; Keppel et al., 1992; Kirk, 2013; Wuensch, 2017). Utilising the same method as in Study 1, a normal distribution was also deemed suitable for the variables in this study.

Main Analyses

The mean ABIs for each of the image sets across the ED/ON, ED, and HC groups are shown in Table 5.1. Table 5.2 provides this data for the ED/ON and ED groups across each ED type.

Table 5.1

Mean (Standard Deviation) Attentional Bias Indices for Those With Eating Disorders With ON Symptoms (ED/ON), Those With Eating Disorders Without ON Symptoms (ED) and Healthy Controls (HC)

Image Category		ED/ON	ED	HC
		<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Food Images				
	Healthy/High-Calorie	35.03 (75.34)	9.21 (62.89)	10.74 (53.12)
	Low-Calorie/Unhealthy	29.15 (76.30)	9.43 (59.43)	21.25 (67.89)
Body Images				
	Thin/Unhealthy	42.30 (79.16)	15.57 (58.38)	14.43 (53.10)
	Healthy/Average weight	21.05 (99.26)	19.02 (49.15)	13.83 (52.24)

Note: positive ABIs indicated an attentional bias towards the target versus the control image; negative ABIs indicated an attentional bias away from the target versus the control image.

Table 5.2

Mean (standard deviation) Attentional Bias Indices for Those With Eating Disorders With ON Symptoms (ED/ON) and Those With Eating Disorders Without ON (ED) by ED Type

ED Type	Healthy/High-Calorie Food	Low-Calorie/Unhealthy Food	Healthy/Average Weight Body	Thin/Unhealthy Weight Body
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
AN				
ED/ON (<i>n</i> = 6)	65.04 (128.08)	85.79 (128.58)	45.35 (190.51)	-8.09 (125.47)
ED (<i>n</i> = 10)	15.20 (48.71)	-24.61 (57.89)	41.63 (68.99)	13.13 (92.29)
BN				
ED/ON (<i>n</i> = 19)	19.58 (70.13)	14.29 (60.95)	3.74 (86.68)	44.26 (71.87)
ED (<i>n</i> = 26)	-5.96 (56.31)	1.66 (58.15)	22.51 (48.37)	19.11 (52.85)
BED				
ED/ON (<i>n</i> = 6)	58.03 (82.56)	84.16 (62.58)	52.89 (107.34)	80.76 (95.04)
ED (<i>n</i> = 47)	17.52 (66.66)	21.73 (60.89)	6.62 (49.88)	15.54 (57.00)
OSFED/UFED				
ED/ON (<i>n</i> = 12)	33.02 (43.31)	-3.16 (43.96)	20.41 (46.91)	45.18 (44.77)
ED (<i>n</i> = 20)	6.77 (70.21)	3.34 (51.41)	32.79(28.47)	11.81 (53.16)

Note: AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder;

OSFED/UFED = other specified feeding and eating disorder/unspecified feeding and eating disorder. Positive ABIs indicated an attentional bias towards the target versus the control

image; negative ABIs indicated an attentional bias away from the target versus the control image.

Healthy/High-Calorie Food Images

As can be seen in Table 5.1, all groups displayed positive ABI scores, indicative of a general tendency to selectively attend to healthy/high-calorie food images versus animal images. A one-way ANOVA revealed a significant main effect of group, $F(2, 263) = 3.05$, $p = .049$, $\eta^2 = .023$ (indicating a small effect size). However, *post hoc* comparisons revealed that there was only a marginally significant difference between the three groups, with a greater ABI in the ED/ON group compared to the other two group (ED/ON vs. ED, $p = .061$; ED/ON vs. HC, $p = .077$) but no significant difference between the ED and HC groups ($p > .999$).

A two-way ANOVA was conducted to determine whether any differences between the ED/ON and ED groups were influenced by ED type. Results revealed a significant main effect of group, with greater ABI scores among the ED/ON versus the ED group, $F(1, 140) = 6.31$, $p = .013$, $\eta^2 = .043$. No significant two-way or three-way interactions were found.

Low-Calorie/Unhealthy Food Images

As can be seen in Table 5.1, the ON/ED, ED, and HC groups overall displayed positive ABI scores, indicative of a general tendency to selectively attend to low-calorie/unhealthy food images versus animal control images. A one-way ANOVA revealed no significant main effect of group, $F(2, 263) = 1.62$, $p = .201$, $\eta^2 = .012$.

A two-way ANOVA was conducted to determine whether any differences between the ED/ON and ED groups emerged when considering ED type. Results revealed a significant main effect of group, $F(1, 137) = 12.30$, $p < .001$, $\eta^2 = .082$, as well as a significant two-way interaction between group and ED type, $F(3, 137) = 3.75$, $p = .013$, $\eta^2 = .076$. Simple effects and pairwise comparisons revealed that the ED/ON group had a significantly greater ABI

than the ED group, but only for those with BED ($p = .021$) and AN ($p < .001$) as can be seen in Table 5.2.

Healthy/Average Weight Body Images

As can be seen in Table 5.1, all groups displayed positive ABI scores, indicative of a general tendency to selectively attend to healthy/average-weight bodies versus animal control images. A one-way ANOVA revealed no significant main effect of group, $F(2, 257) = .30$, $p = .739$, $\eta^2 = .002$, indicating that the groups did not differ in terms of their attentional responses to healthy/average-weight body images.

A two-way ANOVA that was conducted to determine whether any differences between the ED/ON and ED groups emerged when considering ED type found no significant difference between the ED/ON and ED groups, $F(2, 139) = .01$, $p = .916$, $\eta^2 = <.001$. No significant two-way or three-way interactions were found.

Thin/Unhealthy Body Images

As can be seen in Table 5.1, the ON/ED, ED, and HC groups overall displayed positive ABI scores, indicative of a general tendency to selectively attend to thin/unhealthy bodies versus animal control images. A one-way ANOVA revealed a significant main effect of group, $F(2, 257) = 3.72$, $p = .026$, $\eta^2 = .028$ (indicating a small effect size). Bonferroni *post hoc* comparisons revealed that the ED/ON participants displayed a significantly greater positive ABI towards unhealthy/thin bodies as compared to both the ED group ($p = .045$) and the HC group ($p = .030$). There was no significant difference between the ED and HC groups in terms of their ABI for unhealthy/thin bodies ($p > .999$).

A two-way ANOVA was conducted to determine whether the differences between the ED/ON and ED groups were influenced by ED type. It was found the significant main effect of group remained, with the ED/ON group having a greater ABI compared to the ED

group, $F(1, 141) = 5.59, p = .019, \eta^2 = .038$ $F(1, 139) = 5.26, p = .023, \eta^2 = .036$. No significant two-way or three-way interactions were found.

Discussion

To build on the limited previous research that has attempted to examine attentional biases in those with ON, the present study aimed to investigate whether selective attention to food- and body-related stimuli, as measured by the VPDT, could be used to differentiate ON from currently recognised EDs. The image sets were developed so as to clearly capture the proposed focus on health (rather than a thin appearance) in those with ON versus EDs. Specifically, the healthy foods were high in calories and the healthy bodies were average weight to capture the proposed salience of health over thinness in those with ON. Conversely, the low-calorie foods were unhealthy and the thin bodies were unhealthy to capture the proposed salience of thinness over health in those with an ED.

Food Images

Across the food-based VPDTs, the results indicated that the ED/ON, ED, and HC groups overall demonstrated an attentional bias towards the food stimuli compared to the control (animal) stimuli as indicated by positive ABIs. The preferential allocation of attention to food stimuli among each of the groups is consistent with much of the attentional bias literature. Across this research, a pattern of attentional bias for food stimuli, both high- and low-calorie, among those with EDs has been established (Ralph-Nearman et al., 2019; Stott et al., 2021). Additionally, several studies have found attentional bias to food stimuli among their control participants (e.g., unrestrained eaters) (Favieri et al., 2020; Werthmann et al., 2013). The attentional bias found among all groups in the current study and previous research is consistent with an evolutionary perspective that views selective attention to food as an adaptive characteristic of all animals, including humans (Nijs et al., 2010).

There was some support for the hypothesis that those with ON would show greater selective attention towards healthy foods compared to those without ON, with significant differences between the ED/ON versus the ED group (when controlling for ED type) and marginally between the ED groups and the HC group in terms of selective attention towards healthy/high-calorie food images. These results are in line with the only two previous studies investigating attentional bias in the ON context in which higher ON symptoms were associated with higher attentional biases for healthy food stimuli (Albery et al., 2020; 2022). This convergence is noteworthy given marked methodological differences between these studies, including the stimuli. That is, the healthy words in the Albery et al. (2020; 2022) studies were low-calorie foods, making it unclear as to whether the attentional bias reflected a health or thinness motivation. Yet the present study found tentative evidence for an attentional bias for healthy stimuli that are high in calories. In combination, these findings might therefore suggest that an attentional bias for healthy stimuli is apparent in ON irrespective of the caloric content.

Conversely, the present (albeit marginally) significantly higher ABIs in the ED/ON group for the healthy/high-calorie images might have been due to vigilance towards threatening stimuli, namely, images that are high in calories. In other words, the findings might have been largely driven by the high calories of the stimuli rather than their health properties. A meta-analysis by Aspen et al. (2013) of VPDTs found some evidence of vigilance for high-calorie stimuli in ED samples. Although the reliability of this finding is somewhat questionable given Aspen et al. (2013) reported significant heterogeneity in the data, if this finding is valid, it suggests that the ED/ON group in the present study actually responded in a manner consistent with other clinical ED samples, which would be contrary to the hypotheses.

Overall, then, for individuals with ON in the context of an ED, selective attention towards healthy foods which are also high in calories (such as avocado and nuts) might reflect the operation of either, or both, the appetitive motivational system (i.e., a desire for healthy foods) and vigilance (i.e., a fear-based response regarding high-calorie foods). As Stott et al. (2021) note, “a desire to eat may exist alongside a fear of food, and both motivations may even apply to the same food” (p. 1395).

Similar mechanisms may have also accounted for the findings regarding the low-calorie/unhealthy food images where there was again some evidence for the distinctive nature of the ED/ON group. That is, when accounting for ED type, a significant difference was found between the ED/ON and the ED group, with the ED/ON group demonstrating greater selective attention towards the low-calorie/unhealthy food images, but only for those with AN and BED symptomatology.

At least for those with ON and accompanying AN and BED symptomatology, this finding is inconsistent with the work of Albery et al. (2020; 2022) in which ON features were not associated with attentional biases regarding unhealthy food stimuli. However, the unhealthy food stimuli in the Albery et al. studies were high in calories, such that they are not directly comparable to the low-calorie/unhealthy images used in the present study. Such discrepancies might also reflect the different samples utilised across these studies, with the current study entailing ON with an accompanying ED, whereas the ED status of the Albery et al. (2020; 2022) samples is unknown. If replicated, the current findings suggest that the ED/ON group may be compromised by attentional vigilance for both categories of food stimuli (i.e., healthy/high-calorie stimuli and unhealthy/low-calorie). As an alternative to a vigilance/fear-based response, selective attention for low-calorie/unhealthy foods might reflect the operation of the appetitive motivational system, or might simultaneously entail

both appetitive and vigilance/fear-based responses. Adding even further complexity is the possibility that different mechanisms might be relevant for different EDs. For instance, selective attention for food stimuli might constitute an appetitive response for people with BED and a fear-based vigilant response for people with AN. Such complexity underscores the lack of clarity regarding the processes underlying attentional bias findings across the literature, as is evident in Stott et al.'s (2021) meta-review of 15 systematic reviews of attentional bias in EDs.

Although the mechanism underpinning the greater attentional bias towards low-calorie/unhealthy images in ED/ON individuals observed in the present study remains unknown, the finding does challenge Albery et al.'s (2020) claim that the attentional system of those with elevated ON tendencies may be “more fine-tuned to the extent that it is specific to healthy-food-related stimuli” (p. 1230). The results from the current study instead support the notion that the attentional system of those with ON may not be specific to healthy food-related items alone, at least for ON occurring in the context of certain EDs.

The lack of any significant differences between the ED and HC groups in attentional biases regarding either food stimulus category is inconsistent with at least some research demonstrating such biases in ED samples. For example, Blechert et al. (2011) found a greater attentional bias towards food images regardless of calorie content among their ED sample relative to HCs. Lee and Shafran (2008) and Shafran et al. (2007) also found attentional biases for food stimuli in those with an ED relative to HCs, although the nature of this bias differed depending on the type of food, with attentional vigilance for high-calorie food images and attentional avoidance of low-calorie food images. The current study differed from these studies in not confounding low-calorie foods with healthy foods, and high-calorie foods with unhealthy foods, and thus is not directly comparable to previous work. However,

it did confound low-calorie foods with unhealthy foods, and high-calorie foods with healthy foods. Such combinations may have served to somewhat neutralise the threatening and/or appetitive nature of the images for people with EDs, thereby mitigating against an attentional bias. That is, the healthy/high-calorie foods (e.g., avocado) in the current study may have been perceived as less desirable and/or threatening than the unhealthy/high-calorie foods (e.g., ice cream) typically used in previous research.

Body Images

Across the body-based VPDTs, the results indicated that the ED/ON, ED, and HC groups overall demonstrated an attentional bias towards the healthy/average weight and thin/unhealthy stimuli compared to the control (animal) stimuli as indicated by positive ABIs. The preferential allocation of attention to stimuli depicting people among the ED groups is consistent with the research on attentional bias in those with EDs (Ralph-Nearman et al., 2019; Shafran et al., 2007; Stott et al., 2021). Specifically, those with an ED have been found to attend more to stimuli depicting people compared to non-human stimuli (Ralph-Nearman et al., 2019; Shafran et al., 2007; Stott et al., 2021). This has also been found to be the case for HCs (e.g., Shafran et al., 2007). The preferential processing of stimuli of people is consistent with broader findings in cognitive psychology, such as greater attentional biases towards human faces compared to animal faces and non-face objects (Jakobsen et al., 2021).

Contrary to the hypothesis, those in the ED/ON group were found to be comparable to the ED and HC groups in their attentional bias towards the healthy/average-weight body images. Instead, and also inconsistent with the hypothesis, the ED/ON group was found to have a significantly greater attentional bias to the thin/unhealthy images than the ED and comparison groups, even though the thinness of these images was designed to be salient for those with EDs rather than those with ON. This significant difference in attentional bias

remained when accounting for ED type, with the ED/ON group exhibiting greater selective attention towards the unhealthy/thin body images (versus the control images) compared to the ED group across each of the types of EDs.

The lack of a significant difference between groups in the processing of the healthy/average-weight images may indicate that healthy body images are not associated with a unique pattern of attention among those with an ED, regardless of the presence of ON symptoms. Alternatively, such processing biases may exist but were not detected due to the nature of these images. While these images were piloted to ensure they aligned with general perceptions of healthy bodies, it is possible that, due to the subjective nature of health and healthiness defined by those with ON, the 'healthy' body images did not align with their perceptions of health. If this were the case, however, it suggests that the definitions of health among those with ON in the context of an ED may be questionable, and may align more with an ED focus on thinness. In addition, these images depicted average-weight women, whereas several studies have found attentional biases towards stimuli depicting higher weights in people with EDs. For example, in the first use of the VPDT task in EDs, Rieger et al. (1998) found some evidence for an attentional bias towards words that reflected a large physique in those with AN and BN, whereas this pattern was not evident in those with high dietary restraint and HCs. Thus, it may only be higher weight stimuli that are associated with possible attentional biases in people with EDs, including those with ON symptomatology.

While contrary to the hypotheses, the ED/ON group was found to be distinctive from both the ED and HC groups in selectively attending to thin/unhealthy images, while the ED and HC groups were again comparable in this regard. As was highlighted in the previous section on the food stimuli, the attentional bias literature in EDs entails diverse findings

along with diverse interpretations of these findings (Ralph-Nearman et al., 2019; Stott et al., 2021). Thus, possible interpretations of the current results are that the attentional bias found towards the thin/unhealthy images reflected vigilance to threatening unhealthy stimuli and/or a preferential bias indicative of a drive for thinness. While it is beyond the scope of this study to determine why exactly these images held more salience for the ED/ON group, the results suggest that the presence of ON symptoms in people with an ED could be uniquely associated with non-normative levels of attentional bias towards both thin/unhealthy bodies, as well as low-calorie/unhealthy and healthy/high-calorie foods.

Limitations of the Present Study and Directions for Future Research

The results from this study must be considered in light of several methodological limitations. As was the case for Study 1 and Study 2 (contained in Chapters 3 and 4, respectively), the most notable limitation of this study is the absence of a sufficient ON-only group. The current research aimed to determine whether attentional biases for food and body stimuli could be used to distinguish those with ON from those without. Having an ON-only group would have allowed for a clearer comparison between those with ON and those with an ED, yielding more solid conclusions about the nature of ON and how it differs from currently recognised EDs. As it stands, the current findings can only be interpreted in terms of ON symptoms existing in the context of a currently recognised ED. As this is one of the first and only studies to check for the presence of *DSM-5-TR* EDs in an ON study sample, the lack of a sufficient ON-only group does raise some notable questions, namely, whether ON-only samples represent the majority of cases and what this says about the condition. While Levin et al. (2023) did find an ON-only group of participants in their sample, they found more participants who had ON in addition to elevated ED symptoms. Despite the presence of ED symptomatology among the ON sample complicating the interpretation of the results, this

study does add to the ON literature in a meaningful way in helping to characterise the cognitive processes associated with the additional presence of ON in those with an ED. Further research in this area would benefit from investigating whether ON-only samples are consistently identifiable as this has significant implications for determining whether ON represents a distinctly different ED.

Secondly, as previously mentioned, due to the length of the study and to reduce participant cognitive load, this study was not able to conduct a VPDT that directly compared four food stimulus sets, with two independent variables (health and caloric status) each with two levels (healthy vs. unhealthy; high vs low). This would have allowed us to clearly determine whether any differential attentional bias patterns were due to the healthy versus unhealthy nature of the food stimuli and/or to their high versus low caloric content. The study was similarly limited to two body stimulus sets. Not conflating healthy and low-calorie foods (and healthy and thin bodies) was a key strength of the present study compared to previous research in allowing us to ensure that any attentional bias for healthy foods and body types did not reflect an ED characteristic drive for thinness. Yet it was also a limitation of the study in that it was unclear whether the differences in attentional bias that emerged for the ED/ON group reflected the health or caloric status of these foods and body images. Hence future research that clearly distinguishes these dimensions is needed to build on the findings from the current study.

Thirdly, the current study was not designed to investigate similarities and differences between those with and without ON by the separate ED diagnostic groups. As such, investigating whether there are meaningful differences between specific ED diagnoses, both with and without accompanying ON features, is warranted.

Finally, while an *a priori* power analysis indicated that this study was sufficiently powered to detect main effects of a medium effect sizes. Given this, it is possible that this study was not sufficiently powered to detect small but true effects or interaction effects. The study being sufficiently powered to detect main effects was deemed justified as the research questions were focused on main effects, with interactions being included in an exploratory capacity. This highlights the need for future research in attentional bias among those with ON to give special consideration to ensuring study power is sufficient to detect small effect sizes.

Conclusions

Overall, attentional bias is a complex cognitive process to investigate and the results of this study further confirm this in that various interpretations are feasible in terms of understanding the distinctive pattern of attentional biases that emerged among those with an ED and concurrent ON symptomatology. Nevertheless, the results suggest that those with an ED and ON experience a dysfunctional pattern of attentional bias not shared by those with an ED only or healthy individuals for healthy/high-calorie foods, low-calorie/unhealthy foods, and thin/unhealthy bodies. Given the preliminary nature of the research on information processing among people with ON, further research is clearly warranted.

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Chapter 6: General Discussion

Chapter Overview

This chapter will begin by restating the most prominent debates regarding ON, which guided this research project, followed by the research program aims. It will then provide an overview of the main outcomes of the three studies before addressing the clinical implications of the current research program. Specifically, contrary to previously held views, ON may be associated with a greater severity of ED symptomatology and distress and may not represent a subtype of a specific ED. This chapter will conclude by addressing the strengths and limitations of the current research and will propose some important areas of future research.

Rationale and Aims of the Current Program of Research

Eating disorder (ED) prevalence continues to rise, affecting an estimated 9% of the global population, with the possibility of further increases given the proposal of several new EDs (Forgacs et al., 2018; Galmiche et al., 2019). Unfortunately, most of these newly proposed EDs remain under-researched and thus poorly understood. This is the case for orthorexia nervosa (ON) which, despite first being conceptualised in the late 1990s (Dunn & Bratman, 2016) and properly entering the scientific field in 2004, is still the focus of fundamental questions regarding its conceptualisation. Given the severity of psychological and physical impairment associated with EDs and disordered eating behaviours, an increased understanding of the nature of these conditions, including ON, is imperative.

To date, research on ON has primarily been descriptive in nature, focusing on investigating its prevalence among a variety of populations and its relationship with various demographic and psychosocial factors (Atchison & Zickgraf, 2022; Costa et al., 2017; McComb & Mills, 2019; Varga et al., 2013). This research has clearly advanced

understandings of the condition. Nevertheless, there are still fundamental gaps and controversies regarding the nature of ON (McComb & Mills, 2019; Varga et al., 2013).

Arguably the most foundational of these relate to ON's status as a discrete disorder, or indeed whether it is a disorder at all, and its place on the disordered eating spectrum. While the majority of those in the field believe ON fits best within the ED spectrum of conditions, its status as a distinct disorder versus a subtype, precursor or recovery-oriented condition of a currently recognised ED remains unclear (Parra Carriedo et al., 2020; Reynolds & McMahon, 2019; Ryman et al., 2019; Vandereycken, 2011).

It is well understood that one of the defining features of a mental disorder is that it causes significant levels of distress and impairment (American Psychiatric Association, 2022). Additionally, for a condition such as ON to be deemed a distinctly separate disorder it needs to have meaningful differences from other like disorders (in this case, EDs) and for there to be clinical utility (in terms of understanding and treating the condition) in having a separate diagnostic category. Current research has not been able to demonstrate whether these requirements can be met for ON, leaving its status within the ED spectrum unknown (Atchison & Zickgraf, 2022).

Accordingly, the current research program sought to expand our knowledge of ON via the following aims:

1. To investigate the presence of distress/impairment in those with ON compared to those without, including those with an ED and those without shape/weight concerns.
2. To investigate the cognitive content among those with ON compared to those without, including those with an ED and those without shape/weight concerns, in relation to health and appearance using both explicit (self-report) and implicit (implicit associations) methodologies.

3. To investigate cognitive processing among those with ON compared to those without, including those with an ED and those without shape/weight concerns, in relation to attentional biases regarding health- and appearance-based stimuli.

Main Findings of the Current Research Program

Study 1

The first study aimed to investigate areas of similarity and divergence in ED symptomatology and distress and impairment in those with ON compared to those without by assessing self-reported ED symptoms, appearance orientation and evaluation, ED-specific and general impairment, and psychological distress. It has been proposed that ON can be distinguished from EDs in terms of the absence of shape/weight-based appearance concerns (Dunn & Bratman, 2016). Yet the present findings indicated a higher degree of standard ED symptoms, including appearance focus, in those with ON accompanied by an ED when compared to those with an ED-only and healthy comparisons (HCs). In terms of its adverse consequences, the current study extended previous research on the physical and psychological impacts of ON, which has largely been anecdotal, based on single-participant case studies, and/or relied on psychometrically unsound measures (Koven & Senbonmatsu, 2013; Mitrofanova et al., 2020; Moroze et al., 2015; Rania et al., 2021). Consistent with studies suggesting that ON symptoms are associated with substantial impairment (Zickgraf et al., 2019; Zickgraf et al., 2022), the current research found that those with ON in addition to an ED exhibited higher levels of impairment (both ED-specific and general mental health) compared to those with an ED only and HCs. Those with ON symptoms and an ED were found to have comparable levels of general psychological distress, and physical impairment as those with an ED-only, with both clinical groups significantly higher than HCs. Overall, the findings demonstrated that the additional presence of ON was associated with higher

overall ED symptoms and appearance focus, as well as equal or worse distress and impairment compared to those with a currently recognised ED.

Study 2

The second study aimed to determine whether the underlying mechanisms of ON differ meaningfully from currently recognised EDs by investigating whether the cognitive content of those with ON differed from those without in relation to health- and appearance-focused food and body images and statements. More specifically, Implicit Association Tests (IAT) were utilised to assess implicit attitudes to overcome the limitations of self-report measures. To date, only a very limited number of studies have utilised this paradigm for investigating EDs and, to our knowledge, this is the first time IATs have been utilised to investigate ON. Three IATs were used - two picture-based and one questionnaire-based - to assess participants' attitudes towards health-focused stimuli (comprising healthy/high-calorie food images, healthy/average weight body images, and health-focused statements), compared to appearance-based stimuli (comprising low-calorie/unhealthy food images, thin/unhealthy body images, and appearance-focused statements). Results indicated that the implicit associations of those with ON in the context of an ED were significantly different from those without ON symptoms (the ED-only and HC groups) in regards to the strength of the associations, but not the associations themselves (in that all groups had more favourable views of health rather than appearance stimuli). Across all IATs, the presence of ON was associated with a significantly *less* favourable view of the health-based stimuli compared to those with an ED-only and the HCs, with the ED-only and HCs exhibiting comparable associations. This result was contrary to the hypothesised *greater* positive value that those with both an ED and ON would, due to the presence of ON, have for healthy food- and body-related stimuli relative to those with an ED only.

Study 3

The third and final study aimed to further investigate whether the cognitive aspects of ON differed meaningfully from currently recognised EDs in terms of attentional biases indexed using Visual Probe Detection Tasks (VPDTs). At the time of writing only a limited number of studies had investigated attentional bias in those with ON (Albery et al., 2020) or utilising this paradigm (Albery et al., 2022). Results revealed that all three groups (ED/ON, ED, and HC) overall exhibited a greater attentional bias towards the food and body images compared to the control (animal) images. For the food stimuli, those with ON exhibited a significantly greater attentional bias to the healthy/high-calorie food stimuli compared to those with an ED-only (when controlling for ED type) and marginally greater compared to the HCs. Participants with ON also exhibited greater attentional bias towards the low-calorie/unhealthy food stimuli than those with an ED-only, but only for those with AN and BED symptoms. These results could be taken to suggest that the addition of ON symptoms may result in more selective attention for food-based stimuli in general, although it remains unclear as to whether foods of different health quality and caloric content were selectively attended to as a result of fear-based vigilance and/or appetitive processes. For the body stimuli, those with ON exhibited greater attentional bias for the thin/unhealthy body images (but not the healthy/average-weight body images) compared to those with an ED-only and HCs, which again could reflect the operation of threat-based or vigilance motivational systems. While the mechanisms underpinning the results are unclear, the findings suggest that those with an ED with the additional presence of ON symptoms experience a unique pattern of attentional biases for certain food and body stimuli not shared by those with an ED only or HCs .

Clinical Implications of the Current Research Program

The findings from the current research project raise some important clinical considerations regarding our understanding of ON. Given the absence of an ON-only sample of participants, the following discussion relates specifically to the presence of ON symptoms in addition to standard ED symptoms.

The Presence of Orthorexia Nervosa Symptoms is Associated with Greater Dysfunction

The first notable implication is that the results of this research program seem to challenge some of the currently held views about the nature of ON, specifically, the proposal that it represents a subthreshold, recovery-oriented or less severe form of an ED (Brytek-Matera et al., 2015; Gramaglia et al., 2022; Segura-Garcia et al, 2015). The results from the current research support an opposing view, specifically, that the presence of ON symptoms is instead associated with a more severe ED variant.

Results from the three studies converge in suggesting that the presence of ON symptoms is associated with additional and more severe levels of ED-relevant dysfunction compared to when only ED symptoms are present. Greater maladaptive responses were evident in terms of higher ED symptoms, appearance focus, mental and physical impairment, distress, implicit attitudes that indicate a lesser positive valuing of healthy foods and body types, and attentional biases for food and body stimuli. The diverse methodologies employed indicated that not only were those with ON symptoms found to exhibit higher levels of explicitly measured dysfunction, but they were also found to experience more dysfunction in implicit measures indicating more ED-typical evaluations for food and body stimuli, and attentional biases towards such stimuli, than those with an ED-only. Given that the presence of ON symptoms was the only differing factor between the

two ED groups (with ED type controlled for in the analyses), this research demonstrates that the additional dysfunction present can be uniquely attributed to ON symptoms.

While this may have been the first study to investigate whether the presence of ON symptoms in those with an ED is associated with greater dysfunction, the greater pathology conferred through the presence of additional ED symptoms has been found in previous research focused on different ED symptoms. For example, across several studies, Harrison and colleagues found that those with BED presenting with the additional ED symptom of shape/weight overconcern exhibited higher ED symptomatology and had worse outcomes than those with BED in which overconcern was absent (Harrison et al., 2014; Harrison, Mond, Rieger, Hay, et al., 2015; Harrison, Mond, Rieger et al., 2015). Thus, the presence of shape/weight overconcern was indicative of a more severe disorder. Similarly, Serra et al. (2022) found that those individuals with AN who transitioned to engaging in binge eating and purging behaviours experienced worse long-term outcomes. As such, the results found across the current program of research regarding the additional presence of ON features are consistent with research indicating that the presence of additional ED symptoms is generally associated with worse outcomes.

One factor that could result in the increased dysfunction found among those with ON symptoms in the context of an ED is the conflation of a drive for thinness with (distorted) beliefs regarding health, which could intensify the egosyntonic nature of the condition. An egosyntonic condition is one where the behaviours and goals of the disorder are congruent with the desires of the individual and/or where there is perceived value in the disorder (Donini et al., 2022; Koven & Abry, 2015). For individuals with both ON and ED symptoms, the pursuit of thinness might be particularly egosyntonic since it is consistent with both appearance and health goals. Research into EDs has suggested that whether a

condition is egosyntonic plays a significant role in illness acknowledgement, motivation to engage in treatment, and the severity of the illness. For instance, Serpell et al. (1999; 2004) found among their AN sample that endorsement of the 'positive' aspects of the disorder was associated with greater illness severity. Griffiths et al. (2015) found a similar relationship between positive beliefs about the disorder and more elevated symptoms for both those with AN and muscle dysmorphia. ON is also considered to be an egosyntonic condition, with a positive view of one's ON eating behaviours, and a sense of superiority over others in this regard, flagged as a feature of the condition (Donini et al., 2022; Koven and Abry, 2015). Given this, it is reasonable to assume that the egosyntonic nature of the condition plays a role in the more severe ED presentation found among those with ON symptoms in the present research program. This greater egosyntonicity would in turn have treatment implications in suggesting a more treatment-resistant form of an ED, given that low motivation to change at the commencement of treatment predicts worse treatment engagement and outcomes (Rieger, 2015).

Another factor worth noting that is speculated to play a role in the higher levels of dysfunction in those with ON is that, unlike other EDs, the type of eating behaviour typically advocated in this condition (i.e., healthy eating or eating to promote health) is also promoted by the wider society. It is reasonable to assume that this would impact not just an individual's acknowledgement of illness and desire to seek treatment, but also the identification of the illness by significant others and health professionals. Since research suggests that a longer duration of an untreated ED is associated with worse outcomes (Austin et al., 2021), it could be the case that those with additional ON symptoms may be more likely to delay help-seeking, or to not seek help at all, thus resulting in more severe impairment as found in the present research program. Further research is needed to

understand the potential mechanisms accounting for the greater pathology conferred by the presence of ON features in those with an ED.

Orthorexia Nervosa Vis-à-vis Currently Recognised Eating Disorders

The current research findings also have implications for the status of ON as an ED. One such implication stems from the absence of a viable ON-only group alongside the heterogeneous nature of the ED symptoms found among those with ON (i.e., AN, BN, BED, and OSFED/UFED), which calls into question the arguments made by several researchers that ON represents a subtype of AN specifically (Barthels et al., 2015; Parra Carriedo, et al., 2020; Segura-Garcia et al., 2015). Instead, ON was present across each of the ED diagnostic categories assessed. Further, not only did those with ON exhibit ED symptoms consistent with various EDs, but those that had symptoms consistent with AN made up one of the smallest groups of the ED/ON group (i.e., 14%).

Based on the results of this research, two alternative ways of understanding ON's status as a diagnostic category are proposed. First, if it is the case that ON can be part of each of the currently recognised EDs, ON might be plausibly considered to be a specifier applicable to all EDs. The concurrent presence of ON could specify a variant that is associated with more severe pathology as demonstrated by the higher levels of dysfunction found among those with ON symptoms (in addition to an ED) in the current research program.

Alternatively, as has been the case for some EDs when first being introduced as a disorder, it could be that ON does represent a new and distinct ED, but that research is still not at a point where it can be clearly disentangled from other *DSM-5-TR* EDs. Several currently recognised EDs were originally perceived to be phases or variants of other

disorders, with the process of moving from a proposed new condition to a recognised disorder typically entailing a lengthy process of cumulative research.

An example of a current ED originally being believed to be a variant of another ED can be found in the history of BN. This ED was first referred to in 1979 as a ‘chronic phase of anorexia nervosa’ rather than a distinct disorder by the British psychiatrist Gerald Russell (Castillo & Weiselberg, 2017; Russell, 1979). Indeed, this seminal article was entitled, ‘Bulimia nervosa: an ominous variant of anorexia nervosa’ (Russell, 1979). Despite bulimia first appearing in the 1980 *DSM-III* (describing the symptoms, not the condition) and then revised to bulimia nervosa in the 1987 *DSM-III-R* (describing the condition), there were still questions around its status as a separate disorder close to 10 years later as evidenced by Beumont’s (1988) article entitled ‘Bulimia: is it an illness entity’ in which he concluded that it was not a syndrome/disorder, but rather just a configuration of symptoms.

Another example of the lengthy process from identification to recognition of a disorder can be found in the diagnostic category of BED (Giel et al., 2022). The forerunner of BED – ‘night-eating syndrome’ - was first identified in 1955 by the American psychiatrist Albert J Stunkard (Stunkard et al., 1955). However, it was not until 1994 that it was included in the fourth edition of the *DSM* under the Eating Disorder Not Otherwise Specified diagnostic category, before receiving its own diagnostic category in the fifth edition of the *DSM* in 2013 (APA, 1994; APA, 2013). This meant that it took over 60 years from when it was first identified to when it was officially recognised as a distinct disorder.

In summary, while the current findings of ON’s occurrence across various ED diagnoses are consistent with its role as a specifier within these EDs, the examples of the extended process entailed in the emergence of BN and BED as distinct conditions offer a cautionary note against any such premature conclusions. Also speaking to the complexity of

ON's diagnostic status are ongoing general debates in the ED field regarding distinct diagnoses versus a transdiagnostic approach (Fairburn, 2008), or a combined categorical and dimensional approach (Wade et al., 2006). However, the current research program's results demonstrating additional pathology associated with ON symptoms underscore the importance of considering ON symptoms in these wider discussions regarding how to best conceptualise EDs overall.

On a broader note, the current research also highlights the benefit of assessing the presence ON symptoms in ED samples and ED symptoms in ON samples. As one of the first studies to do this, the situation encountered in this research is unique, wherein the ON sample also met criteria for a range of EDs. It is unclear whether this is the standard for those with elevated ON symptoms, as only one study to date has explicitly noted the ED status of their ON participants (Levin et al., 2023). Further research needs to more explicitly investigate the presence of currently recognised EDs in their samples to determine if ON can be disentangled from current EDs.

Implicit versus Explicit Measures of Cognition in Orthorexia Nervosa

Additional implications of the current research for our understanding of ON and future research stem from the partial disconnect found between the explicit and implicit responses among those with ON in the context of an ED. For participants to have been categorised as having ON (with or without an ED) they needed to exhibit an elevated level of ON symptoms as detected by the self-report ON measure (i.e., the Eating Habits Questionnaire-Revised). Despite this, across some of the implicit measures (i.e., the IATs), those with ON symptoms exhibited responses that were inconsistent with what would have been expected of those with an obsession with healthy eating. Specifically, the implicit associations for those in the ED/ON group entailed the *least* favourable view of the health-

based stimuli across all of the IATs, even compared to the ED-only group (who, by definition, had not explicitly endorsed a preoccupation with healthy eating). While it was hypothesised that the presence of ED symptoms would most likely impact the responses of the ED/ON group and could result in a health focus being less pronounced, this group (due to the concurrent presence of ON) was almost certainly expected to exhibit a *more* desirable view towards the health-focused stimuli than those with an ED-only. The attentional bias results could also be interpreted to indicate preferential processing of appearance (rather than health) based stimuli in the ED/ON group, although the interpretation of these results remains ambiguous.

Several reasons could explain the mismatch between an explicit avowal of health-focused eating and the implicit diminished importance of healthy eating and body types, all of which could have implications for how further research into this topic should be done. First, socially desirable responding (in the form of self-deception and/or impression management) are known challenges with self-report measures among those with EDs (Borgers et al., 2021; Howard et al., 2022). This is especially likely to pose a challenge when conducting research with those experiencing an ED that is less favourably viewed by society or more stigmatised, such as those with AN, BN, and BED (Brelet et al., 2021; Vandereycken, 2006; Vandereycken & Van Humbeek, 2008). That there can often be a negative perception of these EDs was evidenced by the results of Brelet et al.'s (2021) scoping review, which found that those with EDs can be described negatively and have less desirable traits attributed to them. For example, they reported that those with BED have been described as weak and lazy, while those with AN have been described as dangerous, incompetent, and attention-seeking. A systematic review demonstrated that this stigma was actively felt by those with EDs (O'Connor et al., 2021). This systematic review also revealed that common

responses to stigma were the concealment of their illness or other forms of identity management (O'Connor et al., 2021). Given this, it is reasonable to assume that those with an ED associated with considerable stigma may inaccurately report their symptoms (in this instance, as a focus on healthy eating) in an attempt to present themselves in more socially desirable ways or to protect their vulnerabilities, whether intentionally or unintentionally. Indeed, there is research indicating that ON may be used by those with less socially desirable EDs to mask their conditions (Parra Carriedo et al., 2020). This is on the basis that a focus on health and subsequent health-oriented eating practices are more socially accepted than an overfocus on thinness, binge eating or purging behaviours. Given that ON symptoms are considered more socially desirable, those with a *DSM-5-TR* ED may be more inclined to respond in ways that intentionally or unintentionally present themselves more favourably. If this were the case, it is possible that some participants were incorrectly categorised into the ED/ON group rather than the ED group due to inaccurate self-reporting, which could have impacted the incongruent results found between the explicit and implicit measures. If valid, this interpretation highlights the crucial need to conduct research into those with ON without clinical levels of another ED, which would mitigate against any tendency towards socially desirable responding on the ON measure due to the presence of an ED and would allow for a more accurate picture of the implicit cognitive processes characteristic of ON only.

A second factor that could have impacted the disconnect between the explicit and implicit results relates to the varied nature of the dietary beliefs and theories found among those with ON. The literature indicates that the dietary beliefs and theories of those with ON can vary significantly based on the 'health' information they adopt/internalise (Barthels et al., 2024; Donini et al., 2022; Mitrofanova et al., 2020; Moroze et al., 2015; Rania et al.,

2021). As a result, it is entirely possible that what is considered healthy by medical and nutritional professionals, and piloted in a general community sample (from which the stimuli utilised across this research program were developed), is not consistent with the dietary theories or definitions of those with ON. Therefore, it is proposed that the disconnect found between the self-reported ON symptoms and the results from some of the cognitive tasks could have been due in part to a misalignment in the definition of what constitutes healthy foods and body types. It should be noted, however, that any such misalignment would suggest that those with ON in the context of an ED define 'healthy' in eating disordered terms (i.e., low-calorie foods of poor nutritional quality and emaciated bodies). Nevertheless, there is a need for further work to be done in developing more ON-specific stimuli. As the present research was the first to investigate ON in this manner, no previous ON-relevant stimulus sets existed and these needed to be created. A notable omission from this development process was the inclusion of those self-identified as having ON. Thus, future research would benefit from a co-creation process to include those with ON lived experience in developing the stimuli to more closely align the stimuli to the perceptions of those with ON.

Strengths and Limitations of the Current Program of Research and Directions for Future Research

Several strengths, limitations, and future directions are worth noting in addition to those already addressed.

Strengths

The current research had several noteworthy strengths. Firstly, diverse methodologies were utilised that featured both explicit and implicit measures. The latter paradigms have only been used to a limited degree in ED research, despite having shown

promise in reducing limitations that arise from self-report measures (i.e., the aforementioned socially desirable responding). At the time of the development of the studies of this research program, IATs and VPDTs had not been used at all in the investigation of ON. As such, the use of more novel approaches to the investigation of ON provides a valuable avenue that complements explicit approaches to allow for a more comprehensive understanding of the condition.

Another notable strength was the inclusion of comparison groups, namely those exhibiting symptoms in accordance with a *DSM-5-TR* ED (without ON) and those without any shape/weight concerns or heightened ON symptoms (HCs). This had the advantage of allowing for the comparison of the three groups of interest on the same measures and tasks, thereby providing a way to investigate the differences between those with and without ON. The inclusion of a comparison group with ED symptomatology without ON is especially noteworthy. The ON literature is made up mostly of prevalence studies (which have generally not assessed whether participants also meet the criteria for an ED) and studies that have assessed the level of ON symptoms among a single population to investigate the relationship between certain risk factors and levels of ON symptoms. As previously stated, few investigate the presence of ED symptoms, and even fewer the ED status of their participants. Those that have done do so to determine whether ED symptoms are correlated with ON symptoms. Given the limitations associated with not including a comparison group when investigating ON (e.g., the difficulty in determining whether ON differs from currently recognised EDs in meaningful ways, or identifying what are ON specific symptoms), there is a need for more research with comparison groups in this area.

A third strength relates to the stimuli utilised across the IAT and VPDT studies. Food and body stimuli were both utilised to investigate the implicit associations and attentional

biases of the research groups. Comparative research has often combined the two stimuli to form one stimulus set or has only utilised one type (e.g., Rieger et al., 1998; Shafran et al., 2007). The separation of these two types of stimuli allowed for the investigation of implicit associations and attentional biases for each stimulus type, which subsequently allows for information to be gained about how cognitive content and processing across these stimulus types might differ between groups. For example, this allowed for the discovery that attentional bias between those with ON and those without differs across various food stimuli (i.e., healthy/high-calorie and low calorie/unhealthy), but only for specific body stimuli (i.e., thin/unhealthy body images but not healthy/average-weight body images). The current research also utilised real pictorial stimuli, which allowed for greater ecological validity (Jiang & Vartanian, 2018). Further, extensive piloting of the stimuli before their use in the study was conducted to ensure, to the best of our ability, that the stimuli were representative of the intended stimulus categories. It also allowed for the matching of target and control images on valence and arousal, which ultimately ensured that the effects found were not due to differences between the target and control images on these dimensions.

Limitations

In addition to the aforementioned strengths, there were some noteworthy limitations of the current research that must be considered when interpreting the findings and informing future research. This section will only discuss the limitations that relate to the research program as a whole, as the limitations related to each study have been addressed in their respective chapters.

The first and most notable limitation relates to the research groups. As noted previously throughout this thesis, the major aim of this research was to compare those with

ON (with and without an ED) to those with a *DSM-5-TR* ED and HCs (those without any shape/weight concerns or elevated ON symptoms). Unfortunately, this was not possible as an adequate group of participants with elevated ON symptoms, without elevated symptoms of a *DSM-5-TR* ED, was not identified. Two reasons are proposed to explain why a viable ON-only group of participants was not found. First, it could be the case that it is not possible to entirely exclude ED symptoms from those with ON. Given the transdiagnostic model of EDs highlighting the high level of symptom crossover among the various EDs (Fairburn, 2008) as well as the view that ON is an ED, it is not surprising that those with ON would also experience elevated ED symptoms. While participants in the current research were in part classified on the basis of their endorsement of shape/weight overconcern, and this is arguably a symptom that distinguishes EDs from ON, it is possible that individuals with ON experience shape/weight overconcern for health rather than appearance reasons. A second explanation for not identifying a pure ON group is simply that ON as a separate disorder does not exist (or is relatively rare) and cannot typically be separated from other EDs. While none of these explanations can be confirmed based on the current research program, the lack of a viable ON-only group does highlight the need for more research in this area to assess the presence of *DSM-5-TR* EDs among ON participants. Additionally, it is worth noting that the sample utilised in Studies 2 and 3 comprised a portion of the sample of Study 1 (38%). The overlap in participants across studies was due to challenges in the recruitment of participants with elevated ON symptoms and as such was done to ensure adequate samples were collected for analysis. This further highlights the need for more research in this area and the replication of the studies in this thesis.

Another relevant limitation that future research should aim to address relates to the nature of the ED samples used across the three studies. These samples, including ED and

ED/ON groups, comprised more than one ED diagnostic group. Analysis of the ED samples revealed that they comprised those experiencing symptoms aligning to an AN, BN or BED diagnosis and those aligning to atypical expressions of these conditions (UFED/OSFED). While the transdiagnostic model suggests that the maintaining processes are similar across EDs, research has demonstrated that distress/impairment, implicit associations, and attentional processing may differ across different ED diagnoses (Blechert et al., 2010; Cooper & Todd, 1997; Faunce, 2002; Izquierdo et al., 2018; Perpina et al., 1993; Ralph-Nearman et al., 2019; Smith et al., 2018). Even though analyses were done to account for the impact of the mixed ED sample across all studies, it is still possible that the significance of some results could have been impacted as a result of the mixed symptomatology and cognitive dysfunction associated with the different ED diagnostic categories. As an investigation by ED diagnosis was not the focus of this study and the diagnostic configuration of the ED groups did not yield viable sample sizes for such comparisons, this could not be unpacked. Future research would benefit from looking at ON compared to each ED diagnostic category to provide information about the relationship between ON and each of the other EDs.

Another limitation related to ED diagnostic groups is the absence of a defined avoidant/restrictive food intake disorder (ARFID) group. ARFID is another ED that some researchers have suggested is a better diagnostic category to fit ON within, given the shared restrictive and rigid eating patterns and proposed absence of body shape/weight concerns (Bhattacharya et al., 2022; Dunn & Bratman, 2016). However, this is still being debated, with several researchers highlighting key differences between ON and ARFID (i.e., food avoidance in ARFID is not specifically linked to concerns about health) (Donini et al., 2022; Dunn & Bratman, 2016). Unfortunately, by not including an ARFID group, this study could not determine how ON may be related to this condition. The omission of an ARFID group

occurred as a result of our attempt to reduce the cognitive load of the research studies for participants. Currently, the assessment of ARFID is not included in the EDE-Q and, as such, requires the use of a separate measurement tool. As it was not the primary focus of this research program to investigate ON compared to the other EDs separately, the inclusion of a separate ARFID measure and subsequent group was not prioritised. Future research should more comprehensively investigate the relationship between ARFID and ON, with the current program of research suggesting some methodologies that could be utilised in this regard.

A final limitation arose as a by-product of the novelty of the research and hence the limited amount of relevant studies available upon which to derive the hypotheses and interpret the findings. This was particularly the case for Study 3 in which the observed attentional biases could be interpreted in various ways, which await clarification in future research.

Future Directions

In addition to the future directions already noted throughout this thesis, there is a critical need for longitudinal research in ON. The developmental trajectory of ON is relevant to debates regarding its status as a disorder, as it has been argued to represent a condition associated with a precursor or recovery phase of an ED. Researchers have highlighted the benefits of longitudinal research in the area of mental disorders, including the ability to assist with identifying risk factors, developmental concomitants, developmental trajectories, and incidence (Anstey et al., 2004). Despite these benefits, to date, no suitable longitudinal research has been conducted on ON in this manner. Such research would allow for the identification of developmental sequences (e.g., whether this condition functions as a less severe phase of an ED, a more severe form emerging out of another ED, and/or is present in isolation) and would help to determine factors contributing to the condition's aetiology.

Conclusion

The current research program aimed to further investigate the nature of ON, a proposed new ED, particularly in terms of its similarities and differences relative to currently recognised EDs. By investigating novel aspects of the condition and using under-utilised research paradigms, the current research has added to our understanding of ON in meaningful ways. Notably, the key findings of this research highlight the potential for ON to represent a more severe ED variant, that it might be associated with a unique level of cognitive dysfunction (in terms of both cognitive content and processing), and that ON symptoms do not appear to be associated with a specific ED but can co-occur across ED types. These novel lines of research provide a foundation for further work in understanding this complex condition.

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Appendix A

Ethics Documentation and Materials for Study 1, 2 and 3

Ethical Approval Email Ethics Protocol 2020/323



Human Ethics Protocol 2020/323 - Approval

From aries@anu.edu.au <aries@anu.edu.au>
Date Fri 17/07/2020 12:17 PM
To Rosemary Clifford <Rosemary.Clifford@anu.edu.au>
Cc Human.Ethics.Officer@anu.edu.au <human.ethics.officer@anu.edu.au>; Elizabeth Rieger <elizabeth.rieger@anu.edu.au>

THIS IS A SYSTEM-GENERATED E-MAIL. PLEASE DO NOT REPLY. PLEASE REPLY TO human.ethics.officer@anu.edu.au.

Dear Ms Rosemary Clifford,

Protocol: 2020/323
 A New Eating Disorder? Understanding Orthorexia Nervosa

I am pleased to advise you that your Human Ethics application received approval by the Chair of the Science and Medical DERC on 17/07/2020.

For your information:

1. Under the NHMRC/AVCC National Statement on Ethical Conduct in Human Research we are required to follow up research that we have approved. Once a year (or sooner for short projects) we shall request a brief report on any ethical issues which may have arisen during your research or whether it proceeded according to the plan outlined in the above protocol.
2. Please notify the committee of any changes to your protocol in the course of your research, and when you complete or cease working on the project.
3. Please notify the Committee immediately if any unforeseen events occur that might affect continued ethical acceptability of the research work.
4. Please advise the HREC if you receive any complaints about the research work.
5. The validity of the current approval is five years' maximum from the date shown approved. For longer projects you are required to seek renewed approval from the Committee.

All the best with your research,

Human Ethics Officer
 Research Services Division
 Level 1, Geography Building 48A
 Linnaeus Way, The Australian National University

Participant Information Sheet Protocol 2020/323



Participant Information Sheet

Thank you for your expression of interest in participating in this study. Before you decide whether to participate in this study, it is important for you to understand why this research is being done and what your participation will entail. Please take your time to read the following information carefully and should you require or desire more information, please let us know.

Researchers:

Rosemary Clifford (PhD candidate, Research School of Psychology, ANU) and Dr Elizabeth Rieger (Associate Professor, Research School of Psychology, ANU).

Project Title: Understanding Orthorexia Nervosa.

General Outline of the Project:

- **Description and Methodology:**

Research suggests that some people may experience an obsession with healthy eating, which has been referred to as Orthorexia Nervosa (ON). However, it is not clear whether such a condition exists and, if so, whether it is different from other conditions such as one of the recognised eating disorders (EDs). In order to determine whether this is the case, more research needs to be conducted to investigate whether ON differs from other eating disorders in a meaningful way. This study, by collecting self-report questionnaire data and administering two Choice Based Conjoint analysis tasks, will allow for comparisons to be made between ON and EDs. The study will also allow for comparisons to be made between ON and other forms of normative healthy eating to determine whether ON represents a pathological variant of healthy eating.

If you decide you want to participate in this research after reading this Participant Information Sheet, you will first be asked to provide your informed consent and create a unique anonymous four-character identification code. This will be recorded with your data. Once you have done this you will be asked to complete a demographics and screening questionnaire to see if you are eligible to take part in the study. If you are eligible to participate based on your responses you will be provided with access to complete the study. If you do not meet eligibility criteria, you will be thanked for your interest and willingness to contribute to this study.

The study will commence with the two Choice Based Conjoint Analysis tasks. In one of these tasks you will be asked to select your preferred foods to eat from the options provided. In the other one of these tasks you will be asked to select the person you would most like to be based on a range of different personal characteristics. Once this has been completed you will be asked to reconfirm your consent before proceeding to the questionnaires. There will be seven questionnaires that will include items assessing eating, shape and weight concerns, your mood, and any difficulties you may be experiencing in functioning in your everyday life.

It is anticipated that this study will take no more than 60 minutes to complete.



Once the study have finished you will be asked to nominate your chosen remuneration, whether this is course credit or the chance to win one of four \$50 Westfield vouchers. If you select the voucher option you will be asked to provide your email address to be put into the draw for one of the \$50 vouchers.

It should be made clear that it is not the purpose of this study to provide a diagnosis of any disorder. As such at no point throughout the entirety of the study will any of the eating disorder measures be used to identify the presence of a condition in our participants. As the identification of the presence of a condition is not the purpose of this research, the primary researcher conducting the study will not be able to give you information regarding this should you be interested.

- **Participants:** Eligible participants will be people aged 18 years old and above who are either (1) individuals who have a strong focus on healthy eating based on the screening measure; (2) individuals who currently have or have had an eating disorder; (3) individuals with no personal experience with eating/shape or weight concerns but who need to exclude certain foods from their diet based on medical, ethical or religious reasons; or (4) individuals who have no personal experience with eating, shape or weight concerns. A total of approximately 400 participants will take part in the study.
- **Use of Data and Feedback:** The data collected in this study will be presented in the PhD thesis of Rosemary Clifford. The results may also be presented in a journal article or at conferences. At the completion of the study, around January 2022, you will be able to obtain a copy of the results from the following Dropbox link:

<https://www.dropbox.com/sh/wxuob3fy4kqvou/AAC7zgKdc6Y8ohOtz3KnTI38a?dl=0>

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in this study is **voluntary** and you may, without negative consequences, decline to take part or withdraw from the study without providing an explanation at any time. If you do decide to withdraw, your data will not be used and destroyed, unless you advise us that you are happy for your data to be retained. Should you desire for your data not to be used, you will need to contact the primary researcher (Rosemary Clifford) within two months of the completion of your participation, provide your unique four-character identification code, and inform the researcher that you wish to have your data withdrawn.
- **What does participation in the research entail?** This study will be conducted entirely online. Interested participants will need to access the study via the link provided to them on the advertisement or by contacting the researcher. During the study you will be asked to complete two cognitive tasks and nine questionnaires. Participation should take no longer than 60 minutes to complete.
- **Location and Duration:** The study will be administered via two online platforms and as such can be completed in your own time in a place where you have privacy and will not be interrupted.
- **Remuneration:** All participants will be offered the opportunity to enter a draw to win one of four \$50 Westfield gift vouchers. Participants recruited through the ANU Research School of Psychology can elect to instead receive a one-hour course credit. For those who choose to enter into the draw, you will need to leave your e-mail address at the end of the survey. Your contact details will not be linked to your responses from the questionnaires. Contact details are pooled separately and stored purely for the



purpose of the draw. This is to ensure that confidentiality is maintained throughout the study. Once the study is completed, the winners will be randomly selected and contacted via e-mail. Subsequently, all contact details will be destroyed. Please note that given the sample will contain 400 participants, if everyone chooses to enter the lottery you will have a 1 in 100 chance of winning one of the four gift vouchers.

- **Risks:** The questionnaires will ask questions about your weight and eating-related thoughts, feelings, and behaviours. As you may be experiencing problems in these areas, answering such questions could cause you some distress or discomfort. If for any reason you experience distress, discomfort or concern about the questions being asked, please take a break from participating or cease participation, whichever option you feel is most suitable for you. Know that you are free to do this without penalty or repercussions. Should you experience concerns or distress, we encourage you to also seek support from relevant health services including your GP and/or the organisations listed below under the 'Contacts if in Distress' section.
- **Benefits:** It is expected that this study will inform future research and clinical practice on Orthorexia Nervosa by providing a clearer understanding of this condition. By participating in this study, you may also benefit from an increased awareness of your own attitudes and behaviours.

Exclusion criteria:

- **Participant Limitation:** People will not be eligible to take part if they are under the age of 18 years.

Confidentiality:

Confidentiality: Your confidentiality will be protected as far as the law allows. Records containing any information, including correspondence, which could identify participants in any way will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. Only the primary investigator and her supervisor will have access to the material provided by participants, and all information provided will only be used for the purposes of this study. The four-character identification code that participants will create prior to study participation will be the only way in which your data can be identified and will be de-identified from any identifiable information collected as to maintain anonymity and confidentiality. A report of this study may be submitted for publication but individual participants will not be identifiable in such a report. Your full name and other identifying information will not appear on any research documentation.

Privacy Notice:

In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppl/document/ANUP_010007 and it contains information about how a person can:

- Access or seek correction to their personal information;
- Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.

Data Storage:

- **Where will the data be stored:** All data will be stored electronically on securely locked university computers and on a personal password protected hard-drive. Only the primary researcher and her supervisor will have access to this data.



- **How long will the data be stored and what will happen to it after this period:** Since the data may be used in future studies, the de-identified electronic data set will be retained for a period of at least 5 years from the date of any publication arising from the data.
- **Handling of Data following the required storage period:** After the required data storage period has expired the data will be destroyed.

Queries and Concerns:

- **Contact Details for More Information:** For further information or any questions regarding this study, please do not hesitate to contact the researchers, whose information is provide below.

Rosemary Clifford on T: 0402779713 or E: Rosemary.Clifford@anu.edu.au
 Dr Elizabeth Rieger on T: 6125 4208 or E: Elizabeth.Rieger@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress as a result of your participation in this study, please contact any of the relevant organisations below:

Your GP

Lifeline

24-hour crisis support and suicide prevention service
 Phone: 13 11 14
 Website: <https://www.lifeline.org.au/>

The Butterfly Foundation

Support for Australians experiencing body image and eating concerns
 Phone: 1800 33 4673
 Email: support@thebutterflyfoundation.org.au
 Website: <http://thebutterflyfoundation.org.au/>

Headspace

Support for young Australians (12-25 years of age) including mental health, physical health, work and study support, and alcohol and drug problems
 Website: <https://headspace.org.au>

Beyondblue

Information and support for mental health problems such as depression, anxiety and suicide
 Website: <https://www.beyondblue.org.au>

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2020/323). If you have any concerns or complains about how this research has been conducted, please contact:

Ethics Manager
 The ANU Human Research Ethics Committee
 The Australian National University
 Telephone: +61 2 6125 3427
 Email: Human.Ethics.Officer@anu.edu.au

What's your healthy?

The Research School of Psychology



Australian
National
University

PARTICIPANTS NEEDED!

Please help us help those who are struggling with their eating and self-esteem. By participating in this research you will provide much-needed information on the various ways that people can experience difficulties with eating and how they can be helped.

It won't take you long but you'll be making a valuable contribution to improving the lives of others.

PARTICIPANT INFORMATION:

What? Participation will involve taking part in an online study. The link to this flyer can be obtained from this flyer or from the primary researcher (Rosemary Clifford). During participation you will be asked about your eating habits and behaviours, your self esteem and your preferences regarding food

Where? ANYWHERE! As participation is online, you can do this study anywhere as long as you have an internet connection, a computer and a quiet place to take the survey. This study cannot be completed on a mobile phone device
Please try and make sure that you are in a place you can concentrate when participating.

Who?

Participants need to be 18 years or older, with normal or corrected vision, who either:

1. have a strong focus on healthy eating based on the screening measure
2. currently have or have had an eating disorder; OR
3. who need to exclude certain foods from their diet based on medical, ethical or religious reasons, (i.e. celiac, gluten free, vegetarian etc.)

If you are eligible to participate based on your responses to the screening measures you will be provided with access to complete the study

How Long? Participation in this study will take at most 1 hour.

To offer some thanks for your time and contribution, you will be offered either a remuneration of a 1 hour course credit or offered the opportunity to enter a draw to win one of four \$50 Westfield gift vouchers.

Interested?

If Interested in participating or for further information, please contact Rose Clifford @ rosemary.clifford@anu.edu.au or head to the link below:
https://anu.au1.qualtrics.com/jfe/form/SV_bjQggOuI5qNA6bP

Ethical Approval Email Ethics Protocol 2019/736



Human Ethics Protocol 2019/736 - Approval

From aries@anu.edu.au <aries@anu.edu.au>
Date Mon 11/11/2019 1:24 PM
To Rosemary Clifford <Rosemary.Clifford@anu.edu.au>
Cc Human.Ethics.Officer@anu.edu.au <human.ethics.officer@anu.edu.au>; Elizabeth Rieger <elizabeth.rieger@anu.edu.au>

THIS IS A SYSTEM-GENERATED E-MAIL. PLEASE DO NOT REPLY. PLEASE REPLY TO human.ethics.officer@anu.edu.au.

Dear Ms Rosemary Clifford,

Protocol: 2019/736
 Understanding Orthorexia Nervosa

I am pleased to advise you that your Human Ethics application received approval by the Chair of the Science & Med DERC on 11/11/2019.

The committee suggests that the additional text on using the data in future studies be repositioned at the end of the relevant section (What participation entails) on the Participant Information Sheet.

For your information:

1. Under the NHMRC/AVCC National Statement on Ethical Conduct in Human Research we are required to follow up research that we have approved. Once a year (or sooner for short projects) we shall request a brief report on any ethical issues which may have arisen during your research or whether it proceeded according to the plan outlined in the above protocol.
2. Please notify the committee of any changes to your protocol in the course of your research, and when you complete or cease working on the project.
3. Please notify the Committee immediately if any unforeseen events occur that might affect continued ethical acceptability of the research work.
4. Please advise the HREC if you receive any complaints about the research work.
5. The validity of the current approval is five years' maximum from the date shown approved. For longer projects you are required to seek renewed approval from the Committee.

All the best with your research,

Participant Information Sheet Ethics Protocol 2019/736



Participant Information Sheet

Thank you for your expression of interest in participating in this study. Before you decide whether to participate in this study, it is important for you to understand why this research is being done and what your participation will entail. Please take your time to read the following information carefully and should you require or desire more information, please let us know.

Researchers:

Rosemary Clifford (PhD candidate, Research School of Psychology, ANU) and Dr Elizabeth Rieger (Associate Professor, Research School of Psychology, ANU).

Project Title: Understanding Orthorexia Nervosa as a Condition.

General Outline of the Project:

- **Description and Methodology:**

Research suggests that some people may experience an obsession with healthy eating, which has been referred to as Orthorexia Nervosa (ON). However, it is not clear whether such a condition exists and, if so, whether it is different from other conditions such as one of the recognised eating disorders (EDs). It is also being debated as to whether this condition demonstrates comparable responses to key ED pathology assessment measures as currently recognised eating disorders. In order to determine whether this is the case, more research needs to be conducted to investigate whether ON differs from other eating disorders in a meaningful way, while still presents comparable responses on measures that are used to indicate ED pathology. This study, by collecting self-report questionnaire data and administering five cognitive tasks, will allow for comparisons to be made between ON and EDs. The study will also allow for comparisons to be made between ON and other forms of normative healthy eating to determine whether ON represents a pathological variant of healthy eating.

If you decide you want to participate in this research after reading this Participant Information Sheet, you will first be asked to provide your informed consent and create a unique anonymous four-character identification code. This will be recorded with your data. Once you have done this you will be asked to complete a demographics and screening questionnaire to see if you are eligible to take part in the study. If you are eligible to participate based on your responses you will be provided with access to complete the study. If you do not meet eligibility criteria, you will be thanked for your interest and willingness to contribute to this study.

Once participants have completed the eligibility screener the study will commence with five cognitive tasks. In these tasks you will be asked to, using your keyboard, select the letter that corresponds to the correct answer to the task explained. It will involve participants being shown images of food and women's body shapes. Once this has been completed you will be asked to reconfirm your consent before proceeding to the questionnaires. There will be seven questionnaires that will include items assessing eating, shape and weight concerns, body image, your mood, and any difficulties you may be experiencing in functioning in your everyday life.



It should be made clear that it is not the purpose of this study to provide a diagnosis of any disorder. As such at no point throughout the entirety of the study will any of the eating disorder measures be used to identify the presence of a condition in our participants. As the identification of the presence of a condition is not the purpose of this research, the primary researcher conducting the study will not be able to give you information regarding this should you be interested.

- **Participants:** Eligible participants will be people aged 18 years old and above who are either (1) individuals who have a strong focus on healthy eating based on the screening measure; (2) individuals who currently have or have had an eating disorder; (3) individuals with no personal experience with eating/shape or weight concerns but who need to exclude certain foods from their diet based on medical, ethical or religious reasons; or (4) individuals who have no personal experience with eating, shape or weight concerns. A total of approximately 160 participants will take part in the study.
- **Use of Data and Feedback:** The data collected in this study will be presented in the PhD thesis of Rosemary Clifford. The results may also be presented in a journal article or at conferences. At the completion of the study, around January 2022, you will be able to obtain a copy of the results from the following Dropbox link:

https://www.dropbox.com/sh/0d15y68cy06q2hk/AABZD3h_84A-68qXyttKFHHAa?dl=0

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in this study is **voluntary** and you may, without negative consequences, decline to take part or withdraw from the study without providing an explanation at any time. If you do decide to withdraw, your data will not be used and destroyed, unless you advise us that you are happy for your data to be retained. Should you desire for your data not to be used, you will need to contact the primary researcher (Rosemary Clifford) within two months of the completion of your participation, provide your unique four-character identification code, and inform the researcher that you wish to have your data withdrawn.
- **What does participation in the research entail?** This study will be conducted entirely online. Interested participants will need to access the study via the link provided to them on the advertisement or by contacting the researcher. During the study you will be asked to complete five cognitive tasks and seven questionnaires. Participation should take no longer than 60 minutes to complete.
- **Location and Duration:** The study will be administered via two online platforms and as such can be completed in your own time in a place where you have privacy and will not be interrupted.
- **Remuneration:** All participants will be offered the opportunity to enter a draw to win one of two \$50 Westfield gift vouchers. Participants recruited through the ANU Research School of Psychology can elect to instead receive a one-hour course credit. For those who choose to enter into the draw, you will need to leave your e-mail address at the end of the survey. Your contact details will not be linked to your responses from the questionnaires. Contact details are pooled separately and stored purely for the purpose of the draw. This is to ensure that confidentiality is maintained throughout the study. Please note that given the sample will contain 160 participants, if everyone chooses to enter the lottery you will have a 1 in 80 chance of winning one of the two gift vouchers. Successful entrants of the gift vouchers



will be notified by their nominated email address (provided during the survey). Successful entrants will have up to one month to respond to the notification email and confirm that they wish to claim their gift voucher. Once the successful entrants have accepted their gift voucher, unsuccessful entrants will be notified by email of the outcome. If the successful entrants do not respond to the notification email within the one-month period, a new successful entrant will be redrawn to replace them. The voucher draw will be done at the conclusion of data collection for this study; the anticipated completion date for data collection will be between February and June 2022. Once all vouchers have been accepted by successful entrants and all unsuccessful entrants have been notified, all contact details will be destroyed.

- **Risks:** The questionnaires will ask questions about your weight and eating-related thoughts, feelings, and behaviours. As you may be experiencing problems in these areas, answering such questions could cause you some distress or discomfort. If for any reason you experience distress, discomfort or concern about the questions being asked, please take a break from participating or cease participation, whichever option you feel is most suitable for you. Know that you are free to do this without penalty or repercussions. Should you experience concerns or distress, we encourage you to also seek support from relevant health services including your GP and/or the organisations listed below under the 'Contacts if in Distress' section.
- **Benefits:** It is expected that this study will inform future research and clinical practice on Orthorexia Nervosa by providing a clearer understanding of this condition. By participating in this study, you may also benefit from an increased awareness of your own attitudes and behaviours.

Exclusion criteria:

- **Participant Limitation:** People will not be eligible to take part if they are under the age of 18 years.

Confidentiality:

Confidentiality: Your confidentiality will be protected as far as the law allows. Records containing any information, including correspondence, which could identify participants in any way will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. Only the primary investigator and her supervisor will have access to the material provided by participants, and all information provided will only be used for the purposes of this study. The four-character identification code that participants will create prior to study participation will be the only way in which your data can be identified and will be de-identified from any identifiable information collected as to maintain anonymity and confidentiality. A report of this study may be submitted for publication but individual participants will not be identifiable in such a report. Your full name and other identifying information will not appear on any research documentation.

Privacy Notice:

In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppl/document/ANUP_010007 and it contains information about how a person can:

- Access or seek correction to their personal information;
- Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.



Data Storage:

- **Where will the data be stored:** All data will be stored electronically on securely locked university computers and on a personal password protected hard-drive. Only the primary researcher and her supervisor will have access to this data.
- **How long will the data be stored and what will happen to it after this period:** Since the data may be used in future studies, the de-identified electronic data set will be retained for a period of at least 5 years from the date of any publication arising from the data.
- **Handling of Data following the required storage period:** After the required data storage period has expired the data will be destroyed.

Queries and Concerns:

- **Contact Details for More Information:** For further information or any questions regarding this study, please do not hesitate to contact the researchers, whose information is provide below.

Rosemary Clifford on T: 0402779713 or E: Rosemary.Clifford@anu.edu.au

Dr Elizabeth Rieger on T: 6125 4208 or E: Elizabeth.Rieger@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress as a result of your participation in this study, please contact any of the relevant organisations below:

Your GP

Lifeline

24-hour crisis support and suicide prevention service

Phone: 13 11 14

Website: <https://www.lifeline.org.au/>

The Butterfly Foundation

Support for Australians experiencing body image and eating concerns

Phone: 1800 33 4673

Email: support@thebutterflyfoundation.org.au

Website: <http://thebutterflyfoundation.org.au/>

Headspace

Support for young Australians (12-25 years of age) including mental health, physical health, work and study support, and alcohol and drug problems

Website: <https://headspace.org.au>

Beyondblue

Information and support for mental health problems such as depression, anxiety and suicide

Website: <https://www.beyondblue.org.au>

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2019/736). If you have any concerns or complains about how this research has been conducted, please contact:

Ethics Manager

The ANU Human Research Ethics Committee

The Australian National University

Telephone: +61 2 6125 3427

Email: Human.Ethics.Officer@anu.edu.au

FOOD, BODY AND MIND

The Research School of Psychology



Australian
National
University

PARTICIPANTS NEEDED!

PARTICIPANT INFORMATION:

Do you want to be a part of **EXCITING NEW** research looking at the difference between healthy eating habits and those that might be problematic? Do you have a few hours to spare? If so, then this study might be for **YOU!**

We are seeking participants for a study on eating attitudes and habits.

What? Participation will involve taking part in an online study. The link to this flyer can be obtained from this flyer or from the primary researcher (Rosemary Clifford). During participation you will be asked about your eating habits and behaviours, your self-esteem and your preferences regarding food.

How Long? Participation in this study will take at most 1 hour. Participants will be offered a 1 hr course credit for their time (ANU students) or a chance to win one of two \$50 Westfield Gift vouchers.

Where? ANYWHERE! As participation is online, you can do this study anywhere as long as you have an internet connection, a computer, and a quiet place to take the survey. This study cannot be completed on a mobile phone device. Please try and make sure that you are in a place you can concentrate when participating.

Who? Participants need to be 18 years or older, with normal or corrected vision, who either:

1. Have/had a diagnosis of **Anorexia Nervosa** or **Bulimia Nervosa**;
2. Have a **strong focus on healthy eating and purity or health**

For information on what Anorexia and Bulimia are, visit www.nationaleatingdisorders.org

Interested? If interested in participating or for further information, please contact Rose Clifford @ rosemary.clifford@anu.edu.au

If you meet any of the above eligibility criteria follow the link below:

https://anu.au1.qualtrics.com/jfe/form/SV_8w8dt3vwxl03BZ

Q

Appendix B

Materials and Images for Study 1, 2 and 3

Demographic Questionnaire

Below you will find a demographic questionnaire. Please answer the following questions as honestly as possible.

Birth Sex:

1. Male
2. Female

Age:

1. 18-24
2. 25-34
3. 35-44
4. 45-54
5. 55-64
6. 65+

Please select the option that best describes the gender identity you most identify with:

1. Male
2. Female
3. Transgender Female
4. Transgender Male
5. Gender variant/Non-conforming
6. Not listed _____
7. Prefer not to answer

Please select the option that best describes your ethnicity

1. Hispanic or Latino
2. Caucasian or European
3. Asian
4. Aboriginal or Torres Strait Islander
5. Black or African American
6. Other _____

Please select the option that best describes your current marital status

1. Married
2. Divorced
3. Widowed
4. Separated
5. Single
6. De facto
7. In a relationship

What is the highest level of education you have completed?

1. Year 12 or less
2. At least year 12

3. Some university/technical school training
4. Trade or vocational training
5. University degree (BA or BS)
6. Diploma
7. Postgraduate degree (MD, PhD)

Please indicate the option which best describes your current work situation

1. Working full time
2. Working part-time
3. Not working and not looking for work
4. Unemployed and looking for work
5. Disabled or retired and not looking for work
6. Student

Kessler Psychological Distress Scale

Please tick the answer that is correct for you:	All of the time (score 5)	Most of the time (score 4)	Some of the time (score 3)	A little of the time (score 2)	None of the time (score 1)
1. In the past 4 weeks, about how often did you feel tired out for no good reason?					
2. In the past 4 weeks, about how often did you feel nervous?					
3. In the past 4 weeks, about how often did you feel so nervous that nothing could calm you down?					
4. In the past 4 weeks, about how often did you feel hopeless?					
5. In the past 4 weeks, about how often did you feel restless or fidgety?					
6. In the past 4 weeks, about how often did you feel so restless you could not sit still?					
7. In the past 4 weeks, about how often did you feel depressed?					
8. In the past 4 weeks, about how often did you feel that everything was an effort?					
9. In the past 4 weeks, about how often did you feel so sad that nothing could cheer you up?					
10. In the past 4 weeks, about how often did you feel worthless?					

Eating Disorder Examination-Questionnaire

EATING QUESTIONNAIRE

Instructions: The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please answer all of the questions. Please only choose one answer for each question. Thank you.

Questions 1 to 12: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only.

On how many of the past 28 days		No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
1	Have you been deliberately <u>trying</u> to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
2	Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	0	1	2	3	4	5	6
3	Have you <u>tried</u> to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
4	Have you <u>tried</u> to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
5	Have you had a definite desire to have an <u>empty</u> stomach with the aim of influencing your shape or weight?	0	1	2	3	4	5	6
6	Have you had a definite desire to have a <u>totally flat</u> stomach?	0	1	2	3	4	5	6
7	Has thinking about <u>food, eating or calories</u> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
8	Has thinking about <u>shape or weight</u> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
9	Have you had a definite fear of losing control over eating?	0	1	2	3	4	5	6
10	Have you had a definite fear that you might gain weight?	0	1	2	3	4	5	6
11	Have you felt fat?	0	1	2	3	4	5	6
12	Have you had a strong desire to lose weight?	0	1	2	3	4	5	6

Questions 13-18: Please fill in the appropriate number in the boxes on the right. Remember that the questions only refer to the past four weeks (28 days).

Over the past four weeks (28 days).....

13	Over the past 28 days, how many <u>times</u> have you eaten what other people would regard as an <u>unusually large amount of food</u> (given the circumstances)?	
14	...On how many of these times did you have a sense of having lost control over your eating (at the time that you were eating)?	
15	Over the past 28 days, on how many <u>DAYS</u> have such episodes of overeating occurred (i.e. you have eaten an unusually large amount of food and have had a sense of loss of control at the time)?	
16	Over the past 28 days, how many <u>times</u> have you made yourself sick (vomit) as a means of controlling your shape or weight?	
17	Over the past 28 days, how many <u>times</u> have you taken laxatives as a means of controlling your shape or weight?	
18	Over the past 28 days, how many <u>times</u> have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape or amount of fat or to burn off calories?	

Questions 19-21: Please circle the appropriate number. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.

19	Over the past 28 days, on how many days have you eaten in secret (ie, furtively)?.....Do not count episodes of binge eating	No days	1-5 days	6-12 days	13-15 days	16-22 days	23-27 days	Every day
		0	1	2	3	4	5	6
20	On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape or weight?Do not count episodes of binge eating	None of the times	A few of the times	Less than half	Half of the times	More than half	Most of the time	Every time
		0	1	2	3	4	5	6
21	Over the past 28 days, how concerned have you been about other people seeing you eat?Do not count episodes of binge eating	Not at all		Slightly		Moderately		Markedly
		0	1	2	3	4	5	6

Questions 22-28: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days)

On how many of the past 28 days		Not at all		Slightly		Moderately		Markedly
22	Has your <u>weight</u> influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
23	Has your <u>shape</u> influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
24	How much would it have upset you if you had been asked to weigh yourself once a week (no more, or less, often) for the next four weeks?	0	1	2	3	4	5	6
25	How dissatisfied have you been with your <u>weight</u> ?	0	1	2	3	4	5	6
26	How dissatisfied have you been with your <u>shape</u> ?	0	1	2	3	4	5	6
27	How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?	0	1	2	3	4	5	6
28	How uncomfortable have you felt about others seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?	0	1	2	3	4	5	6

What is your weight at present? (Please give your best estimate).

What is your height? (Please give your best estimate).

If female: Over the past three-to-four months have you missed any menstrual periods?

If so, how many?

Have you been taking the "pill"?

THANK YOU

SF-12 Health Survey

SF-12 Health Survey

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. **Answer each question by choosing just one answer.** If you are unsure how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

☐₁ Excellent ☐₂ Very good ☐₃ Good ☐₄ Fair ☐₅ Poor

The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	YES, limited a lot	YES, limited a little	NO, not limited at all
2. Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	☐ ₁	☐ ₂	☐ ₃
3. Climbing several flights of stairs.	☐ ₁	☐ ₂	☐ ₃

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	YES	NO
4. Accomplished less than you would like.	☐ ₁	☐ ₂
5. Were limited in the kind of work or other activities.	☐ ₁	☐ ₂

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	YES	NO
6. Accomplished less than you would like.	☐ ₁	☐ ₂
7. Did work or activities less carefully than usual.	☐ ₁	☐ ₂

8. During the **past 4 weeks**, how much did pain interfere with your normal work (including work outside the home and housework)?

☐₁ Not at all ☐₂ A little bit ☐₃ Moderately ☐₄ Quite a bit ☐₅ Extremely

These questions are about how you have been feeling during the **past 4 weeks**.

For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**...

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
9. Have you felt calm & peaceful?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
10. Did you have a lot of energy?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆
11. Have you felt down-hearted and blue?	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₆

12. During the **past 4 weeks**, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

☐₁ All of the time ☐₂ Most of the time ☐₃ Some of the time ☐₄ A little of the time ☐₅ None of the time

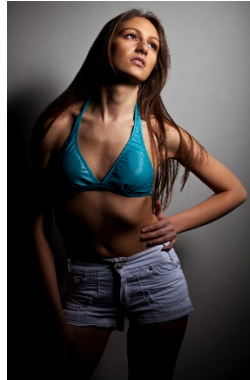
Clinical Impairment Assessment

INSTRUCTIONS					
Please place an 'X' in the column which best describes how your eating habits, exercising or feelings about your eating, shape or weight have affected your life over the past four weeks (28 days). Thank you.					
		Not at all	A little	Quite a bit	A lot
	Over the past 28 days, to what extent have your ...eating habits ...exercising or feelings about your eating, shape or weight ...				
1	... made it difficult to concentrate?				
2	... made you feel critical of yourself?				
3	... stopped you going out with others?				
4	... affected your work performance (if applicable)?				
5	... made you forgetful?				
6	... affected your ability to make everyday decisions?				
7	... interfered with meals with family or friends?				
8	... made you upset?				
9	... made you feel ashamed of yourself?				
10	... made it difficult to eat out with others?				
11	... made you feel guilty?				
12	... interfered with you doing things you used to enjoy?				
13	... made you absent-minded?				
14	... made you feel a failure?				
15	... interfered with your relationships with others?				
16	... made you worry?				

Indicative IAT/VPDT Images

The below images are indicative of those used in the Implicit Association Tests and Visual Probe Detection Tasks utilised in study 2 and 3. The actual images utilized in the cognitive tasks could not be replicated here due to copyright concerns.

Underweight/Unhealthy



Average/Healthy



Low-Calorie/Unhealthy



High-Calorie/Healthy



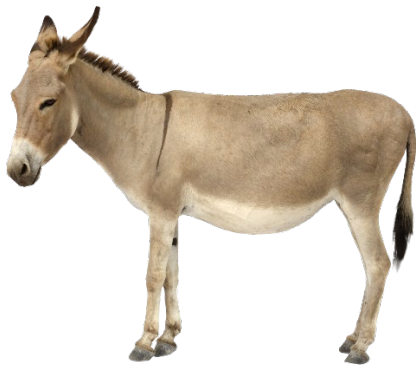
Indicative Animal Images

Image Pilot Survey

Participant Information Sheet

Participant Information Sheet

Researcher:

Rosemary Clifford (PhD candidate, Research School of Psychology, ANU) and Dr Elizabeth Rieger (Associate Professor, Research School of Psychology, ANU).

Project Title: Piloting of Food and Body Shape/Weight Images

You are invited to take part in this research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and ask if there is anything that is not clear or if you would like more information.

General Outline of the Project:

- **Description and Methodology:**

The focus of the current research is to obtain ratings on various images, specifically, valence ratings (how positive or negative the image is) and arousal ratings (how interesting the image is). The images will consist of various foods, women of varying body shape/weight images (i.e., thin and average), and animals (domestic and wild). This research project is the first stage of the development of two cognitive tasks for future research on Orthorexia Nervosa. Orthorexia Nervosa is a condition characterised by an obsession with healthy eating that can result in distress and impairment for those individuals affected. By gathering this information the investigators will be able to determine the most suitable images to use in the two cognitive tasks and measurement tools to be developed. These cognitive tasks and measurement tools are needed in order to complete the necessary research into a condition called Orthorexia Nervosa.

- **Participants:** Eligible participants are anyone aged between 18 and 60, with normal to corrected vision who does not currently have eating issues or who has not had eating issues in the past.
- **Use of Data and Feedback:** The data obtained from this research project will be used to determine the most suitable images from each category (animal, food and women) to be used in the development of cognitive assessment/measurement tools. As the data obtained from this research project will be used to help inform the next stage of the cognitive assessment/measurement tool development, it will be discussed in minor detail in the thesis and any relevant publications of the primary researcher (Rosemary Clifford). Participants will be given access to any publications related to this research project through the link below.
- **Project Funding:** This project is being funded by the ANU Research School of Psychology as part of the primary researcher's PhD research requirement.

Participant Involvement:

- **Voluntary Participation & Withdrawal:** Participation in this study is **voluntary** and you are free to end your participation at any time during the survey without giving any reason and without experiencing any negative personal repercussions. Should you wish to withdraw your data from the study, please contact the primary investigator and provide them the exact time at which you commenced the study and the exact time at which you ceased participation. The primary investigator will then remove your data. You may,

without negative consequences, decline to take part or withdraw from the research without providing an explanation at any time, until the data are submitted to the researcher. If you choose to withdraw from the study, as is the standard, your data will be removed and destroyed. You also have the right to refuse to answer a question.

- **What does participation in the research entail?** If you decide to participate, you will complete a survey which will involve you looking at images of food, women and animals, and then rating these images on valence and arousal.
- **Location and Duration:** The study will be conducted online. By following the link contained on the advertisement you have been taken to this site. The study will be completed on this site and will begin once you have given your informed consent after reading this Participant Information Sheet. Once you have completed the online survey your participation in this study will be concluded. The study will take up to 30 minutes to complete.
- **Remuneration:** A 30 minute course will be given to those participants desiring it at the conclusion of their participation in appreciation for your contribution. Please inform the interviewer at the conclusion of the study whether you would like the 30 minute remuneration.
- **Risks:** The risk of psychological harm associated with this study is minimal. However, looking at images of food, thin and average-weight women, and/or animals may be distressing for some people. Some of the images may also be distressing or uncomfortable for those from various religious, cultural or ethnic background, as they include images of women in swimwear and revealing attire. If you become distressed at any time during the session, you are free to cease participation immediately and consider contacting one of the resources provided at the bottom of this Participant Information Sheet.

If you experience any distress as a result of your participation in this study you may wish to contact one of the following services:

ANU Counselling Service

Phone: 02 6125 2442 (ext 52442)

Website: <http://counselling.anu.edu.au>

Lifeline

Phone: 13 11 14

Crisis Assessment and Treatment Team (ACT Mental Health)

Phone: 1800 629 354 (24 hour service) or (02) 6205 1065

- **Benefits:** The benefits of this research project relate to its role as a vital step needed in order to develop the cognitive tasks and measurement tools needed to continue research into Orthorexia Nervosa.

Confidentiality:

- **Confidentiality:** Your confidentiality will be protected as far as the law allows. Records containing any information, including correspondence, which could identify participants in any way will be kept

confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. Only the primary investigator and supervisor will have access to the material provided by participants, and all information provided will only be used for the purposes of this study.

- All data will be completely anonymous. Your name will not appear on any research documentation. All research information will be stored in a secure filing cabinet in a secure office at the ANU Research School of Psychology and electronic information will be password protected. Only the investigators (Rosemary Clifford and Dr. Elizabeth Rieger) will have access to this information. Questionnaires will be kept for 5 years, after which they will be shredded and electronic information deleted. A report of this study will be submitted for publication as part of a thesis but individual participants will not be identifiable in this report. If, after providing informed consent, you decide to withdraw from the study, your data will be destroyed.

Privacy Notice:

In collecting your personal information within this research, the ANU must comply with the Privacy Act 1988. The ANU Privacy Policy is available at https://policies.anu.edu.au/ppi/document/ANUP_010007 and it contains information about how a person can:

- Access or seek correction to their personal information;
- Complain about a breach of an Australian Privacy Principle by ANU, and how ANU will handle the complaint.

Data Storage:

- **Where will the data be stored:** Data from the research project will be stored at the ANU. All research documents will be stored in a secure filing cabinet in a secure office at the ANU Research School of Psychology and electronic information will be password protected on the ANU system and stored on a secure portable personal hard-drive. Only the investigators (Rosemary Clifford and Dr. Elizabeth Rieger) will have access to this data.
- **How long will the data be stored and what will happen to it after this period:** Since the data may be used in future studies, the electronic data set will be retained for a period of at least 5 years from the date of any publication arising from the data.
- **Handling of Data following the required storage period:** After the required data storage period has expired the data will be destroyed.

Queries and Concerns:

- **Contact Details for More Information:** For further information or any questions regarding this study, please do not hesitate to contact the researchers, whose information is provide below.

Rosemary Clifford on T: 0402779713 or E: rosemary.clifford@anu.edu.au

Dr Elizabeth Rieger on T: 6125 4208 or E: Elizabeth.Rieger@anu.edu.au

- **Contact Details if in Distress:** If you experience any distress as a result of your participation in this study, please contact Lifeline on 13 11 14.

Ethics Committee Clearance:

The ethical aspects of this research have been approved by the ANU Human Research Ethics Committee (Protocol 2019/736). If you have any concerns or complaints about how this research has been conducted, please contact:

Ethics Manager
The ANU Human Research Ethics Committee
The Australian National University
Telephone: +61 2 6125 3427
Email: Human.Ethics.Officer@anu.edu.au

You are able to download a copy of this information sheet from the link below. If you agree to take part, then you will be asked to give your consent by checking 'Yes' on the following page. If you check 'Yes' you will be taken to the survey. If you check 'No' you will be exited from the survey.

Instructions

During this study you will be shown a number of pictures. Your task is to look at the pictures and rate each in terms of how it made you feel while viewing it. There are no right or wrong answers, so simply respond as honestly as you can. You will see two sets of five figures, each arranged along a continuum. You will use these figures to rate how you felt while viewing each picture. You will make two ratings for each picture that you observe on a scale of 1 to 9, with each number representing a different section on the continuum. Your rating of each picture should reflect your immediate personal experience and no more. Please rate each one as you actually felt while looking at the picture. It is important not to dwell on your ratings.

The first scale is the happy vs. unhappy scale, which ranges from a smile to a frown:

At one extreme of the happy vs. unhappy scale, you felt happy, pleased, satisfied, contented, hopeful. If you felt completely happy while viewing the picture, you can indicate by clicking the number 1 from the options given. The other end of the scale is when you felt completely unhappy, annoyed, unsatisfied, melancholic, despaired, bored. You can indicate feeling completely unhappy by clicking the number 9 from the options given. The figures also allow you to describe intermediate feelings of pleasure, by circling any of the other pictures. If you felt completely neutral, neither happy nor unhappy, click the number 5 as this represents the middle figure. If, in your judgment, your feeling of pleasure or displeasure falls between two of the pictures, then click the number that corresponds to the space between the figures that best describes what you are feeling.

The excited vs. calm dimension is the second type of feeling displayed:

At one extreme of the scale you felt stimulated, excited, frenzied, jittery, wide-awake, aroused. If you felt completely excited while viewing the picture, click the number 1 to represent the figure at the left of the row. On the other hand, at the other end of the scale, you felt completely relaxed, calm, sluggish, dull, sleepy, unaroused. You can indicate you felt completely calm by clicking the number 9 to represent the figure at the right of the row. You can represent intermediate levels by circling any of the other figures. If you are neither excited nor calm click the number 5 to represent the middle figure in the row. Again, if you wish to make a more finely tuned rating of how excited or calm you feel, then click the number that corresponds to the space between the figures that best describes what you are feeling.

In addition to the Happy vs Unhappy and Excited vs Calm scales, for each of the food pictures, you will be asked to complete three additional scales. You will be asked to click the option out of the seven available that best represents your opinion. These scales include:

A Familiarity Scale, which will ask you about your familiarity with the food item in the picture.

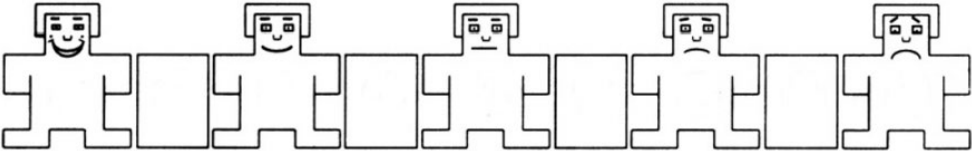
A Perceived Healthiness Scale, which will ask you what you perceive the healthiness or unhealthiness of the food in the picture to be.

A Perceived Calorie Content Scale, which will ask you what you perceive the calorie content of the food in the picture to be.

Indicative Question (Food)



Happy
Unhappy

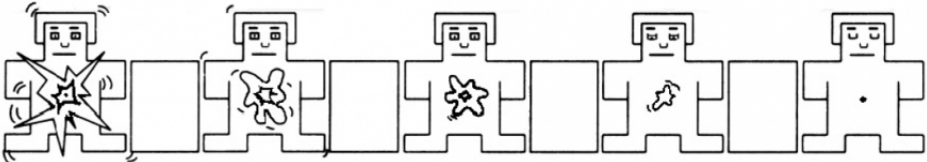


1 2 3 4 5 6 7 8 9

Please check the button that best represents your feelings towards the image just viewed.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Excited
Calm



1 2 3 4 5 6 7 8 9

Please check the button that best represents your feelings towards the image just viewed.

- 1
- 2
- 3

- 4
- 5
- 6
- 7
- 8
- 9

Please select the option that best represents your familiarity with the food item in the above image to be.

- 1 = Not at all familiar with this food item
- 2 = Slightly familiar with this food item
- 3 = Somewhat familiar with this food item
- 4 = Moderately familiar with this food item
- 5 = Familiar with this food item
- 6 = Very familiar with this food item
- 7 = Extremely familiar with this food item

Please select the option that best represents how healthy or unhealthy you perceive the food in the above image to be.

- 1 = Very unhealthy
- 2 = Unhealthy
- 3 = Slightly unhealthy
- 4 = Neither healthy nor unhealthy
- 5 = Slightly healthy
- 6 = Healthy
- 7 = Very healthy

Please select the option that best represents where you would perceive the calorie content of the food in the above image would fall.

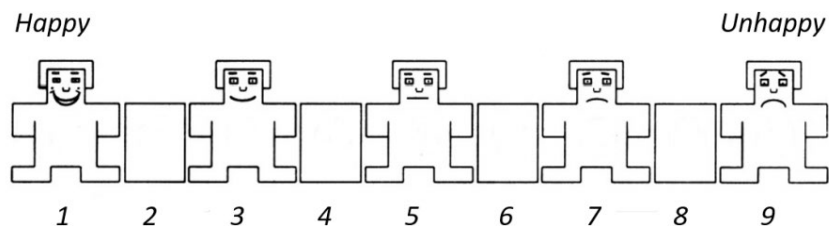
- 1 = Almost no calories
- 2 = Low calorie content
- 3 = Somewhat low calorie content
- 4 = Neither specifically low nor high calorie content

5 = Somewhat high calorie content

6 = High calorie content

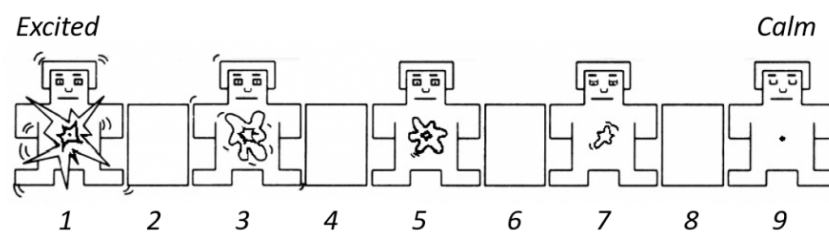
7 = Very high calorie content

Indicative Question (body)



Please check the button that best represents your feelings towards the image just viewed.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9



Please check the button that best represents your feelings towards the image just viewed.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Please select the option that best represents how healthy or unhealthy you perceive the woman in the above image to be.

- 1 = Very unhealthy
- 2 = Unhealthy
- 3 = Slightly unhealthy
- 4 = Neither healthy nor unhealthy
- 5 = Slightly healthy
- 6 = Healthy
- 7 = Very healthy

Please select the option that best represents how you perceive the weight of the woman in the above image.

- 1 = Very thin
- 2 = Thin
- 3 = Slightly thin
- 4 = Neither thin nor overweight
- 5 = Slightly overweight
- 6 = Overweight
- 7 = Very overweight