

What makes dietary restraint problematic?

Development and validation of the Inflexible Eating Questionnaire

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Development of the Inflexible Eating Questionnaire

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Abstract

This study presents the Inflexible Eating Questionnaire (IEQ), which measures the inflexible adherence to subjective eating rules.

The scale's structure and psychometric properties were examined in distinct samples from the general population comprising both men and women.

IEQ presented an 11-item one-dimensional structure, revealed high internal consistency, construct and temporal stability, and discriminated eating psychopathology cases from non-cases. The IEQ presented significant associations with dietary restraint, eating psychopathology, body image inflexibility, general psychopathology symptoms, and decreased intuitive eating. IEQ was a significant moderator on the association between dietary restraint and eating psychopathology symptoms.

Findings suggested that the IEQ is a valid and useful instrument with potential implications for research on psychological inflexibility in disordered eating.

Keywords: Inflexible eating; psychological flexibility; eating psychopathology; psychometric properties; confirmatory factor analysis

Introduction

Dietary restraint can be defined as the intentional cognitive effort to restrict caloric intake with the aim of losing or maintaining weight (Herman & Mack, 1975; Herman & Polivy, 1980; Wadden, Brownell, & Foster, 2002). Consistent evidence has shown that these dieting behaviours and attempts to control or lose weight are highly prevalent, especially among women (Malinauskas, Raedeke, Aeby, Smith, & Dallas, 2006; Kruger, Galuska, Serdula, & Jones, 2004; Bish et al., 2005). Even though research in men is limited in comparison to women, there has been a growing interest in the study of body image problems and disordered eating in men (Dakanalis et al., 2015; Masuda et al., 2015; Orellana et al., 2016). In fact, both women and men face similar pressures in our current modern environment to control eating behaviour and to achieve specific body types (e.g., avoid fatness and pursuit a slender and fit body). However, in this environment there is an easy access to abundant and high caloric food. This may have consequences for one's ability to maintain healthy eating behaviours and weight (Polivy & Herman, 2006; Stubbs, Gail, Whybrow, & Gilbert, 2012).

Given the current epidemic rates of excess weight and obesity and its comorbidities (World Health Organization, 2014), the ability to reduce and control food intake may be an adaptive behaviour. Nonetheless, findings on the benefits of dietary restraint are mixed (for a review see Schaumberg, Anderson, Anderson, Reilly, & Gorrell, 2016). While there is research that relates successful dietary restraint with positive health outcomes (e.g., Avenell et al., 2004; Phelan et al., 2009), other authors suggest that dieting is not only ineffective, but can create greater problems (De Witt Huberts, Evers, & De Ridder, 2012). Research has shown that dietary restraint prospectively predicts increased risk for future weight gain (French, Perry, Leon, & Fulkerson, 1995; Mann et al., 2007; Mann & Ward., 2001; Neumark-

1 Sztainer et al., 2006) and obesity (Field et al., 2003; Klesges, Isbell, & Klesges, 1992; Stice,
2 Presnell, Shaw, & Rohde, 2005), with this association being stronger for women than for men
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4 (e.g., van Strien, Herman & Verheijden, 2014). Moreover, dietary restraint is an important
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6 risk factor for disordered eating (Fairburn, 2008; Stice, 2002; Stice, Marti, & Durant, 2011;
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8 Stice, Presnell, & Spangler, 2002). Etiological models of eating psychopathology, namely
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10 bulimic behaviours, suggest that dietary restraint may increase one's perceptions of
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12 deprivation and lead to counterregulatory eating, predicting the onset and development of
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14 these disorders (Stice, 2001; Fairburn, 2008). Thus, research leaves open the question of what
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16 in dietary restraint makes it a risk factor for difficulties in regulating eating behaviour and
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18 weight (De Witt Huberts et al., 2012; Mann & Ward., 2001).
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24 Dietary restraint seems to be a complex construct that involves distinct facets and that
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26 cannot be categorized as entirely beneficial or detrimental (Schaumberg et al., 2016).
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28 Westenhoefer (1991) proposed that dietary restraint involved two dimensions: i) rigid
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30 restraint, which is characterized by a dichotomous, rigid all-or-nothing mentality to eating;
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32 and ii) flexible restraint, which entails a more graduated flexible approach to eating, in which
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34 the individual limits the quantities of certain foods (instead of entirely excluding them) and
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36 eats them without feeling guilty. There is evidence that these two approaches to eating may
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38 have different outcomes. Rigid restraint is associated with disordered eating behaviours, such
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40 as binge eating, increased Body Mass Index (BMI) and weight management difficulties,
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42 whereas a flexible approach to eating is associated with better eating and weight-related
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44 outcomes (Westenhoefer, Stunkard & Pudel, 1999; Westenhoefer et al., 2013). Other studies
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46 show that the rigid adherence to restrictive eating rules is associated with increased concerns
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48 about eating and pathological dietary behaviours (Brown, Parman, Rudat, & Craighead,
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50 2012; Eiber, Mirabel-Sarron, & Urdapilleta, 2005; Mann & Ward, 2001). Studies also
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52 suggest that inflexible dietary restraint is associated with lower intuitive eating, that is the
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1 ability to recognize and respond to one's internal hunger and satiety cues to flexibly regulate
2 food intake (Tylka & Kroon Van Diest, 2013; Tylka, Calogero, & Daniélsdottir, 2015).
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5 It is plausible that dietary restraint may become problematic when associated with
6 psychological inflexibility (Hayes, 2004; Hayes, Strosahl, & Wilson, 2011; Lillis & Kendra,
7 2014). Psychological inflexibility involves the rigid dominance of cognitions and emotions
8 over one's values and contextual cues. Psychological inflexibility has been associated with
9 general psychopathology indicators (e.g., depression, anxiety and stress symptoms; Hayes et
10 al., 2006) and eating-related difficulties (Ferreira, Pinto-Gouveia, & Duarte, 2011; Hill,
11 Masuda, & Latzman, 2013; Masuda, Boone, & Timko, 2011; Merwin & Wilson, 2009;
12 Merwin et al., 2011; Sandoz, Wilson, Merwin, & Kellum, 2013). In particular, body image
13 inflexibility – the inflexible adherence to body image-related cognitions and rigid behavioural
14 patterns, which are disconnected from one's values – has been identified as a core dimension
15 of body image and eating-related difficulties (e.g., Sandoz et al., 2013). Despite the efforts
16 made to adapt psychological inflexibility measures to specific areas (e.g., body image in the
17 Body Image Acceptance and Action Questionnaire; BI-AAQ), a measure that specifically
18 addresses psychological inflexibility focused on eating behaviour remained inexistent.
19 Recently, Duarte, Pinto-Gouveia, Ferreira and Silva (2016) developed the Cognitive Fusion
20 Questionnaire - Food Craving, a measure that assesses the tendency to become fused with
21 cognitions about food and urges to eat. Nonetheless, none of the existing measures capture an
22 inflexible adherence to eating rules.
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There are several measures available to assess dietary restraint – such as the Restraint Scale (Herman & Polivy, 1980); the Dietary Intent Scale (Stice, 1998); the Dutch Restraint Eating Scale (van Strien, Frijters, van Staveren, Defares, & Deurenberg, 1986); the Restraint subscale of the Eating Disorder Examination (Fairburn & Beglin, 1994); and the Cognitive Restraint subscale of the Three Factor Eating Questionnaire (Stunkard & Messick, 1985),

1 which distinguishes flexible control and rigid control (Westenhoefer, 1991). Despite the fact
2 that these are widely used and validated measures, they are focused on the cognitive effort or
3 attempts to restraint caloric consumption, and not on the psychological process underlying
4 such attempts. Therefore, a new measure was developed to measure psychological
5 inflexibility focused on eating behaviour: the Inflexible Eating Questionnaire (IEQ).
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11 The IEQ aims at capturing psychological inflexibility focused on eating, involving the
12 inflexible adherence to eating rules, without meeting internal (e.g., hunger or satiety cues) or
13 external (e.g., certain social contexts) contingences, a sense of control when meeting such
14 rules and distress when perceiving failures in meeting such rules. Recent studies have shown
15 that this construct contributes to a wider understanding of the correlates of eating
16 psychopathology. In fact, research conducted with young women from the community
17 demonstrated that psychological inflexibility focused on eating, as measured by the IEQ, was
18 highly linked with other psychological processes that have been demonstrated as central for
19 psychological adjustment and disordered eating. Ferreira, Trindade and Martinho (2015)
20 demonstrated that body image and weight dissatisfaction and unfavorable social comparisons
21 significantly predicted women's levels of psychological inflexibility focused on eating,
22 mediated by the mechanism of body image inflexibility. Duarte, Ferreira, Trindade, and
23 Pinto-Gouveia (2015), in a sample of adolescent girls, found that psychological inflexibility
24 focused on eating was a significant predictor of eating psychopathology. Moreover,
25 preliminary evidence show that this scale presents good internal consistency and construct
26 validity, being significantly associated with increased BMI, general psychopathology and
27 eating psychopathology (Duarte, Ferreira, Trindade & Pinto-Gouveia, 2015). Thus, this
28 measure seems to be an important contribution for the assessment of forms of psychological
29 inflexibility relevant for the study of eating behaviours. Nonetheless, until now the factor
30 structure and psychometric properties of the IEQ were not systematically examined.
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1 The current study examined the factorial structure and psychometric properties of this
2 measure in a large sample of the general community. Research on the role of dietary restraint
3 and psychological inflexibility on disordered eating has focused mainly on female
4 populations, as women comprise a more vulnerable group for body image and eating
5 disturbances (Sandoz et al., 2013). Nonetheless, recent research show that these problems are
6 also relevant among men (e.g., Masuda, Hill, Tully, & García, 2015; Orellana et al., 2016).
7 Therefore, the IEQ factor structure was investigated in both men and women.
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10 The construct validity of the IEQ was examined through associations with measures
11 of dietary restraint (Stice, 1998; Fairburn & Beglin, 1994) and psychological flexibility
12 focused on the body image dimension (Sandoz et al., 2013). Moreover, we examined the
13 associations between IEQ and a measure of intuitive eating, which assesses the ability to
14 guide one's eating behaviours considering internal cues of hunger and satiety rather than
15 external cues or rigid rules (Tylka & Kroon Van Diest, 2013). We also examined the
16 associations between IEQ and general psychopathology and body mass index. Finally, this
17 study examined whether IEQ moderates the association between dietary restraint and eating
18 psychopathology. Research demonstrates that dietary restraint per se is not inherently
19 beneficial or detrimental. We hypothesize that the relationship between dietary restraint and
20 eating psychopathology is exacerbated by psychological inflexibility focused on eating
21 behaviour.
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51 **Method**

52 *Participants*

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58 *Sample 1.* IEQ was developed and analysed in a sample of 805 women from the community
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1 recruited in different institutions (e.g., schools, universities, hospitals, retail services).
2 Participants presented ages ranging from 18 to 51 ($M = 20.70$; $SD = 2.65$), and with a mean
3 of 13.15 ($SD = 1.63$) years of education. Participants presented a mean BMI of 21.66 ($SD =$
4 3.14), which corresponded to a ‘normal weight’ category. Of the 805 participants, a
5 subsample of 100 completed the IEQ a second time to test the scale stability. This subsample
6 included participants recruited at the institutions that approved a follow-up assessment. At the
7 first assessment these participants indicated a personal code to match the two surveys, and
8 after a 1-month period they completed the IEQ again.
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19 *Sample 2.* The scale structure and psychometric properties were further examined in a distinct
20 sample of 905 participants from the general community (402 men and 503 women), with ages
21 ranging from 18 to 50. The male participants presented a mean age of 24.73 ($SD = 7.61$), a
22 mean of 12.35 ($SD = 3.00$) years of education; the female participants mean age was 22.35
23 ($SD = 5.44$), and of 13.24 ($SD = 2.08$) years of education. The two groups presented a mean
24 BMI corresponding to ‘normal weight’, with men presenting a mean of 23.77 ($SD = 3.98$) and
25 the women presenting a mean BMI of 21.80 ($SD = 3.02$).
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39 *Measures*

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41 *Body Mass Index (BMI).* Participants’ BMI was calculated using the formula weight (kgs)
42 divided by height (m) squared.
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46 *Dietary Intent Scale (DIS; Stice, 1998).* The DIS is a 9-item measure developed to assess
47 dietary restraint aimed at weight loss or weight maintenance. Participants are asked to answer
48 to the scale according to the frequency with which they experience what is described in each
49 item, using a 5-point Likert scale ranging from ‘Never’ to ‘Always’. The DIS has high
50 internal consistency (presenting Cronbach’s alpha values ranging from .93 to .94; Stice,
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1998). In the current study the scale presented high internal consistency with a Cronbach's alpha estimate of .92 for both men and women.

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994; Portuguese version by Machado et al., 2014). The EDE-Q comprises 36 items and is a comprehensive measure of eating psychopathology. This measure includes four subscales: restraint, eating concern, weight concern and shape concern. Participants are asked to rate each item according to the frequency of occurrence (on a scale ranging from 'No days' to 'Every day'), or severity of symptoms (on a scale ranging from "Not at all" (0) "Markedly" (6) over the past 28 days. Higher scores indicate higher levels of eating psychopathology severity. This measure presents good psychometric properties in both clinical and community samples (Fairburn et al., 2008). In the current study, the EDE-Q restraint subscale presented adequate internal consistency for men (.74) and good internal consistency for women (.80). The total scale presented high internal consistency for both sexes (with Cronbach's alpha estimates of .90 for men and .94 for women).

Intuitive Eating Scale-2 (IES-2; Tylka & Kroon Van Diest, 2013; Portuguese version by (Duarte, Pinto-Gouveia, & Mendes, 2015, July). The IES-2 is a 23-item scale which measures intuitive eating, which refers to the awareness of internal hunger and satiety signals, the capacity to eat in response to internal physiological cues, instead of following rigid dietary or as a form of coping with emotional distress. Participants are asked to rate each statement selecting the option which best describes their attitudes and behaviours, using a 5-point Likert scale (ranging from 'Strongly disagree' to 'Strongly agree'. The scale presented good internal reliability both in the original study (.87; Tylka & Kroon Van Diest, 2013) and in the Portuguese version (.97; Duarte et al., 2015, July). In the current study, the IES-2 presented high internal consistency for both men and women (with Cronbach's alpha estimates of .85 and .87, respectively).

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Body Image Acceptance and Action Questionnaire (BI-AAQ; Sandoz et al., 2013); Portuguese version by Ferreira et al., 2011). The BI-AAQ is a 12-item scale which measures body image-related psychological flexibility. Respondents are asked to rate the extent to which they consider that each item applies to them, using a 7-points scale (ranging from ‘Never true’ to ‘Always true’). The scale presented high internal consistency in the original validation study (presenting Cronbach’s alpha values of .92 and .93 in different samples; Sandoz et al., 2013) and in the Portuguese validation (presenting a Cronbach’s alpha coefficient of .95; Ferreira et al., 2011). In the current study the scale presented high internal consistency with a Cronbach's alpha value of .92 for men and .94 for women.

Depression Anxiety and Stress Scales – 21 (DASS21; Lovibond & Lovibond, 1995; Pais-Ribeiro, Honrado, & Leal, 2004). This measure includes 21 items measuring symptoms of depression, anxiety and stress. Respondents are asked to indicate the frequency with which they experienced the symptoms over the past week, using a 4-point Likert scale (ranging from ‘Did not apply to me at all’ to ‘Applied to me very much or most of the time’). In the original study, the scale revealed high internal consistency, with the three subscales presenting Cronbach’s alpha values of .88, .82, and .90 (Lovibond & Lovibond, 1995), as well as in the Portuguese version, with values of .85, .74, and .81, respectively (Pais-Ribeiro et al., 2004). In the current study the Cronbach's alpha estimates were .92 for depression, .83 for anxiety and .89 for stress, for men, and .90, .85, and .89 for women, for each respective scale.

Procedures

This study sample included university students and participants from the community recruited within distinct labour sectors (e.g., schools, universities, hospitals, retail services). The Ethics Committees and Boards of the involved institutions approved the study. At times

1 scheduled by the institutions, the researchers presented the study, its aims and procedures to
2 the participants, emphasising the voluntary and confidential nature of their cooperation.
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4 Those willing to participate provided their written informed consent and filled the self-report
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6 questionnaires. Students filled the measures at the end of a designed lecture, and the
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8 participants from the community answered the measures at an authorized break.
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11 12 13 14 *Development of the measure* 15

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17 The IEQ was developed to measure the psychological inflexibility focused on eating,
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19 which involves the inflexible adherence to subjective eating rules, while avoiding or
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21 disregarding internal or external contingencies, a sense of control derived from
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23 accomplishing such rules, and the emotional distress when feeling that one has failed to do
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25 so. Based on an extensive review of the literature on the role of dietary restraint and eating
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27 rules on disordered eating behaviours, and clinical experience with eating disorders and
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29 obesity, the authors developed a pool of items. After reviewing and discussing the content of
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31 the items, the authors developed the initial version of the scale, which was then presented to
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33 and discussed with patients with body image and eating-related difficulties. The items were
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35 then revised and minor changes were made to the scale, which ended up comprising 25 items.
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41 The instructions of the measure invite respondents to rate the degree to which they agree with
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43 each statement, using a 5-point Likert scale (from ‘Fully disagree’ (1) to ‘Fully agree’ (5)).
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48 49 *Analytic Strategy* 50

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52 The factorial structure and internal reliability of the scale was initially tested in women
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54 from the general community (sample 1). The scale was first examined through an exploratory
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56 factor analysis (EFA) via principal components analysis (PCA). The scale's structure was
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58 confirmed through a parallel analysis (Horn, 1965). A conservative approach was adopted to
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1 reach a short measure that retained the items most representative of the construct, while
2 avoiding burdening the participants with a lengthy assessment protocol. The internal
3 reliability of the scale was assessed through Cronbach's alpha coefficients. A confirmatory
4 factor analysis (CFA) of the obtained structure was then conducted in a distinct sample from
5 the general community comprising both sexes (sample 2). The Maximum Likelihood
6 estimation method was used in the CFA. The model fit was confirmed through the following
7 indices: Chi-Square (χ^2), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and
8 Normed Fit Index (NFI), with values $\geq .95$ providing evidence for a very good fit (Bollen,
9 1986; Kline, 2005). We also considered the Root-Mean Square Error of Approximation
10 (RMSEA), with 90% confidence interval. Authors suggest that RMSEA values close to .06
11 (Hu & Bentler, 1999) indicate a well-fitting model, while less stringent proposals indicate
12 that values between .08 and .10 provides a mediocre fit (MacCallum, Browne, & Sugawara,
13 1996; Kline, 2013). An invariance testing analysis was conducted to test the model invariance
14 between men and women. Based on the recommendations by Cheung and Rensvold, 2002,
15 we analysed the changes in CFI; in comparing a more restricted model to a less restricted
16 model, changes greater than -.01 suggests the rejection of the null hypothesis of invariance.
17 The internal reliability of the scale was confirmed through the analysis of the Composite
18 Reliability (CR) and the Average Variance Extracted (AVE; Fornell & Larcker, 1981).

19 Descriptive statistics and sex differences were calculated in sample 2. The temporal
20 stability of the measure was assessed through Pearson product-moment correlations between
21 the scores obtained in the first and second administration of the IEQ (after a one-month
22 period) to 100 participants (comprising a convenience subsample derived from sample 1).
23 Differences on the IEQ score for participants with significant levels of eating
24 psychopathology and individuals with normative scores, was assessed through Student t-tests.
25 Participants with significant levels of eating psychopathology were identified in sample 1 and

1 sample 2 using the criterion EDE-Q scores ≥ 4 (Fairburn et al., 2008); the participants with
2 normative scores were randomly selected from the two samples matching for age, years of
3 education and BMI. Pearson product-moment correlations were calculated to examine the
4 IEQ relationships with other related measures (sample 2).
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9 To analyse how inflexible eating contributes to explain the negative effect that dietary
10 restraint may have on eating psychopathology, a moderator analysis was conducted (sample
11 2). The moderator effect of eating inflexibility on the association between dietary restraint
12 (independent variable) and eating psychopathology (dependent variable) was examined
13 through a hierarchical regression analysis. A standardized procedure was adopted, centering
14 the values of the two predictors. The interaction product of the predictors was obtained by
15 multiplying the two centered variables.
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26 The analyses were conducted using IBM SPSS Statistics 20 (Statistical Package for the
27 Social Sciences, Chicago, IL, USA) and AMOS (Analysis of Momentary Structure, software
28 version 18, SPSS Inc. Chicago, IL).
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36 **Results**

37 *IEQ factorial structure*

38 Preliminary analyses indicated no violation of the assumption of multivariate
39 normality (Kline, 2005). Results (sample 1) indicated the adequacy of the data to conduct the
40 analysis: the Kaiser Meyer-Olkin test value was .98, and the Bartlett's sphericity test was
41 significant ($\chi^2_{(55)} = 16759.28; p < .001$). The initial analysis indicated two factors, which
42 explained 56.64% and 4.85% of the variance, respectively. However, the analysis of the scree
43 plot suggested a one-dimension structure. A parallel analysis was conducted to confirm the
44 number of factors to retain and results revealed that one factor presented an eigenvalue that
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1 exceeded the 95th percentile of the eigenvalues that emerged from a random data matrix. A
2 new analysis was conducted forcing the structure to one factor and results indicated that this
3 solution accounted for 56.44% of the variance, and that all items presented high factorial
4 loadings (above .53).
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9 A selection of items was then conducted in order to reach a shorter measure. First,
10 two items (6. 'To me a correct dietary plan must have 'allowed' and 'totally forbidden foods'
11 and 9. 'I give up on activities that are important to me if they interfere in following my eating
12 plan (for example, having dinner with friends) were removed because they presented the
13 lowest communalities. Then, 11 items were retained given that they had high factorial
14 loadings, while presenting unique content relevant to the construct under analysis. This 11-
15 item scale resulted in an improvement of the amount of variance explained to 62.26%. The
16 items presented factorial loadings ranging from .73 to .82.
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29 This structure was then confirmed in CFA, which was conducted in a distinct sample
30 comprising both male and female participants (sample 2). It was expected that items that
31 contained similar wording (e.g., 'When I cannot follow (...)'; 'When I do not follow (...)';
32 'Not following (...)') would share method effects. The analysis of the modification indices
33 (MI) supported this assumption (items 7 and 10 MI = 127.09; 1 and 10 MI = 79.01; 1 and 2
34 MI = 69.04; 1 and 7 MI = 40.05; 6 and 7 MI = 82.05; 6 and 10 MI = 47.72). Taking into
35 account scholar's recommendations (Brown, 2006; Kline, 2005), the errors between these
36 items were estimated. The measure presented the following model fit indices: $\chi^2_{(38)} = 328.24$,
37 $p < .001$; CFI = .96; TLI = .94; NFI = .95; RMSEA = .09 [.08, .10]. Regarding local
38 adjustment, the items presented standardized regression weights ranging from .53 (item 10) to
39 .85 (item 4 and item 11). Furthermore, the items presented squared multiple correlations
40 ranging from .28 (item 10) to .72 (item 11), which confirmed the individual reliability of the
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Then, the 11-item model was analysed in women ($\chi^2_{(27)} = 242.47, p < .001; CFI = .92; TLI = .89; NFI = .91; RMSEA = .13 [.11, .14]$). Results indicated the correlation of the errors of the items 1 and 2 (MI = 35.85) and 1 and 10 (MI = 63.12). This resulted in an improvement of model fit ($\chi^2_{(25)} = 128.04, p < .001; CFI = .96; TLI = .94; NFI = .95; RMSEA = .09 [.08, .11]$). The model was then examined in men ($\chi^2_{(27)} = 258.42, p < .001; CFI = .91; TLI = .87; NFI = .90; RMSEA = .15 [.13, .16]$) and results indicated that the same pair of items had large MI (69.46 and 56.55, respectively). The correlation between the errors improved the model fit ($\chi^2_{(25)} = 117.03, p < .001; CFI = .96; TLI = .95; NFI = .95; RMSEA = .10 [.08, .11]$). The invariance testing analysis revealed that no differences between men and women were found in regard to factor weights ($\Delta CFI = -.001$; Cheung & Rensvold, 2002; Chen, Sousa & West, 2005). The model invariance was further supported in relation to the item's means ($\Delta CFI = -.004$). Results of these analyses are reported in Table 1.

Insert Table 1 about here

Validity and descriptive statistics of the IEQ

Descriptive statistics are reported in Table 2. Results indicated that the IEQ presented a very good internal reliability, with a Cronbach's alpha value of .90. Furthermore, the scale presented item-total correlations that ranged from .66 to .82, and the deletion of any item would not result in an improvement of the internal reliability of the measure (sample 1). The validity of the scale was further assessed through the CR and AVE (sample 2). The IEQ presented a CR of .96, which indicates very good construct reliability, and an AVE of .77, confirming the instrument convergent validity.

Regarding sex differences, results indicated that women ($M = 29.76, SD = 9.44$) presented significantly higher scores of inflexible eating than men ($M = 29.95, SD = 9.67$;

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$t_{(903)} = 4.40, p < .001$).

Measure stability

Results ($n = 100$) indicated a correlation of .84 ($p < .001$) between the first and second administration of the IEQ (four weeks between administrations).

Differences in IEQ scores in groups with high vs. normative eating psychopathology scores

Were compared cases with significant levels of eating psychopathology ($n = 47$), as established by the cut-off point of 4 in the EDE-Q, and cases with normative scores ($n = 66$), with similar demographic and weight characteristics ($t_{\text{age}(111)} = .16, p = .873$; $t_{\text{education}(111)} = 1.08, p = .289$, $t_{\text{BMI}(111)} = 2.01, p = .088$). Results indicated that the sample with high EDE-Q scores presented significantly higher levels of inflexible eating ($M = 41.55, SD = 7.11$), in comparison to the group with normative scores ($M = 37.44, SD = 7.88$; $t_{(111)} = 2.85, p = .005$).

IEQ association with other measures

In both men and women, the IEQ presented moderate to strong positive associations with dietary restraint as measured by the DIS and by the Restraint EDE-Q subscale. Furthermore, there was a positive strong association between the IEQ and the EDE-Q total score. On the contrary, the IEQ was negatively associated with intuitive eating (IES-2), with a moderate magnitude of association in men, and a strong association in women. Regarding psychological inflexibility related to body image, results showed moderate positive associations between the IEQ and BI-AAQ in both men and women. Furthermore, results indicated small positive associations between IEQ and depressive, anxiety and stress symptoms, for both men and women. Finally, regarding the relationship between IEQ and

1 BMI, no significant association was found for men, and a small significant correlation was
2 verified in women.
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12 *The moderator effect of inflexibility eating on the association between restraint and eating*
13 *psychopathology*
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17 DIS was entered as a predictor on the first step of the regression analysis, IEQ was
18 entered on the second step, and the interaction between the two was entered in the third step
19 (Table 3). In men, both predictors produced statistically significant models. In the final step
20 the R^2 increased to .58 and the interaction between the predictors was significant, indicating
21 the moderator effect of IEQ on the association between DIS and EDE-Q. In women, the two
22 predictors also produced statistically significant models. Findings revealed that there was a
23 significant increase in R^2 in the final step (.60) and that the interaction between the two
24 predictors was significant, also confirming the hypothesised moderator effect. The graphic
25 representation of these moderation analyses (Figure 1) considered three levels of IEQ: low
26 (one *SD* below the mean), medium (mean) and high (one *SD* above the mean). The visual
27 inspection of the graphics indicates that inflexible eating has an exacerbation effect on the
28 association between dietary restraint and eating psychopathology: in individuals with the
29 same levels of dietary restraint, those who present a higher psychological inflexibility with
30 eating present greater levels of eating psychopathology.
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Discussion

The current study examined the IEQ, a new measure assessing the inflexible adherence to idiosyncratic eating rules with an inability to contact and accept present moment eating-related internal and contextual cues, which may hinder one's ability to act adaptively according to one's values. Results demonstrated that the IEQ presents a one-dimensional structure, with 11 items. This structure was further examined in a distinct sample that comprised men and women, and the results confirmed the suitability of the identified structure. Overall, the analysis of the model fit indices indicated a good model fit. The RMSEA values suggested that the poor-fit hypothesis could not be rejected, but scholars propose that this statistic's performance may be influenced by model specifications and degrees of freedom, potentially biasing model fit interpretation (Chen, Curran, Bollen, Kirby, & Paxton, 2008; Kline, 2013). Thus, even though the adequacy of the model was supported by the other selected fit indices, incoming studies are needed to corroborate the current findings.

Results also suggested that the measure can be used in samples comprising both men and women. Even though research on dietary restraint and psychological inflexibility focused on body image has been focusing mainly on women, there is evidence that these dimensions may also be problematic for men (e.g., Masuda et al., 2015; Orellana et al., 2016). Therefore, the development and testing of this new measure of eating-related psychological inflexibility in both women and men, may allow for future research on the mechanisms underlying body image, eating and weight-related problems, in both sexes.

This scale also presented good psychometric properties, including high internal consistency and temporal stability. These results indicate that this scale measures a relatively stable construct. Results also revealed that participants with EDE-Q scores representative of

1 clinically significant eating psychopathology presented significantly higher scores of
2 psychological inflexibility focused on eating than participants with normative EDE-Q scores,
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4 which points out to the potential pathogenic effect of this dimension on eating behaviours.
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7 The associations between the IEQ and other measures assessing dietary restraint
8 supported the measure's convergent validity. Results indicated that the IEQ and dietary
9 restraint, as measured by the DIS and the EDE-Q restraint subscale, were positively
10 associated. Nonetheless, the strength of the associations suggests that the IEQ and these
11 measures of dietary restraint assess a related but distinct construct. The IEQ seems to
12 measure a dimension conceptually distinct from attempts to restraint eating (which is the
13 focus of the existent dietary restraint measures), that may contribute to understand the mixed
14 findings on the effects of dietary restraint on eating and weight-indicators (Schaumberg et al.,
15 2016), by clarifying the psychological processes that may potentially cause dietary restraint
16 to be problematic.
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31 Results showed a strong correlation between psychological inflexibility focused on
32 eating and EDE-Q global scores, which is in line with prior research suggesting that
33 psychological inflexibility is a key process operating in eating psychopathology (Ferreira et
34 al., 2011; Hill et al., 2013; Sandoz et al., 2013). Results also indicated that inflexible eating
35 and inflexibility focused on body image were significantly and moderately linked. On the
36 contrary, inflexible eating was negatively associated with intuitive eating, that is, the ability
37 to recognize and use one's internal physiological cues to guide one's eating behaviours
38 (Tylka & Kroon Van Diest, 2013). This was an expected result since inflexible eating
39 involves a disconnection from contextual cues and the rigid adherence to eating rules, despite
40 its possible deleterious consequences. Results also provided evidence for IEQ's divergent
41 validity, given that IEQ was positively albeit weakly associated with self-reported symptoms
42 of depression, anxiety and stress. The associations between IEQ and the other study's
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measures presented the same directions and similar magnitudes for both women and men.

This suggests that IEQ may be a particularly useful measure to examine the role of psychological inflexibility focused on eating on body image and eating-related aspects, in both sexes.

The moderator analysis of inflexible eating on the association between dietary restraint and eating psychopathology indicated that inflexible eating moderates this association. Results were similar among women and men, suggesting that psychological inflexibility related to eating exacerbates the association between dietary restraint and eating psychopathology in both men and women. In fact, findings indicated that in individuals with the same levels of dietary restraint those who present greater psychological inflexibility in relation to eating are those who present higher eating psychopathology. This contributes to clarify the complex relationship between dietary restraint and eating psychopathology (Schaumberg et al., 2016). It seems that dietary restraint may become problematic, for both women and men, when individuals adhere to inflexible dietary rules that are rigidly followed while ignoring other sources of eating regulation. These findings may have clinical implications as in certain contexts (e.g., obesity management) the implementation of dietary rules and self-monitoring are advised and/or necessary. These weight management strategies should however be associated with the promotion of psychological flexibility to prevent the development of disordered eating and instead promote healthy eating behaviours (e.g., Lillis & Kendra, 2014). Although these findings require further examination (e.g., in eating disorder samples, individuals with obesity) they point out to the relevance of considering psychological inflexibility when addressing the potential negative effect of dietary restraint on eating behaviour.

This study has potential implications for future research and treatment approaches in medical and psychological contexts. The IEQ may be particularly useful for the development

1 and testing of eating psychopathology conceptualization models. Current approaches to
2 eating psychopathology suggest that body image and eating-related difficulties are at their
3 core problems of psychological inflexibility (Sandoz et al., 2013; Lillis & Kendra, 2014). The
4 IEQ allows for a brief assessment of psychological inflexibility related to eating behaviour,
5 complementing extant measures of psychological inflexibility in relation to body image. The
6 use of a measure that captures the tendency to inflexibly adhere to idiosyncratic eating rules
7 while disregarding and contextual and internal cues, may expand future research investigating
8 the mediating mechanisms operating on the relationship between dietary restraint and eating
9 psychopathology, emotional distress and ill-being. Moreover, the assessment of
10 psychological inflexibility in relation to eating may be particularly useful in clinical contexts
11 in which dietary restrictions may be beneficial and necessary (e.g., weight management
12 contexts; medical conditions, such as diabetes). In particular, IEQ may be included in
13 assessment protocols of interventions that promote the cultivation of psychological
14 flexibility, namely a flexible approach to eating attitudes and behaviours (e.g., Acceptance
15 and Commitment Therapy; Hayes, 2004; Hayes et al., 2011; Lillis & Kendra, 2014).

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These findings should be considered taking into account some limitations. IEQ focuses on the individual's tendency to become fused with personal eating rules and by experiential avoidance around such rules. Even though this measure may be particularly useful to understand how these processes may impact eating behaviour and psychological adjustment, IEQ does not specifically assess interference with valued living. Future research could consider whether the scale can be further developed to address this aspect. Although the present study supports the validity of the IEQ in a Portuguese population, this was the first study examining the structure of this new measure. Future investigations should be conducted to test the adequacy of the IEQ in other samples and languages. Also, an important limitation of the current study was that it did not include other measures of inflexible control

1 over eating (e.g., Westenhoefer, 1991). Incoming research should expand current data by
2 analyzing how psychological inflexibility focused on eating interacts with and complements
3 other existent measures of rigid control over eating on the understanding of disordered eating
4 symptoms. Moreover, future studies should explore the utility of the IEQ to assess patients
5 with body image and eating-related problems (eating disorders or obesity). Our findings
6 showed that cases with significant levels of eating psychopathology present significantly
7 higher scores on the IEQ, in comparison to participants with normative scores. This indicates
8 that this instrument may be potentially useful in clinical settings, namely for supporting
9 diagnoses and for the assessment of therapeutic changes in eating disorders and weight
10 management treatments.
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24 The IEQ was found to be a reliable and useful instrument to address a dimension that
25 remains little explored, the inflexible adherence to personal eating rules, with an inability to
26 attend to internal and contextual cues. This measure has potential utility to expand current
27 conceptualization models of eating-related problems, in both men and women. The IEQ may
28 be useful for research aimed at understanding the complex relationship between dietary
29 restraint, difficulties in regulating eating behaviour and psychological adjustment. This
30 measure may also be an important resource to clinicians to assess individuals' degree of
31 psychological inflexibility related to eating. The IEQ may also be included in assessment
32 protocols to test the efficacy of treatment and preventive programmes that promote
33 psychological flexibility in the context of eating and/or weight regulation.
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Table 1.

Items' means (*M*), standard deviations (*SD*), factorial loadings (λ) and communalities (h^2) of the EFA ($N = 805$); and standardized regression weights (*SRW*) and squared multiple correlations (*SMC*) of the CFA ($N = 905$).

Items	<i>M</i>	<i>SD</i>	λ	h^2	<i>SRW</i>	<i>SMC</i>
1. My eating plan must be followed rigorously.	2.54	1.07	.75	.56		
2. When I cannot follow my eating plan I feel very anxious (or nervous).	2.19	1.04	.79	.63	.62	.38
3. When I define an eating plan I have to follow it regardless of the circumstances (for example, even on festivities like Christmas).	2.14	1.01	.70	.48		
4. I feel I am more competent (for example in work/school) when I can follow a rigorous eating plan.	2.56	1.15	.73	.53		
5. When I do not follow one of my eating rules, then I make an effort to compensate it by following my rules even more strictly.	2.51	1.14	.80	.62	.74	.55
7. When I eating without any guidance (that is, according to my will) I feel like a person with no control.	2.20	1.08	.74	.55		
8. I feel confident when I rigorously follow my eating plan.	3.00	1.8	.74	.54		
10. I feel anxious when I do not follow my eating rules, even when I know that it won't have negative consequences (for example, for my health or weight).	2.03	0.98	.79	.63		
11. I feel I have more worth (or I am a better person) when I control my eating pattern.	2.80	1.19	.75	.56		
12. For me, having a balanced eating pattern requires strictly following certain rules.	2.73	1.12	.78	.61	.77	.60
13. Having well defined eating rules makes me feel organized/in control.	2.88	1.15	.80	.64	.85	.71
14. I rather follow my eating rules than to eat without any guidance or according to my appetite or will.	2.32	1.16	.77	.60	.79	.63
15. If I am in a situation where I cannot follow my eating pattern, I feel 'lost' (confused).	2.01	0.96	.77	.59		
16. If I notice any change in my weight (even a small one), following my diet becomes a priority for me.	2.18	1.05	.82	.67	.72	.51
17. There are foods I avoid eating no matter what the circumstances are.	2.43	1.18	.63	.40		
18. I get worried when I do not follow my eating rules, even if it only happens occasionally.	2.17	1.03	.82	.67	.73	.53
19. Even if I feel satisfied with my weight, I do not allow myself to ease my eating rules.	2.98	1.20	.75	.56	.71	.50
20. I feel proud when I can rigidly follow certain eating rules.	2.02	1.01	.80	.64	.82	.66
21. I diet is only effective if it is followed rigorously.	2.82	1.12	.66	.44		
22. I feel frustrated every time I fail to follow my eating pattern.	2.30	1.09	.84	.71		
23. Not following my eating rules makes me feel inferior.	2.58	1.13	.82	.53	.53	.28
24. To manage my eating through rules gives me a sense of control.	2.19	1.04	.82	.67	.85	.72
25. Rigorously following my eating plan is one of the most important things to me.	2.09	1.05	.79	.63		

Note: Items in bold comprise the final 11-item measure.

Table 2.

IEQ correlations with other measures(N = 905)

		DIS	EDE-Q	EDEQ	IES-2	BI- Restraint	DEP	ANX	STR	BMI
						AAQ				
IEQ	Women	.68***	.53***	.62***	-.54***	.64***	.25***	.24***	.24***	.24***
	Men	.54***	.41***	.51***	-.28***	.55***	.21***	.23***	.27***	.20***

IEQ = Inflexible Eating Questionnaire; DIS = Dietary Intent Scale; EDE-Q = Eating Disorder Examination Questionnaire; BI-AAQ = Body Image Acceptance and Action Questionnaire; DEP = Depression; ANX = Anxiety; STR = Stress; BMI = Body Mass Index.

*** $p < .001$

Table 3.

Regression analyses testing the moderator effect IEQ on the relationship between DIS and EDE-Q in men and women (in bold).

Model	Predictors	β	t	p	R^2	F	p
Step 1					.55	175.13	<.001
					.55	998.40	<.001
	DIS	.74	13.23	<.001			
		.74	31.60	<.001			
Step 2					.56	5.54	.020
					.58	50.15	<.001
	DIS	.66	9.94	<.001			
		.60	19.16	<.001			
	IEQ	.16	2.36	.020			
		.22	7.08	<.001			
Step 3					.58	4.05	.046
					.60	20.11	<.001
	DIS	.53	13.17	<.001			
		.52	15.37	<.001			
	IEQ	.20	2.88	.005			
		.26	8.32	<.001			
	DIS X IEQ	.15	2.01	.046			
		.13	5.40	<.001			

Note: IEQ = Inflexible Eating Questionnaire; DIS = Dietary Intent Scale; EDE-Q = Eating Disorder Examination Questionnaire

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Figure 1. Moderator analysis of the moderator effect of inflexible eating (IEQ on the association between dietary restraint (DIS) and eating psychopathology (EDE-Q) in men (on the left) and women (on the right).

Figure(s)
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