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Exploring the association of body mass index, mindful and emotional eating, and orthorexia

BACKGROUND

Orthorexia nervosa (ON) is defined as a fixation on healthy eating behaviours. Research exploring ON and body mass index (BMI) has been inconsistent, with some findings indicating a positive relationship between ON and BMI, while other studies have suggested no relationship. To date, potential associations with emotional and mindful eating have been explored only in a vegan population. The present research adopted an exploratory approach and examined the relationship between orthorexia and BMI, and possible associations with emotional and mindful eating. The potential predictive value of mindful and emotional eating with respect to ON was also explored, while the role of four different types of emotional eating (happiness, sadness, anger, anxiety), utilising an emotional eating scale incorporating positive and negative emotions, was further explored.

PARTICIPANTS AND PROCEDURE

Two hundred and twenty-three participants completed the online survey that was distributed via social media to a British sample.

RESULTS

The findings suggested a negative correlation between ON and BMI. Participants who presented higher levels of orthorexia were more likely to display higher levels of focused eating, a central aspect of mindful eating, as well as lower levels of emotional eating in response to happiness – two elements that further predicted ON in multiple regression models.

CONCLUSIONS

The results suggest a need to conduct further research to explore the possible role of happiness as a potential protective tool against ON, and further suggest the likely negative role of some components of mindful eating in ON. Future directions are discussed in light of the present findings.

KEY WORDS

orthorexia; body mass index; emotional eating; mindful eating; happiness

ORGANIZATION – Birmingham City University, Birmingham, United Kingdom

AUTHORS' CONTRIBUTIONS – A: Study design · B: Data collection · C: Statistical analysis · D: Data interpretation · E: Manuscript preparation · F: Literature search · G: Funds collection

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BACKGROUND

In the current obesogenic environment, public health officials, dietitians and medical experts are endorsing a focus on health-oriented eating to reduce high rates of obesity (Ogden et al., 2014), and in particular, advising consumers to increase their awareness of their eating behaviours (Bublitz et al., 2010). Overconsumption of convenience food has been identified as a cause of obesity (Jordan et al., 2014). When compared with normal-weight populations, obese populations are at a greater risk of physical health complications (e.g., cardiovascular disease, type 2 diabetes; Chu et al., 2018; McComb & Mills, 2019), as well as psychological health problems (e.g., depression, low self-esteem; Harriger & Thompson, 2012). While health-oriented eating and increased awareness of eating behaviours may be key to a healthy lifestyle and body mass index (BMI) (Mantzios et al., 2018; Taylor et al., 2015), for some individuals, this preoccupation can result in negative health consequences and orthorexia (Costa et al., 2017).

The term orthorexia was first coined by Steven Bratman (1997) and describes a pathological fixation on following a restrictive diet, whereby certain food groups that are classed as ‘unhealthy’ are avoided (Koven & Abry, 2015). Examples of foods that are branded as ‘unhealthy’ and subsequently restricted are foods containing higher proportions of fat, salt, sugar, and artificial colours/flavourings. Food preparation is also of high importance to individuals scoring high in orthorexia, including manufacturing methods, sourcing organic ingredients and meal planning – elements that take up much time and effort (Costa et al., 2017). Individuals with orthorexia display a desire to achieve optimum health; however, the frequently observed form of disordered eating quickly evolves into an obsession with rigid eating rules (Vandereycken, 2011). Orthorexia has also been described as ‘clean eating’, characterised by the consumption of organic and raw foods and avoiding any foods that the individual considers unhealthy with the ultimate goal of achieving diet purity, rather than the extreme calorie deficit we often associate with other forms of disordered eating (Costa et al., 2017; Koven & Abry, 2015). Despite these healthy intentions, orthorexia can lead to a wide range of physical (nutritional deficiencies, weight loss; Aksoydan & Camci, 2009), psychological (fatigue, emotional consequences; Cena et al., 2019) and social (lower quality of life, social isolation; Brytek-Matera et al., 2019) side effects, which in turn, negatively impact one’s health (Mathieu, 2005).

When exploring the literature on orthorexia, it is important to consider body mass index (BMI), as this has been consistently linked to other disordered forms of eating (e.g., Anderson et al., 2015; Nagata et al., 2018). However, research exploring the rela-

tionship between orthorexia and BMI presents inconsistent findings (Brytek-Matera et al., 2020). To clarify the relationship between orthorexia and BMI, two studies made use of the ORTO-15, a 15-item instrument measuring orthorexia nervosa (Donini et al., 2005) and found significant results, concluding that as orthorexic eating increases, so does BMI (Asil & Sericeous, 2015; Fidan et al., 2010). However, Missbach et al. (2015) suggested that the ORTO-15 was not sufficiently reliable and valid to make clear assessments of orthorexia and proposed the development of another psychometric tool. Meanwhile, utilising the Düsseldorf Orthorexia Scale (DOS; Luck-Sikorski et al., 2019), which is an improved method of measuring orthorexia, a similar positive association was found between orthorexia and BMI. Oberle et al. (2017) utilised the eating habits questionnaire (EHQ), and reported similar findings when comparing high BMI individuals to low BMI individuals; those with a higher BMI display greater orthorexia symptomology, and reported greater positive feelings toward healthy eating. Furthermore, again utilising the EHQ, Oberle and Lipschuetz (2018) found no significant relationship. Interestingly, it was suggested that the lack of a significant relationship was due to the measure of BMI not distinguishing between body fat and muscle, while a significant relationship was observed between orthorexia, perceived muscularity and perceived body fat (Oberle & Lipschuetz, 2018). Similarly, researchers using the ORTO-15 found no significant relationship between orthorexia and BMI (Varga et al., 2014), as in a psychometric evaluation of the DOS (Chard et al., 2018).

Barrada and Roncero (2018) made use of the Teruel Orthorexia Scale (TOS), a scale that distinguishes between healthy and unhealthy orthorexia, and found a negative correlation between the ‘healthy’ dimension of orthorexia and BMI. This same relationship was also reported by Ferreira and Coimbra (2021), although higher DOS scores associated with lower BMI were not replicated. Recently, Godefroy et al. (2021) highlighted the use of a variety of different diagnostic tools in exploring this relationship and concluded that the validated structural model globally suggests no relationship between high or low BMI and orthorexia. The first aim of this research was to add to the literature on the relationship between orthorexia and BMI. When conducting further exploration of this relationship, other correlates of BMI may be of interest, such as emotional eating, which has been found to correlate positively with orthorexia (Banna et al., 2018).

Emotional eating is commonly defined as increased food intake in response to emotional fluctuation, with negative emotions being at the forefront of consideration (Macht & Simons, 2011). Other research showed, however, that increased food intake in response to positive emotions also occurred as frequently (Macht et al., 2004). Moreover, it has also

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been found that food intake can decrease in response to experiencing certain negative emotions, such as sadness (van Strein et al., 2012). Several theoretical explanations of emotional eating have been proposed, such as attempting to alleviate negative emotions or distracting oneself from emotions as a way of avoiding negative affect (Pink et al., 2019). Emotional eating is considered problematic due to its association with multiple eating psychopathologies, such as episodes of binge eating in bulimia (Meule et al., 2021), binge eating disorder (Pinaquy et al., 2012) and episodes of starvation in anorexia (Meule et al., 2021). Only a few studies have explored the association between emotional eating and orthorexia (e.g., Barthels et al., 2019; Kalika et al., 2022); therefore further exploration of these concepts may lead to the development of interventions.

An early exploratory study by Donini et al. (2004) focusing on the diagnosis and prevalence of orthorexia concluded that orthorexia may be rooted in a generalised state of anxiety. Furthermore, it was also suggested that this negative emotion is compensated by food (Donini et al., 2004). More recently, in an attempt to clarify the behavioural or psychological nature of orthorexia, Strahler et al. (2018) found no relationship between orthorexia and emotional eating. More general research into mood/emotions and orthorexia found that the style of eating associated with orthorexia could act to regulate emotional states, specifically where high levels of guilt are felt following the consumption of 'forbidden' foods (Brytek-Matera et al., 2019), and that negative mood was predicted by higher orthorexia in women (Stutts, 2020). An earlier study found the same positive association between orthorexia and emotional eating across a sample of both men and women (Barthels et al., 2019). Interestingly, Barthels et al. (2019) also explored positive emotions and found positive affect to positively predict 'healthy orthorexia' and negatively predict orthorexia. Despite the lack of further evidence and mixed findings, the aforementioned literature on emotional eating and emotions supports the notion that there is a relationship between orthorexia and emotional eating. The different types of emotional eating that reflect positive and negative aspects have not been explored, and again, this research aimed to investigate the potential relationship by increasing awareness as to how orthorexia is related to both positive and negative emotional eating.

As previously mentioned, correlates of BMI may be of interest when exploring the relationship between orthorexia and BMI. Mindfulness, and specifically mindful eating, has been found to correlate negatively with BMI (Durukan & Gül, 2019). Mindfulness is described as an awareness that stems from paying attention to the present moment and experiences, and doing so without judgement (Bishop et al., 2004; Kabat-Zinn, 1990; Mantzios & Egan, 2018).

The practice of mindfulness has been adapted for use with eating behaviours, with early research focusing on interventions for binge eating (Kristeller & Hallet, 1999), providing the field with a term and intervention that is more specific to eating, that is, mindful eating. Nelson (2017) highlights the desirable health benefits of mindful eating behaviours, claiming that within a mindful approach to eating, individuals tend to savour eating experiences that involve lower volumes of more 'healthy' foods. In recent years, the practice of mindful eating has been examined in obese, overweight, and normal-weight populations (e.g., Warren et al., 2017). In underweight and eating disorder populations, mindful eating interventions have been incorporated and have been shown to hold promise as a possible treatment (Heffner et al., 2002; Katterman et al., 2014). Additionally, mindfulness practice has been negatively related to some forms of disordered eating such as restrictive eating, binge eating and excessive dieting (e.g., Katterman et al., 2014; Moore et al., 2014), which suggests a potential link between mindfulness and orthorexia, which is largely unexplored.

A study exploring the possible role that mindfulness, but not mindful eating, plays in orthorexia, focused on the two distinct dimensions of orthorexia: 'healthy' orthorexia and orthorexia (Strahler, 2020). The study used the Teruel Orthorexia Scale to distinguish between the two dimensions and found a positive association between mindfulness and 'healthy' orthorexia and a negative association between mindfulness and orthorexia. Furthermore, participants who reported lower self-acceptance and non-judgemental acceptance of experience also reported higher levels of orthorexia (Strahler, 2020). On the other hand, Kalika et al. (2022) explored the relationship between orthorexia and mindful eating, and the results indicated no relationship between the two concepts. However, this was explored with a vegan population, and thus suggested limited relevance to the way mindful eating works for people who consume different diets.

Additionally, past research has indicated an interrelation between mindful eating, emotional eating, and BMI. For example, increased BMI has been associated with high levels of negative emotion and low levels of mindful eating (Czepczor-Bernat et al., 2019), indicating potential significance in further explorations with orthorexia. Mindfulness-based eating has been successfully included in BMI reduction strategies (Mantzios & Wilson, 2014; Mantzios & Wilson, 2015a, b), an intervention which is rooted in the understanding that mindfulness practice enhances the individual's ability to cope with negative emotions (Kristeller & Wolever, 2011). This notion is supported by the literature, with Goyal et al. (2014) presenting data indicating that mindfulness is associated with lower stress and stress-related eating patterns such as binge eating and emotional eating

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(Dutt et al., 2019; Ouwens et al., 2015). Cotter and Kelly (2018) more recently suggested that individuals scoring higher for mindfulness present with a weaker correlation between stress and stress-related eating. Mindful based eating strategies have also been found to be effective in reducing levels of emotional eating, with mindfulness practice aiding the restoration of an individual's ability to discriminate various emotions from the state of hunger or satiety; a type of eating is often lost with emotional eating and other problematic eating behaviours (Conceição et al., 2015; Kristeller et al., 2013; Mantzios et al., 2019, 2020; Wnuk et al., 2018). Relationships between mindful eating, emotional eating and BMI, respectively, have been well documented; therefore, this research aimed to investigate the possible interrelations of these eating styles with BMI and orthorexia, with the latter being the primary outcome of this research. To enhance the understanding of the proposed relationships, a second aim was to explore the four types of emotional eating (happiness, sadness, anger, anxiety) and the separate subscales of mindful eating in observing the relationship with orthorexia.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

The final sample of 223 participants comprised 193 females (86.5%), 28 males (12.6%), 1 transgender male (0.4%) and 1 non-binary individual (0.4%), with a mean age of 28 years ($SD = 9.93$, range = 18-69 years). One hundred and forty-nine participants were excluded from the final analyses due to having provided incomplete data. The sample was 97.3% White British, 0.9% White Irish, 0.4% Mixed White and Caribbean, 0.4% African and 0.9% other ethnic groups. Employment status varied across the sample, with 42.5% employed full-time, 19.6% employed part-time, 25.6% in full-time education, 5% unemployed, 3.2% self-employed, 0.9% retired and 3.2% reporting another employment status. Over half of the sample reported following an omnivorous diet (53.8%) with the remaining participants following vegan (24.7%), vegetarian (17.5%) or other dietary requirements (4%). The majority of the sample reported not currently dieting (74%), and the sample had a mean BMI of 26.11 kg/m² ($SD = 5.65$, range = 17.58-45.12).

Participants were recruited using opportunity sampling through social media, such as Facebook and Twitter, as well as the university Research Participation Scheme (RPS). Participants who were recruited via the RPS were rewarded upon completion of the study with RPS credits, and those recruited via social media were not provided with any compensation. Participants under the age of 18 were excluded from the study and although not excluded, participants

with a current or historic diagnosis of disordered eating were advised to consider not taking part.

MATERIALS

Demographic questionnaire. The questionnaire required participants to report their age, gender, ethnicity, height, weight, annual household income and employment status, as well as whether or not they eat meat/dairy products and if they were currently dieting.

The English version of the Düsseldorf Orthorexia Scale (DOS). The DOS (Chard et al., 2018), a 10-item scale utilising self-report methods, was used to measure orthorexic eating behaviour. The DOS consists of items such as "My thoughts constantly revolve around healthy nutrition and I organize my day around it" and "Eating healthy food is more important to me than indulgence/enjoying the food". Participants' responses to the items were scored on a four-point Likert scale, ranging from 1 (*this does not apply to me*) to 4 (*this applies to me*). A higher score indicated a greater presence of orthorexic behaviour, with a maximum of 40 points. Scores of ≥ 30 indicated the presence of orthorexia, and a score between 25 and 29 indicated a risk of orthorexia. Cronbach's α reliability for the scale was .83, which shows high internal consistency.

The Salzburg Emotional Eating Scale (SEES). The SEES (Meule et al., 2018), a 20-item scale that utilises self-report methods, was used to assess emotional eating. Four subscales that have 5 items each (happiness, sadness, anger, and anxiety) are used to differentiate between specific types of emotion. Additionally, the SEES differentiates between increased vs. decreased eating following these emotions; this is advantageous compared with other self-report emotional eating questionnaires as it allows one to distinguish between different types of emotions. Participants' responses to items such as "When I feel optimistic" and "When I feel frustrated" were scored on a five-point Likert scale, ranging from 1 (*I eat much less than usual*) to 5 (*I eat much more than usual*). Mean scores for each subscale were calculated to evaluate how participants' eating changes in response to these emotions. Scores of < 3 indicate that the participant eats less, scores = 3 indicate no change and scores of > 3 indicate that the participant eats more. Cronbach's α reliability for the SEES was .88, which shows high internal consistency. Cronbach's α reliability was also calculated for each subscale. For the 'happiness' subscale, Cronbach's α was .84, for the 'sadness' subscale, Cronbach's α was .82, for the 'anger' subscale, Cronbach's α was .84 and finally, for the 'anxiety' subscale, Cronbach's α was .92.

The Mindful Eating Behaviour Scale (MEBS). The MEBS (Winkens et al., 2018), a 20-item scale, was used to measure the attentional element of mindful eating.

The MEBS was recently validated to be used with English-speaking populations, and showed equivalent properties to the original Dutch version (Mantzios et al., 2022). The scale used four subscales: focused eating (5 items), eating with awareness (3 items), eating in response to hunger and satiety cues (5 items) and eating without distraction (4 items). Participants' responses to items such as "I rely on my fullness signals to tell me when to stop eating" and "I think about things I need to do while I am eating" were scored on a five-point Likert scale, from 1 (*never*) to 5 (*very often*). Some items on the scale were reverse coded. Higher scores represented higher levels of mindful eating. Cronbach's α reliability for the scale was .71, which shows a medium internal consistency. Cronbach's α reliability was also calculated for each subscale. For the subscale 'eating while focusing on the food' Cronbach's α was .69, for the subscale 'eating while paying attention to hunger and satiety cues' Cronbach's α was .78, for the subscale 'being aware of eating' Cronbach's α was .91 and finally, for the subscale 'eating while not being distracted' Cronbach's α was .60. A Cronbach's α value of .50 or higher is considered satisfactory where there are fewer than 20 items (Dall'Oglio et al., 2010).

PROCEDURE

Ethical approval was granted by the Birmingham City University's Ethics Committee (no. PSY_XXX_Dec20_158). Participants were directed to an online link, and prior to giving consent, all participants were required to read through an information sheet which explained the inclusion and exclusion criteria. Participants were made aware of their right to withdraw at any time during the study. Once participants had given their consent to take part, they were presented with measures online, such as a demographic questionnaire, DOS, SEES and MEBS. Once the aforementioned questionnaires were completed, participants were taken to a debrief sheet, where they were presented with comprehensive information about the study and options to access relevant support services. Additionally, participants were given contact details and information about how to withdraw their data on the debrief sheet.

DATA ANALYSIS

Data were analysed using IBM SPSS Statistics 25.0. Bivariate correlations were used initially, to investigate for associations between the measured continuous variables. Multiple linear regression-based approaches to test the theorised models of the study aims, exploring direct effects on orthorexia through emotional and mindful eating, were also implemented.

RESULTS

CORRELATION ANALYSES

Significant negative correlations were observed between orthorexia and BMI ($p < .01$), eating while paying attention to hunger and satiety cues and BMI ($p < .01$), being aware of eating and BMI ($p < .01$), happiness and orthorexia ($p < .01$), sadness ($p < .01$), anger ($p < .01$) and anxiety ($p < .01$) with eating while paying attention to hunger and satiety cues and finally, sadness ($p < .01$), anger ($p < .01$) and anxiety ($p < .05$) with being aware of eating. Additionally, significant positive correlations were observed between eating while focusing on the food and orthorexia ($p < .05$) and sadness ($p < .01$), anger ($p < .05$) and anxiety ($p < .05$) with BMI. The mean total scores of continuous variables are presented in Table 1, and Table 2 summarises the results of the correlations.

A multiple linear regression where mindful eating subscales were entered in a model in predicting orthorexia revealed statistical significance [$F(4, 207) = 2.79, p = .027$] and the predictive capacity calculated through R^2_{adj} was .04. Interestingly, the results indicated that only attentive eating ($\beta = .38, p = .009$) significantly predicted orthorexia. The findings are summarised in Table 3. A second multiple linear regression where emotional eating subscales were entered in a model in predicting orthorexia also

Mindful and emotional eating and orthorexia

Table 1

Means and standard deviations of continuous variables

| Measure | <i>M</i> | <i>SD</i> |
|-----------|----------|-----------|
| DOS | 20.02 | 5.87 |
| MEBS | 67.82 | 8.16 |
| MEBS-FE | 18.81 | 2.85 |
| MEBS-HS | 20.09 | 4.44 |
| MEBS-EA | 10.78 | 3.24 |
| MEBS-ED | 18.40 | 3.69 |
| SEES | 2.84 | 0.53 |
| Happiness | 2.92 | 0.51 |
| Sadness | 3.44 | 0.85 |
| Anger | 2.70 | 0.80 |
| Anxiety | 2.32 | 0.87 |

Note. DOS – the English version of the Düsseldorf Orthorexia Scale; MEBS – the Mindful Eating Behaviour Scale; MEBS-FE – focused eating subscale; MEBS-HS – hunger and satiety subscale; MEBS-EA – eating with awareness subscale; MEBS-ED – eating without distractions subscale; SEES – the Salzburg Emotional Eating Scale and subscales: happiness, sadness, anger, anxiety.

indicated statistical significance [$F(4, 207) = 3.49, p = .009$] and the predictive capacity calculated through R^2_{adj} was .05. Interestingly, the results in-

dicated that only eating in response to happiness ($B = -2.84, p < .001$) significantly predicted orthorexia. These findings are summarised in Table 4.

Table 2

Pearson correlation matrix among BMI, DOS, eating while focusing on the food, eating while paying attention to hunger and satiety cues, being aware of eating, eating while not being distracted, happiness, sadness, anger, and anxiety

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| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------------|--------|--------|------|--------|--------|------|-----|-------|-------|----|
| 1. BMI | – | | | | | | | | | |
| 2. DOS | -.18** | – | | | | | | | | |
| 3. MEBS-FE | -.02 | .17* | – | | | | | | | |
| 4. MEBS-HS | -.30** | -.09 | .11 | – | | | | | | |
| 5. MEBS-EA | -.21** | .04 | .04 | .18** | – | | | | | |
| 6. MEBS-ED | -.10 | .10 | -.01 | .04 | .23** | – | | | | |
| 7. Happiness | -.11 | -.25** | -.02 | .10 | -.01 | .01 | – | | | |
| 8. Sadness | .32** | .01 | .03 | -.30** | -.45** | -.11 | .13 | – | | |
| 9. Anger | .15* | -.04 | .01 | -.21** | -.31** | .13 | .09 | .57** | – | |
| 10. Anxiety | .17* | -.07 | -.07 | -.22** | -.16* | -.13 | .08 | .40** | .61** | – |

Note. BMI – body mass index (kg/m²); DOS – the English version of the Düsseldorf Orthorexia Scale; MEBS – the Mindful Eating Behaviour Scale; MEBS-FE – focused eating subscale; MEBS-HS – hunger and satiety subscale; MEBS-EA – eating with awareness subscale; MEBS-ED – eating without distractions subscale; happiness, sadness, anger, anxiety – subscales of the Salzburg Emotional Eating Scale; * $p < .05$, ** $p < .01$.

Table 3

Summary of multiple linear regression of mindful eating predicting orthorexia

| Variable | B | SE B | Standardized β | t | p | 95% CI | |
|----------|------|------|----------------------|-------|------|--------|-------|
| | | | | | | Lower | Upper |
| MEBS-FE | .38 | .14 | .19 | 2.64 | .009 | .10 | .66 |
| MEBS-HS | -.15 | .09 | -.11 | -1.56 | .120 | -.33 | .04 |
| MEBS-EA | .03 | .13 | .02 | 0.23 | .816 | -.23 | .29 |
| MEBS-ED | .18 | .11 | .11 | 1.54 | .126 | -.05 | .40 |

Note. MEBS – the Mindful Eating Behaviour Scale; MEBS-FE – focused eating subscale; MEBS-HS – hunger and satiety subscale; MEBS-EA – eating with awareness subscale; MEBS-ED – eating without distractions subscale.

Table 4

Summary of multiple linear regression of emotional eating predicting orthorexia

| Variable | B | SE B | Standardized β | t | p | 95% CI | |
|-----------|-------|------|----------------------|-------|--------|--------|-------|
| | | | | | | Lower | Upper |
| Happiness | -2.84 | .80 | -.25 | -3.56 | < .001 | -4.41 | -1.27 |
| Sadness | -0.20 | .58 | -.03 | -0.34 | .732 | -1.34 | 0.95 |
| Anger | 0.34 | .74 | .05 | 0.46 | .646 | -1.11 | 1.79 |
| Anxiety | -0.44 | .59 | -.07 | -0.76 | .451 | -1.60 | 0.71 |

Note. Happiness, sadness, anger, anxiety – subscales of the Salzburg Emotional Eating Scale.

DISCUSSION

The present study aimed to explore the relationship between orthorexia and BMI, and the possible association between mindful and emotional eating. Furthermore, the present study also aimed to explore the four types of emotional eating (happiness, sadness, anger, anxiety) and the separate subscales of mindful eating in observing the relationship with orthorexia.

Correlation analyses revealed that orthorexia was significantly related to BMI, with individuals who displayed higher levels of orthorexia having a lower BMI, and vice versa. BMI was additionally found to correlate positively with mindful eating, and the subscale of attentive eating. Interestingly, although non-significant, the hunger and satiety scale displayed a negative relationship with orthorexia, providing an insight into intervention development. Two aspects of mindful eating, paying attention to hunger and satiety cues and being aware of eating, were also found to be significantly negatively related to BMI. Paying attention to hunger and satiety cues and being aware of eating were also negatively related to sadness, anger, and anxiety within the emotional eating scale. These three emotional eating subscales were also found to be related positively to BMI. The positive aspect of emotional eating (i.e., happiness) is related negatively to orthorexia.

Some of the findings of the present study were consistent with existing literature. As expected, we observed a significant, positive relationship between eating in response to three negative emotions (sadness, anger, anxiety) and BMI, mirroring the positive correlation between emotional eating and BMI within other literature (Banna et al., 2018). The only positive emotion, happiness, that is included in the Salzburg Emotional Eating Scale (SEES; Meule et al., 2018) was not found to correlate with BMI, despite reports that increased eating in response to positive emotions occurs as frequently as with negative emotions (Macht et al., 2004). A potential reason for the lack of association with positive emotions is rooted in the theory underpinning emotional eating; Pink et al. (2019) explained emotional eating as an attempt to alleviate negative emotions and affect, where emotional eating due to happiness may be an element that is closely aligned to individual differences. For example, it could be the case that testing populations that are happier, and controlling for happiness, to observe potential individual differences in eating behaviour research. Similar arguments could be made with deprivation indices, ethnicity and body and weight satisfaction, which need further future investigations (Chao et al., 2016; Lien et al., 2002). All in all, there is still much research that needs to be conducted into emotional eating and potential correlates with positive elements that are responsible for eating dysregulation.

An unexpected finding of the present study was a positive correlation between orthorexia and one

aspect of mindful eating, focusing while eating. This finding is somewhat surprising, due to mindful eating being frequently suggested as a useful practice for other forms of disordered eating (Albers, 2010; Masuda & Hill, 2013). The current study finds that increased levels of mindful eating are associated with increased orthorexia, which would suggest caution in individuals with orthorexia practising mindfulness-based eating interventions as described elsewhere. Mindful eating interventions have often been used in an attempt at weight loss, weight regulation, promotion of low energy dense foods or regulated consumption (e.g., Dutt et al., 2019; Hussain et al., 2021a, b, c; Mantzios et al., 2019, 2020; Mantzios & Wilson, 2014). While concerns have already been raised, as to how “decision-making” and “eating behaviour” are different aspects of mindful eating and may signal different outcomes (see Mantzios, 2021 for review), the present research shows how decision-making and eating behaviours differ. Decision-making as to when to start and stop eating according to hunger and satiety either supports lower orthorexia, or lower and more adaptive levels of orthorexia promote higher attendance to internal signals of hunger and satiety. Conversely, being attentive to the sensational aspects of the food, which is a behavioural aspect of eating as it occurs during consumption, either promotes more orthorexic symptomatology, or orthorexia promotes a more attentive way of eating, which is similar to other findings in eating disorders (Long et al., 2011). Future research needs to look more closely at potential implications for applied and clinical practice, as well as seek the utilisation of better mindful eating scales that are more inclusive of fundamental mindfulness elements (Keyte et al., 2020; Mantzios, 2021).

Another unexpected finding of the present study was a significant negative correlation between orthorexia and emotional eating in response to happiness; in other words, as emotional eating in response to happiness increases, orthorexic eating decreases, and vice versa. Despite being an unexpected result, this finding could be beneficial in exploring potential indirect ways to develop new interventions for orthorexia. Individuals with orthorexia often feel negative emotions such as guilt and worry after they have eaten, especially where larger quantities and/or foods that they classify as ‘forbidden’ are consumed (Brytek-Matera et al., 2019). However, here we see that increased eating in response to positive emotions, such as happiness, relates not to increased, but decreased, orthorexia. This suggests that happiness (and eating in response to this emotion) could serve as a protective tool against orthorexia, and warrants further research in any future explorations, especially in consideration of anorexia data and findings related to positive emotions signifying motivational aspects of the disease (e.g., Selby & Coniglio, 2020).

The results of the present study should be considered within the context of the limitations. First, the

cross-sectional nature of the research is a limitation, which requires further exploration with experimental research. Second, the participant sample of the current study was also highly populated with females, over 85%, which may have produced different results than if the population was more equally split, or more representative of the general population. Further research is needed to explore the potential implications for men when discussing the potential of mindful and emotional eating, and the implications for orthorexia. Third, Chase and Kluck (2022) recently validated the TOS, which provides a “healthy” version of measuring orthorexia, and can be more useful in the utility of scientific enquiries and clinical applications. Future research should utilise a wider array of scales to capture orthorexia.

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CONCLUSIONS

These results extend beyond the current literature, adding to the current knowledge of orthorexia and describing the nature and direction of the relationship with mindful eating components, as well as with happiness and emotional eating. Positive psychology could add to the protective factors against orthorexia and may provide insight into public health intervention and clinical treatments by adopting the findings and utilising them in future research.

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