Alma Mater Studiorum – Università di Bologna

DOTTORATO DI RICERCA IN

SCIENZE PSICOLOGICHE

Ciclo XXVII

Settore Concorsuale di afferenza**:** 11/E4 PSICOLOGIA CLINICA E DINAMICA

Settore Scientifico disciplinare**:** M-PSI/08 PSICOLOGIA CLINICA

TITOLO TESI

The relationship between eating behavior and psychological distress among overweight and obese people: is there a role for *mindfulness*?

Presentata da: CECILIA CLEMENTI

Coordinatore Dottorato **Relatore**

Prof. MAURIZIO CODISPOTI **Prof.ssa PAOLA GREMIGNI**

Esame finale anno 2015

INDEX

The relationship between eating behavior and psychological distress among overweight and obese people: is there a role for *mindfulness*?

DEDICATION

To my Mentor of Life, Daisaku Ikeda

and to our dream of the Soka University of Europe

"Ultimately, happiness rests

on how we establish

a solid sense of self or being . .

Happiness does not lie

in outward appearances nor in vanity.

It is a matter of what you feel inside,

it is a deep resonance in our lives"

(Daisaku Ikeda)

"*Life at each moment encompasses the body and mind and the self and environment of all sentient beings in the Ten Worlds as well as all insentient beings in the three thousand realms, including plants, sky, earth, and even the minutest particles of dust. Life at each moment permeates the entire realm of phenomena.*

and is revealed in all phenomena (…).

A mind now clouded by the illusions of the innate darkness of life

is like a tarnished mirror, but when polished, it is sure to become like a clear mirror,

reflecting the essential nature of phenomena and the true aspect of reality."

(Nichiren Daishonin, *On attaining Buddhahood in this lifetime*).

AKNOWLGEMENTS

I would like to thank my Mentor in research, Prof. Paola Gremigni who welcame me, encouraged and supported me during the research work.

Moreover I want to thank all the people who participated at this research for their contribute.

A special thanks goes to my lovely husband, Wolfango, for his support, understanding, encouragement and help, to my dear parents and the little Mimì.

ABSTRACT

Introduction

Obesity is a multifactorial condition, caused by a complex interaction between biological, social and psychological factors (Heitmann et al., 2012; Sarwer, Dilks, & West-Smith, 2011). The relationship between obesity and psychological distress is still not clear: some studies highlighted a strong relationship (e.g. Gonzaòez & Balle, 2012), whereas others reported only a weak or no relationship at all (e.g. Fabricatore & Wadden, 2004). This differences across studies depend on methodological aspects, assessment tools, and also the kind of population investigated. Risk factors, such as sociodemographic variables and the presence of dysfunctional eating behaviours, might influence the psychopathological level (Van de Merwe, 2007).

Not only binge eating disorder (BED) and Night Eating Syndrome (NES), but also other common subclinical overeating behaviours, such as snacking, grazing, might reduce psychological well-being (Gremigni & Letizia, 2011), seem to increase the psychological distress in obese people (Fandino et al, 2010).

Most of the obesity treatments resulted to be ineffective, particularly those based on restrictive diets, which do not effect on a long term weight loss and can contribute to an higher psychological distress (Schaefer & Magnuson, 2014).

However, interventions based on mindful eating, a not-judgemental awareness of physical and emotional sensations related to the experience of eating (Framson et al., 2009), such as MB-EAT (Kristeller & Wolever, 2011), seem to be effective in reducing dysfunctional eating behaviours and in promoting physical and psychological well-being (O'Reilly et al., 2014). Effective and validated assessment tools are essential to investigate the construct of mindfulness and mindful eating.

Further research need to better explore these constructs in relation to others (i.e. psychological distress, overeating behaviours, body dissatisfaction, and quality of life). Although the study of the role of mindfulness as a mediator and moderator between different predictors and outcome is at onset stage (e.g., Masuda et al., 2010; Saavedra et al., 2010), research should investigate a possible

role of mindfulness and particularly mindful eating as mediator or moderator in the relationship between eating behaviours and psychological distress, body dissatisfaction and quality of life.

The present research is composed by three different and indipendnt studies with different objectives and hypothesis.

STUDY 1

Objectives: To investigate: 1) e 2) the relationship between BMI, binge eating and psychological distress and between BMI (as a continuous variable), common subclinical overeating behaviours and psychological distress; 3) the association between overeating and psychological distress in normoweight, overweight and obese.

Methods: 691 subjects (69.6% female, mean aged 39.26±15 years) divided in normoweight (43.99%), overweight (39.06) and obese (17.94%) according to BMI criteria (WHO, 1998) were assessed by BES (binge eating) and SCL-90R (psychological distress) and only in a indipendent sample of 191 subjects common overeating behaviours were assessed by EBQ. ANCOVA and multiple linear regression were used for statistical analysis.

Results: BMI was not associated with psychological distress, whereas binge eating increases the psychopathological level. BMI and male gender represent negative predictors of psychological distress, but certain types of overeating (i.e., NES/grazing, overeating during or out of meals, and guilt/restraint) result as positive predictors of psychological distress.

Conclusions: Overeating behaviours represent the major risk factor for psychological distress, whereas BMI seems to be a protective factor.

STUDY 2

Objectives: To improve the psychometric properties of the Mindful Eating Questionnaire (MEQ) (Framson et al., 2009) by assessing item dimensionality, test-retest reliability, and criterion validity in Italy, a different culture and language from the original study.

Methods: A total of 1067 participants (61.4% female, mean aged 34 years) were recruited in different centers (mindfulness, yoga, and weight-loss) and among the Italian general population. Main outcomes measures were mindful-eating measured by MEQ, mindfulness, measured by Freiburg Mindfulness Inventory (FMI), socio-demographic and behavioral characteristics (i.e., BMI, meditation, exercise, and diet). Structural validity of MEQ was tested by explorative and confirmatory factor analysis, criterion validity was assessed by correlation with FMI and ANOVA between subgroups, test-retest reliability was calculated in an independent sample of 60 subjects at a four-week interval.

Results: The Italian MEQ resulted in a 26-item 4-factor model measuring Disinhibition, Awareness, Distraction, and Emotional response. Internal consistency (Cronbach's alpha range 0.60-0.82 for each factor) and test-retest reliability for the MEQ total score and subscales were acceptable (ICCs range 0.72-0.85; 95% CI: 0.60-0.91). MEQ correlated positively with FMI (r = 0.10-0.37) and its scales were associated with gender, age and education. Meditators compared to non-meditators showed higher ME; yoga-type activities were associated with higher level of ME compared to aerobic exercise. Intensity of exercise was not related to MEQ scores and BMI was inversely associated with all MEQ scales. Being on a diet plan was inversely related to Disinhibition and Emotional response scales.

Conclusions: This study contributes to the empirical validation of the concept of mindful eating, supporting the use of the MEQ in clinical settings and outcome research.

STUDY 3

Objectives . 1) and 2) to explore the relationship between mindfulness and mindful eating and other constructs (binge eating, emotional overeating, psychological distress, body dissatisfaction, and quality of life) and possible differences between normal weight, overweight and obesity. 3) To investigate the role of mindfulness as a mediator and mindful eating as a moderator in the

relationship between binge eating or emotional overeating and psychological distress, body dissatisfaction, and quality of life.

Methods: 502 subjects (68.8% female, mean aged 39.42 years) grouped in normal weight (53%), overweight (23%) and obese (21.9%) were assessed by BES (binge eating), EOQ (emotional overeating), SCL-90-R (psychological distress), FMI (mindfulness), MEQ (mindful eating), BIAQ (body dissatisfaction), WHO-5 (quality of life). MANOVA, multiple regressions and mediation and moderation models were used in the statistical analysis.

Results: MEQ and FMI negatively correlated with BES, EOQ, SCL-90-R, and BIAQ. Binge eating and body dissatisfaction were positively associated with BMI and negatively with psychological distress. Obese people showed lower level of mindful eating and higher levels of binge eating, emotional overeating, and body dissatisfaction, compared to the other groups.

Mindfulness partially mediates the relationship between a) binge eating and psychological distress, b) emotional overeating and psychological distress, c) binge eating and quality of life, d) emotional overeating and quality of life. Mindful eating was a moderator only in the relationship between emotional overeating and body dissatisfaction.

Conclusions: Mindfulness and mindful eating based interventions could have promising effects in the obesity treatment: by targeting dysfunctional overeating behaviours they might indirectly increase psychological well-being. Future studies are needed to better clarify these findings, given the lack of similar researches.

Keywords: Obesity, BMI, eating behavior, psychological distress, Mindfulness, Mindful eating, MEQ.

Theorical part

Chapthers 1, 2 & 3

Statement of the Problem and Literature Review

Chapter 1

Obesity, overeating behaviours and psycgological distress

1.1. Defining overweight and obesity

Obesity is a chronic condition that results in an accumulation of adipose tissue, whether due to increased caloric intake and/or a decreased expenditure of calories, which results from a physiological energy imbalance (WHO, 1998). Obesity is defined as a body mass index (BMI) of 30 kg/m2 or greater, and it is classified into Class I, Class II, and Class III, depending on increasing levels of BMI. Overweight is defined as having a BMI between 25 kg/m2 and 29.9 kg/m^2 (Pi-Sunnier, 1998). Obesity is also classified according to the location of fat: in the android type the prevalence of fat is in the abdomen area, whereas a greater amount of gluteal fat corresponds to the ganoid type. The waist-to-hip ratio is the index to discriminate which pattern is prevalent (Bray, 1992).

The prevalence of overweight and obesity has increased exponentially during the past 30 years all around the world and now it is considered “a global pandemic” (Swinburn et al., 2011, p. 894).

The World Health Organization (WHO, 2014) globally estimates that more than 1.4 billion adults, 20 years and older, are overweight. Among them, over 200 million men and nearly 300 million women are obese. Overall, more than 10% of the world’s adult population is obese and in 2013, 42 million children under the age of 5 were overweight or obese.

In Italy, the ISTAT’s report (2013) estimated that in 2012 more than 1/3 of the adult population was overweight (35,6%) and 1/10 was obese (10.4%).

Obesity and overweight increase the risk of several serious chronic diseases, such as type 2 diabetes, cardiovascular diseases, hypertension and stroke, hypercholesterolemia, hypertriglyceridemia, arthritis, asthma, and certain forms of cancer (WHO, 2005; Mokdad et al., 2003). Furthermore, obesity can lead to increased mortality rates and less life expectancy in the

future (Finkelstein et al., 2012). According to the WHO (2014), at least 2.8 million people die each year as a result of being overweight or obese. The adverse effects of obesity are not only medical as overweight individuals' increased need for medical care creates significant economic and financial burdens, both to the individual and the society. Moreover, negative attitudes toward obesity are prevalent in the society at large, and stigmatization and isolation contribute to a poor quality of life in obese people (Ogden & Clementi, 2010; Puhl & Heuer, 2009).

Obesity is a multifactorial condition: genetic, physiological, environmental, psychosocial, cultural and cognitive factors all contribute to its etiology in a complex way (Heitmann et al., 2012; Sarwer, Dilks & West-Smith, 2011). As a consequence, there are different kinds of obesity, two largest categories being represented by regulatory and metabolic obesity (Bouchard, Pe´russe, Rice, & Rao, 2004).

Researchers suggest that many factors might affect metabolism (i.e. age, sex, genetics, neuroendocrine factors, sarcopenia, metabolically active fat, and medications prior weight loss), energy intake (i.e. socio-cultural factors, mindless eating, physical hunger, emotional eating and mental health) and activity (i.e. socio-cultural factors, physical and emotional barriers) (Sharma & Padwal, 2010). Therefore, a global assessment approach of obesity is recommended, where biomedical, iatrogenic, socio-cultural, and psychological factors that potentially influence energy intake, metabolism and expenditure are taken into consideration (Sharma & Padwal, 2010).

1.2 Obesity and psychological distress

The relationship between obesity and psychological or mental health had been largely investigated in the last three decades, and several reviews and meta-analyses have focused on different aspects of it. Between those aspects, the main cover the association between obesity and mental disorders, such as mood disorders (McElroy, Kotwal, Malhotra, Nelson, Keck, & Nemeroff, 2002), depression (Luppino et al., 2010; Atlantis & Baker, 2008; Markowitz et al., 2008; de Zwaan, 2001), anxiety (Gariepy, Nitka, & Schmitz, 2010; Lykouras & Michpoulos,

2011), binge eating (de Zwann, 2001), personality (Gerlach, Herpez, & Loeber, 2015), psychopathological comorbidities (Balle & Gonzalez, 2012), or investigate the psychological profile of the morbidly obese (van Hout, van Oudheusden, & van Heck, 2004). In addition, a non-systematic overview focused comprehensively on various psychological aspects of obesity (Fabricatore & Wadden, 2004).

Taken together, results of previous reviews suggest a rather contradictory nature of the relationship between obesity and mental health. In fact, certain psychological disorders (e.g. depression, anxiety, mood disorders, personality disorders, or substance abuse) are either strongly associated (Gerbach et al., 2015; Balle & Gonzalez, 2012; Luppino et al., 2010; van Hout et al., 2004; Mc Elroy et al., 2002; de Zwann, 2001) or weakly associated (Gariepy, Nitka, & Schmitz, 2010; Atlantis & Baker, 2008) and even unrelated to obesity (Fabricatore & Wadden, 2004).

1.2.1 ***Cross-sectional studies***

A large amount of studies has a cross-sectional design and the association between obesity and mental health seems also to vary according to the type of population studied.

Most cross-sectional studies from the general population found a significant association between obesity and psychological distress, particularly mood disorders (i.e., major depression, dystonia, bipolar disorders) and anxiety disorders, in terms of lifetime, past and current symptoms (Zhao et al., 2012; Reynoso, Alegría, Chen, Laderman, & Roberts, 2011; de Wit, van Straten, van Herten, Penninx, & Cuijpers, 2009; Zaho Ford, Dhingra, Strine, & Mokdad, 2009a; Zhao, Ford, Li, Strine, Dhingra, Berry, & Mokdad, 2009b; Mather, Cox, Enns, & Sareen, 2009; Perry, Barry, Pietrzak, & Wagner, 2008; Barry, Clarke, & Petry, 2008; Buffaerts et al., 2008; Baumeisteir & Harter, 2007; Pikering, Grant, Chou, & Compton, 2007; Heo, Pietrobelli, Fontaine, Sirey, & Faith, 2006; Simon et al., 2006; Chiadi et al., 2003; Becker, Margraf, Turke, Soeder, & Neumer, 2001; Carpenter, Hasin, Allison, & Faith, 2000; Roberts, Kaplan, Shema, & Strawbridge, 2000). This

association persisted even after adjusting for demographics, obesity related conditions and lifestyles (Reynoso et al., 2011; Zaho et al., 2009a; Zaho et al., 2009b; Berry et al., 2008).

Modest associations of obesity with depression and anxiety were found by Scott et al. (2008) in pooled data across 13 worldwide countries. Other studies reported an association between obesity and suicide ideation or attempt (Carpenter et al., 2000; Mather et al., 2009; Zaho et al., 2012).

In contrast, Goldney and colleagues (Goldney, Dunn, Air, Dal Grande & Taylor, 2009) found that high body mass index (BMI) was not necessarily associated with major depression, psychological distress, or suicidal ideation and it even seemed to be protective for obese and morbid obese people in terms of mental health. Other studies also found no association between overweight/obesity and mental health (Hach, Ruhl, Klose, Klotsche, Kirch, & Jacobi, 2006; John, Meyer, Rumpf, & Hapke, 2005), using standardized clinical assessment based on DSM-IV criteria and adjusting for many confounding variables.

In addition to mood and anxiety disorders, the presence of personality disorders has been observed in the obse; particularly, antisocial or avoidant (Pickering et al., 2007) and schizoid, paranoid, and obsessive-compulsive personality disorders (Perry et al., 2008).

Finally, the relationship between obesity and substance use in the general population appeared controversial, since obesity was associated with lower risk for substance use in some studies (Reynoso et al., 2011; Mather et al., 2009; Pickering et al., 2007; Simon et al., 2006; Hatch et al., 2006; John et al., 2005), but not in others (Becker et al., 2001; Perry et al., 2008).

Several cross-sectional studies have been conducted in clinical settings involving patients seeking treatment for obesity. Some of these studies showed a strong association of obesity with mood and anxiety disorders (Martinelli, McElroy, Kotwal, Stanford, & Keck Jr, 2010; Carpiniello et al., 2009; Colles, Dixon, & O'Brien, 2007; Guerdjikova, McElroy, Kotwal, Stanford, & Keck Jr, 2007; Tuthill, Slawik, O'Rahilly, & Finer, 2006), low self-esteem and negative body-image

evaluation (Friedman, Reichmann, Costanzo, & Musante, 2003), personality disorders (Martinelli et al., 2010; Carpiniello et al., 2009; Tuthill et al., 2006), and eating disorders (Folope, Chapelle, Grigioni, Coëffier, & Déchelotte, 2012; Martinelli et al., 2010; Marzocchi, Moscatiello, Villanova, Suppini, & Marchesini, 2008; Guerdjikova et al., 2007; Colles et al., 2007).

Conversely, Zimmerman et al. (2011) did not observe any difference between obese and non-obese psychiatric patients as regards major depressive disorder, although small differences were found in the operating characteristics of some symptoms.

Certain risk factors appeared to increase the likelihood of psychopathology in obese persons. A review by Van de Merwe (2007) summarized the principal risk factors for psychological distress in obesity: 1) demographics, such as gender and age (with problems occurring in young women), the degree of obesity and childhood onset of it, Hispanic ethnicity and lower socio-economic class; 2) eating dietary behaviors, such as dieting and restraint eating, weight cycling, binge eating, and high level of disinhibition with feeling of constant hunger; 3) social and environmental risk factors such as societal pressure to be thin, long history of stigmatization related to weight, discrimination and negative reaction from family and peers, and poor interpersonal relationship contributing to body dissatisfaction and low self-esteem.

Some studies (Reynoso et al., 2011; Heo et al., 2006; Simon et al., 2006) found that the association between obesity and mood and anxiety disorders was strongest in certain racial/ethnic groups (e.g., non-Hispanic whites and college graduates; non-Latino whites, Latinos, Asians, and African-Americans). Baumeisteir et al. (2007) reported that gender, marital status and comorbid musculoskeletal diseases were correlated to an increased risk for mental disorders in obese individuals. Other studies showed that overweight/obese females were at greater risk for serious psychological problems or psychopathology (Zaho et al2012; 2009a; 2009b; Mather et al., 2009; Berry et al., 2008; Pickering et al., 2007; Heo et al., 2006; Becker et al., 2001; Carpenter et al., 2000).

Alongside socio-demographic characteristics, disordered eating behaviors, particularly BED an NES, and body concern were found to be associated with psychological disorders (Jones-Corneille et al., 2012; Fandiño et al., 2010; Ramacciotti, Coli, Bondi, Massimetti, & Dell'Osso, 2008; Colles et al., 2007; Darby, Hay, Mond, Rodgers, & Owen, 2007; Petroni et al., 2007;Fassino, Leombruni, Pierò, Abbate-Daga, & Rovera , 2003). For example, Fandiño et al. (2010) found that obese women with BED presented significant higher level of psychopathology compared to non–BED obese. Particularly, obsessive-compulsivity, interpersonal sensitivity, paranoid ideation and psychoticism were independently related to the severity of BED. Anger expression (Fassino et al., 2003), poor self-esteem (Jones-Corneille et al., 2012) and impairment quality of life (Folope et al., 2012) were also found to contribute to impairment mental health in the obese.

Finally, the severity of obesity was highly associated to psychopathology in studies based on patients with Class II-III obesity and bariatric surgery candidates (Jones-Corneille et al., 2012; Marzocchi et al., 2008; Petroni et al., 2007; Kalarchian et al.,2007).

1.2.2. Prospective studies

Carano et al. (2005) claim that, from a psychological perspective, it is crucial to distinguish the psychological features implicated in the development of obesity from those that might be a direct consequence of it. For this reason, some researchers have investigated the causal role of obesity in the development of psychological distress using prospective study designs.

Some prospective studies suggest that obesity might cause psychopathology. Kasen, Cohen, Chen, & Must (2008), in a 30 years follow-up study, found that a BMI $\geq$ 30 significantly increased the odds for subsequent generalized anxiety disorder and major depression after adjusting for other risk factors. Kubsansky, Gilthorpe, and Goodman (2012) found that an higher baseline BMI was associated with higher level of depression and anxiety four years later. Roberts, Deleger, Strawbridge, and Kaplan (2003) showed that obesity at baseline was associated with increased risk

of depression five years later, and Vogelzangs et al. (2010) found the same result in a sample of elderly, especially in men.

In contrast, Pine, Cohen, Brook, and Coplan (1997) found that BMI at baseline was inversely related to depression ten years later, although in males but not in females. Bjerkeset, Romundstad, Evans, and Gunnell (2008) found an inverse association between BMI and suicide attempt in both females and males at a four-year follow-up. Roberts et al. (2000) found that obesity predicted depression one year later, but this relation disappeared using BMI as a criterion for obesity.

On the other hand, obesity might also be a consequence of psychopathology. Prospective studies showed some evidence of a consequent role of obesity in a previous psychopathological state. Indeed, psychological distress during childhood or adolescence, such as conduct disorders (McClure, Eddy, Kjellstrand, Snodgrass, & Martinez Jr., 2012; Mamum et al., 2009; Pine et al., 1997), ADHD (Fuemmeler, Ostbye, Yang, McClernon, & Kollins 2011), depression (McClure et al., 2012; Anderson, Cohen, Naumova, & Must, 2006; Hasler et al., 2004; 2005; Richardson et al., 2003), anxiety (Anderson et al., 2006), and personality traits (Hasler et al., 2004) were found to predict the development of obesity later in life.

Several studies (Armon, Melamed, Shirom, Shapira, & Berliner, 2013; Chapman, Fiscella, Duberstain, Kawachi, & Coletta, 2009; Faith, Fairburn, Goodwin, Allison, 2001; Brummet, Babyak, Williams, Barefoot, Costa, & Sie.g.ler, 2006) have shown neuroticism as a risk factor for developing overweight and obesity, particularly in women.

In a recent review, Hemmingsson (2014) sustains a causal model where psychological and emotional distress represents a fundamental link between socioeconomic disadvantage and weight gain. More in depth, at higher risk of psychological and emotional distress were found children growing up in a disharmonious family environment (i.e. socioeconomic disadvantage, relationship discord, lack of support, negative belief systems, unmet emotional needs, and general insecurity). Consequently, they presented low self-esteem and self-worth, negative emotions, negative self-

belief, powerlessness, depression, anxiety, insecurity, and a heightened sensitivity to stress. These inner disturbances eventually caused a psycho-emotional overload, triggering a cascade of weight gain-inducing effects including maladaptive coping strategies, such as eating to suppress negative emotions, chronic stress, appetite up-regulation, low-grade inflammation, and possibly reduced basal metabolism. Over time, this causes obesity, circular causality and further weight gain.

Three studies (Hemmingsson, Johansson, & Reynisdottir, 2014; Boynton-Jarrett, Rosenberg, Palmer, Boggs, & Wise, 2012; Pagoto et al., 2012) reported a relationship between past traumas and obesity. Boynton-Jarrett et al. (2012) found that, in a large sample of black women, high frequency of abuse in childhood or adolescence was associated with overall and central obesity in adulthood. Moreover, in a methanalysis of studies, Hemmingsson et al. (2014) found that adults who reported childhood emotional, physical, sexual or general abuse were significantly more likely to be obese, and the risk increased with the severity of abuse. This suggests that adverse life experiences during childhood play a major role in obesity development, potentially by inducing mental and emotional perturbations, maladaptive coping responses, stress, inflammation, and metabolic disturbances.

Finally, Mather et al. (2009) found that obesity was positively associated with several lifetime mood and anxiety disorders, suicidal ideation and attempts, as well as with past psychiatric disorders, especially in women, although the retrospective nature of this investigation did not allow to establish any causal relationship between preexistent psychological disorders and obesity.

Sharma (2012) observed a considerable overlap between mental health and obesity co-epidemics. In fact, not only the majority of treatment-seeking obese manifest a wide range of mental disturbances, but psychiatric disorders, in turn, can promote weight gain and constitute barriers to obesity management. As Taylor et al. (2012) suggested, the latter is not simply a matter of obesogenic psychiatric medications promoting weight gain. Rather, the links between obesity and psychological disturbances (i.e., mood, anxiety, attention, addiction, psychotic,

personality disorder and trauma) depend on a complex interaction of societal, cognitive, behavioral, and biological factors. Consequently, there has been an open debate in the most recent literature to support the decision of whether or not to include obesity in DSM-V as a psychiatric disorder. Volkow and O'Brien (2007) found in DSM-V the opportunity to recognize specific components of obesity as mental disorders.

On the opposite, Marsha, Marcus and Wildes (2009) concluded that, even though some mental mechanisms related to reward processing play a role in the onset and maintenance of obesity, there is insufficient evidence for the inclusion of obesity in DSM-5 (APA, 2013). As a result, the Eating Disorders Work Group concluded that obesity should not be included in DSM-V (Marcus & Wildes, 2012) because it is an heterogeneous condition with a complex and incompletely understood etiology, and thus it cannot be considered a mental disorder *per se*. There may be obesity phenotypes that are caused by mental disorder, but research focusing on the role of neural mechanisms in the onset and maintenance of obesity and obesity-related behaviors (e.g. overeating) is still only in its infancy.

1.3 Overeating behaviors and obesity

1.3.1 Binge eating disorder

Disordered eating patterns have a substantial impact on emergence and maintenance of overweight and obesity (Terpitz & Remund, 2013).

The most common dysfunctional overeating behaviors are binge eating disorder (BED) and night eating syndrome (NES), which contribute to an increased psychopathology in obese persons (Stunkard & Allison, 2003).

Binge eating behavior is defined as consuming an unusually large amount of food in a short time while experiencing a lack of control over eating during the eating episode. Binge eating disorder (BED) was introduced in 1994 in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; APA, 1994) as a provisional eating disorder diagnosis.

The core symptom is recurrent binge eating in the absence of inappropriate compensatory behaviors (i.e., purging, fasting, or laxative misuse) and/or extreme dietary restraint that characterizes bulimia nervosa.

Only in the DSM-5 (APA, 2013), BED was recognized as an actual eating disorder with the following diagnostic criteria:

A. Recurrent episodes of binge eating (same as bulimia nervosa).

B. Binge eating episodes are associated with three (or more) of the following:

1. Eating much more rapidly than normal.

2. Eating until feeling uncomfortably full.

3. Eating large amounts of food when not feeling physically hungry.

4. Eating alone because of embarrassment.

5. Feeling disgusted with oneself, depressed, or very guilty after

C. Marked distress regarding binge eating is present.

D. At least once a week for 3 months.

E. The binge eating is not associated with the recurrent use of inappropriate compensatory behavior.

BED is associated with an increased risk for weight gain and the development of obesity (Villarejo et al., 2012; Tanofsky-Kraff et al., 2009; Devlin 2007, Keski-Rahkonen et al., 2007). BED is also associated with significant morbidity, including medical complications related to obesity (i.e., type 2 diabetes, cardiovascular disease), eating disorder psychopathology (i.e., weight and shape concerns), psychiatric co-morbidity, reduced quality of life, and impaired social functioning (Mond et al., 2006; Riger, Wilfley, Stein, et al., 2005; Johnson et al., 2001).

BED is highly prevalent in females and among individuals seeking treatment for obesity, with prevalence estimates ranging between 15 and 50%, while in the general population, the lifetime prevalence of BED is between 0.7% and 4% (APA, 2000).

Furthermore, it has been estimated that the prevalence of obese with BED in weight-loss treatment is about 30%, whereas in the general population is 10% (Legenbauer et al., 2011).

Compared to obese non-bingers, obese binge eaters have a more perfectionistic attitude toward dieting and greater levels of dysphoria. In addition, they report constantly struggling to control their urges to eat and manifest a decreased awareness of their level of satiety, which is a critical aspect in the regulation of food intake (Wilfley et al., 2003; Kristeller & Hallett, 1999). Laboratory studies have shown that persons with BED consume more calories at both binge and non-binging meals than weight-matched control participants without BED (Yanovski, 2002). In general, obese binge eaters report an higher level of psychopathology than non-binge obese in term of depression, anxiety, substances use disorders, and personality disorders (Schulz & Leassle, 2010; Javaras et al., 2008; Hudson et al., 2007; Fabricatore & Wadden, 2004; Dingemans et al., 2002; Wilfley et al., 2000; Ramacciotti et al., 2000), and the level of psychological distress seems to be more related to the severity of BED than to obesity. Particularly, Fandiño et al. (2010) reported that obese women with BED scored significantly higher than non-binger obese women in the following SCL-90-R subscales: depression, obsessive-compulsiveness, interpersonal sensitivity, paranoid ideation, and psychoticism. In another study (Schulz & Leassle, 2010) BED obese women compared to non-BED ones showed higher levels of comorbidity also in terms of external and emotional eating scores.

Studies on BED patients have also underlined other relevant aspects: a) a link between self-criticism, depressive symptoms and body dissatisfaction and misperception that contribute to the vulnerability and maintenance of disordered eating symptoms (Dunkley & Grilo, 2007; Dunkley et al., 2010); b) evidence showing that self-criticism may play an important mediator role on the association between shame and eating psychopathology (Pinto-Gouveia et al., 2014); c) evidence that binge eating is a maladaptive way to cope with the threat of being negatively viewed by others because of one's physical appearance and the consequent

engagement in a severe critical self-relating style marked by hatred, disgust and contempt towards the self (Duarte, Pinto-Gouven, & Ferreira, 2014).

1.3.2 Night Eating Syndrome

Night Eating Syndrome (NES) is now considered to be a dysfunction of circadian rhythm with a disassociation between eating and sleeping, characterized by a phase onset delay of morning appetite and continuation of evening eating (Goel et al., 2009; Rogers et al., 2006) and by depressed mood and distress (Gallant, Lundgren, & Drapeau, 2012). Developments in the conceptualization of NES have been hindered over time by the adoption of differing diagnostic criteria by researchers from various disciplines (Cleaton, Abbottz, Jodd, Sutton, & Wilding, 2012).

Current diagnostic criteria proposed by the International NES Working Group in 2008 (Allison et al., 2010) are listed below:

A. Daily eating pattern of evening/night-time hyperphagia of one or both of the following:

1. At least 25% caloric intake after the evening meal.

2. At least two episodes of nocturnal eating per week.

B. Awareness and recall of evening- and nocturnal-eating episodes.

C. At least three of the following must be present:

1. Morning anorexia and/or skipped breakfast four or more mornings per week.

2. Presence of a strong urge to eat between dinner and sleep onset and/or during the night.

3. Sleep onset and/or sleep maintenance insomnia four or more nights per week.

4. Presence of a belief that one must eat to return to sleep.

5. Mood is frequently depressed and/or mood worsens in the evening.

D. The disorder is associated with significant distress and/or impairment in functioning.

E. The disordered pattern of eating is maintained for at least 3 months.

F. The disorder is not secondary to substance abuse or dependence, medical disorder, medication or another psychiatric disorder.

NES has been included in the eating disorders not otherwise specified (EDNOS) of the DSM-5 (APA, 2013) with the following diagnostic criteria:

Repeated occurrences of night eating, demonstrated by eating after waking from sleep or by an excess in food intake after the evening meal.

1. The individual is aware of and can recall the eating.

2. Other influences such as changes in the individual's sleep-wake cycle or social norms cannot better explain the night eating.

3. Significant distress and/or impairment in functioning results from the night eating.

4. The disordered pattern of eating is not caused by binge-eating disorder, a mental disorder, a medical disorder, or the effect of medication.

Evidence suggests no gender difference in NES (Striegel-Moore, Franko, & Garcia, 2009) and an overall trend for prevalence to be low in general population samples (0.5–1.5%) and to increase with the degree of obesity (8.9–14%), but the percentage varies depending on the type of criteria adopted (Gallant et al., 2012).

Many studies reported a positive relationship between NES and obesity (e.g., Grilo et al., 2012; Colles et al., 2007; Lundgren et al., 2006; Ceru-Bjork et al., 2001). NES could lead to weight gain (4.3–4.5 kg over 3–6 years) as a result of excess calories consumed at night (Gluck, Venti, Salbe, & Krakoff, 2008; Anderson, Stunkard, Peterson, & Heinmam, 2004) and obesity onset occurs earlier in life (6.0–7.5 years) in those with NES (Napolitano, Head, Banyak, & Blumenthal, 2001).

Some authors (e.g., de Zwaan et al., 2006) found that NES preceded obesity in 40% of obese night eaters earlier in life (6.0–7.5 years). In contrast, other studies disconfirmed the positive relationship between NES and obesity (Gluck et al., 2010; Striegel-Moore et al., 2006; 2005) even among morbid obese people (Calugi et al., 2009; Allison et al., 2006). Moreover,

In some studies NES was associated with an increased energy intake (400–600 kcal d–1) compared with controls (Lundgren, Allison, O'Reardon, & Stunkard, 2008; Birketvedt, et al.,1999), whereas no differences were observed in other studies (Allison, Ahima, & O'Reardon et al., 2005; O'Reardon et al., 2004).

Some common food consumed by people with NES are breads, sandwiches, and sweets (de Zwaan, Roerig, Crosby, Karaz, & Mitchell, 2006; Ceru-Bjork et al., 2001), although other kind of foods have also been reported. As a consequence, NES might represent a possible obstacle to weight loss according with the results by Gluck et al. (2001), although this has not been confirmed in other studies (i.e., Dalle Grave, Calugi, Ruocco, & Marchesini, 2011) and different results might be related also to the type of treatment adopted.

In a study based on a student population (Nolan et al., 2012) it has been shown no difference in restrained eating between the normal and full syndrome NES groups. Those with moderate and full syndrome NES symptoms also reported significantly lower sleep quality. No significant relationship was found between NES and BMI. The results showed an association between NES and emotional and external eating. Individuals with NES usually experience insomnia (Allison et al., 2008) with reported 1.5–4.5 awakenings per night (Rogers et al., 2006; O'Reardon et al., 2004; Birketvedt, et al., 1999) and with a general impairment in the sleep quality, such as greater sleep latency, reduced sleep duration, and sleep efficiency (Lundgren et al., 2008; Rogers et al., 2006). Dysregulation of the circadian levels of the regulatory hormones (Cortisol, melatonin and leptin), which regulate various psychological and metabolic functions (Sinha et al., 1996; Aschoff, 1984), was found among the night eaters and not among the controls (Birkervedt et al., 1999). Although the nature of this complex relationships is not completely clear, this circadian rhythmicity could be one of the links between NES, obesity, mood and stress (Garaulet, Ordovas, & Madrid, 2010; Stunkard & Allison, 2003).

NES is associated with several psychopathological features including depressed mood (Striegel-Moore et al., 2010; Allison et al., 2009; Striegel-Moore et al., 2008; Gluck, Geliebter,

& Satov, 2001), low self-esteem (Striegel-Moore et al., 2010; Gluck et al., 2001), substance-related disorders (Lundgren et al., 2008), and functional impairment (Striegel-Moore et al., 2010). NES severity is positively associated with trait anxiety, cortisol levels, and perceived stress (Pawlow, O'Neil, & Malcolm, 2003). Independent of BMI, NES is linked to pathological attitudes regarding eating (e.g. bulimia nervosa. Binge eating) (Gallant et al., 2012) as well as to mood and sleep disturbance or anxiety disorders (Lundgren, et al., 2008).

Overall, research findings are still inconsistent or controversial regarding many aspect of NES. The main reasons are the use of different assessment tools and bias related to study design, sampling and methodology (Vander Wall, 2012).

1.3.3. Overeating as an addiction

A long- term debate has been focussed on a potential addictive role of specific typologies of food and whether overeating behaviours (common in binge-related eating disorders or obesity), may represent a form of addiction. The term *food addiction* was first introduced by Randolph (1956). However, recent research findings contributed to an increased scientific interest on ”food addiction”. First of all studies on neuroimaging and subsequent findings that obesity and binge eating are associated with alterations in dopaminergic signaling and food-cue, elicited hyper activation of reward-related brain areas, which are comparable to processes seen in drug users (Schienle, Schäfer, Hermann, & Vaitl, 2009; Wang et al., 2001). Also animal models seem to confirm this relationship, showing addiction-like behaviors and neuronal changes in rodents after some weeks of intermittent access to sugar (Avena, Rada, & Hoebel, 2008). Therefore, there is evidence of a parallelism between substance use disorders (SUD) and food addiction as reported by Barry, Clarke, and Perry, (2009) (see table A.)

Table A. DSM-IV criteria for substance dependence diagnosis and parallel criteria for a possible disorder of overeating (Barry, Clarke, Perry, 2009)

Substance Dependance Criterion	Parallel Criterion for "Overeating Disorder"
1. Tolerance, including need for more of a substance to achieve the same effect or a diminished effect when using the same amount of the substance over time. *Example*: Alcohol dependent individual does not feel intoxicated after consuming entire 6-pack in an evening.	1. Physiological tolerance unlikely, but some individuals feel need for increased quantities of food in order to feel satisfied. *Example*: Overweight or obese individual feels hungry after a large meal.
2. Withdrawal, including characteristic syndrome of withdrawal symptoms for specific substance or use of the substance or a similar one to relieve or prevent those symptoms. *Example*: Heroin dependent individual experiences dysphoria, nausea, sweating, and insomnia when she can't obtain heroin, takes oxycontin to compensate.	2. Comparable withdrawal syndrome not yet identified, but dieters and other individuals deprived of food report psychological preoccupation with food, and some individuals use substances such as nicotine or stimulants to suppress appetite. *Example*: Dieter feels lethargic and depressed, smokes or drinks caffeinated beverages to compensate.
3. Individual frequently takes more of a substance than intended or takes it over a longer period of time than planned. *Example*: Alcoholic plans to stop at the local bar for one beer, ends up staying until closing and having several drinks.	3. Food is often consumed in larger amounts or over a longer time than was intended. *Example*: Dieter plans to have one small serving of ice cream, but ends up having eating an entire pint.
4. Repeated unsuccessful efforts to reduce substance use or persistent desire to do so. *Example*: Cocaine dependent individual repeatedly vows to stop using at the start of the day, but ends up using by the end of the day.	4. Obese individuals who overeat often have a persistent wish to reduce or control how much they eat or try repeatedly to eat less. *Example*: Repeated, unsuccessful diets or regaining weight after successful diet are the norm for most obese individuals.
5. Substantial amount of time spent obtaining, using, or recovering from use of substance. *Example*: Cannabis dependent individual spends	5. Overeaters can spend substantial time shopping for food, eating and snacking, and recovering from physical and psychological effects of overeating (e.g., nausea, guilt about eating

Substance Dependance Criterion	Parallel Criterion for "Overeating Disorder"
hours calling his various contacts to locate available marijuana, travels 2 hours to get it, then smokes for most of the weekend. 6. Individual abandons or cut back on social activities, work or family responsibilities, and recreational interests in order to use substances. *Example*: Drug user stops associating with non-drug using friends. 7. Substance use continues in spite of associated physical and psychological problems. *Example*: Alcohol dependent individual continues to drink after being diagnosed with hypertension and gastric ulcers.	too much) *Example*: Obese individual snacks throughout the day in addition to or instead of eating regular meals. 6. A range of activities may be abandoned or reduced because of consequences of overeating (i.e., obesity) and accompanying decreased mobility, increased social anxiety, etc. *Example*: Obese individual stops participating in sports or going to the beach because of embarrassment about weight. 7. Overeating continues in spite of associated physical and psychological problems. *Example*: Obese individual continues to eat candy after being diagnosed with type II diabetes mellitus.

Craving represents the major shared feature between SUDs and food addiction, which refers to an intense desire to consume a substance (Tiffany & Wray, 2012). However, the term craving can be easily reported to other substances like food or non-alcoholic beverages (Hormes, & Rozin, 2010). Typical craving food are those high in sugar or fat (or both) and, thus, highly palatable, such as chocolate, pizza, salty foods, ice cream and other sweets and desserts (Weingarte & Elston, 1991), and they are more likely to be consumed in an addictive-like manner (Rodriguez, Martin, & Meule, 2015; Meule, Vogele, & Kubler, 2012). Moreover, activation patterns of neuronal structures underlying craving experiences, largely overlap across different substances, including food (Tang, Fellows, Small, & Dagher, 2012; Pelchat, Johnson, Chan, Valdez, & Ragland, 2004).

Overeating is associated with more intense and more frequent experiences of food craving and patients with BN, BED, or obesity showed higher scores on self-reported food craving measures (Meule et al., 2012; Meule, 2012). Thus, the criterion of frequently experiencing

craving or a strong urge to consume a substance can be translated to food and represents an important symptom in food addiction. Overall, many evidence seem to support similarities between overeating and substance use disorders, including potential commonalities in symptom presentations, comorbidities, behavioral and personality characteristics, and biological mechanisms, while differences also exist (i.e. physiological tolerance and withdrawal are not salient in overeating as in SUDs) (Barry et al., 2009).

Despite these similarities, there have been critical evaluations about the food addiction model which is still unclear and inconsistent (Meule, 2012). Some researchers have expressed reservations about the creation of an additional diagnosis in terms of "Overeating Disorder" or "Food Dependence." They point out that food, unlike drugs and alcohol is necessary for life, that it is impossible to abstain from food, and that physiological markers of dependence like tolerance, withdrawal, and craving for food are not well characterized or understood at this time (Ziaudden, Farmooqui, Fletcher, 2012; Wilson, 2010; Devlin, 2007). Nevertheless, Barry et al. (2009; p. 447) concluded that "an addiction based model of overeating provides a compelling theory for understanding obesity and the difficulties involved in controlling food intake, contributing to prevention and treatment of obesity".

1.3.4. Subthreshold overeating behaviors

Although there is a wide literature addressing Binge Eating Disorder and Night Eating Syndrome, relatively little is known about the common subthreshold or disordered eating patterns that may be associated with overweight and obesity (Carter & Jansen, 2012; Tanofsky-Kraff & Yanovski, 2004). Most of these disordered overeating behaviors are not included among the DSM-5 diagnostic criteria (APA, 2013).

In clinical practice, other forms of disturbed eating–subthreshold, partial syndrome, atypical–eating are regularly encountered, which has a significant impact on daily functioning. Research involving non-clinical populations suggests that the prevalence of partial syndrome

eating disorders is higher than that of full-syndrome and that those with partial syndrome eating disorders often engage in the same disturbed eating behavior as those with full syndrome, but at a somewhat lower level of frequency or severity (Sanderson, 2004; Hsu, Sullivan, & Benotti, 1997).

Descriptions of subthreshold eating behaviors associated with overweight and obesity include: constant overeating (Mitchell, Devlin,de Zwaan, Crow, & Peterson, 2008), hyperphagia, 'stuffing syndrome' (Kornhabe 1970), nibbling, picking (Fairburn, 2008), grazing (Lane, & Swabo, 2012; Saunders, 2004), between meal snacking (O'Connor, Jones, Connor, McMillan, & Ferguson, 2008), night eating (Colles et al., 2007), and a general 'chaotic' and unstructured eating style (Hagan, Whitworth, & Moss, 1999).

Grazing. One of the most interesting among such eating behaviors is grazing, which has been described as repetitious, continuous and unplanned eating between mealtimes, where the amount of food at each intake may be small, but overall intake is relatively large (Carte & Janson, 2012; Saunders, 2004; 1999). It is differentiated from binge eating by its lack of discrete time limits, the relatively slow manner in which eating occurs, and the relatively small amounts of food at each intake. In addition, grazing is differentiated from planned snacking, a behavior associated with positive outcomes (Fairburn, 2008). Unlike planned snacking, and similar to binge eating, grazing may also involve the perception of a loss of control (Kofman et al., 2010; Saunders, 2004). However, It is still controversial whether the loss of control over eating represents a common feature during grazing (Carter & Jansen, 2012) or not considering the small amounts of food consumed (Fairburn, 2008), Most of the studies on grazing eating pattern derived from bariatric surgery in morbid obese patients. The presence of both grazing and binge-eating behaviors have been documented in these populations pre-operatively (Busetto et al., 2005; Saunders, 1999). Binge-eaters lose less weight than others after surgery (Sallet et al., 2007), and a post-operative shift towards a grazing-type eating pattern has been commonly observed among these individuals (Colles et al., 2008; Saunders, 2001). Indeed, up

to 80% of bariatric patients report that they still experience a loss of control over their eating post-operatively, when objectively large binge episodes are no longer physically possible (Saunders, 2004). Such a shift towards grazing following surgery has been shown to reduce post-operative success (Kofman, Lent, & Swencionis, 2010; Faria, Kelly, Faria, & Kiyomi, 2009). For this reason, there is an increased interest of research on grazing, particularly in relation to obesity treatment (Carter & Jansen, 2012; Saunders, 2004).

Grazing eating pattern has also been shown among healthy-weight students approaching examinations to alleviate stress (Macht, Haupt & Ellgring, 2005). Nevertheless, the prevalence of grazing in the general population is largely unknown. In a study based on a student sample, Lane and Swabo (2013) found a positive association between the Grazing Questionnaire scores and scores on measures of binging, night eating and chaotic eating.

Individuals who graze were also more likely to engage in other forms of disordered eating behaviors, particularly binge eating, indicating that the tendency to graze is related to a tendency to binge eat, and the relationship is not accounted for by a sense of loss of control.

External eating and emotional eating, but not restrained eating, were found to be positively associated with grazing in both genders, indicating that grazing may represent an attempt to regulate negative emotional states (Lane & Swabo, 2013)

Nibbling/picking has been recently included in the Eating Disorder Examination (EDE, version 16), (Fairburn, Cooper, & O'Connor, 2008) a semi-structured interview that assess eating pathology with specific eating disorder diagnoses. Nibbling/picking episodes are characterized by eating in an unplanned, repetitious manner between meals and snacks without feeling a loss of control, and this could be an important aspect to differentiate it from “grazing”, although there is still a controversial between researchers (Carter and Jansen, 2012).

Fairburn et al. (2008) highlighted that, in contrast with snacking, it is difficult to detect the quantity of food assumed during nibbling, because people eat only small part of different types of food, instead of eating the all portion.

One study by de Zwaan and colleagues (2010) found that among 59 morbidly obese patients receiving gastric bypass surgery, 32% reported nibbling, but no relationship between nibbling and the presence of eating disorders prior to surgery or between nibbling and post-surgery weight loss was detected. In addition, Reas et al. (2012) examined nibbling behaviors among a normative sample of 58 young adult women. While they found that the majority reported engaging in some nibbling in the 28 days prior to the interview (91%), this behavior was not associated with BMI, frequency of meal or snack consumption, objective bulimic episodes, compensatory behaviors or any of the four EDE subscales. The study did reveal that engaging in more frequent nibbling was related to less avoidance of specific foods and less sensitivity to weight gain over a period of one week.

In a study on consecutive, treatment-seeking, obese patients with BED, Masheb et al. (2013) found that the majority of individuals with BED (90%) engaged in nibbling behavior. Furthermore, 24.1% of patients reported nibbling every day, while Reas et al. (2012) found that only 5% of a non-clinical, young adult sample reported daily nibbling. Although many participants with BED were engaging in frequent nibbling and increased nibbling was associated with more frequent consumption of morning and afternoon snacks, it was not associated with participants' BMI, overeating or binge eating frequency or eating disorder psychopathology. These findings are consistent with a study that assessed nibbling among a community sample of 69 individuals who were classified as having BED based on the EDE self-report questionnaire, where no relationships between bulimic episodes or restraint scores and nibbling were detected (Masheb et al., 2011). In contrast with the study by Reas et al. (2012), no relationship between nibbling/picking and food avoidance, and sensitivity to weight gain was observed. According to the authors (Masheb et al., 2013), it is plausible that normal weight individuals without eating disorders who have less sensitivity to weight gain and food avoidance would be more likely to engage in nibbling/picking episodes. In contrast, individuals with BED might infrequently engage in food avoidance behaviors, explaining the lack of a relationship with nibbling/picking.

Snacking. Another common eating behavior is represented by snacking, which is becoming a very common eating pattern in modern society (Tam et al., 2010). In US, the percentage of adults consuming snacks increased from 71% in 1977-1978 to 97% in 2003-2006. Moreover, the number of snacking occasions increased 0.97 events over this same time period and the contribution of snacks to total energy intake increased from 18% to 24% (Piernas & Popkin, 2010; Tam et al., 2010). Flexibility and freedom seem to be key features of snacking pattern, because people can snack everywhere and at every time of the day or night, comparing to the main meals. Furthermore, daily stress might also increase snacking pattern, particularly preferring foods high in fat and sugar density (O'Connor et al., 2008; Cartwright et al., 2003).

As highlighted by Sobal et al. (2007), these snacking pattern may often be automatic, out of control and mindless.

The study of O'Connor et al. (2008) showed that daily hassles were associated with increased consumption of high fat/sugar snacks and with a reduction in main meals and vegetable consumption. For example, threatening, interpersonal and work-related hassles were associated with increased snacking, whereas, physical stressors were associated with decreased snacking. The overall hassles-snacking relationship was significantly stronger and more positive at high compared to low levels of restraint, emotional eating, disinhibition, external eating and in females and obese participants. Therefore, emotional eating represented the preeminent moderator of the hassles-snacking relationship.

Snacking has been shown to be associated with increased energy intake (Hampl, Heaton, & Taylor, 2003). This may reflect the energy density (Piernas, & Popkin, 2010) and portion sizes of many foods and beverages consumed as snacks (Kerr, Rennie & McCaffrey et al., 2009; Nielsen & Popkin, 2003; Jahns, Siega-Riz, & Popkin, 2001).

Several studies have suggested that characteristics of dietary behavior such as eating frequency or snacking may influence body weight (Miller, Benelam, Stanner & Buttriss, 2013; Larson & Story, 2012). In contrast with the hypothesis by Booth et al. (1986), according to

which snacking between meals rather than three meals per day represents a major risk factor for weight gain, other studies have shown that snacking was positively (Basdevant, Craplet, & Guy-Grand, 1993) or negatively associated with body fatness (Drummond, Crombie, Kirk, 1994), or reduced the risk of overweight and abdominal obesity (Keast, Nicklas, & O'Neil, 2010; Summerbell, Moody, Shanks, Stock, & Geissler, 1996). Other studies have shown that snacking was not associated with weight (Phillips, et al., 2004; Humpl et al., 2003; Drummond et al.,1996; Summerbell et al., 1996; Andersson & Rossner, 1996) and was not an independent predictor of weight gain (Field, Austin, & Gillman et al., 2004). Results should be taken cautiously, because snack definitions have not been clearly established and thus, they were not consistent across studies (Piernas et al., 2010; Howarth, Huang, Roberts, Lin, & McCrory, 2007; Kant, Graubard, 2006; Summerbell et al., 1995).

Moreover, snacking patterns may differ in their contribution to nutrient intake. Therefore, snacking has been shown to be associated with improved diet quality (Ovaskainen et al., 2006; Humpt et al., 2003; Kerr et al., 1997;) and increased intakes of fruit, whole grains, and fiber (Kerr et al., 2009; Hampl et al., 2003), which could promote satiety and reduce risks for obesity.

Snacking has also been associated with increased vigorous physical activity (Kerver et al., 2006; Drummond, et al., 1998); thus, the increased energy intake associated with snacking may have been compensated for by increased energy expenditure during physical activity.

A lack of association between snacking and weight could also be explained if overweight individuals who try to lose weight avoid eating snacks. More studies are needed to better understand the mechanisms by which snacking may impact the balance of energy intake and energy expenditure (Nicklas, O'Nei, & Fulgoni, 2014).

Hyperphagia out of meal or excessive eating has been described as eating a huge amount of food (as in binge episodes) without a lack of control, because people are aware of eating too much, but they do not intend to stop (Gremigni & Letizia, 2011, p.41). Hyperphagia can be distinguished between an excessive eating during meal or out of meal. Generally, people with

excessive eating like the pleasure of food and enjoy it. Kornhhaber (1970) identified the *sniffing syndrome* as a distinct clinical entity characterized by hyperplasia, emotional withdrawal and clinical depression, but recent studies did not mentioned it anymore.

According to Gremigni and Letizia (2011), different forms of subthreshold overeating behaviors, such as irregular eating, nibbling, grazing, snacking, are recurrent in overweight individuals and might be associated with significant levels of distress.

Taken as a whole, the literature results on subthreshold overeating behaviors are still inconsistent. Therefore, a specified assessment of these overeating behaviors is needed to better examine their features in different populations and over a longer time period, and also to evaluate their relationship to treatment outcome. Furthermore, a study highlighted no differences between obese women with subthreshold BED compared to those with full criteria of BED (Striegel-Moore, Dohm, Solomon, Fairburn, Pike, & Wilfley, 2000). Therefore, these subclinical cases need to be better understood. Besides, eating disordered behaviors and cognitions represent the main predictors of psychological distress in obese women (Darby, Hay, Mond, Rodgers, & Owen, 2007).

Further studies are needed to investigate different forms of overeating behavior as predictors of psychological distress in different BMI categories.

1.3.5 Emotional, external and restraint eating styles

Eating behaviors have also been classified according to specific eating styles: emotional, external and restraint eating (French et al., 2012; Wardle, 1987; van Strien, Frijters, Bergers, & Defares, 1986). This classification derives from the psychosomatic, externality, and restraint theories, respectively, and the concepts of emotional, external and restraint eating having a firm place in a etiology models of obesity (Van Hout et al.,2005; van Strien et al., 1986).

The concept of emotional eating implies the tendency to eat in response to negative emotions and is rooted in the psychosomatic theory (Kaplan &Kaplan, 1957; Bruch, 1973).

Emotional overeating is considered to be an inappropriate response to distress (Heatherton, Herman, & Polivy, 1991).

According to the psychosomatic theory, it is a consequence of the inability to distinguish hunger from other aversive internal states such as anger, fear or anxiety, or of using food to reduce emotional distress, probably because of early learning experiences. In case of emotional arousal or stress, emotional eaters respond with excessive eating, while normally emotional arousal and stress would result in loss of appetite (Greeno & Wing, 1994; Bruch, 1973; Schachter, Goldman, & Gordon, 1968; Kaplan, & Kaplan, 1957). Emotional eating has indeed been related to symptoms of anxiety and depression, suicidal ideation and behavior, as well as problems with intimacy and sexuality (Ouwens, van Strien, & van Leeuwe, 2009; Van Strien, Schippers, & Cox, 1995).

The externality theory, focusing on external eating, states that certain people are more sensitive to external food cues than others, and eat in response to those stimuli, regardless of their internal state of hunger and satiety (Herman, 2008; Spitzer & Rodin, 1981; Schachter & Rodin, 1971). External eaters overeat as a result of their elevated responsiveness to food-related cues in the immediate environment (van Strien et al., 2009).

According to the restrained eating theory, dieting can cause overweight through bingeing. People who diet suppress their feeling of hunger cognitively and eat less. This paradox is based on the concept of natural weight, a range of body weight that is homeostatically preserved by the individual. Attempts to weight-loss by the conscious restriction of food intake provokes physiological defenses, such as lowering the metabolic rate (Goldsmith et al., 2010; Major et al., 2007) and the arousal of persistent hunger. When self-control is undermined by disinhibitions, such as alcohol, anxiety, depression, or even the consumption of high-calorie foods, the cognitive resolve to diet may easily be abandoned (Herman & Polivy, 2004). Counter regulation may then occur, resulting in excessive food intake (Polivy & Herman, 1985). Thus, intense dieting may ultimately result in overeating patterns (emotional or external eating), since both

arousal and external stimuli disrupt the cognitive restraint normally exercised by dieters faced with persistent hunger (Herman, van Strien, & Polivy, 2008).

Emotional eating pattern can begin as early as in childhood and can continue later in life (Goossens, Braet, Van Vlierberghe, & Mels, 2009; Nguyen-Rodriguez, Chou, Unger, & Spruijt-Metz, 2008). For instance, it was reported that in overweight children and teenagers, emotional eating mediated the relationship between anxiety and loss of control over eating and that increased depression was associated with emotional eating (Goossens et al., 2009). Overeating in response to negative emotions can continue or develop in adulthood and has been reported by obese adults (Van Strien & Ouwens, 2003; Manzoni et al., 2009), women with eating disorders (Agras & Telch,1998), and normal-weight dieters (Polivy, Herman, & McFarlane, 1994). In general, women tend to score higher on emotional eating than do men (Oliver, Wardle, & Gibson, 2000).

Moreover, it has been suggested that emotional eating increases the consumption of sweet and high-fat foods in particular in response to negative emotions (Macht, 2008; Oliver, Wardle, & Gibson, 2000; de Lauzon et al., 2004; Elfhag, Tholin, & Rasmussen, 2008).

In contrast, other studies did not found any relationship between emotional eating and total energy consumption (Anschutz, Van Strien, Van De Ven, & Engels 2009; Lluch, Herbeth, Mejean, & Siest, 2000).

Although eating in response to positive emotions has been reported to occur as frequently as eating in response to negative emotions (Macht, Haupt, & Salewsky, 2004), a study by Van Strien et al. (2013) showed that low emotional eaters ate similar amounts after the sad and after the joy mood condition, whereas high emotional eaters ate significantly more after the sad mood condition than after the joy mood condition.

Some studies have examined the relationship between emotional distress and eating styles. For example, results of the study by Ouwens, van Strien, and Leeuwe (2009) suggested potential mediating pathways between depression and emotional eating, while no relation appeared to

exist between depression and external eating. As a consequence, emotional and external eating would appear to be different constructs of overeating, explained by diverse mechanisms: affect regulation (Hallings-Pott, Waller, Watson, & Scragg, 2005) and regulation of perceptual proprieties of food (Volkow et al., 2003), respectively.

Furthermore, Kontinem et al. (2010) reported that emotional eating and depressive symptoms correlated positively among men and women, and both were related to a higher body mass index. Emotional eating was also related to a higher consumption of sweet foods in both genders and non-sweet foods in men, independently of depressive symptoms and restrained eating. These findings suggest that emotional eating and depressive symptoms both affect unhealthy food choices. Emotional eaters report to overeat in response to negative emotions, and are more at risk of gaining excess weight (Hays & Roberts, 2008). High levels of emotional eating have been demonstrated in at least 40% of obese community samples (Van Strien & Ouwens, 2007). Compared to normal weight individuals, obese people have been observed to score more highly on the measures of emotional eating (Konttinen et al., 2009; Van Strien et al., 2009; de Lauzon-Guillain et al., 2006).

In a study by Brogan and Hevey (2013) based on morbid obese, it has been found that emotional and external eating were unrelated to food intake, and emotional eater status did not moderate food intake in response to positive and negative mood states. On the other hand, restraint eating was the only predictor (negative) of overall food intake and the variable most strongly associated with the consumption of top-shelf foods.

In line with this, there is evidence of a link between dietary restraint and food craving, with restrained eaters often reporting higher food craving scores and showing higher levels of disinhibition and binge eating than unrestrained eaters (Nammi, Saisudha, Chinnala, & Boini, 2004; Cepeda-Benito, Fernandez, & Moreno, 2003; Hill, Weaver, & Blundell, 1991).

On the contrary, Burton, Smit, and Lightowle (2007) showed externality as the principal predictor of food craving, which was greater in males compared to females, but differential for

different food groups between genders. Restrained eating and cravings for fats and fast food fats were negatively associated in women only. Total cravings and cravings for fats and fast food foods mediated the positive association between external eating and BMI.

In a study based on BED and no-BED obese women, Schultz and Leassle (2010) reported that anxiety and emotional eating were significant predictors for BED status. In the BED group, depressive symptoms were significantly related to emotional eating and food intake and negatively related to restraint. Anxiety was significantly related to emotional eating. In general, food intake significantly enhanced mood.

As a consequence of the lack of interceptive awareness (i.e., the ability to discriminate between sensations and feelings, and between the sensations of hunger and satiety) that represents a common feature in emotional eaters, after eating a pre-load of food, emotional eaters show to eat more, rather than less (van Strien & Ouwens, 2003; van Strien, Cleven, & Schippers, 2000). Lack of interceptive awareness is strongly related to alexithymia, which means the inability to express feelings with words, and usually involves a deficiency in understanding, processing, or describing emotions (Quinton & Wagner, 2005).

Alexithymia, and more specifically the component of difficulty in identifying feelings, has been found to be positively related to emotional eating (Larsen, Van Strien, Eisinga, & Emgles, 2006; Van Strien, 2000) and more specifically to be a moderator between experimental stress-induction and food intake (Van Strien & Ouwens, 2007), as well as between depression and emotional eating (Ouwens, van Strien, & van Leeuwe, 2009).

Finally, a review by Nowakowski, Traci McFarlane, and Cassin (2013) confirmed the presence of an association between alexithymia and BED symptom severity, and that difficulties identifying and describing feelings predicted the severity of BED, higher body dissatisfaction and depressive symptoms (Carano et al., 2006). According to Efang and Lundh (2007), alexithymia should be recognized as a trait-like personality feature that is important for people's

ability to deal with and process affects in their lives, which may hypothetically impact obesity behaviors such as eating, or results from being obese.

1.4. Obesity and Binge eating treatment

Obesity is well-known as being difficult to treat; calorie restricting diets, even when combined with behavioral techniques and exercise, seldom result in lasting weight loss (e.g., Mann, Tomiyama, Westling, Lew, & Samuels Chatman, 2007; Wilson, 1999).

Between one third and two thirds of the dieters regain more weight than was initially lost on their diets (Turk et al., 2009; Cussleret al., 2008; Mann et al., 2007; Jones, Wilson, & Wadden, 2007). A mean weight loss of 5 to 8.5 kg (5-9%) was observed during the first 6 months from interventions involving a reduced-energy diet and/or weight-loss medications (Franz et al., 2007).

A weight loss between 7 to 10% has been associated with a significant decrease on the obesity related medical illnesses (NIH, 1998) and with an increased health related quality of life and psychological well-being (Marchesini, Marzocchi, & Dalle Grave, 2006) such as decreased anxiety and depression, enhanced self-esteem, reduced body dissatisfaction and improved interpersonal functioning (Foster & Wadden,1994). On the contrary, weight regain, has negative effects on self-confidence, body image and mood (Foster & Wadden, 1994). .

According to Cooper and Fairburn (2001), there are two interrelated reasons for patients' failure to engage in effective weight maintenance strategies. First, they abandon their weight loss efforts because they do not achieve their weight loss goals, or the anticipated benefits of achieving them. As a consequence, they seem not to be interested to acquire weight maintenance skills and to persevere in their efforts, thus they return to their previous eating habits, gaining weight back. For this reason, it has been designed a new cognitive behavioral treatment which not only targets the overeating pattern and low level of activity, but it also focuses on processes

hypothesized to hinder successful weight maintenance (Cooper et al., 2010; Cooper & Fairburn, 2001).

A recent review and meta-analysis on behavioral and pharmacological treatment of obesity by Peirson et al. (2014) highlighted three principal findings. First, the pooled-effect estimates for all weight outcomes were statistically significant in favor of the interventions and, compared with the control groups, intervention participants had, on average, a 3.02 kg greater weight loss, a 2.78 cm greater reduction in waist circumference, and a 1.11 kg/m^2 greater reduction in BMI, and were more likely to lose ≥ 5% (RR 1.77) and ≥ 10% (RR 1.91) of their baseline body weight. Second, there was no significant difference between behavioral and pharmacologic interventions for any weight outcomes, although the potential for adverse outcomes appears greater with pharmacologic treatments. Third, modest weight reduction, corresponding to loss of ≥ 5% and ≥ 10% of baseline body weight, had clinically important effects, most notably a 38% reduction in the incidence of type 2 diabetes in prediabetic populations.

A Cochrane review (Shaw, Rourke, Del Mar, & Kennardy, 2009) suggests that behavioral and cognitive behavioral strategies are effective weight loss therapies. Cognitive therapies do not appear to be as effective in term of weight-loss and weight maintenance; however a much smaller body of evidence exists for these strategies. The RCT study by Cooper et al., (2010) evaluated the immediate and long term effect of a new form of CBT for obesity by comparing it with the behavioral therapy (BT) and with a minimal intervention, a form of guided self-help (GSH). The great majority of participants lost weight and then regained it, and CBT, despite being explicitly designed to prevent post-treatment weight regain, was no better than BT in this regard (from 5% to 10% weight loss were maintained throughout follow-up in both treatments).

On the other hand, the pattern of weight loss in CBT differed from that obtained with BT and CBT was also successful at achieving change in participants' acceptance of shape and in improving psychiatric symptoms and quality of life. In general, all weight loss treatments did not promote binge eating, either during treatment or afterwards.

Psychological evidence-based treatments (CBT, IPT) resulted in significant 1-2 years improvement on multiple outcome measures aside from binge eating (i.e., specific eating disorder psychopathology, psychosocial functioning and general psychopathology), both in overweight and obese patients with the exception of short and long term weight loss outcome (Wilson, 2011). In general, these kinds of psychological treatments contribute to normalize eating patterns and reduce distress, particularly in obese with BED (Devlin, Yanovski, & Wilson, 2000).

Although binge eaters may quickly regain weight, both short- and long-term weight loss of BED and no-BED patients appear quite similar (Wilson, 2011).

Comparable results were reported in a review by Shaw, O'Rourke, Del Mar, and Kenardy (2005), where cognitive therapy was not found to be effective as a treatment for weight loss itself, both behavioral approaches and cognitive- behavioral therapy were found to be useful in the context of providing strategies for diet and exercise. The conclusion was that "psychological interventions ideally should be used in the context of a multi-component weight loss program to gain their maximal benefit " (Shaw et al., 2005, p.1).

Growing research on Cognitive Behavioral Therapy (CBT) has demonstrated its effectiveness in reducing binge eating (Brownley et al., 2007), and CBT protocols have been further developed into guided self-help (Wilson et al., 2010) and trans-diagnostic versions (Murphy et al., 2010), which are considered first line or gold standard treatments for binge eating disorder (BED).

CBT for binge eating is based on the restraint model where over-evaluation of shape and weight are believed to lead to a cycle of dietary restraint and binge eating in attempt to control weight (Iacovino et al., 2012; Telch et al., 2001). Therefore, CBT aims to decrease dietary restraint and establish healthy eating patterns. Despite moderate treatment outcomes, CBT remains ineffective for many patients with BED, and remission rates typically range between 40

and 60 % (Grilo et al., 2011). Further, these interventions have not been successful in promoting weight loss (Wilson et al., 2007), which is often a significant problem in this population.

Overall, the actual amount of weight that can be lost with lifestyle interventions, medications, or even cognitive behavioral therapy remains so minimal that bariatric surgery (i.e., gastric bypass, the so-called Roux-en-Y, or some form of gastric banding) has become ever more used as a consequence of the increased prevalence of morbid obesity in recent years (Karasu, 2013). Although bariatric surgery may have multiple side effects (i.e. nutrients malabsorption, mortality, dumpting syndrome) (Karasu & Karasu, 2010) and in about 20% of patients, there will be substantial weight regain after surgery (Karasu, 2013), bariatric surgery was found to be more effective for obesity compared to psychological intervention. This was not only in term of weight loss, but also in improving dysfunctional eating particularly when looking at long-term follow-up of several years (Moldovan & David, 2011). In particular two studies (Ogden, Clementi, Aylwin, & Patel, 2005; Ogden, Clementi, & Aylwin, 2006) described that the surgical patients weighed less, had more past negative experiences of eating and yet reported improved subjective health status. Moreover, weight-loss surgical patients also showed improved energy and self-esteem and changes in their eating behavior in terms of perception of fullness and hunger, but also in a reduced role of food in their lives, being more in control of their food intake.

Therefore, to select patients most suitable for bariatric surgery, a comprehensive pre-surgical assessment is hightly recommended (Marcus et al., 2009).

Some reviews (Ethag & Rossner, 2006; Teixeira, Going, Sardinha, & Lohman, 2005) confirmed that many factors seem to be associated with a long term weight loss. Some are related to nutrition and lifestyle, such as few previous weight loss attempts, an higher initial weight loss, active life-style, achievement of a self-determined target in weight, regular meals, healthy eating, control over eating, behavior self-monitoring. In obese samples, higher initial BMI may also be correlated with larger absolute weight losses (Teixeira et al., 2005).

In addition, psychological factors were found to be related to long term weight loss outcome such as internal motivation to lose weight, social support, adaptive coping strategies, stress management skills, self-efficacy, self-sufficiency, maturity, persistency, psychological stability and psychological well-being (Teixeira et al., 2005).

Drop-out rate in the out-patient treatment of obesity are elevated (up to 80% after one year) and they are related to physically and psychologically healthier patients (Moroshko, Brennan, & O'Brien, 2014; Inelmen et al., 2005). Moreover, obese binge eaters have a higher associated psychopathology and are more likely to drop out on behavioral weight-control treatments (Sherwood, Jeffery, & Wing, 1999). However, attrition rates from non-research treatment are generally unknown. This high drop-out rate is of concern as attrition is associated with poorer treatment outcomes (Wadden, Foster, Letizia, & Stunkard.,1992) and poorer weight loss maintenance (Kalarchian et al., 2009) for the individual, as well as with decreased treatment effectiveness overall (Davis & Addis, 1999) and cost-effectiveness for the treatment provider.

Understanding the factors that influence attrition can be used to inform the modification of treatment programs and to target those most at risk of drop-out so as to maximize the success of obesity interventions (Miller & Brenan, 2014).

Cooper et al. (2010) concluded that behavior change in people with obesity represents a difficult target to achieve, unlike with people with eating disorders (i.e., Fairburn et al., 2009). Therefore, "it seems to be ethically questionable to claim that psychological treatments for obesity work in the absence of data on their longer-term effects" (Cooper et al., 2010; p. 706).

Chapther 2: The constructs of Mindfulness and Mindful Eating

2.1 Mindfulness and mindful eating

2.1.1. ***The construct of mindfulness***

The concept of mindfulness, originally derived from Buddhist thinking, has been introduced in the area of psychology by Jon Kabat-Zinn (1990). Mindfulness has been defined as the awareness that arises through intentionally attending to one's moment-to moment experience in a nonjudgmental and accepting way (Shapiro, Carlson, Astin, & Freedman, 2006; Kabat-Zinn, 2003). In other words, mindfulness can be seen as an adaptive regulation process of enhanced attention to, and nonjudgmental awareness of, present moment experiences (Brown & Ryan 2003).

A different perspective definition of Mindfulness has been described by Langer (1989) as "a state in which one is open to novelty, alert to distinctions, sensitive to context, aware of multiple perspectives, and oriented in the present" (Bodner & Langer, 2001, p. 1). Further aspects of Langer's concept of mindfulness are openness to new information, flexibility to take over different cognitive perspectives, and a "step by step" attitude, so that one concentrates on the task at hand (Sauer et al., 2012).

Nevertheless, a consensus description of mindfulness stated: ''We see mindfulness as a process of regulating attention in order to bring a quality of non-elaborative awareness to current experience and a quality of relating to one's experience within an orientation of curiosity, experiential openness, and acceptance. We further see mindfulness as a process of gaining insight into the nature of one's mind and the adoption of a de-centered perspective on thoughts and feelings so that they can be experienced in terms of their subjectivity (versus their necessary validity) and transient nature (versus their permanence)'' (Bishop et al., 2004, p. 234).

These authors offered an influential suggestion for a consensual definition and operationalization of mindfulness. Bishop and colleagues (2004) described two components of mindfulness:

1) self regulation of attention such that it is directed to the present moment,

2) a particular orientation involving curiosity, openness and acceptance.

Currently, three fundamental components of mindfulness have been differentiated: (a) *intention,* involves knowing why one is paying attention (motivation); a conscious direction and purpose. (b) *Attention*, involves the direct, moment-to-moment knowing of what is happening as it is actually happening. The mind is trained to focus, aim, and sustain attention; and (c) *attitude,* describes how one pays attention, refer to the accepting, caring, and discerning qualities of mindfulness (Shapiro et al., 2006). As Kabat-Zinn noted, mindfulness can be spoken of as ‘‘affectionate attention’’ (as cited in Cullen, 2006, p. 26). Hence, mindfulness can be conceptualized as a form of attention characterized by a range of attributes or aspects, which are distinct but overlapping (i.e., acceptance, non-judgment, compassionate and openhearted attitude, non-identification with the experiences, insightful understanding, non-reactivity to the experiences, a decentered stance and participation in the experience (Walach, Buchheld, Buttenmüller, Kleinknecht & Schmidt, 2006; Lau et al.,2006; Brown & Ryan, 2004; Kabat-Zinn, 2003,1994; Robins, 2002; Teasdale et al., 2002; Marlatt & Kristeller, 1999).

Despite different conceptualizations, mindfulness seems to be an inherently human quality, while there may be substantial inter- and intra-individual differences in the natural degree of mindfulness (Brown & Ryan 2003). Therefore, the goal of mindfulness is to maintain awareness moment by moment, disengaging oneself from strong attachment to beliefs, thoughts, or emotions, thereby developing a greater sense of emotional balance and well-being. (Ludwing & Kabatt-Zinn, 2008).

It is claimed that mindfulness enhances the self-observation of internal states which improves internal regulatory processes (Walach, et al., 2006).

Dispositional mindfulness is considered to be a trait or tendency that exists across situations, which, however, may be influenced by mindfulness-based treatment, (Brown & Ryan, 2003). Moreover, it thus may be related to specific personality traits (Thomson & Waltz, 2007). The theoretical and operational distinction between state and trait mindfulness is appropriate, as both are closely related but different constructs (Thompson & Waltz, 2007).

Ludwig and Kabat-Zinn (2008) highlighted many ways by which mindfulness might influence susceptibility to, or ability to recover from, disability and disease. These may include (1) decreased perception of pain severity; (2) increased ability to tolerate pain or disability; (3) reduced stress, anxiety, or depression; (4) diminished usage of, and thereby reduced adverse effects from analgesic, anxiolytic, or antidepressant medication; (5) enhanced ability to reflect on choices regarding medical treatments (i.e., decision to seek a second opinion); (6) improved adherence to medical treatments; (7) increased motivation for lifestyle changes involving diet, physical activity, smoking cessation, or other behaviors; (8) enriched interpersonal relationships and social connectedness; and (9) alterations in biological pathways affecting health, such as the autonomic nervous system, neuroendocrine function, and the immune system.

Many reviews and meta-analyses have been examined the role of mindfulness on both physical and psychological illnesses such as chronic medical diseases (Monshat & Castle, 2012; Bohlmeijer, Prenger, Taal, & Cuijpers, 2010), rheumatism (Young, 2011), cancer (Matchim, Armer, & Stewart, 2011; Musial, Büssing, Heusser, Choi, & Ostermann, 2011; Ledesma & Kumano, 2009), sleep disturbances (Winbush, Gross, & Kreitzer, 2007), blood pressure (Rainforth, Schneider, Nidich, Gaylord-King, Salerno, & Anderson, 2007) , fibromyalgia (Bernardy, Füber, Köllner, & Häuser, 2010), ischemic attack and stroke (Lawrence, Booth , Mercer, & Crawford, 2013), or sexuality (Brotto, Krychman, & Jacobson, 2008). Other reviews also showed positive effects of mindfulness on cognitive ability (Chiesa, Calati, & Serretti, 2010; Canter & Ernst, 2003; So & Orme-Johnson , 2001), stress (Chiesa & Serretti, 2009; Fjorback, 2012); psychiatric disorders (Chiesa & Serretti, 2011), psychological distress (Marchand, 2012;

Carmody & Baer, 2009), anxiety and depression (Green, Key, & McCabe, 2015: Norton, Abbott, Norberg, & Hunt, 2014; Stratford, Cooper, Di Simplicio, Blackwell, & Holmes, 2014; Chen & Berger, 2012; Edenfield & Saeed, 2012; Piet & Hougaard, 2011; Hofmann, Sawyer, Witt, & Oh, 2010), ADHD (Travis, Grosswald, & Stixrud, 2011;Krisanaprakornkit, Ngamjarus , Witoonchart, & Piyavhatkul, 2010), various types of addiction (de Lisle, Dowling, & Allen, 2012; Zgierska, Rabago, Chawla, Kushner, Koehler, & Marlatt, 2009) and eating disorders and obesity (Godfrey, Gallo, & Afan, 2014; Katterman et al., 2014b; O'Reilly et al., 2014*;* Wanden-Berghe, Sanz-Valero, & Wanden-Berghe, 2011*).*

Many of these reviews over and above, substantiate the clinical effectiveness of mindfulness (e.g., Walach et al., 2012; Chiesa et al., 2011; Fjorback et al., 2011; Hofmann et al., 2010; Burke 2010; Mars and Abbey 2010). However, according to Goyal et al. (2014), reviews to date report a small to moderate effect of mindfulness in reducing emotional symptoms (e.g., anxiety, depression, and stress) and improving physical symptoms (e.g., pain). These inconsistent findings depend on methodological a weakness that makes difficult the comparability of studies.

More in depth, a recent review and methanalysis (Goyal et al., 2014) based on RCTs, indicated that meditation programs can reduce the negative dimensions of psychological stress. Mindfulness meditation programs, in particular, show small improvements in anxiety, depression, and pain with moderate evidence and small improvements in stress/distress and the mental health component of health-related quality of life and well-being with low evidence when compared with nonspecific active controls. Mantra meditation programs did not improve any of them. Moreover, a small and consistent signal has been found, that any domain (anxiety, depression, and stress/distress) of negative affect is improved in mindfulness programs when compared with a nonspecific active control.

Despite the limitations of the literature, evidence suggests that mindfulness meditation programs have a salutary effect across diverse behavioral and clinical areas (e.g. Brown, Ryan, & Creswell, 2007), including a reduction of general psychological distress (Marchand, 2012) and

disordered eating symptoms (Lavender, Jardin, & Anderson, 2009) and can be considered promising treatments in these fields. As a consequence, many psychotherapies now incorporate mindfulness into their theories and practices (e.g., Didonna, 2009; Baer, 2006) such as Mindfulness-based cognitive therapy (MBCT) (Segal et al., 2002), Dialectical and Behavioral Therapy (DBT; Linehan, 1993), Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) and Compassion Focused Therapy (CFT; Gilbert, 2009). Such interventions use mindfulness practice to build awareness, acceptance, and distress tolerance and reduce emotional and cognitive reactivity, automatic behavioral patterns, and avoidance of unwanted experiences (Baer, 2005). In addition, many of these therapies reorient the individual to his or her values, which guides new and more adaptive behavioral patterns.

The most used mindfulness based programs are: mindfulness-based stress reduction (Kabat-Zinn, 1994) and mindfulness-based cognitive therapy (Segal et al., 2002), but also Mindfulness Based Relapse Prevention (MBRP , Bowen, Chawla & Marlatt, 2011) and Mindfulness Based Eating Awareness Training (MB-EAT, Kristeller & Wolver, 2011) have been incresiling used respectively for addictions and eating disorders.

2.1.2. The construct of Mindful eating

The construct of Mindful Eating (ME) has been defined as a learned skill based on a nonjudgmental awareness of physical and emotional sensations associated with eating (Framson et al., 2009). It is being present with internal emotions, thoughts, and sensations as well as the external sensations associated with eating. This includes being attentive and in the moment with the sensation of taste, awareness of satiety cues, cognition, and emotions associated with eating (Andersen, 2007). According to Kristeller et al. (2014; 2011; 1999), the main principles of Mindful eating are the following:

- Allowing yourself to become aware of the positive and nurturing opportunities that are available through food preparation and consumption by respecting your own inner wisdom.

- Choosing to eat food that is both pleasing to you and nourishing to your body by using all your senses to explore, savor and taste.
- Acknowledging responses to food (likes, neutral or dislikes) without judgment.
- Learning to be aware of physical hunger and satiety cues to guide your decision to begin eating and to stop eating.

In other words, ME is an experience that engages body, heart and mind in choosing, preparing and eating food, which involves all senses. Moreover, ME replace self-criticism with self-nurturing and also shame with respect for your own inner wisdom (Bays, 2009). "Mindful eating is not about what you eat (healthy or junk food), but it is about the way you eat" (Albers, 2008, p.19). According to Albers (2008), ME is based on learning seven different skills: awareness, observation, being in the moment, being mindful of the environment, non-judgment, letting go and acceptance.

2.2 Mindfulness and mindful eating assessment

2.2.1. Measures of Mindfulness

Currently, researchers increasingly concentrate on the mechanisms through which mindfulness exerts positive influences on mental and physical well-being (Williams, et al., 2011; Crane et al., 2010; Coffey & Hartman, 2008; Shapiro et al., 2006). Therefore, a reliable and valid measurement of mindfulness is crucial for empirical investigation. Some reviews have been focused on the state of assessment of mindfulness (Bergomi, 2013; Sauer et al., 2012; Baer, Walsh & Lykins, 2009; Johnson, 2007). The set of trait mindfulness measures that has emerged in the literature in recent years can be described as heterogeneous in many respects, indicating that the definition and operationalization of the construct is far from consensual (Bergomi et al., 2013; Hart et al., 2013; Sauer et al., 2012).

As a result, over the last decade various mindfulness self-report questionnaires have been developed and are now largely used in psychological research. Most of these scales were

designed to measure trait mindfulness: the *Freiburg Mindfulness Inventory* (FMI; Buchheld, Grossman & Walach, 2001; Walach et al., 2006), the *Mindful Attention Awareness Scale* (MAAS; Brown & Ryan, 2003), the *Cognitive and Affective Mindfulness Scale-Revised* (CAMS-R; Feldman, Hayes, Kumar, Greeson & Laurenceau, 2007; Hayes & Feldman, 2004), the *Southampton Mindfulness Questionnaire* (SMQ; Chadwick et al., 2008), the *Kentucky Inventory of Mindfulness Scale* (KIMS; Baer, Smith & Allen, 2004), the *Five Facet Mindfulness Questionnaire* (FFMQ; Baer, Smith, Hopkins, Krietenmeyer & Toney, 2006), and the *Philadelphia Mindfulness Scale* (PHLMS; Cardaciotto, Herbert, Forman, Moitra & Farrow, 2008).

On the other hand, the *Toronto Mindfulness Scale* (TMS; Lau et al., 2006) specifically assesses the capacity to invoke a mindfulness state during meditation practice.

As reported in two reviews (Sauer et al., 2012; Bergomi et al., 2009) a brief description of the most used mindfulness questionnaires has been summarized below:

- *Cognitive and Affective Mindfulness Scale Revised* (CAMS-R) (Feldman et al., 2007; Hayes & Feldman, 2004) is a 12–item scale of mindfulness in daily life experience. It is based on a broad conceptualization of mindfulness accordingly to the definition of Kabat-Zinn (1990). The scale consists of four factors (attention, present focus, awareness, and acceptance) and a second-order mindfulness factor. A short version of the scale is also presented in the development article (Feldman et al., 2007). The CAMS-R may be of particular use in clinical studies because 1) it measures mindfulness as the willingness and ability to be mindful rather than as a realization of mindfulness experience during the day, and 2) it is particularly related to psychological distress (Thompson &Waltz, 2007; Baer et al., 2006).
- *Kentucky Inventory of Mindfulness Skills* (Baer, 2004) comprises 39 items, which incorporate mindfulness skills as taught by MBSR (Kabat-Zinn 1990), MBCT (Segal et al., 2002a, b), ACT (Hayes et al., 1999) and DBT (Linehan, 1993). The scale consists of

four factors (observe, describe, act with awareness, nonreactive stance). It is thus unclear to what extent the ability to verbally describe experiences as measured by the KIMS constitutes a core component of mindfulness and should accordingly be a central facet in a mindfulness scale. A short form of the scale has recently been published (Höfling et al., 2011b).

- *Five Factors Mindfulness Questionnaire* (FFMQ) (Baer et al., 2006) is a 39 item tool which unifies the most widely used mindfulness questionnaire. This scale and its facets resulted from an exploratory factor analysis of the combined pool of 112 items collected from the KIMS, the FMI, the MAAS, the CAMS, and the SMQ. The factor analysis produced five factors (in total: nonreactivity to inner experience, observing/noticing/attending to sensations/perceptions/thoughts/feelings, acting with awareness/automatic pilot/concentration/non-distraction, describing/labeling with words, nonjudging of experience).that could be replicated with confirmatory factor analysis (Baer et al., 2006). Mindfulness is conceptualized as a general second-order construct that related to the five specific first-order factors. The FFMS is considered to be a suitable instrument for the assessment of differential contributions of mindfulness aspects. Unfortunately, it also has several limitations. The approach leading to the scale was mainly empirically (rather than theoretically) founded.
- *Freiburg Mindfulness Inventory* (FMI; Kohls et al., 2009; Walach et al., 2006; Buchheld et al., 2001) is a 30 item scale explicitly builded on the fraimwork of Buddhist psychology. The four-factor structure found in the validation study (mindful presence, non-judgmental acceptance, openness to experiences and insight) was found to be unstable (Walach et al., 2006). Correspondingly, in two studies principal component analyses yielded a three-factor (Leigh et al., 2005) and a four-factor (Bergomi, 2007). Recent research favors a two-dimensional factorial structure with an attention to the present moment aspect (factor presence) and a factor of non-judgmental attitude (factor

acceptance). Short versions of FMI have been proposed: a 14-item version, and a 7-item version (Jimenez et al., 2010). The 14-item version has been found to be one-dimensional (Walach et al., 2006) and also two-dimensional, comprising a *presence* scale and *acceptance* scale (Kohls, Sauer, & Walach, 2009; Ströhle, 2006

- *Toronto Mindfulness Scale* (TMS) (Lau et al., 2006) measures mindfulness as a state. The scale addresses a person's experiences during an immediately preceding meditation session. The conceptual base is built on Kabat-Zinn's (1990) work. The TMS comprises two factors, *curiosity* and *decentring.* A trait version of the TMS was developed and preliminarily validated in meditators and nonmeditators (Davis, Lau & Cairns, 2009). Both *trait decentering* and *trait curiosity* were positively associated with other trait mindfulness scales, with correlations higher for *trait decentering.* The *trait decentering* scores were higher in participants with longer meditation experience. Similarly, in the validation study of the state version of the TMS *state decentering* was generally higher in meditators with more meditation experience, whereas *state curiosity* was increased only in a subgroup of meditators trained in mindfulness meditation as described in MBSR (Bergomi et al., 2009). The TMS has the advantage of explicitly assessing the decentered stance to experiences which, as a central aspect of mindful attention (Teasdale et al., 2002), is clearly underrepresented among current mindfulness scales. The TMS seems to focus on the second component of mindfulness (mindful orientation) proposed by Bishop and colleagues (2004), whereas self-regulation of attention is not explicitly measured by this scale.
- *Southampton Mindfulness Scale* (SMQ; Chadwick et al., 2008) is a 16-item scale with four bipolar aspects: 1) decentered awareness *vs*. being lost in reacting to cognitions; 2) allowing attention to stay in contact with difficult cognitions *vs.* experiential avoidance; 3) acceptance of difficult thoughts and images and of oneself *vs.* being judgmental; 4) letting go of and being non-reactive to difficult cognitions *vs.* rumination or worry.

Exploratory factor analyses, however, suggested a one-dimensional factor structure of the scale (Chadwick et al., 2008; 2005). The SMQ may prove to be very useful for the investigation of relationships between mental health problems and mindful awareness. The scale appears particularly suited for studies focusing on the effects of a mindful attitude towards distressing inner experiences but may be too specific for more general use, as it does not involve items relating to positive or neutral phenomena (Bergomi et al, 2009).

- *Mindfulness Attention Awareness Scale* (MAAS; Höfling et al., 2011a; Brown and Ryan 2003) is a 15-item scale measuring mindfulness as a single factor relating to attention. The one-dimensional structure of the MAAS was replicated in several studies (MacKillop & Anderson, 2007; Carlson & Brown, 2005). Despite recent criticism (Grossman 2011; Grossman & Van Dam 2011). this scale is probably the most widely used to date, but it does not measure mindfulness but rather "mindlessness"—assuming that mindlessness can be seen as the inverted concept of mindfulness (i.e., the two constructs can be converted by simply recoding the items). As a consequence, measuring mindfulness 'negatively' may not reflect the complete spectrum of mindfulness experiences (Bergomi et al, 2009). Moreover, MAAS appears to address both the attention and the acceptance aspects of mindfulness, but does not differentiate one aspect from the other. An alternative and shorter version has recently been proposed (Höfling et al., 2011a). The MAAS allows a concise assessment of mindfulness in populations without previous meditation experience.
- *Philadelphia Mindfulness Scale* (PHLMS; Cardaciotto et al., 2008b) has a clear-cut factorial structure with two factors (awareness, acceptance) building on Bishop's et al. (2004) concept. Mindfulness is not seen as a second-order factor but rather as consisting of two independent but interrelated factors. The *awareness* subscale comprises open awareness of perceptions, sensations and feelings and omits the *acting with awareness*

aspect that is covered, for example, in the KIMS or FFMQ (Baer et al., 2006). Moreover, the *acceptance* subscale contains only items that are negatively formulated and capture experiential avoidance while positive acceptance, a compassionate stance towards oneself, non-reactivity and non-judgment are excluded.

- *Langer Mindfulness/Mindlessness Scale* (Haigh et al., 2011). Interestingly, the authors of this scale conceptualize mindfulness on the basis of information processing and creativity theory. In contrast to other scales, this instrument is not explicitly based on Buddhist ideas but rather reflects a Western approach to mindfulness that originates in cognitive psychology.

Others less used questionnaires on Mindfulness are the *Developmental Mindfulness Survey* (DMS; Salloway & Fischer 2007) and the *Effects of Meditation Scale* (EOM; Reavley and Pallant, 2009).

Studies suggest that there is little or no relationship between the mindfulness state during meditation (TMS) and everyday trait mindfulness (FFMQ, CAMS-R, & MAAS) (Carmody, Reed, Kristeller & Merriam, 2008; Thompson & Waltz, 2007).

The main evident point of divergence between Mindfulness questionnaires concerns which aspect s of mindfulness are covered by the scales (Christopher et al., 2009). Some questionnaires assess multifaceted aspect of mindfulness (i.e. KIMS, FFMQ, FMI-30), others evaluate two dimensions (i.e. PHLMS, TMS, FMI-14, one dimension (i.e. MAAS, FMI-14). Moreover, some of these scales (CAMS, FMI, SMQ) showed a more holistic conceptualization of mindfulness with tightly interconnected aspects (Leary & Tate, 2007; Walach et al., 2006). Alternatively, validation studies of the KIMS, FFMQ, TMS and PHLMS support that mindfulness may be conceptualized and assessed by distinct and stable facets with a correlation rate from .21 to .67 (Cardaciotto et al., 2008; Lau et al., 2006; Baer et al., 2006, 2004).

A recent study (Siegling & Petrides, 2014) focused on investigating the construct validity and homogeneity of the trait mindfulness measures (FMI, KIMS, CAMS-R, SMQ, MAAS,

LMS) and their linkage to FFMQ. Results showed that a single dimension explains the shared variance among measures based on the original, Eastern conceptualization of mindfulness, although not all of them seem to represent this construct comprehensively. The authors concluded that the Eastern and Western conceptualizations, and their respective measures, reflect distinct constructs. Therefore, for comprehensive measurement of the Eastern conceptualization of mindfulness, the FFMQ, KIMS, and CAMS-R seem to be the best options at present, whereas the MAAS appears to be least comprehensive, consistent with its relatively narrow focus on mindful attention and awareness.

Current mindfulness scales include nine distinguishable aspects of mindfulness: (1) *observing, attending to experiences*, (2) *acting with awareness*, (3) *non-judgment, acceptance of experiences,* (4) *self-acceptance,* (5) *willingness and readiness to expose oneself to experiences, non-avoidance,* (6) *non-reactivity to experience,* (7) *non-identification with own experiences,* (8) *insightful understanding, and* (9) *labeling, describing*. However, each scale comprises a different subset of these aspects, but none includes all (Bergomi, Tschacher & Kupper, 2012).

This heterogeneity in the self-report assessments of mindfulness evidently constitutes a problem for comparing and replicating research findings (Bergomi et al., 2013a; 2013b). For this reason Bergomi et al. (2013b) attempted to create the Comprehensive Inventory of Mindfulness Experience Beta (CIME-β).

2.2.2. Measures of Mindful eating

Mindful eating is a quite new approach which is increasingly used in both clinical and research settings. Consequently, researchers and clinicians need effective tools to measure this construct that are pertinent to desired change (Hulbert-Williams, Nichols, Joy, & Huibert-Williams, 2013). However, at the present time, only two scales are available to assess mindful eating: the *Mindful Eating Questionnaire* (MEQ; Framson et al., 2009) and the *Mindful Eating Scale* (MES; Hulbert-Williams et al.,, 2013).

– *Mindful Eating Questionnaire* (MEQ; Framson et al., 2009) is composed of 28 items scored one to four with higher scores indicating greater degrees of mindful eating or being aware of and able to respond to physiological indicators of hunger and satiety. EFA of the original scale (Framson et al., 2009) resulted in five categories of mindful eating: awareness of physiological and psychological experiences while eating (i.e., awareness), ability to stop eating when full (i.e., disinhibition), not eating in response to negative emotions (i.e., emotional response), attentiveness during food consumption (i.e., distraction), and awareness of external cues for consumption (i.e., external cues). The MEQ has been shown to possess acceptable internal consistency (Cronbach's α ranging from 0.64 to 0.83) and adequate relative validity based on association with yoga and not with other physical activities such as aerobic (Framson et al., 2009). Moreover the intensity of exercise is not associated with mindful eating (measured by MEQ) (Framson, 2009; Moor, Scott, & McIntosh, 2013), MEQ is not associated with cognitive restraint. Furthermore, MEQ and its subscales are strongly and inversely associated with BMI, independent from sex, age and education. A higher BMI is associated with lower scores in all MEQ subscales, whereas higher age is associated with higher level of mindful eating. Female gender is associated with lower level of emotional response scale. As they seem to be more likely than men to respond to emotional distress by eating. (Framson et al., 2009). Although the MEQ was used in other studies (Beshara, Hutchinson & Wilson, 2013; Moor et al., 2013; Kidd, Graor, & Murrok, 2013; Garautlet et al., 2012), MEQ means and standard deviations related to demographic variables or specific subgroups are not available for all studies, thus they can not be compared. Finally, the MEQ had been already used in various researches in different countries such as US, Australia and Spain, (Moor, et al., 2013; Kidd, et al., 2013; Garautlet et al., 2012; Besharaet al., 2013), but no Italian version of MEQ is still available and this will be one of the objectives of the present work.

– *Mindful Eating Scale* (MES; Hubert-Williams et al., 2013) is a 28-item self-report measure of eating-related mindfulness. It was developed by a pooled items from the Five-Factor Mindfulness Questionnaire(Baer et al., 2006) and the Philadelphia Mindfulness Scale (Cardaciotto et al., 2008) adapted to make more direct reference to eating-related behaviors whilst maintaining the original meaning of the item so far as possible. For instance, the FFMQ item, “I am easily distracted” became, “I am easily distracted whilst eating”. Moreover 74 items were included in the original pool to ensure an over-determination of the model. The scoring method is based on a 4-point Likert-type scale: never, rarely, sometimes and usually. In contrast with the Mindful Eating Questionnaire (MEQ, Framson, 2009) items are more related to acceptance and nonreactivity-concepts central to most definition of Mindfulness (Bishop et al., 2004). The initial validation of MES based on ungraduated University Students, reported six factors: acceptance (6 items), awareness (5 items), non-reactivity (5 items), routine (4 items), act with awareness (4 items), and unstructured eating (4 items). The factors correlated with existing measures of mindfulness ($0.113 < r < 0.522$), acceptance ($0.052 < r < 0.325$) and eating disorder symptoms ($-0.629 < r < -0.056$). The MES can be considered as a promising useful measure in mindfulness-based interventions for eating disorders and obesity.

Chapther 3: Mindulness based eating therapies

3.1 Mindfulness based therapies for overeating behaviors and obesity

Mindfulness principles have been incorporated in other psychotherapy's approaches to promote eating regulation in binge eaters such as Dialectical Behavior Therapy (Telch et al., 2001; Linehan, 1993), Acceptance and Commitment Therapy (Tapper et al., 2009; Hayes, Strosahl, & Wilson, 1999), Compassion Focussed Therapy (Goss & Allan, 2014; Goss, 2011; Gilbert, 2009, 2010) and Mindfulness Base Cognitive Therapy (Segal et al., 2002). Moreover, specific mindful eating programs have been developed for obesity and overeating behaviours such as Mindfulness Based Eating Awareness Training (Kristeel & Wilver, 2011) or others.(Dalen et al., 2010; Albers, 2008).

3.1.1 Dialectical and behavioral therapy

The *Dialectical and Behavioural Therapy* (DBT) in the adapted version for binge-type eating disorders (Safer, Telch, & Agras, 2001a, b; Telch, Agras, & Linehan, 2001, 2000) consists of 20 weekly sessions and has been applied in both group and individual formats. The rationale for this approach is based on the emotion regulation model (Wiser & Telch, 1999), which posits that binge eating functions to reduce aversive emotional states, and that by diverting attention from negative affect, binge eating temporarily reduces distress and thus is negatively reinforced. This version of DBT is designed to improve participants' ability to manage negative affect adaptively and includes training in mindfulness, emotion regulation, distress tolerance, and behavioral chain analysis skills, which are applied to binge eating episodes. The mindfulness skills are taught to counteract the tendency to use binge eating to avoid awareness of negative emotional states. These skills encourage nonjudgmental and sustained awareness of emotional

states as they are occurring, without reacting to them behaviorally. Participants learn to observe their emotions without efforts to escape them and without self-criticism for having these experiences. This state of mindful awareness facilitates adaptive choices about emotion regulation and distress tolerance skills that could be used in place of binge eating.

Several clinical trials have provided strong support for this adaptation of DBT (Telch et al., 2001, 2000; Safer et al., 2001b). This same DBT treatment protocol was later used by the authors of two other studies (Klein et al., 2012; Safer et al., 2010), with an adaptation by Masson et al. (2013) into a self-help manual.

For the joint treatment of BED or BN and borderline personality disorder (BPD), Chen et al., (2008) modified the standard DBT for BPD to add an emphasis treating eating-related problems with weekly skills groups, individual psychotherapy, consultation teams, and 24-h telephone access to staff.

3.1.2. Acceptance and Commitment therapy

The *Acceptance and Commitment Therapy* (ACT; Hayes et al., 1999) is based on an experiential avoidance model, which suggests that many forms of disordered behavior are related to attempts to avoid or escape aversive internal experiences. ACT emphasizes nonjudgmental acceptance of thoughts and feelings while changing overt behavior to work toward valued goals and life directions. ACT interventions draw on a variety of mindfulness-based techniques and exercises to bring about a willingness to experience difficult thoughts, feelings and sensations rather than trying to avoid or control them. In doing so, the individual is able to abandon maladaptive behaviors normally used for avoidance and control and instead focus on behaviors that move them towards valued outcomes (Hayes et al., 1999).

Since ACT directly targets experiential avoidance it may therefore be effective in bringing about reductions in emotional and external eating behaviors (Tapper et al., 2009). Another important component of ACT is *cognitive defusion*, helping the individual to see thoughts simply

as thoughts, rather than as things that should necessarily be believed and followed. This technique helps individuals relate differently to their thoughts enabling them to choose to act in accordance with their personal values and life goals. Thus applied to the above cognitions it may help individuals refrain from bouts of overeating and adhere to exercise and eating plans.

Different studies have been used similar protocols/workshops based on ACT. For example, in the study of Tapper et al., (2009) participants gained awareness that eating had been used as a way to avoid negative emotions, and acceptance and mindfulness were used to tolerate feelings and sensations related to diet like hunger and cravings. Lillis et al. (2011) also employed an ACT workshop intervention modified to address concerns around weight loss and maintenance with an emphasis on acceptance, mindfulness, and cognitive defusion. The information, exercises, and group processing activities targeted thoughts and feelings surrounding eating, body image, and self-stigma, values regarding health and relationships, and barriers and commitments to valued living.

Another ACT study (Weineland et al., 2012b) cover similar content (values, acceptance, mindfulness, defusuion and committed action) for a post-bariatric surgery population delivered through a combination of in-person, online, telephone, and recorded media information and exercises. This intervention targeted emotional eating, healthy behaviors, thoughts about shape and self-image, behavioral analysis, and barriers to valued change.

The most recent ACT study (Katterman et al., 2014a) was unique in combining the core ACT exercises and topics with behavioral lifestyle changes (i.e., monitoring food, calories, and physical activity, and stress management) to control weight in group sessions with young adult women.

3.1.3 Compassion Focused Therapy

The *Compassion Focused Therapy* (CFT; Gilbert, 2010; 2009) was specifically developed to address shames, self-criticism, and self-directed hostility by helping people to cultivate affiliate

emotions and compassion. This involves three processes: being open to the helpfulness and compassion from others, being helpful and compassionate *towards* others, and developing an encouraging, supportive, and compassionate approach to oneself (Gilbert, 2014).

CFT can have both individual or group-based format. CFT is derived from an evolutionary and neuroscience model of affect regulation that argues that different affect regulation systems evolved for different functions (Gilbert, 2014; 2010). It focuses on three specific affect regulation systems:

1) *The threat detection and protection system*: associated with rapidly activated emotions such as anxiety, anger and disgust, and defensive behaviors of fight/flight/avoidance, and submissiveness.

2) *The drive, vitality, and achievement system*: associated with emotions of pleasure and excitement and behaviors of approach and engagement.

3) *The contentment and affiliate soothing system*: associated with the experience of peaceful well-being and with giving and receiving affection and affiliation. It allows us to experience social connectedness and soothing from others or from ourselves.

These systems are mutually regulating, and the soothing system is seen as playing a crucial role in affect regulation. Therefore, CFT focuses on balancing affect regulation through the development of affiliate and caring processes.

An adapting version of CFT has been developed for eating disorders (CFT-E; Gross et al., 2014; Gross, 2011) to address the biopsychosocial factors that have been identified as having possible an etiological and maintenance roles in eating disorders (i.e. biological effects of starvation and chaotic eating, implications of weight change, the function of eating disordered behaviors in regulating threat and drive systems, a diet-centred culture). It pays particular attention to developing the ability to approach and work with one's eating disorder from a compassionate orientation. It uses interventions adapted from CFT and it promotes recovery for restricting and/or bingeing and purging types of eating disorders. CFT-E incorporates many of

CBT techniques: Socratic dialogue, guided discovery, inference chaining, mindful monitoring of thoughts, emotions, and behaviors, diary keeping, graded exposure to difficult situations, behavioral experiments, problem solving, learning emotional regulation strategies, stress inoculation training, and out-of-session tasks. It also retains elements from CBT protocols specific to eating disorders including structured eating and meal planning, exposure to specific foods and eating situations and a focus on working on issues related to weight and shape. Moreover, CFT-E emphasizes the use of sensory and imagery practices to stimulate the affiliative system.

One of the core practices is the development of the compassionate self, which becomes the focal point for engaging in problematic behaviors and emotions on behalf of oneself and other group members. This can include the use of method acting and psychodrama techniques. This frequently involves working on the fears and blocks to receiving compassion from others and from the self (Gross et al., 2014; 2011).

3.1.4 Mindful based eating awareness training

The most used mindfulness based program specific for binge eating and related issues is the *Mindfulness-Based Eating Awareness Training* (MB-EAT; Kristeller & Wolver, 2011; Wolever & Best, 2009; Kristeller, Baer, & Quillian-Wolever, 2006; Kristeller & Hallett, 1999).

MB-EAT is based on three theoretical approaches: models of food intake regulation that emphasize the interaction of psychological and physiological control processes (Hetherington & Rolls, 1996; Rodin, 1981), self-regulation theory (Schwartz, 1975), and neuro-cognitive and therapeutic models of mindfulness meditation (Kristeller, 2007: Siegel, 2007; Goleman, 1988). The MB-EAT model is consistent with other perspectives on treating dysfunctional and highly conditioned eating patterns, including the following: the chronic dieting model (Herman & Polivy, 1980), the escape model (Heatherton & Baumeister, 1991), cognitive-behavioral approaches (Apple & Agras, 1997; Fairburn & Wilson, 1993), interpersonal therapy (Wilfley et

al., 2002) for BED, and other approaches incorporating mindfulness within acceptance-based treatments (Safer et al., 2009; Wilson, 2004).

MB-EAT employes self-regulatory processes related to appetite, emotional balance, and behavior to promote a balanced regulation between physiological and non-nutritive factors that drive eating. This helps people to cultivate greater awareness of hanger and satiety, emotional states and external triggers (Kristeller & Wolver, 2011).

Moreover, through the concept of inner wisdom, self-acceptance, compassion and forgiveness, MB-EAT encourage participants to recognize their own internal strengths to make aware choices on challenging situations instead of reacting judgmentally and with the automatic pilot. Therefore patients can learn how to interrupt the dysfunctional cycles of binging, self-recrimination, and over-restraint.

Furthermore, the program emphasizes the pleasure and nurturing aspects of eating, while encouraging healthier patterns of food choice, in terms of both types and amount of food eaten, also in a way that can be internalized by the person and maintained over time (Wolever & Best, 2009; Kristeller, et al., 2006; Kristeller, 2003).

An important component of the program is, noticing by the experience of taste, when the pleasure or satisfaction from a particular food begins to decrease (as explained by the processes involved in SSS (Rolls 2006; Heatherington & Rolls, 1996). This helps individuals to maximize pleasure from eating much smaller portions, even of favorite foods and to reevaluate their actual "liking" vs. "wanting" patterns, interrupting typical restraint–craving–bingeing cycle.

As reported by Kristeller et al. (2014), this process of heightened, nonreactive awareness of hunger and satiety cues may be reregulating sensitivity in reward areas of the brain associated with obesity (Stice et al., 2010a,b; 2009) and those identified in addiction models of obesity and BED (Appelhans, 2009; Cassin & von Ranson, 2007).

More in details, the MB-EAT is a 12 group sessions program (9 weekly sessions with 3 monthly booster sessions) structured to gradually introduce, in parallel, elements of mindfulness

meditation practice, mindful eating, and themes of self-awareness and self-acceptance. As explained by Kristeller et al. (2011) MB-EAT is based on 6 domains which are integrated to each other:

-*Cognitive*: implies the awareness of reactivity to food cues and quieting the find, Furthermore it promotes the disengagement from black and white thinking and the increase of a non-judgmental awareness.

-*Physiological*: implies the reconnection with appropriate use of hunger and satiation cues and the reduction of hyper-reactivity.

-*Emotional*: related to the decrease of depression and other negative emotions and the increase of joyful eating.

-*Behavioral*: involves the decrease of binges and the interruption of highly conditioned responses.

-*Relationship to Self/Others***:** implies the improvement of self-acceptance, the facilitation of forgiveness of others.

- *Spiritual*: is related to the promotion of an increased sense of connection with wiser self and to free energy for higher level meaning and purpose.

As described by Kristeller, Wolever, & Sheets, (2014) an outline of MB-EAT's sessions is reported in tab. B.

Tab. B. Outline of MB-EAT sessions (Kristeller et al, 2014)

MB-EAT Outline sessions and home practice (Kristaller, Wolver & Sheets, 2014)	**Home meditation practices**
Session 1: Introduction to self-regulation model; raisin exercise; introduction to mindfulness meditation with practice in group	Sessions 1–3: Meditate 20 min with audio recording, with full instructions. Meditati on pratice (Others sessions)
Session 2: Brief meditation (continues all sessions); mindful eating exercise (cheese and crackers); concept of mindful eating; body scan	Home practice: Eat one snack or meal per day mindfully (repeated for all sessions, with increasing number of meal/snacks to be eaten mindfully per day)
Session 3: Theme: Binge triggers. Binge trigger meditation; mindful eating exercise (sweet, high fat food, such as brownies)	Home practice: Mini-meditation before meals
Session 4: Theme: Hunger cues—physiological vs. emotional. Hunger meditation; eating exercise: mindful food choices (cookies vs. chips); healing self-touch	Home practice: Eat when physically hungry Sessions 4–5: Mindfulness track, minimal instructions
Session 5: Theme: Taste satiety cues—type and level of cues. Taste satiety meditation; seated yoga	Home practice: Attend to taste and satisfaction/enjoyment
Session 6: Theme: Fullness cues—type and level of cues. Fulgesse meditation; potluck meal	Home practice: Stop eating when moderately full; eat at a buffet
Session 7: Theme: Forgiveness. Forgiveness meditation	Home practice: Eat all meals and snacks mindfully
Session 8: Theme: Inner wisdom. Wisdom meditation; walking meditation	Home practice: Eat all meals and snacks mindfully
Session 9: Theme: Have others notices? Where do you go from here? Maintaining change/relapse prevention; celebratoty potluck meal;	Maintaining a personal regular practice
Booster sessions: Meditation practice; review of progress; other weight management approaches.	Maintaining a personal regular practice

In the MB-EAT program three forms of meditation are used:

1) *general (breath/open awareness) mindfulness meditation* which are based on focusing intentionally the attention on different objects of the present moment experience (e.g. breath, body sensations, sounds, thoughts, emotions) or to the “open awareness”, in a non-judgemental way, returning attention to the object whenever it becomes engaged with another focus. This practice increases awarness of the mental process, becoming the observer of the ezperience and not automatically reacting over it. 2) *Mini-meditations* to be used at mealtime and throughout the day, are based on taking a few moments to stop and becoming aware of feelings, thoughts, and sensations, at times of stress, prior to meals, when binge urges occur, etc .3) *Guided eating meditations* cultivate awareness of the experiences of hunger, fullness, taste experience, taste satisfaction, and food choice through mindfully eating small amounts of increasingly challenging foods. The foods used represent those that individuals with binge eating typically

overeat (e.g. cheese, crackers, corn chips and cookies). In the *potluck meal* participants bring two dishes (an healthy and not healthy dish), but that they would like to continue eating in moderation. This experience serves to integrate all elements of mindful eating within a full meal experience and it prepares participants for their homework of going to an "all-you-can-eat buffet," a very challenging situation for most individuals in which to maintain mindful awareness and moderate food intake (Kristeller et al, 2014).

Efficacy of MB-EAT has been supported in an uncontrolled trial (Kristeller & Hallett, 1999) and in a recent controlled trial (Kristeller et al., 2013) with 4-months follow-up which showed that compared to the waiting list control, MB-EAT reported a consistent reduction of binging episodes, overeating pattern and depression and anxiety symptoms. Moreover, the amount of mindfulness practice predicted improvement on a range of variables, including weight loss.

The MB-EAT program have been shown to reduce episodes of overeating in obese individuals and improved eating regulation (Kristeller et al., 2013; Daubenmier et al., 2011; Kristeller & Hallett, 1999) and on decreasing depression and anxiety symptoms. A specific version was created for type2-Diabetes (MB-EAT-D) (Miller et al., 2014; 2012) which also included basic information regarding diet, physical activity, weight regulation, and glycaemia; but it does not provide specific diet or activity goals. The MB-EAT-D was found effective in improving depressive symptoms, outcome expectations, nutrition and eating-related self-efficacy, and cognitive control and disinhibition of control regarding eating behaviors.

3.1.5 Mindful Eating and Living program

Another specific mindful eating program for overweight and obesity has been proposed by Dalen and collegues (2010): *The Mindful Eating and Living (MEAL)*. It is designed to specifically teach skills which lead to increased awareness of eating, emotions, and negative self-judgment. The goal is to help participants cultivate awareness of their behaviors and reduce

automatic eating, ideally resulting in less binge-type eating behavior and improved psychological functioning.

The MEAL format is a 6-week curriculum, taught in weekly sessions of two hours each. Specific exercises include mindfulness meditation, group eating exercises, and group discussion. Participants use written materials and Cds at home on a daily basis.

The MEAL curriculum has elements of other mindful eating curricula (Smith et al., 2006; Kristeller et al., 1999), but in a briefer format with minimal didactic information on diet, exercise, calories, and nutrition. It emphasizes brief daily meditation, and pairing meditation with eating. This enables participants to individually examine hunger and satiety cues, the qualities of foods they crave, and emotional and cognitive states associated with eating. Each MEAL class includes an eating exercise, with a variety of foods and in several common meal situations (hungry, full, alone, social) and sitting meditation, light yoga, walking meditation, and group discussion.

The MEAL program was proven effective in increasing mindfulness and cognitive restraint around eating, decreasing in weight, eating disinhibition, binge eating, depression, perceived stress, physical symptoms and negative affect and C- reactive protein (Dalen et al., 2010). However, these results are limited to a small sample of obese people without a control group.

3.1.6. Eat, drink and be mindful program

A similar intervention on mindful eating was used for obese women (Kidd et al., 2013) based on the seven principles of mindful eating, described in the book “Eat, drink and be mindful” (Albers, 2008). The program used by Kidd et al. (2013) was structured in 8 week-sessions of 60-90 minutes each based on mindfulness exercises, discussion of the homework and reading and discussing workbook chapters.

In the study the authors (Kidd et al., 2013) used a mixed method to analyze the efficacy of the intervention. No changes have been found in term of weight- loss and depression, but a

significant increase of self-efficacy for weight loss was reported both in quantitative and qualitative analysis which promotes changes in eating patterns. Finally, also adapted forms of MBSR and MBCT have been used to treat binge eating behaviors.

3.1.7. Mindfulness based stress reduction

The *Mindfulness based stress reduction* program (MBSR; Kabat-Zinn, & Hanh, 2009; Kabatt-Zinn, 2003; 1990) is a group-based intervention that focuses on improving awareness and acceptance of moment-to-moment experiences, including physical discomfort and difficult emotions.

The core of MBSR consists of mindfulness exercises that serve to increase awareness of sensations, emotions and thoughts, to provide self-regulation strategies, and to promote healthy and adaptive responses to stress. The standard MBSR program requires one 2 to 2.5-h session per week for duration of 8 weeks, as well as a 1-day session of intensive practice. Program components include different mindfulness meditation exercises (sitting and walking meditation and yoga practices), with different focus (e.g., body sensations, breath, thoughts). Each class has a didactic component and group discussions. In between sessions, participants are assigned up to 45 min of daily practice of the MBSR components at home which is generally supported by audio recordings and handouts. Furthermore, participants are encouraged to integrate mindfulness into their daily activities through choosing routine activities (i.e., showering, washing dishes) and executing these activities in a mindful way through focusing fully on the experience of the task at hand.

As reported by Godfried et al., (2014) some studies used an adaptation of MBSR (Kabat-Zinn, 1990) but with limited results in term of weight loss and reduction of binge eating. A recent study (Corsica, Katterman, & Kleinman, 2014) compared MBSR with a focused stress-eating intervention (SEI) and a combination of both. SEI was developed for this study that directly addressed the problem of eating in reaction to stress through cognitive and behavioral

strategies. This intervention included education on the psychological and biological impact of stress-eating, improving nutrition, reducing intake of sugar and processed foods (that tend to promote continued reliance on eating to cope with stress), developing alternate coping strategies, and repeated and structured in vivo exposure to "problem" foods while under stress. The last component was unique in teaching participants how, under stressful circumstances, to learn to resist eating convenient, tempting, but low quality foods and learn new ways of responding. Results showed that all three interventions resulted in significant improvement in the target variables of perceived stress and stress eating. In addition, these effects appear to have been maintained and in some cases, even improved over time, as further reductions were apparent at follow-up. Moreover, while all groups exhibited improvements in symptoms, the combination intervention appeared to result in the best overall outcomes at post treatment, suggesting that combining both a mindfulness-based treatment for general stress reduction and a cognitive behavioral treatment targeting stress-eating behavior directly may be the most effective strategy for reducing stress and stress-eating.

3.1.8 Mindfulness based cognitive therapy

The *Mindfulness based cognitive therapy (*MBCT; Segal et al., 2002) is an 8 sessions protocol which was designed to target the cognitive processes that render depressed individuals vulnerable to repeated relapse and recurrence, such as rumination and high cognitive reactivity to mood shifts (Teasdale, Segal, & Williams, 1995). It incorporates mindfulness training (Kabat-Zinn, 1990) with components of CBT.

Studies show that MBCT reverses processes hypothesized to underlie depressive psychopathology (e.g., Teasdale et al.,2000) and is associated with positive changes in emotion-related brain activation (Barnhofer et al., 2007).

The adaptation of MBCT for binge eating has been modified by Baer et al., (2005a). The protocol included mindfulness exercises, being accepting and non-judgmental, realizing that

thoughts are not facts, increasing activities related to pleasure and mastery, reducing activities related to negative thoughts and moods, and observing and experiencing sensations, thoughts, and feelings while making a choice of behaviors to engage in. Leahey et al., (2008) used an MBCT protocol adapted for the post-bariatric surgery population, emphasizing self-monitoring and modifying eating to be consistent with post-surgery recommendations, identifying and coping with external and internal triggers to overeating, practicing mindful eating, and emotion regulation techniques. Woolhouse et al., (2012) employed a MBCT called Mindful Moderate Eating Group (MMEG.), which added mindfulness exercises to CBT for binge eating (Crafti & Peyton, 2005; Crafti, 1994). The CBT component of the intervention involved regular and planned meals, self-monitoring, and identifying triggers for binge episodes. Courbasson et al., (2011) developed Mindfulness-Action based Cognitive Behavioral Therapy (MACBT) group treatment for individuals with concurrent BED and Substance Use Disorder (SUD). MACBT contained components of mindfulness, psychoeducational and balanced physical activity taught in a group setting and practiced at home through experiential exercises, behavior chain analysis, self-monitoring, goal setting, focusing on strengths (Courbasson et al., 2011).

Although there were differences between these 4 MBCTs, they all contained CBT elements for binge eating that target dietary restraint such as self-monitoring and recognizing cognitive and emotional triggers for binge eating or overeating in addition to building mindfulness skills through exercises in group and as homework.

3.2 The efficacy of mindfulness based eating programs

A recent review (Shafer & Magnuson, 2014) shows that restrictive diets are likely ineffective for weight loss and have negative consequences on eating habits and psychological well-being. On the contrary, no-dieting programs that encourage eating in response to internal hunger and satiety cues are more likely to be effective in promoting healthy eating and quality of life.

Some reviews and meta-analysis (e.g., O' Really, et al., 2014; Godfrey, et al., 2014; Katterman, et al., 2014; Godsey, 2013; Wander-Berghe et al., 2011) examined studies using mindfulness interventions to address binge eating behaviors, eating disorders, obesity and related outcomes such as weight, glycemic control, cravings, and emotional eating. Taking as a whole, mindful eating-based interventions have been found effective in reducing obesity-related behaviors and promoting weight maintenance and weight loss (O' Really, et al., 2014), and they can be considered an effective treatment in adjunct to obesity treatment (Godsey, 2013).

Moreover, ME- interventions have been found effective as a treatment for eating disorders in terms of reduction in eating concern, increasing eating awareness and improvement in emotion regulation (Wander-Berghe et al., 2011),showing a medium to large effect size on reducing binge eating (Godfrey et al., 2014). They have been shown effective also on disordered eating and emotional eating (Katterman et al., 2014). More specifically, positive outcomes have been found in relation to binge eating (e.g. Kristeller & Wolver, 2011, Courbasson**,** et al., 2011; Smith, et al., 2006; Kristeller & Hallett, 1999), emotional and external eating (Alberts et al., 2012; Woolhouse et al., 2012; Leahey et al., 2008), stress-eating (Corsica et al., 2014) and dietary intake (Miller et al., 2012; Timmerman & Brown, 2012).

There is empirical evidence that ME interventions can help reducing a variety of negative dimensions including depression (Kristeller & Wolever, 2011; Leahey, et al., 2008), anxiety (Smith et al., 2006), body image concern (Alberts et al., 2012), and physical symptoms (Miller et al., 2012; Dalen et al., 2010), although a mixed method study (Kidd et al., 2013) concluded that reductions in psychological distress were rather small.

ME-based interventions have also been found to increase level of physical activity (Tapper et al., 2009) and reduce Body Mass Index (BMI) (Niemeier et al., 2012; Dalen et al., 2010; Tapper et al., 2009), although reported effect sizes for change in body weight were small (O' Reially et al., 2014).

Mindfulness based interventions can also be used in the prevention of eating disorders: Lavander et al. (2009) found that non-eating disordered individuals who exhibited higher levels of dispositional mindfulness were less likely to engage in disordered eating behaviors.

Other research suggests that mindfulness-based skills offered to young women earlier in their psychosocial development might assist in the prevention of eating disorders (Proulx, 2008).

Although these promising results regarding ME-interventions for disordered eating and obesity, these findings should be taken carefully for the weak methodology used in many studies such as : small size samples, lack of control group, no long-term follow-up etc. As a consequence, more research is needed to clarify several factors including the appropriate dosage of mindfulness training versus other treatment components.

Empirical part

Chapter 4, 5, 6: The RESEARCH

This research sought to explore:

– the nature of the relationship between overweight/obesity, eating behaviors and psychological distress;

-the construct of Mindful eating trough the validation of the Italian adaptation of the Mindful Eating Questionnaire (MEQ);

-the role of mindfulnessand mindful eating as respectively potential mediator and moderator between overeating behavior (binge eating and emotional overeating) and negative outcomes (psychological distress, body dissatisfaction and poor mental well-being).

The body of work have been divided into 3 studies with specific questions and hypothesis to test.

Chapther 4: STUDY 1

The relationship between BMI, overeating behaviours and psychological distress

4.1 BACKGROUND

Obesity is a multifactorial condition caused and maintained by complex interactions between genetic, physiological, environmental, psychosocial, cultural and cognitive factors (Heitmann et al., 2012; Sarwer et al., 2011).

The relationship between body mass index (BMI) and psychological distress is still not clear.

Some reviews highlight the association between high BMI and psychological distress in terms of depression and mood disorders (Luppino et al., 2010; Atlantis & Backer, 2008), anxiety spectrum (Gariepy, et al., 2010), personality disorders (Gerlach, et al., 2015), binge eating disorder (de Zwann, 2001), low self-esteem and poor self-image (Schwartz & Brownell, 2004).

However, other reviews suggest a rather contradictory nature of the relationship between obesity and mental health, which goes from the absence of any link (Fabricatore & Wadden, 2004) or the presence of a weak link (Atlantis & Baker, 2008; Gariepy et al., 2010) to the detection of a strong link (Balle & Gonzalez, 2012; de Zwann, 2001; Luppino et al., 2010; Mc Elroy et al., 2002; van Hout et al., 2004; Gerlach, et al., 2015). Furthermore, discrepancies were found between results obtained from community or clinical samples (Fabricatore & Wadden, 2004).

Considering cross-sectional studies in the general population, a significant association was found between major depression, dystimia, bipolar disorders, and anxiety disorders, in terms of lifetime, past and current symptoms (Baumeisteir & Harter, 2007; Becker, et al., 2001; Barry, et al., 2008; Buffaerts et al., 2008; Carpenter et al., 2000; Chiadi et al., 2003; de Wit et al., 2009; Heo, et al.,2006; Mather et al., 2009; Perry, et al., 2008; Pikering, et al., 2007; Reynoso et al.,

2011; Roberts, et al., 2000; Simon et al., 2006; Zaho et al., 2009a; 2009b; 2012). This association was found to hold after adjusting for demographics, obesity related conditions, and lifestyle (Berry et al., 2008; Reynoso et al., 2011; Zaho et al. 2009a; 2009b). In addition, an higher level of BMI was associated with suicide ideation/attempt (Carpenter et al., 2000; Mather et al., 2009; Zaho et al., 2012) and personality disorders, especially antisocial, avoidant (Pickering et al., 2007), schizoid, paranoid, and obsessive-compulsive personality (Perry et al., 2008).

On the other hand, some studies found only modest association between an higher BMI and psychological distress (depression and anxiety) across 13 worldwide countries (Scott et al., 2008) or no association at all (Goldney et al., 2009; Hach, et al., 2006; John, et al., 2005), using standardized clinical assessment based on DSM-IV criteria and adjusting for many confounding variables. Therefore, in these studies, an higher BMI seemed to be protective for obese and morbid obese people.

Cross sectional studies based on clinical populations highlighted significant association between higher BMI and mood and anxiety disorders (Carpiniello et al., 2009; Colles et al., 2007; Guerdjikova, et al., 2007; Tuthill et al., 2006), low self-esteem and negative body-image (Friedman et al., 2003), personality disorders (Carpiniello et al., 2009; Martinelli et al., 2010; Tuthill et al., 2006), and eating disorders (Colles et al., 2007; Folope et al., 2012; Guerdjikova et al., 2007; Martinelli et al., 2010; Marzocchi, et al., 2008). In contrast, other studies found only small or no differences at all (Zimmerman et al., 2011; Papelbaum et al. 2010). For instance, Papelbaum et al. (2010) reported no associations between higher BMI and psychological distress in almost all scales of SCL-90R, except for Somatisazion.

Overall, the relationship between BMI and mental health has been described as threshold, because of the non-linearity and diversity of associations depending on medical, demographic and lifestyle patterns (Kelly et al, 2011; McLarenet al, 2008). In fact, these risk factors have been shown to increase psychological distress in excess weight individuals, but the risk disappears or

is significantly reduced after controlling for confounders (Brandheim et al, 2013). Discrepancies on studies also depend on how mental health is defined and assessed. Consequently, it is still not possible to clearly identify a specific psychological distress profile both in overweight and obese individuals.

Disordered eating patterns have a substantial impact on emergence and maintenance of overweight and obesity (Terpitz & Remund, 2013) and they might represent predictors of psychological distress, particularly in obese women (Darby et al., 2007).

Binge Eating Disorder (BED) and Night Eating Syndrome (NES) contribute to an increased psychopathology in obese population (Stunkard & Allison, 2003; Striegel-Moore et al., 2010).

Binge eating can occur in both nonobese and obese individuals (Carrard, Van der Linden, & Golay, 2012). Some cross-sectional studies reported an higher psychological distress in obese BED compared to obese nonBED in term of all SCL-90-R domains (Fandino et al, 2010), body dissatisfaction, poor self esteem, social phobia (Ramaciotti et al, 2008), anger suppression, and borderline personality traits (Fassino et al, 2003).

Strong evidence suggests an association between binge eating and both depressive symptoms and eating styles (i.e., emotional eating and external eating) (Schulz & Laessle, 2010; Pinaquy et al., 2003; Stice et al.,, 2002), and Mason and Lewis (2014) reported that individuals with higher BMI, depressive symptoms, emotional and external eating have the most severe binge eating symptoms. However, a recent study showed weak correlations between BMI and binge eating (Saules et al., 2009).

Not only BED and NES, but also common forms of overeating behavior (e.g., irregular eating, grazing, snacking, etc.), which are recurrent in overweight individuals (Gremigni & Letizia, 2011), might be associated with significant levels of distress. Some of these eating behaviours are very similar and not clearly defined, and thus they may overlap. Research involving non-clinical populations suggests that the prevalence of partial syndrome eating disorders is higher than that of the full-syndrome and that those with partial syndrome eating

disorders often engage in the same disturbed eating behavior as those with the full syndrome, but at a somewhat lower level of frequency or severity (Sanderson, 2004; Hsu, Sullivan, & Benotti, 1997).

Therefore, further studies are needed to investigate the role of various overeating behavior as predictors of psychological distress in different BMI categories.

4.1.1. Objectives and hypothesis

The aims of this study were the following:

- to explore the association of BMI (both as continuous and categorical variable) and binge eating with psychological distress;
- to investigate the association of BMI (both as continuous and categorical variable) with common overeating behaviours;
- to investigate the association between overeating behaviours and psychological distress among different BMI categories.

It was expect that:

- higher BMI was associated with higher psychological distress;
- binge eating was positively associated with psychological distress;
- certain types of overeating (e.g. NES/grazing, overeating out of meals, etc.) might predict psychological distress especially among overweight and obese persons.

4.2. METHODS

4.2.1 Partecipants

A sample of 691 adults from general and clinical populations was recruited in the waiting room of a variety of family physicians and weight loss clinics in the Italian Emilia Romagna and Marche regions.

Exclusion criteria were: 1) being under-weight, since comparisons of obese and overweight with this group were beyond the scope of this study; 2) being diagnosed for eating disorders; and 3) having a major chronic disease (e.g., heart disease, cancer, etc.) according to the medical record of the family doctor.

The sample size was established based on epidemiological data on obesity and overweight in Italy (Palmieri et al., 2010) indicating a rate of, respectively, 25.1% and 47.1 % among men, and 25.6% and 33% among women, of the general adult population. To allow the recruitment of at least 50 obese (50% female), we considered it necessary having at least 200 subjects involved in the study, taking into consideration also potentially incomplete returned questionnaires. An independent sample was laso recruited with the same approach and used to investigate the association between psychological distress and overeating behaviours.

4.2.2 Procedures

We obtained permission for this study from the Ethical Research Committee of the University of Bologna. Informed consent to participate in the assessment was obtained before entry into the study.

4.2.3 Measures

The assessment included socio-demographic variables, self-reported weight and height, eating behaviour, and psychological distress.

Socio-demographics included gender, age, and school education, as such factors were found to be associated with disordered eating symptoms (Striegel-Moore & Bulik, 2007).

School education was categorized into primary, secondary (high school) and higher (university degree and more).

Self-reported height and weight data were used to calculated BMI. Although the use of self-report measures is associated to a general overestimation of height and underestimation of weight resulting in an underestimation of BMI (Krul, Daanen, & Choi, 2011), self-reported measures are valid for identifying relationships in epidemiological studies as they were found to highly correlate with measured height and weight ($r > 0.9$, $p < 0.001$; Spencer et al., 2002).

Participants were categorized in 3 groups based on BMI (WHO, 1995):

- normal weight ($18.5 \leq BMI < 25$)
- overweight ($25 \leq BMI < 30$)
- obese ($BMI \geq 30$).

BMI was also treated as a continuos variable as it was suggested in some studies (e.g., Fonseca et al, 2006).

Overeating behaviours and binge eating

Eating behaviours were investigated by the *Eating Behaviour Questionnaire* (EBQ; Gremigni, Letizia, & Dalle Grave, in press), an Italian 58-item questionnaire developed to measure 7 factor analitically-derived dimensions representing various overeating behaviours: *Uncontrolled/hypercontrolled overeating* (13 items, alpha = 0.84); *Guilt/restraint* (9 items, alpha=0.80); *Overeating during meals* (9 items, alpha = 0.80); *Overeating out of meals* (7 items, alpha = 0.74); *Irregular eating* (5 items, alpha = 0.66); *NES-Grazing* (5 items, alpha=0.61) and *Snacking* (5 items, alpha = 0.60), The response format is based on a 5-point Likert scale, higher score corresponding to higher frequency in self-reporting of the eating behaviour.

The *Binge Eating Scale* (BES; Gordmally, Black, Daston, & Rardin, 1982) was used to categoriezed the sample into binge eaters (BED) and non-binge eater (NO-BED) according to the established cut off-point of 17, which indicates the possible presence of BED. BES is a 16- item

self-report measure of the presence and severity of behavioral and cognitive characteristics of binge eating. Individual items (graded from 0 to 3) examine both behavioral signs and feeling or cognition during a binge episode. The BES has proven excellent internal consistency (Cronbach's alpha: from 0.85 to 0.89) (Freitas, Lopes, Appolinario, & Coutinho, 2006; Gormally et al., 1982). In this study Cronbach's alpha was 0.85

Psychological distress

The *Symptoms Checklist-90 Revised*, (SCL-90R) (Derogatis, 1983) was used to assess psychological distress. It is a 90-item multi-dimensional questionnaire designed to screen for a broad range of psychological problems in both community and clinical samples. The response format is based on a 5-point Likert scale of distress, ranging from `not at all' (0) to `extremely' (4). Nine primary symptom dimensions are measured: *Somatizationn, Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Anger-Hostility, Phobic Anxiety, Paranoid Ideation and Psychoticism*. There are seven additional items that explore disturbances in appetite and sleep. In addition, the overall psychological distress is measured by the *Global Severity Index*, the *Positive Symptom Total* and the *Positive Symptom Distress Index*. Significant levels of psychological distress are represented by a mean score ≥ 1 at each subscales (range from 0 to 4).

The Italian validation study of SCL-90R (Prunas et al, 2012; Derogatis, 2011) supported a multi-dimensional structure with eight components, covering the same domains as the original questionnaire. In the Italian study it was also suggest to use, alternatively, the original 9 scales, as we did in the present study, in order to compare findings with those presented in the international literature.

4.2.4 Statistical analysis

Analysis of variance (ANOVA) between subjects was used to analyze the differences between normal weight, overweight and obese subjects on psychological distress (SCL-90R scales) taking into account the presence of binge eating (BED) and controlling for gender. Age

was not included as a covariate since preliminary analysis showed small correlations with the dependent variables.

In addition, a series of multiple linear regression analysis were performed using BMI as a continuous variables and BED and gender as dummy variables, to explain the variability of each of the SCL-90R scales.

In an independent sample of subjects, MANOVA was used to investigate the differences between groups based on BMI on overeating behaviours (EBQ scales), after controlling for gender. In the same sample, a series of multiple linear regression analyses was also run, separately for each BMI group, to test whether overeating behaviours (EBQ scales) might explain the variability of psychological distress (SCL-90R scales) among different BMI categories, controlling for gender.

Assumptions were preliminary tested for all the established analyses. MANOVA was used as moderate correlations were found between dependent variables that resulted in a confirmation of the assumption related to the absence of multicollinearity.

In the multiple regression models, multicollinearity between regressors was preliminary tested, with variance inflation factor (VIF) of 5 and above indicating a multicollinearity problem (O'Brien, 2007). Although a multiple regression model with correlated predictors can indicate how well the entire set of predictors predicts the outcome variable, it may not give valid results about any individual predictor, that was indeed an issue of interest in this study.

In the evaluation of estimates, conclusions were based on both statistical significance (significant level set at $p < 0.05$) and standardized measures of effect. By convention, Cohen's f^2 and partial eta square of 0.02, 0.15, and 0.35 were termed small, medium, and large, respectively; Pearson's r of 0.10 was considered small, 0.30 medium, and 0.50 large (Cohen, 1988).

Analyses were performed with IBM SPSS 20 (SPSS Inc., Chicago, IL).

4.3. RESULTS

4.3.1 Sample characteristics

The sample was predominantly formed by relatively young and highly educated women. BMI was used as a continuous variable and also categorized into three groups, where normal weight represented the majority of the sample (43.99%) followed by overweight (38.06%) and obese (17.94%). Compared to Italian epidemiological data presented by Palmieri et al. (2010), in this sample overweight people were over-represented and obese were under-represented. However, compared with a more recent ISTAT's report (2013), in which in Italian adult population were estimated 35.6% of overweight and 10.4% of obese, in this study obese people were overestimated and owerweight people underestimated.

Table 1 summarizes the sociodemographic characteristics of the sample.

Table 1. Characteristics of the sample (n = 691)

Characteristics		*Frequency (%)*	*Range*	*Mean ± SD*
Gender				
	Male	210 (30.39)		
	Female	481 (69.61)		
Age			18-80 yrs	39.26 ± 15
	≤ 35 yrs[a]	354 (51.23)		
	> 35 yrs[a]	337 (48.77)		
Education				
	Primary	127 (18.4)		
	Secondary	243 (45.2)		
	Higher	321 (46.5)		
BMI			18.50-71.86	29.95 ± 8.69
	Normal weigh[b]	304 (43.99)		
	Overweight[b]	236 (38.06)		
	Obese[b]	124 (17.94)		

SD = standard deviation; BMI = Body Mass Index

[a] categories are based on the median split

[b] categories are based on the WHO classification (1995)

4.3.2 *BMI and psychological distress*

Correlations between the dependent variables (SCL-90R scales) were all highly significant and with a large effect size, ranging in Pearson's *r* values between 0.50 and 0.87 (see Table 1A in Appendix). Therefore, a series of ANOVAs were run in the place of MANOVA for each SCL-90R scale. Preliminary correlations were run between SCL-90R scales and age to test whether age would be entered as a confounding variable in an ANCOVA model. Correlations were all small with Pearson's *r* values ranging between -0.04 (Somatization) to -0.16 (Hostility), and a mean value $r = |0.11|$. We thus considered age as not very useful in reducing the within-group error variance and we did not entered it in the ANOVA models.

It should be underlined that the design was not balanced, since we had 78 subjects with BED *vs.* 596 non-BED and females doubled males, as we can observe in the table below. Anyway, we preferred to perform the analyses, even if it can results in a reduction of the test power.

Tab. 2 Between subjects factors design

Factors	Value Label	N
BMI category	Normal weight	288
	Obese	262
	Overweight	124
BED	Non-BED	596
	BED	78
Gender	Female	464
	Male	210

Analyses are presented below by SCL-90R scales.

Somatization

Results of ANOVA presented in table 2 show that all the interactions were not significant and with very small effect sizes. Thus, there were independent effects of BED and gender on Somatization, where the effect of BMI was not significant. Mean values of BED groups and genders, that are presented in tables 3, show that female scored higher than males and subjects with BED scored higher than non-BED. However, these comparisons should be interpreted cautiously because of the imbalance of the design.

Table 3 Tests of Between-Subjects Effects Dependent Variable: Somatization

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	3515.15[a]	9	390.57	8.32	.0001	.101
Intercept	2627.79	1	2627.79	56.01	.0001	.078
BMI_category	238.21	2	119.10	2.53	.080	.008
BED	295.98	1	295.98	6.30	**.012**	.009
Gender	370.81	1	370.81	7.90	**.005**	.012
BMI_category * BED	20.45	2	10.23	.21	.804	.001
BMI_category * Gender	125.19	2	62.59	1.33	.264	.004
BED * Gender	24.75	1	24.75	.52	.468	.001
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	31152.71	664	46.917			
Total	50508.45	674				
Corrected Total	34667.870	673				

a. R Squared = .101 (Adjusted R Squared = .089)

Table 4 Descriptive statistics Dependent Variable: Somatization

BED	*Gender*	*Mean*	*Std. Deviation*	*N*
Non-BED	Female	5.39	7.48	390
	Male	2.31	3.77	206
	Total	4.33	6.61	596
BED	Female	9.09	9.87	74
	Male	2.91	2.80	4
	Total	8.77	9.72	78
Total	Female	5.98	8.02	464
	Male	2.32	3.75	210
	Total	4.84	7.17	674

Obsessive-Compulsive

Results of ANOVA presented in table 5 show that interactions were non-significant except for the BMI*BED interaction that was statistically significant at the $p = 0.04$ level.

However, its effect size was so small to be considered negligible. Thus, there were almost independent effects of BMI, BED and gender on Obsessive-compulsive symptoms. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 6, show that the obese scored lower than normal weight people, BED svored higher than non-BED and females scored higher than males.

Planned contrasts were performed between the obese and normal weight and between overweight and the other two groups taken together. Results show that the obese scored significantly lower than normal weight people.

These comparisons should be interpreted cautiously because of the imbalance of the design.

Table 5 Tests of Between-Subjects Effects Dependent Variable: obsessive-compulsiveness

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	3435.82[a]	9	381.75	8.80	.0001	.106
Intercept	3419.11	1	3419.11	78.82	.0001	.106
BMI_category	982.41	2	491.20	11.32	**.0001**	.033
BED	500.15	1	500.15	11.53	**.001**	.017
Gender	224.11	1	224.11	5.16	**.023**	.008
BMI_category * BED	277.34	2	138.67	3.19	**.042**	.010
BMI_category * Gender	45.85	2	22.92	.52	.590	.002
BED * Gender	16.73	1	16.73	.38	.535	.001
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	28844.47	665	43.375			
Total	48842.76	675				
Corrected Total	32280.29	674				

a. R Squared = .106 (Adjusted R Squared = .094)

Table 6 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Ossessive- compulsiveness

Groups	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	5.90	7.36	303
Obese	3.84	6.02	263
Overweight	4.89	7.19	124
Total	4.93	6.90	690
BED			
Non-BED	4.52	6.50	597
BED	8.25	8.87	78
Total	4.95	6.92	675
Gender			
Female	5.77	7.43	480
Male	3.03	5.00	210
Total	4.93	6.90	690

Table 7 BMI category Difference Contrast Results (K Matrix) Dependent variable: Ossessive compulsiveness

Level 2 vs. Level 1	Contrast Estimate	-5.623	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	-5.623	
	Std. Error	1.113	
	Sig.	**.0001**	
	95% Confidence Interval for Difference	Lower Bound	-7.809
		Upper Bound	-3.437
Level 3 vs. Previous	Contrast Estimate	-1.092	
	Hypothesized Value	0	
	Difference (Estimate - Hypothesized)	-1.092	
	Std. Error	.901	
	Sig.	.226	
	95% Confidence Interval for Difference	Lower Bound	-2.862
		Upper Bound	.678

Interpersonal hypersensitivity

Results of ANOVA presented in table 8 show that interactions were non-significant except for the BMI*BED interaction that was statistically significant at the $p = 0.02$ level. However, its effect size was so small to be considered negligible. Thus, there were almost independent effects of BMI, BED and gender on Interpersonal hypersensitivity symptoms. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 9, show that the obese scored lower than normal weight people, BED scored higher than non-BED and females scored higher than males.

Planned contrasts show that the obese scored significantly lower than normal weight people. These comparisons should be interpreted cautiously because of the imbalance of the design.

Table 8 Tests of Between-Subjects Effects Dependent Variable: Interpersonal hypersensitivity

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	4008.29[a]	9	445.36	13.59	.0001	.155
Intercept	2683.30	1	2683.30	81.90	.0001	.110
BMI_category	511.81	2	255.90	7.81	**.0001**	.023
BED	659.24	1	659.24	20.12	**.0001**	.029
Gender	323.66	1	323.66	9.87	**.002**	.015
BMI_category * BED	253.52	2	126.76	3.86	**.021**	.012
BMI_category * Gender	10.12	2	5.06	.15	.857	.0001
BED * Gender	44.30	1	44.30	1.35	.245	.002
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	21786.12	665	32.761			
Total	36587.30	675				
Corrected Total	25794,41	674				

a. R Squared = ,155 (Adjusted R Squared = ,144)

Table 9 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Interpersonal hypersensitivity

Groups	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	4.30	5.85	303
Obese	3.78	6.60	263
Overweight	3.73	6.05	124
Total	3.94	6.13	690
BED			
Non-BED	3.31	5.16	597
BED	9.19	9.88	78
Total	3.99	6.18	675
Gender			
Female	4.87	6.80	480
Male	1.83	3.41	210
Total	3.94	6.13	690

Table 10 BMI category Difference Contrast Results (K Matrix) Dependent variable: Interpersonal hypersensitivity

	Contrast Estimate		-4.050
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-4.050
11Level 2 vs. Level 1	Std. Error		.968
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	-5.950
		Upper Bound	-2.150
	Contrast Estimate		-1.601
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.601
Level 3 vs. Previous	Std. Error		.783
	Sig.		**.041**
	95% Confidence Interval for Difference	Lower Bound	-3.139
		Upper Bound	-.063

Depression

Results of ANOVA presented in table 11 show that interactions were non-significant except for the BMI*BED interaction that was statistically significant at the p= 0.05 level. However, its effect size was so small to be considered negligible. Thus, there were almost independent effects of BMI, BED and gender on Depression. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 12, show that the obese scored lower than normal weight people, BED svored higher than non-BED and females scored higher than males. Planned contrasts show that the obese scored significantly lower than normal weight people. These comparisons should be interpreted cautiously because of the imbalance of the design.

Table 11 Tests of Between-Subjects Effects Dependent Variable: Depression

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	9448.01[a]	9	1049.77	11.72	.0001	.137
Intercept	7234.33	1	7234.33	80.80	.0001	.108
BMI_category	1794.15	2	897.07	10.02	**.0001**	.029
BED	1470.60	1	1470.60	16.42	**.0001**	.024
Gender	669.17	1	669.17	7.47	**.006**	.011
BMI_category * BED	558.08	2	279.04	3.11	**.045**	.009
BMI_category * Gender	119.98	2	59.99	.67	.512	.002
BED * Gender	41.47	1	41.47	.46	.496	.001
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	59538.63	665	89.532			
Total	100357.85	675				
Corrected Total	68986.64	674				

a. R Squared = .137 (Adjusted R Squared = .125)

Table 12 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Depresion

Group	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	7.97	10.32	303
Obese	5.60	9.62	263
Overweight	6.69	10.42	124
Total	6.77	10.05	690
BED			
Non-BED	5.96	9.12	597
BED	13.36	14.19	78
Total	6.81	10.11	675
Gender			
Female	8.29	11.00	480
Male	3.32	6.18	210
Total	6.77	10.05	690

Table 13 BMI category Difference Contrast Results (K Matrix) Dependent variable: Depression

Level 2 vs. Level 1	Contrast Estimate		-7.693
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-7.693
	Std. Error		1.600
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	-10.834
		Upper Bound	-4.552
Level 3 vs. Previous	Contrast Estimate		-1.750
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.750
	Std. Error		1.295
	Sig.		.177
	95% Confidence Interval for Difference	Lower Bound	-4.293
		Upper Bound	.793

Anxiety

Results of ANOVA presented in table 14 show that all interactions were non-significant. Thus, there were independent effects of BMI, BED and gender on Depression. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 15, show that the obese scored lower than normal weight people, BED svored higher than non-BED and females scored higher than males. Planned contrasts show that the obese scored significantly lower than normal weight people. These comparisons should be interpreted cautiously because of the imbalance of the design.

Table 14 Tests of Between-Subjects Effects Dependent Variable: Anxiety

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	3033.02[a]	9	337.00	10.55	.0001	.125
Intercept	2184.35	1	2184.35	68.38	.0001	.093
BMI_category	509.72	2	254.86	7.97	**.0001**	.023
BED	332.45	1	332.45	10.40	**.001**	.015
Gender	266.57	1	266.57	8.34	**.004**	.012
BMI_category * BED	113.06	2	56.53	1.77	.171	.005
BMI_category * Gender	67.80	2	33.90	1.06	.347	.003
BED * Gender	27.21	1	27.21	.85	.356	.001
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	21240.73	665	31.94			
Total	35740.55	675				
Corrected Total	24273.76	674				

a. R Squared = .125 (Adjusted R Squared = .113)

Table 15 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Anxiety

Group	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	5.01	6.32	303
Obese	3.34	5.60	263
Overweight	3.70	5.75	124
Total	4.12	5.99	690
BED			
Non-BED	3.68	5.51	597
BED	7.43	8.22	78
Total	4.12	6.00	675
Gender			
Female	4.99	6.65	480
Male	2.09	3.33	210
Total	4.10	5.99	690

Table 16 BMI category Difference Contrast Results (K Matrix) Dependent variable: Anxiety

	Contrast Estimate		-4.222
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-4.222
Level 2 vs. Level 1	Std. Error		.955
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	-6.098
		Upper Bound	-2.345
	Contrast Estimate		-1.190
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.190
Level 3 vs. Previous	Std. Error		.774
	Sig.		.124
	95% Confidence Interval for Difference	Lower Bound	-2.709
		Upper Bound	.329

Hostility

Results of ANOVA presented in table 17 show that interactions were non-significant except for the BMI*BED interaction that was statistically significant at the p= 0.04 level. However, its effect size was so small to be considered negligible. Thus, there were independent effects of BED and

gender and BMI category on hostility. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 19, show that BED scored higher than non-BED and females scored higher than males.

Table 17 Tests of Between-Subjects Effects Dependent Variable: Hostility

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	727.11[a]	9	80.79	7.48	.0001	.092
Intercept	704.44	1	704.44	65.28	.0001	.089
BMI_category	218.52	2	109.26	10.12	**.0001**	.030
BED	80.06	1	80.06	7.42	**.007**	.011
Gender	69.14	1	69.14	6.40	**.012**	.010
BMI_category * BED	117.84	2	58.92	5.46	**.004**	.016
BMI_category * Gender	4.86	2	2.43	.22	.798	.001
BED * Gender	8.19	1	8.19	.75	.384	.001
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	7185.88	666	10.79			
Total	11674.77	676				
Corrected Total	7913.00	675				

a. R Squared = .092 (Adjusted R Squared = .080)

Table 18 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Hostility

Group	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	2.78	3.66	304
Obese	1.97	3.20	263
Overweight	2.18	3.19	124
Total	2.34	3.40	691
BED			
Non-BED	2.16	3.14	598
BED	3.81	4.84	78
Total	2.35	3.42	676
Gender			
Female	2.16	3.14	598
Male	3.81	4.84	78
Total	2.35	3.42	676

Table 19 BMI category Difference Contrast Results (K Matrix) Dependent variable: Hostility

	Contrast Estimate		-2.641
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.641
Level 2 vs. Level 1	Std. Error		.555
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	-3.732
		Upper Bound	-1.551
	Contrast Estimate		-1.132
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-1.132
Level 3 vs. Previous	Std. Error		.450
	Sig.		**.012**
	95% Confidence Interval for Difference	Lower Bound	-2.015
		Upper Bound	-.250

Phobic Anxiety

Results of ANOVA presented in table 20 show that all interactions were non-significant. Thus, there were independent effects of BED and gender on Phobic Anxiety, while BMI groups did not differ in this dimension. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 21, show that BED scored higher than non-BED and females scored higher than males.

These comparisons should be interpreted cautiously because of the imbalance of the design.

Table 20 Tests of Between-Subjects Effects Dependent Variable: Phobic Anxiety

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	409.99[a]	9	45.55	7.69	.0001	.094
Intercept	197.15	1	197.15	33.29	.0001	.048
BMI_category	15.53	2	7.76	1.31	.270	.004
BED	48.22	1	48.22	8.14	**.004**	.012
Gender	34.95	1	34.95	5.90	**.015**	.009
BMI_category * BED	4.60	2	2.30	.38	.678	.001
BMI_category * Gender	18.12	2	9.06	1.53	.217	.005
BED * Gender	6.22	1	6.22	1.05	.306	.002
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	3943.89	666	5.92			
Total	5294.22	676				
Corrected Total	4353.89	675				

a. R Squared = .094 (Adjusted R Squared = .082)

Table 21 Descriptive statistics by BED group and gender. Dependent variable: Phobic Anxiety

BED	*Gender*	*Mean*	*Std. Deviation*	*N*
Non-BED	Female	1.23	2.49	392
	Male	0.43	1.06	206
	Total	0.95	2.15	598
BED	Female	2.99	4.24	74
	Male	0.82	0.93	4
	Total	2.88	4.16	78
Total	Female	1.51	2.91	466
	Male	0.44	1.06	210
	Total	1.17	2.53	676

Paranoid Ideation

Results of ANOVA presented in table 22 show that all interactions were non-significant. Thus, there were independent effects of BMI catgory, BED and gender on Paranoid Ideation. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 23, show that the obese scored lower than normal weight people, BED scored higher than non-BED and females scored higher than males.

Planned contrasts show that the obese scored significantly lower than normal weight people. These comparisons should be interpreted cautiously because of the imbalance of the design

Table 22 Tests of Between-Subjects Effects Dependent Variable: Paranoid Ideation

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	1101.14[a]	9	122.34	9.15	.0001	.110
Intercept	1082.95	1	1082.95	80.99	.0001	.109
BMI_category	160.25	2	80.12	5.99	**.003**	.018
BED	149.46	1	149.46	11.17	**.001**	.017
Gender	105.57	1	105.57	7.89	**.005**	.012
BMI_category * BED	54.66	2	27.33	2.04	.130	.006
BMI_category * Gender	.92	2	.46	.03	.966	.000
BED * Gender	14.58	1	14.58	1.09	.297	.002
BMI_category * BED * Gender	.000	0	.	.	.	.0001
Error	8891.355	665	13.37			
Total	15422.583	675				
Corrected Total	9992.494	674				

a. R Squared = ,110 (Adjusted R Squared = ,098)

Table 23 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Paranoid Ideation

Group	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	3.07	3.81	303
Obese	2.50	3.78	263
Overweight	2.98	4.03	124
Total	2.79	3.82	690
BEDgroup			
Non-BED	2.50	3.46	597
BED	5.35	5,44	78
Total	2,83	3,85	675
Gender			
Female	3,27	4,20	480
Male	1,68	2,43	210
Total	2,79	3,82	690

Table 24 BMI category Difference Contrast Results (K Matrix) Dependent variable: Paranoid Ideation

	Contrast Estimate		-2.270
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.270
Level 2 vs. Level 1	Std. Error		.618
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	-3.484
		Upper Bound	-1.056
	Contrast Estimate		-.391
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.391
Level 3 vs. Previous	Std. Error		.500
	Sig.		.435
	95% Confidence Interval for Difference	Lower Bound	-1.373
		Upper Bound	.592

Psychoticism

Results of ANOVA presented in table 25 show that all interactions were non-significant. Thus, there were independent effects of BMI, BED and gender on Psychoticism. Mean values of BMI categories, BED groups and genders, that are presented separately in tables 26, show that the obese scored lower than normal weight people, BED svored higher than non-BED and females scored higher than males.

Planned contrasts show that the obese scored significantly lower than normal weight people. These comparisons should be interpreted cautiously because of the imbalance of the design.

Table 25 Tests of Between-Subjects Effects Dependent Variable: Psychoticism

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	1539.86[a]	9	171.09	10.30	.0001	.123
Intercept	1177.48	1	1177.48	70.90	.0001	.097
BMI_category	229.63	2	114.81	6.91	**.001**	.020
BED	285.60	1	285.60	17.19	**.000**	.025
Gender	110.63	1	110.63	6.66	**.010**	.010
BMI_category * BED	84.94	2	42.47	2.55	.078	.008
BMI_category * Gender	1.19	2	.59	.03	.965	.000
BED * Gender	24.58	1	24.58	1.48	.224	.002
BMI_category * BED * Gender	.000	0	.	.	.	.000
Error	11010.54	663	16.60			
Total	16868.90	673				
Corrected Total	12550,41	672				

a. R Squared = .123 (Adjusted R Squared = .111)

Table 26 Descriptive statistics by BMI category, BED group and gender. Dependent variable: Psychoticism

Group	*Mean*	*Std. Deviation*	*N*
BMI category			
Normal weight	2.62	3.95	303
Obese	2.27	4.36	262
Overweight	2.88	4.88	123
Total	2.50	4.28	688
BEDgroup			
Non-BED	2.08	3.49	595
BED	5.93	7.45	78
Total	2.53	4.32	673
Gender			
Female	2.08	3.49	595
Male	5.93	7.45	78
Total	2.53	4.32	673

Table 27 BMI category Difference Contrast Results (K Matrix) Dependent variable: Psychoticism

	Contrast Estimate		-2.567
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-2.567
Level 2 vs. Level 1	Std. Error		.689
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	-3.920
		Upper Bound	-1.214
	Contrast Estimate		-.195
	Hypothesized Value		0
	Difference (Estimate Hypothesized)		-.195
Level 3 vs. Previous	Std. Error		.558
	Sig.		.727
	95% Confidence Interval for Difference	Lower Bound	-1.291
		Upper Bound	.901

To complete the investigation of the association between BMI as a continuous variables and psychological distress. taking into consideration also the presence of a BED. multiple linear regression was performed for each SCL-90R scale.

Detailed results of the analyses are reported in Appendix. table 2A.

As regards *Somatization*, 6% of variance was explained by gender, but adding BED and BMI it rised to 8% with a statistically significant change ($p < 0.0001$), but a still small effect size, with Cohen's $f^2 = 0.09$. Being female was the best predictor ($\beta = -0.20$), followed by BED ($\beta = 0.19$) and a small contrinution of a lower BMI ($\beta = -0.10$).

Obsessive Compulsiveness presented the same pattern of relationships than Somatization, with the model explaining 8% of variance with a small Cohen's $f^2 = 0.09$, the best predictors being BED ($\beta = 0.20$) and a lower BMI ($\beta = -0.18$) followed by being female ($\beta = -0.16$).

Regarding *Interpersonal Hypersensitivity*, the model explained 13% of variance that represents a medium effect with $f^2 = 0.15$ and BED was the best predictor, with standardized β = 0.30, followed by being female (β = -0.18) and having a lower BMI (β = -0.11).

BED was also the best predictor of *Depression*, with standardized β = 0.25, followed being female (β = -0.19) and having a lower BMI (β = -0.17). This model explained 12% of Depression variance, which was a medium effect with $f^2 = 0.14$.

Ten percent of *Anxiety* was explained by the model with a small effect size $f^2 = 0.11$ and a major contribution of BED, with standardized β = 0.21, followed by being female (β = -0.19) and having a lower BMI (β = -0.16).

A small proportion of variance of *Hostility* (i.e., 6%; $f^2 = 0.06$) was explained by being female (β = -0.16), with BED (β = 0.16) and a lower BMI (β = 0.14).

The variance of *Phobic Anxiety* was explained (8%), although with a small effect size $f^2 = 0.09$, by a model where BMI gave a negligible contribution (β = 0.004)., and BED was the best predictor, with β = 0.21, together with being female (β = -0.15).

Nine percent of *Paranoid Ideation* was explained, with a small effect $f^2 = 0.10$, by a model where BED was the best predictor, with β = 0.24, followed by being female (β = -0.16) and having a lower BMI (β = -0.12).

Ten percent of *Psychoticism* was explained by the model with a small effect size $f^2 = 0.11$ and a major contribution of BED, with standardized β = 0.29, followed by being female (β = -0.12) and having a lower BMI (β = -0.11).

4.3.3 BMI and and subthreshold overeating behaviours

To investigate, in an independent sample of subjects, the association between common overeating behaviours and psychological distress, considering BMI (as a continuos variable) and sex, preliminary correlations were calculated between the dependent variables (EBQ scales).

Correlations between the dependent variables (EBQ scales) were all significant except for guilt/restraint and with a small to medium effect size, ranging in Pearson's *r* values between -0.10 and 0.52 (see Table 3A in Appendix). Therefore, MANOVA was run with EBQ scales as dependent variables and gender and BMI categories as independent variables. Preliminary correlations were run between EBQ scales and age to test whether age would be entered as a confounding variable in the MANOVA model. Correlations were all small with Pearson's *r* values ranging between -0.008 (Irregular Overeating) to -0.21 (Guilt/Restraint), and a mean value $r = |0.19|$. We thus considered age as not very useful in reducing the within-group error variance and we did not entered it in the MANOVA model.

In table 28 are summarized the main sociodemographic characteristics of the sample.

Table 28 Sociodemografic characteristic of sample (n = 191)

Characteristics		*Range*	*Mean ± s.d.*
Gender			
	Male	70 (36.64)	
	Female	121 (63.35)	
Age		19-88 yrs	40.41 ± 14.56
Education			
	Primary	37 (19.4)	
	Secondary	61 (31.9)	
	Higher	93 (48.7)	
BMI		18.50-67.54	29.06 ± 7.84
	Normal weigh[b]	68 (35.6)	
	Overweight[b]	45 (23.6)	
	Obese[b]	78 (40.8)	

Note. s.d. = standard deviation; BMI = Body Mass Index

[a] categories are based on the median split

[b] categories are based on the WHO classification (1995)

Results of MANOVA are reported in the table 29.

Table 29 MANOVA results

Effect	*Wilk's Lambda*	*F*	*Hypothesis df*	*Error df*	*Sig.*
BMI group	.63	6.27	14	142.00	**.0001**
Sex	.87	2.84	7	142.00	**.008**
BMIgroups * Sex	.91	.92	14	284	.532

The interactions BMIgroup * sex, was not significant (p >0.05). Significant differences were found between BMI group (p< 0.001) and gender (p = 0.008).

The results of univariate ANOVA between subjects effects for each EBQ scale are reported in table 30.

Tab. 30 Tests of between subjects effects

Source	*Dependent Variable*	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Intercept	EBQ1 Uncontrolled hypercontrol.	87864.85	1	87864.85	1412.86	.0001
	EBQ2 guilt/restraint	45222.97	1	45222.97	1306.52	.0001
	EBQ3 overeating during meals	38923.92	1	38923.92	1185.87	.0001
	EBQ4 overeating out of meals	11750.11	1	11750.11	1168.87	.0001
	EBQ5 irregular overeating	9443.42	1	9443.42	976.42	.0001
	EBQ6 .NES/grazing	11432.88	1	11432.88	985.65	.0001
	EBQ7 Snacking	4985.58	1	4985.58	1285.05	.0001

sex	EBQ1 Uncontrolled /hypercontrol.	32.40	1	32.40	.52	.472
	EBQ2 guilt/restraint	361.49	1	361.49	10.44	**.002**
	EBQ3 overeating during meals	151.78	1	151.78	4.62	**.033**
	EBQ4 overeating out of meals	76.53	1	76.53	7.61	**.007**
	EBQ5 irregular overeating	12.60	1	12.60	1.30	.256
	EBQ6 .NES/grazing	58.09	1	58.09	5.00	**.027**
	EBQ7 Snacking	42.02	1	42.02	10.8	**.001**
BMI categories	EBQ1 Uncontrolled hypercontrol.	755.37	2	377.68	6.07	**.003**
	EBQ2 guilt/restraint	1321.77	2	660.88	19.09	**.0001**
	EBQ3 overeating during meals	203.08	2	101.54	3.09	**.048**
	EBQ4 overeating out of meals	84.21	2	42.10	4.18	**.017**
	EBQ5 irregular overeating	9.54	2	4.77	.49	.612
	EBQ6 .NES/grazing	19.57	2	9.78	.84	.432
	EBQ7 Snacking	29.47	2	14.73	3.79	**.025**
sex * BMI_categories	EBQ1 Uncontrolled hypercontrol.	10.01	2	5.00	.08	.923
	EBQ2 guilt/restraint	32.81	2	16.40	.47	.623
	EBQ3 overeating during meals	38.60	2	19.30	.58	.557
	EBQ4 overeating out of meals	103.51	2	51.75	5.14	**.007**
	EBQ5 irregular overeating	17.96	2	8.98	.92	.397
	EBQ6 .NES/grazing	12.01	2	6.009	.518	.597
	EBQ7 Snacking	3.72	2	1.86	.48	.620

a. R Squared = ,078 (Adjusted R Squared = ,047)

Significant interaction sex* BMI categories were found only for Overeating out of meals (p=0.007) where overweight females (11.28±4.35) scored higher than other obese female (10.74±4.31) and normal weight females (8.53±2.48).

Significant differences were found between sex in Guilt/restraint (p=0.002), Overeating during meals (p=0.033), NES/grazing (p=0.027) and Snacking (p=0.001) with the exception of Uncontrolled overeating/hypercontrolled

Females scored significantly higher than men in Guilt/restraint, Overeating during meals, NES/grazing, and Snacking.

Significant differences were also found between BMI categories in Uncontrolled hypercontrol (p=0.003), Guilt/restraint (p<0.001), Overeating during meals (p=0.048), and Snacking (p=.025), whereas non significant differences were found in Irregular overeating and NES/grazing (p>0.05). Obese group scored significantly higher in Guilt/restraint and Overeating during meals compared to overweight and normal weight.

In tables 31 and 32 are reported means and SD for each category.

Tab 31 Means and SD of EBQ scales in BMI groups (n = 191)

	Normal weight *Mean±SD*	*Overweight* *Mean±SD*	*Obese* *Mean±SD*	*p*
Uncontrolled hypercontrol	28.32±7.36	24.35±8.95	23.56±7.42	.003
Guilt/restreint	14.60±4.81	20.60±6.39	23.22±6.78	.0001
Overeating during meals °	16.22±4.14	15.97±6.34	19.00±7.16	.048
Overeating out of meals	8.20±2.35	9.77±3.91	10.24±3.85	.017*
Irregular overeating	8.06±3.16	8.22±3.12	8.783±3.00	.612
NES/Grazing	9.65±3.76	8.90±3.24	9,26±3.05	.432
Snacking	6.68±2.00	5.67±1.84	6.06±2.13	.025

*significant interaction sex * BMI categories

Tab 31 Means and SD of EBQ scales in females and males (n = 191)

	Females Mean±SD	*Males Mean±SD*	*p*
Uncontrolled hypercontrol	26.12±8.46	25.48±7.49	.472
Guilt/restreint	19.28±6.89	15.83±6.16	.002
Overeating during meals ° s	17.80±6.14	15.72±5.25	.033
Overeating out of meals	9.69±3.85	8.48±2.37	.007*
Irregular overeating	8.51±3.24	8.02±2.86	.612
NES/Grazing	9.79±3.48	8.63±3.24	.027
Snacking	6.64±2.08	5.60±1.85	.001

*significant differences also in the interaction sex*BMIcategories p=0.007

4.3.4 ***Subthreshold overeating behaviours and psychological distress***

To complete the investigation of the association between overeating behaviours (EBQscales) and psychological distress. taking into consideration BMI as a continuous variables and sex, linear regression (method ENTER) was performed for each SCL-90R scale.

Somatization

The model explained 38% of variance (R^2 = 0.41, R^2 adjusted 0.38; F = 9.81, P<0.001) where Guilt/restriction (β= 0.23), Overeating out of meals (β= 0.20), Overeating during meals (β= 0.18), and NES/grazing (β= 0.18) were the main positive predictors of Somatization. The other EBQ scales, sex and BMI were not significant (p>0.05) (see table 32).

Table 32 Regression summary results: Somatization

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.654	.302		-2.163	032
	sex	.040	.093	.030	.430	.668
	EBQ1. Uncontrolled Hypercontrolled.	-.012	.007	-.153	-1.857	.065
	EBQ2 Guilt/restraint	.022	.008	.235	2.656	**.009**
	EBQ3 Overeating during meals	020	.009	.186	2.155	**033**
	EBQ4 Overeating out of meals	039	.017	.204	2.311	**022**
	EBQ5 Irregular overeatibg	-.004	.016	-.018	-.227	.821
	EBQ6.NES/grazing	.034	.014	.180	2.391	**.018**
	EBQ7 Snacking	.031	.024	.099	1.323	.188
	BMI	.005	.009	.046	.565	.573

Dependent Variable: Somatization

Obsessive-compulsiveness

The model explained 36% of variance (R^2 = 0.36, R^2 adjusted 0.31; F = 3.15, P<0.001) where Overeating during meals (β=.245), Guilt/restraint (β=.225), and NES/grazing (β= .162) were the main positive predictors of Obsessive-compulsiveness. In contrast sex, BMI and the other EBQ scales were not significant predictors (p>0.05) (see table 33).

Table 33 Regression summary results: Obsessive-compulsiveness

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.463	.313		-1.481	.141
	sex	.069	.096	.051	.718	.474
	EBQ1. Uncontrolled /Hypercontrolled.	-.010	.007	-.121	-1.446	.150
	EBQ2 Guilt/restraint	.020	.009	.202	2.255	**.026**
	EBQ3 Overeating during meals	.027	.010	.245	2.794	**.006**
	EBQ4 Overeating out of meals	.034	.017	.176	1.960	.052
	EBQ5 Irregular overeatibg	-.005	.017	-.021	-.274	.785
	EBQ6.NES/grazing	.031	.015	.162	2.120	**.036**
	EBQ7 Snacking	.044	.024	.136	1.790	.076
	BMI	-.005	.009	-.042	-.506	.613

Dependent Variable: Obsessive-compulsiveness

Interpersonal hypersensitivity

The model explained 31% of variance (R^2 = 0.31, R^2 adjusted 0.27; F = 7.45, P<0.001) where Guilt/restraint (β= .233), Overeating during meals (β= .185), NES/grazing (β= .198) and sex (β= .155) were the main positive predictors of interpersonal hypersensitivity, and BMI and the other EBQ scales were not significant predictors (p>0.05) (see table 34).

Table 34 Regression summary results: Interpersonal hypersensitivity

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.440	.312		-1.412	.160
	sex	.201	.096	.155	2.163	.037
	EBQ1. Uncontrolled /Hypercontrolled.	-.001	.007	-.0.17	-.192	.848
	EBQ2 Guilt/restraint	.022	.009	.233	2.509	**.013**
	EBQ3 Overeating during meals	.020	.010	.185	2.032	**.044**
	EBQ4 Overeating out of meals	.021	.017	.114	1.231	.220
	EBQ5 Irregular overeatibg	-.017	.017	-.085	-1.048	.296
	EBQ6.NES/grazing	.037	.015	.198	2.505	**.013**
	EBQ7 Snacking	.024	.024	.079	1.008	.315
	BMI	-.008	.009	-.076	-.882	.378

Dependent Variable: Interpersonal hypersensitivity

Depression

The model explained 40% of variance (R^2 = 0.40, R^2 adjusted 036; F = 10.65, P<0.001) where Guilt/restraint (β=.296), Overeating out of meals (β=.196), and NES/grazing (β= .150) were the main positive predictors of depression, and BMI, sex and the other EBQ scales were not significant predictors (p>0.05) (see table 35).

Table 35 Regression summary results: Depression

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.539	.300		-1.796	.075
	sex	.150	.092	.113	1.627	.106
	EBQ1. Uncontrolled Hypercontrolled.	-.009	.007	-.110	-1.346	.180
	EBQ2 Guilt/restraint	.028	.008	.294	3.378	**.001**
	EBQ3 Overeating during meals	.019	.009	.169	1.981	**.050**
	EB4 Overeating out of meals	.037	.017	.196	2.250	**.026**
	EBQ5 Irregular overeatibg	.003	.016	.014	.187	.852
	EBQ6.NES/grazing	.028	.014	.150	2.021	**.045**
	EBQ7 Snacking	.027	.023	.085	1.149	.252
	BMI	-.007	.009	-.067	-.828	.409

Dependent Variable: Depression

Anxiety

The model explained 42% of variance (R^2 = 0.42, R^2 adjusted 039; F = 11.90, P<0.001) where Overeating out of meals (β=.308), Guilt/restraint (β=.253), and NES/grazing (β= .221) were the main positive predictors of Anxiety, whereas, BMI, sex and the other EBQ scales were not significant predictors (p>0.05) (see table 36).

Table 36 Regression summary results: Anxiety

Model		*Unstandardized Coefficients*		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.772	.286		-2.696	.008
	sex	.141	.088	.109	1.604	.111
	EBQ1. Uncontrolled Hypercontrolled.	-.001	.006	-.016	-.203	.840
	EBQ2 Guilt/restraint	.024	.008	.253	2.972	**.003**
	EBQ3 Overeating during meals	.001	.009	.009	.107	.915
	EB4 Overeating out of meals	.058	.016	.308	3.626	**.0001**
	EBQ5 Irregular overeatibg	-.007	.015	-.034	-.457	.648
	EBQ6.NES/grazing	.050	.013	.271	3.729	**.0001**
	EBQ7 Snacking	.025	.022	.080	1.103	.272
	BMI	-.002	.008	-.017	-.218	.828

Dependent Variable: Anxiety

Hostility

The model explained 29% of variance (R^2 = 0.29, R^2 adjusted 025; F = 6.77, P<0.001) where NES/grazing (β= .230) and Overeating during meals (β= .215) were the main positive predictors of hostility. In contrast, BMI, sex and the other EBQ scales were not significant predictors (p>0.05) (see table 37).

Table 37 Regression summary results: Hostility

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.256	.295		-.866	.388
	sex	.164	.091	.136	1.814	.072
	EBQ1. Uncontrolled Hypercontrolled.	.003	.006	.043	.486	.628
	EBQ2 Guilt/restraint	.013	.008	.151	1.601	.112
	EBQ3 Overeating during meals	.022	.009	.215	2.331	**.021**
	EB4 Overeating out of meals	.031	.016	.177	1.878	.062
	EBQ5 Irregular overeatibg	-.030	.016	-.158	-1.916	.057
	EBQ6.NES/grazing	.040	.014	.230	2.860	**.005**
	EBQ7 Snacking	.001	.023	.004	.056	.956
	BMI	-.007	.009	-.068	-.785	.434

Dependent Variable: Hostility

Phobic anxiety

The model explained 21% of variance (R^2 = 0.21, R^2 adjusted 016; F = 6.77, P<0.001) where NES/grazing (β= .243) was the only positive predictor of Phobic anxiety. In contrast, BMI, sex and the other EBQ scales were not significant predictors (p>0.05) (see table 38).

Table 38 Regression summary results: Phobic anxiety

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.394	.257		-1.529	.128
	sex	.144	.079	.145	1.822	.070
	EBQ1. Uncontrolled.	.002	.006	.030	.318	.751
	EBQ2 Guilt/restraint	.009	.007	.119	1.195	.234
	EBQ3 Overeating during meals	-.001	.008	-.016	-.161	.873
	EB4 Overeating out of meals	.019	.014	.130	1.303	.195
	EBQ5 Irregular overeatibg	-.011	.014	-.071	-.808	.420
	EBQ6.NES/grazing	.034	.012	.243	2.852	**.005**
	EBQ7 Snacking	.030	.020	.127	1.497	.137
	BMI	-.004	.007	-.053	-.571	.569

Dependent Variable: Phobic anxiety

Paranoid Ideation

The model explained 22% of variance (R^2 = 0.22, R^2 adjusted 0.16; F =5.87, *P*<0.001), where Guilt/restraint (β=.271) and NES/grazing (β= .265) were the main positive predictors of Paranoid ideation. BMI resulted to be a negative predictor (β=-.208), whereas Sex and the other EBQ scales were not significant predictors (p>0.05) (see table 39).

Table 39 Regression summary results: Paranoid ideation

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	.127	.389		.326	.745
	sex	.117	.119	.075	.980	.329
	EBQ1. Uncontrolled overeating/Hypercontrolled.	.003	.008	.031	.347	.729
	EBQ2 Guilt/restraint	.030	.011	.271	2.816	**.006**
	EBQ3 Overeating during meals	.012	.012	.089	.946	.346
	EB4 Overeating out of meals	.023	.022	.104	1.082	.281
	EBQ5 Irregular overeatibg	-.038	.021	-.153	-1.817	.071
	EBQ6.NES/grazing	.059	.018	.265	3.228	**.002**
	EBQ7 Snacking	.029	.030	.079	.966	.336
	BMI	-.026	.011	-.208	-2.340	**.021**

Dependent Variable: Paranoid ideation

Psychoticism

The model explained 37% of variance (R^2 = 0.37, R^2 adjusted 0.33; F = 9.55, *P*<0.001) where Guilt/restraint (β= .271) NES/grazing (β= .265) were the main positive predictors of Psychoticism, BMI resulted to be a negative predictor (β=- .208), whereas Sex and the other EBQ scales were not significant predictors (p>0.05) (see table 40).

Tab. 40 Regression summary results: Psychoticism

		Unstandardized Coefficients		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	-.013	.253		-.050	.960
	gender	-.090	.077	-.082	-1.164	.246
	EBQ1. Uncontrolled /Hypercontrolled.	.011	.006	.165	1.991	**.048**
	EBQ2 Guilt/restraint	-.008	.007	-.101	-1.136	.258
	EBQ3 Overeating during meals	-.010	.008	-.111	-1.281	.202
	EB4 Overeating out of meals	.022	.014	.140	1.579	.116
	EBQ5 Irregular overeating	.008	.013	.048	.619	.537
	EBQ6.NES/grazing	.062	.012	.395	5.208	**.0001**
	EBQ7 Snacking	.041	.020	.157	2.076	**.040**
	BMI	-.009	.007	-.107	-1.296	.197

Dependent VariablePsychoticism

4.4 DISCUSSIONS

The first aim of the study was to explore the association of BMI (both as continuous and categorical variable) and binge eating with psychological distress.

As reported in many studies, we expected to find an higher level of psychological distress in overweight and obese groups (e.g., Baumeisteir & Harter, 2007; Barry, et al., 2008; Reynoso et al., 2011) and in binge eaters (Colles et al., 2007; Darby, et al, 2007; Fandiño et al., 2010; Jones-Corneille et al., 2012). Our hypothesis was only partially confirmed.

Only 78 individuals (11.29%) of the toal sample were classified as BED according to BES cut off (Gormally et al, 1982), but this percentage was higher than that found in the general population (1.7-4%) (APA, 2000) and more similar to the proportion of BED obese in the general population (10%) (Legenbauer et al., 2011). Although the majority of binge eaters were

obese (74%), followed by 19% overweight and 6% normal weight, this result confirms that binge eating can occur in both nonobese and obese individuals (Carrard, et al, 2012).

In all ANOVAs BED, BMI and gender had an independent effect on psychological distress, while age was not entered in the analysis, because in our sample it did not represent a confounding variable.

Binge eaters, compared to non bingers, reported significant higher level of Somatization, Obsessive-Compulsiveness, Interpersonal Hypersensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation and Psychoticism. This result is in line with previous studies in which binge eating is associated with an higher level of psychopathology (Colles et al., 2007; Darby, 2007; Fandiño et al., 2010; Fassino et al., 2003; Jones-Corneille et al., 2012; Petroni et al., 2007; Ramacciotti, et al., 2008).

Significant differences were found also between BMI categories in all SCL-90-R scales, with the exception of Somatization and Phobic anxiety. However, in contrast with our hypothesis, obese group showed a significantly lower level of psychological distress compared to normal weight. Other studies (i.e., Goldney et al., 2009; Hach, et al., 2006; John, et al., 2005; Roberts et al, 2002) have also shown that an higher BMI was not associated with higher level of psychological distress. Our results were only partially in accordance with a study by Papelbaum et al. (2010) in which an higher BMI was not associated with SCL-90-R scales apart from Somatization.

In accordance with other studies (Becker et al., 2001; Berry et al, 2008; Carpenter et al., 2000; Heo et al., 2006; Mather et al., 2009; Pickering et al, 2007; Zaho et al., 2009a; 2009b; 2012), females showed an higher level of psychological distress, reporting significantly higher scores than men in all SCL90-R scales,

Overall, results of multiple regression analysis showed that in all the models the predictors (BED, BMI and gender) explained a small to medium variance of different psychological distress.

Binge eating was the main predictor of psychological distress in term of obsessive-compulsiveness, interpersonal hypersensitivity, depression, anxiety, phobic anxiety paranoid ideation and psychotism.

Female gender was the main predictor of somatization and hostility, whether a lower BMI had a small but still statistically significant impact on psychological distress

Therefore, the present study confirmed that sex and the presence of binge eating represent major risk factors for psychological distress, in line with the literature (i.e. Van de Merwe, 2007).

In addiction, these results suggested that not only the level of psychological distress seems to be more related to the severity of BED than obesity (Javaras et al., 2008; Hudson et al., 2007; Fabricatore & Wadden, 2004; Dingemans et al., 2002; Wilfley et al., 2000; Ramacciotti et al., 2000), but also that a lower BMI is related to an higher psychological distress. Consequently, being obese seems to represent a protective factor from psychological distress. This is in line with the "jolly-fat" hypothesis of Crisp and McGuinness (1975) in which obese are more "jolly" people than those with normal weight. On the contrary, Sharma (2012) observed a considerable overlap between mental health and obesity co-epidemics, particularly in the treatment seeking obese (clinical population).

Therefore, as suggested by Friedman & Brownell (1995), the third generation studies should focus on the causal relationship between obesity and psychological distress, investigating which subgroup of obese have major psychological dysfunction, the nature of this dysfunction and the protective and risk factors that intervene.

Furthermore, no interactions were found of gender *BMI categories in common overeating behaviours, apart from overeating out of meals, where females overweight scored higher compared to obese and normal weight females.

Significant differences were found between BMI group in five of the EBQ scales, where obese group scored significantly higher on guilt/restraint, overeating during and out of meals

compared to the other groups. Normal weight group scored significantly higher in uncontrolled overeating /hypercontrolled and snacking.

These results in BMI groups seem to be in line with some common patterns of obese individuals, in which overeating behaviours that may occur in every moment of the day might not necessarily be followed by hypercontrol over eating. Eating out of meals might be characterized by nibbling/picking episodes (eating in an unplanned, repetitious manner between meals and snacks without feeling a loss of control) or by hyperphagia (during or out of meals) where a huge amount of food can be eaten without the lack of control, because food is considered a pleasure and people do not intend to stop eating (Gremigni & Letizia, 2011).

Besides, females scored significantly higher than men in many EBQ scales such as Guilt/restraint, Overeating during and out of meals, NES/grazing and Snacking. This seems to be in line with other studies (Framson et al, 2009; Oliver & Wardle, 1999), where women showed higher level of disinhibition and were more likely than men to respond to emotional distress by eating.

The second hypothesis of the study was confirmed. Results from linear regression analysis highlighted that specific overeating behaviours (NES/grazing, Overeating out of meals, Guilt/restraint, and Overeating during meals) were positive predictors of psychological distress (SCL-90R scales). These results are in line with previous studies. For instance, Lane and Swabo (2013) in a student sample, found a positive associations between grazing and binge eating, night eating and chaotic eating, indicating that the tendency to graze is related to a tendency to binge eat, and the relationship is not accounted for by a sense of loss of control.

In addition, studies reported an association between NES and several psychopathological features including depressed mood (Striegel-Moore et al., 2010; Allison et al., 2009; Striegel-Moore et al., 2008; Gluck, Geliebter, & Satov, 2001).

More in depth, in the present study, NES/grazing was found to be a positive predictor in all SCL-90R scales scale, and Guilt restraint represented a positive predictor of Somatisation,

Obsessive-compulsiveness, Interpersonal hypersensitivity, Depression, and Anxiety. Overeating out of meals was a positive predictor of both Depression and Anxiety, whereas Overeating during meals was a positive predictor of Obsessive compulsiveness, Interpersonal hypersensitivity and Hostility. BMI was found to negatively predict only Paranoid ideation and Psychoticism.

These results suggested that also subclinical form of binge eating (e.g., all the variety of overeating behaviours taken into consideration in this study) might be associated with different form of psychological distress. Indeed, in line with other studies (Striegel-Moore et al., 2010; Stunkard & Allison, 2003), NES was associated with a more severe psychological distress.

No causal association can be detected from these results, so that overeating behaviours might be a dysfunctional way to manage the psychological distress (Yau, Potenza, 2013) or having a disordered eating pattern might contribute to psychological distress.

In this study the majority of participants were non-bingers, according to BES cut-off, but, as some authors reported (Sanderson, 2004; Hsu, Sullivan, & Benotti, 1997), in no-clinical populations the prevalence of partial syndrome eating disorders is higher than that of full-syndrome although with lower frequency and severity. Therefore, these different forms of overeating should be assessed more carefully in order to prevent a more severe BED and psychological distress.

4.4.1 Strenghts and limitations of the study

The present study has many strengths: first of all it is the first study in Italy that has investigated, in a large general population sample, the associations between BMI, binge eating and psychological distress, and also between common overeating behaviors and psychological distress.

Only few studies (e.g., Lane & Swabo, 2013; Piernas & Popkin, 2010; Tam et al, 2010; Macht, et al, 2005) have explored atypical overeating behaviours in the general population, but they included only some of them (e.g. grazing and snacking).

We also used both ANOVA and multiple regression analysis, in order to take into consideration BMI either as a continuous or a categorical variable, also controlling for the main confounding variables.

However this study has also some limitations. First of all, the cross-sectional design of the study did not allow to infer a causal relationships between variables (BMI, overeating, and psychological distress).

In addition, the unbalanced characteristic of the samples used, composed mainly by relatively young and highly educated women, made them only partially representative of the Italian population.

Finally, the data collected were based on self-reported measures of weight and height, which according to Krul, Daanen and Choi (2011) may result in an underestimation of BMI; however, other authors reported a good correlation with measured weight and height (Spencer et al., 2002), suggesting that self-reports can be reliabily used.

4.5 CONCLUSION

Overall, BMI was not associated with psychological distress, but binge eating strongly influenced the level of psychopatology. Furthermore, BMI and male gender were negative predictors of psychological distress, acting as a potentially protective factors against distress.

Common subthreshould overeating behaviours (NES, grazing, overeating during and out of meals, guilt/restraint) have been found to be positive predictors of psychological distress. Therefore, we could conclude from this study that the main risk factors for psychological distress are represented by disordered eating behaviours, more than by BMI.

Further studies might compare clinical and general populations by a complete assessment including both self-report and measured or directly observed variables, such as overeating behaviours (BED, NES, common overeating), emotional, external and restraint eating, controlling for all confounding variables. To accomplish this goal, a much larger sample is necessary and much more time and finantial resources to use direct observation of behaviours than that used or available in this study.

Chapther 5: STUDY 2

Test restest validity and reliability of Mindfulness Eating Questionnaire in Italian samples

5.1 BACKGROUND

Eating behaviors seem to affect people's health, mood, and performance (Chaplin & Smith, 2011; Quirk et al., 2013; Reeves, Halsey, McMeel, & Huber, 2013).

A recent review (Schaefer & Magnuson, 2014) shows that restrictive diets are likely ineffective for weight loss and have negative consequences on eating habits and psychological well-being. On the contrary, no-dieting programs that encourage eating in response to internal hunger and satiety cues are more likely to be effective in promoting healthy eating and quality of life.

The mindfulness-based eating awareness approach (MB-EAT) (Kristeller & Wolever, 2011) is a no-dieting program based on the acquisition of mindful eating (ME). ME is a learned skill that can be described as a nonjudgmental awareness of physical and emotional sensations associated with eating (Framson et al, 2009). Mindful eating might help to recognize and respond to internal cues of hunger and satiety, or to manage inappropriate emotional and external cues.

ME-based interventions have been found effective in reducing obesity-related behaviors and promoting weight maintenance and weight loss (O'Reilly et al.,, 2014). Positive outcomes have been found in relation to binge eating (Kristeller & Wolever, 2011; Courbasson et al., 2011; Smith et al., 2006; Kristeller & Hallett, 1999), emotional and external eating (Alberts et al., 2012; Woolhouse et al., 2012; Leahey, et al., 2008); and dietary intake (Miller et al., 2012; Timmerman & Brown, 2012).

There is empirical evidence that ME interventions can help reducing a variety of negative dimensions including depression (Kristeller & Wolver, 2011; Leahey et al, 2008), anxiety (Smith et al, 2006), body image concern (Alberts et al, 2010), and physical symptoms (Miller et al, 2014; Dalen et al., 2010), although a mixed method study (Kidd et al., 2013) concluded that reductions in psychological distress were rather small.

ME-based interventions have also been found to increase the level of physical activity (Tapper et al, 2009) and reduce Body Mass Index (BMI) (Dalen et al, 2010; Tapper et al, 2009; Niemeier et al., 2012), although reported effect sizes for change in body weight were small (Kidd et al, 2013).

In light of the promising results of the ME-based approach, researchers and clinicians need effective tools to measure those variables that are pertinent to the desired change (Hulbert-Williams et al., 2014).

The quantitative assessment of mindfulness as a psychological state or learned skill has kindled a fast-growing interest in the last three decades, and various self-report questionnaires have been developed and used to measure a general mindfulness construct (Sauer et al, 2013; Park et al., 2013; Bergomi et al., 2013).

However, at the present time, only two scales are available to assess mindful eating: the Mindful Eating Questionnaire (MEQ; Framson et al, 2009) and the Mindful Eating Scale (MES; Hulbert-Williams et al, 2014). The MES was at a very preliminary stage of development when we started this study, whereas the MEQ had been already used in various researches in different countries such as US, Australia and Spain (Kidd et al, 2013; Moor et al.,2013; Garaulet et al, 2012; Beshara et al.,, 2013).

The authors of MEQ (Framson et al, 2009) underlined several limitations of the preliminary validation study and none of the subsequent studies addressed the psychometric characteristics of MEQ except for Cronbach's alpha reliability.

In addition, other authors suggested exploring further the relation of mindful eating with

BMI and physical activity as it was not straightforward (Moor et al, 2013).

5.1.1 Objectives and Hypothesis

The present validation study represents an attempt to address some limitations of previous studies to better characterizing the MEQ psychometric properties. Specifically: a) a larger sample size was used; b) practitioners were recruited from a broader range of meditation and yoga-type practices; c) the subjects' actual dietary practice; was taken into consideration d) structural validity of MEQ was addressed with both exploratory and confirmatory factor analyses to test whether the factor model represented a satisfactory solution for the data; e) we tested criterion validity through correlation with a reference measure of general mindfulness; f) test-retest reliability was calculated in addition to internal consistency; g) it was attempted to prove that MEQ measures the same construct in a different language and culture than the original. Two main differences between Italy and US are potentially related to our study matter: a) Italy is characterized by the Italian-style Mediterranean diet (i.e., low total fat, low saturated fat, high complex carbohydrates, and high dietary fiber (Ferro-Luzi & Branca, 1995) which is different from the US dietary pattern; b) in Italy mindful eating is still less investigated than in US as it is shown by the paucity of published studies (Compare, Callus, Grossi, 2012).

In the present study, hypotheses regarding correlations or mean differences related to mindful-eating were formulated a priori:

1) Positive correlations were expected between MEQ subscales and the general mindfulness tool.
2) Participants with previous meditation experience or practicing yoga were expected to report higher level of mindful eating than those without such experiences (Baer, Walsh, & Lykins, 2009).
3) Obese and overweight people were expected to report lower level of mindful eating than normal weight people (Kristeller & Wolver, 2011; Moor et al, 2013).

4) Finally, we expected to observe a negative association of mindful eating with being on a restrictive diet (Shafer et al, 2014).

5.2 METHODS

5.2.1 Study design and setting

This is a cross-sectional validation study aimed at improving the psychometric properties of the Mindful Eating Questionnaire (MEQ) by assessing item dimensionality, test-retest reliability, and criterion validity in Italy, a different culture and language from the original study. The permission for this study was obtained from the Ethical Research Committee of the University of Bologna.

A convenience sampling approach was employed in which participants were recruited in different settings in central and northern Italy between January and December 2013. A large part of the study sample was selected from the general population by 20 students as part of a requirement for a psychometrics course. Other participants were recruited by direct contact in a mindfulness center, in two weight-loss centers, and in four yoga or yoga-type centers. A small independent group was enrolled at a university consultation center to complete the MEQ twice at a four-week interval.

On designing this study we used the STROBE checklist (von Elm, Altman, & Egger, 2007) complemented by the COSMIN checklist (Terwee et al, 2012) and recommendations by Gleason and colleagues (2010) to make sure that the study met the standards for good quality.

5.2.2 Participants

In establishing the sample size we made sure to have a sufficient number of cases for randomly splitting the sample into two separate subsamples to run exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), and for the CFA model to converge without improper solutions (Wolf, Harrington, Clark, & Miller, 2013).

The test-retest sample size was calculated with power of 95% and the type I error rate of 0.05. Allowing for attrition, 72 was considered an adequate target number to detect a Cohen's d effect size of at least 0.50 in the association between pre- and post-test measures. Eligibility criteria for inclusion both in the principal sample and the independent test-retest sample were adults of both genders, aged 18 years or over, and able to read or speak Italian.

5.2.3 ***Variables and measurement***

The main variable of this study was mindful eating, as measured with the Mindful Eating Questionnaire (MEQ; Framson et al, 2009). A general tendency to be mindful in daily life, as measured with the Freiburg Mindfulness Inventory (FMI; Buchheld, et al.,2001; Walach, et al., 2006; Kohols et al., 2009) was used as a criterion variable for assessing the validity of MEQ. Meditation, physical activity, BMI, and diet plan were also used to assess criterion validity of the MEQ, while demographic information were used as potential confounders.

The MEQ (Framson et al, 2009) is composed of 28 items scored one to four with higher scores indicating greater degrees of mindful eating or being aware of and able to respond to physiological indicators of hunger and satiety. EFA of the original scale (Framson et al, 2009) resulted in five categories of mindful eating: awareness of physiological and psychological experiences while eating (i.e., *Awareness*), ability to stop eating when full (i.e., *Disinhibition*), not eating in response to negative emotions (i.e., *Emotional response*), attentiveness during food consumption (i.e., *Distraction*), and awareness of external cues for consumption (i.e., *External cues*). The MEQ has been shown to possess acceptable internal consistency (Cronbach's alpha ranging from 0.64 to 0.83) and adequate relative validity based on associations with yoga and not with other physical activities (Framson et al, 2009). The MEQ was translated from English into Italian and then independently back-translated by two bilingual psychologists following an iterative method (Guillemin et al, 1993). Any discrepancies between the two versions were resolved by joint agreement between the translators.

The FMI (Buchheld et al., 2001; Walach et al., 2006; Kohols et al., 2009) evaluates several interrelated aspects of mindfulness such as cognitive process, acceptance of experience, and a non-judgmental stance, using a four-point scale ranging from one to four. We used a short 13-item version of FMI (Sauer et al, 2013), which was formed by two subscales: *Presence* (6 items), measuring attention-related aspects of mindfulness, and *Acceptance* (7 items), measuring non-evaluative, open, and curious attitude towards consciousness content. Cronbach's alphas of the two scales in the present study were 0.71 and 0.76, respectively.

The questionnaire administered to the study sample also contained basic demographic information (gender, age, educational level); anthropometric measures (self-reported current weight in kilograms and height in meters); frequency (times per week) and type of physical activity; meditation experience (yes-no), and being on a specific diet plan. BMI was calculated as current weight divided by height squared. Categorical variables were created for BMI (< 25; 25-29.90; ≥ 30), years of age (18-29, 30-40, > 40), education (secondary, university), type of physical activity (none; yoga and other activities, such as taichi, qigong, baguazhang, martial arts and postural streching-pilates; aerobic exercise, such as running, walking, cycling, swimming, and team sports); intensity of exercise (none; moderate = 1-3 times/week; strenuous ≥ 3 times/week) and diet plan (weight loss and other restrictive diets such as low fat/low cholesterol, low salt/sodium, or diabetic diet; vegetarian/vegan/macrobiotic; no diet).

5.2.4 Statistical analysis

Data quality was assessed by checking for completeness of responses. Subjects with ≥ 5% missing data were excluded from analyses. Missing values of subject with <5% missing data were assumed to be missing at random (MAR) and replaced using MICE (multivariate imputation by chained equations) method. Estimates of parameters of interest were averaged across 5 copies of the data to give a single estimate, and standard errors were computed according to Rubin's rules. Potential bias arising from questionnaires not filled in completely or

subjects lost to retest was addressed by controlling that individuals with missing data had the same characteristics as the whole sample.

Test for multivariate skewness and kurtosis were conducted to assess multivariate distribution of data. Analyses were then performed in three steps.

Step 1. Structural validity was addressed by performing EFA and CFA, after dividing the entire sample into two random halves. The correlation matrix of the 28 MEQ items in the first half of the sample was subjected to principal axis factoring (PAF) and oblimin rotation. Parallel analysis (PA) was used to determine the number of common factors to retain (Bentler & Wu, 2005), and a cut-off of 0.35 was used to select significant factor loadings. CFA was performed on the second half of the sample to test the factor model that emerged from EFA. Model parameters were estimated using the robust maximum likelihood method, which corrects for non-normal data. The goodness of fit was assessed using the Satorra-Bentler scaled χ^2 statistic (S-B χ^2) (Hayton & Allen, 2007), the root mean square error of approximation (RMSEA, cut-off < 0.08) (Satorra & Bentler, 1888), the standardized root mean square residual (SRMR, cut-off < 0.08) (Browne & Cudeck, 1993) and the comparative fit index (CFI, cut-off ≥ 0.90) (Hu & Bentler, 1999).

Step 2. Internal consistency was calculated for the total MEQ and each scale separately in the entire sample using Cronbach's alpha (cut-off ≥ 0.70) (Bentler, 1990). and corrected item-total correlations (≥ 0.30) (Nonnally, 1978). To assess test-retest reliability, an independent sample participated in two administrations of MEQ under similar conditions (e.g. type of administration, setting and instructions) at a time interval of four weeks, and the intraclass correlation coefficient (ICC) with a 2-way random-effects model (cut-off ≥ 0.70) (Nonnally, 1978) was calculated.

Step 3. As evidence of criterion validity, zero-order correlations were calculated between MEQ scales and FMI scales. ANOVAs were computed to test the ability of MEQ to differentiate

between groups based on meditation, physical activity, BMI, and diet plan. The interactions between independent variables (sociodemographic and subgroups) was not analyzed because of their high numerosity compared to the sample size. Means, standard deviations (SD), and standard error of measurement (SE) were calculated for each MEQ scale for relevant subgroups.

In the evaluation of estimates, we based conclusions on statistical significance ($P \leq 0.05$). CFA was performed using LISREL version 8.80 (Jöreskog & Sörbom, 2008).and other analyses were performed with IBM SPSS version 21.0 (2012).

5.3 RESULTS

5.3.1 Sample characteristics

The initial sample consisted of 1094 subjects, and 72 additional patients formed the test-retest sample. The main total sample shrank to 1067 subjects because 27 questionnaires (2.5%) were excluded from analyses for incompleteness. There were no statistically significant differences on demographic characteristics between subjects who completed the questionnaire and those who provided incomplete answers. Of 1067 respondents, 59 (5.5%) were recruited in a mindfulness center, 78 (7.3%) in two weight-loss centers, 70 (6.6%) in four yoga or yoga-type centers, and 860 (80.6%) constituted the general population sample recruited by students. Sample characteristics are presented in Table 41

Table 41. Sociodemographic characteristics of participants (N = 1067)

Gender, N (%)	
Female	655 (61.4)
Male	412 (38.6)
Age, years, mean ± SD	34.1 ± 12.8
Age category, N (%)	
18-30 years	594 (55.7)
31-40 years	189 (17.7)
>40 years	284 (26.6)
Education, N (%)	
Secondary	497 (46.6)
University	570 (53.4)
Meditation experience, N (%)	
None	940 (88.1)
Some	127 (11.9)
Type of physical activity, N (%)	
None	331 (31.0)
Aerobic	636 (59.6)
Yoga-type	100 (9.4)
Exercise intensity (time/week), N (%)	
Sedentary (never)	331 (31.0)
Moderate (1-3 times/week)	497 (46.6)
Strenous (>3 times/week)	239 (22.4)
Diet, N (%)	
No diet	858 (80.4)
Weight-loss/other restrictive diets	167 (15.7)
Vegetarian/vegan/macrobiotic	42 (3.9)
Body Mass Index, mean ± SD[a]	24.2 ± 5.6
Body Mass Index category, N (%)	
Normal (<25)	729 (68.3)
Overweight (25-29.9)	227 (21.3)
Obese (>30)	111 (10.4)

[a]SD standard deviation

Participants were all Italian, predominantly women, young adults, well educated, normal weight, practicing aerobic exercise with moderate intensity, and not on a diet plan. Participants who declared to have meditation experiences were about 12% and those practicing yoga or yoga-type activities were about 9%.

The test-retest sample shrank to 60 cases as 12 subjects (17%) did not complete the MEQ again at the four-week interval. No significant differences were found on demographic characteristics between the initial sample and subjects who declined participation in the second

administration of the questionnaire. Participants in the final sample were 52% male, aged 18-74 years (mean age 40.8 ± 12 years).

5.3.2 Structural validity

All MEQ items showed an approximately normal distribution; however, tests for multivariate skewness and kurtosis were significant ($p < 0.001$), indicating a non-normal multivariate distribution. After extracting eigenvalues from the data correlation matrix of the first subsample, only the first four actual eigenvalues were greater than those generated by PA, and thus four factors were retained. Two items (i.e., items 8 and 25) were cut because they did not meet the minimum required factor loading. Therefore, EFA yielded a final sample of 26 items loading ≥ 0.35, representing the following factors: Disinhibition (8 items), Awareness (11 items), Distraction (3 items), and Emotional response (4 items). Factors were named on the basis of the subsets that emerged from the original MEQ study (Framson et al, 2009), although the number of factors extracted changed from five to four. Four of the six external cues items became subsumed by Awareness, except for item 3 ("At a party where there is a lot of good food, I notice when it makes me want to eat more food than I should"), which loaded on Disinhibition, and item 8 ("I notice when just going into a movie theater makes me want to eat candy or popcorn") that was excluded. Therefore, Awareness, defined as being aware of how food affects the senses and internal states, kept all the original items with the addition of four items from the External cues domain. Disinhibition, defined as the ability to stop eating when full, retained the original items except for item 25 ("When I'm at a restaurant, I can tell when the portion I've been served is too large for me"), which was excluded, and acquired item 3 from the External cues domain. Distraction and Emotional response both maintained their original composition. The four-factor solution accounted for 45% of the total variance. This proportion was acceptable since in EFA we used an estimation method (i.e., PAF) that extracts only the common item variance, avoiding the inflation of estimates of variance accounted for.

The four-factor model was tested in the second half of the sample with CFA. Fit indices met the cut-off values, indicating that the model provided an acceptable representation of the data (RMSEA = 0.068; 90% CI 0.64-0.73; SRMR = 0.072; CFI = 0.90). Pearson's *r* correlations between factors ranged from 0.03 to 0.55, indicating that factors were measuring different aspects of the general mindful eating construct.

Scores for each of the MEQ factors were calculated as the mean of items comprising that factor and the MEQ summary score was calculated as the mean of the four factors.(see tab. 42).

Table 42. Exploratory factor analysis: 26-item Mindful Eating Questionnaire

	Factors			
Item[a]	Disinhibition	Awareness	Distraction	Emotional
Item 18	0.79			
Item 2	0.72			
Item 11	0.68			
Item 15	0.58			
Item 9	0.55			
Item 7	0.51			
Item 5	0.50			
Item 3	0.46			
Item 22		0.63		
Item 21		0.61		
Item 12		0.51		
Item 16		0.49		
Item 10		0.47		
Item 26		0.45		
Item 23		0.45		
Item 20		0.40		
Item 4		0.38		
Item 14		0.35		
Item 24		0.35		
Item 6			0.57	
Item 28			0.47	
Item 1			0.45	
Item 19				0.88
Item 17				0.71
Item 27				0.51
Item 13				0.36
Cronbach's α	0.81	0.71	0.60	0.74

[a]Items with factor loadings <0.30 were suppressed and loading values <0.20 are not reported.

5.3.3 Reliability

Internal consistency was acceptable, with a Cronbach's alpha coefficient of 0.79 for the total MEQ and in the 0.60-0.82 range for the MEQ scales (see table 42).

Corrected item-total correlations were in the 0.40-0.70 range for Disinhibition, 0.30-0.44 for Awareness, 0.36-0.41 for Distraction, and 0.43-0.62 for Emotional response. Test-retest stability over a four-week period (N = 60) was acceptable, with an ICC of 0.83 (95% CI: 0.60-0.91) for the MEQ total scale, and ICCs of 0.72 for Disinhibition (95% CI: 0.50-0.85) and Awareness (95% CI: 0.49-0.85), 0.80 (95% CI: 0.64-0.89) for Distraction, and 0.85 (95% CI: 0.73-0.92) for Emotional response.

5.3.4 Criterion validity

The mean MEQ summary score was slightly lower than in the original study (2.80 ± 0.39 *vs.* 2.92 ± 0.37). Consistent with our hypothesis, positive correlations, although small to moderate, were observed between MEQ and FMI scales, with *r* values ranging between 0.10 and 0.37 (see table 43).

Table 43 Correlations between MEQ and FMI scales

	FIM total scale	FMI Acceptance	FMI Presence
MEQ total scale	0.34	0.25	0.36
MEQ Disinhibition	0.14	0.10	0.15
MEQ Awareness	0.31	0.21	0.37
MEQ Distraction	0.15	0.13	0.14
MEQ Emotional response	0.22	0.21	0.19

MEQ, Mindful Eating Questionnaire; FMI, Freiburg Mindfulness Inventory

All values were significant at $p < 0.001$ level.

Results of ANOVAs showed that compared to men, women reported higher mindful eating on Disinhibition [$F(1,1055) = 9.2$, $p = 0.002$] and Awareness [$F(1,1055) = 6.2$, $p = 0.01$], and lower on Emotional response [$F(1,1055) = 42.5$, $p < 0.001$]. Older subjects reported higher mindful eating on Disinhibition than both the other age-groups [$F(2,1055) = 11.3$, $P < 0.001$; post hoc Scheffé test $p < 0.01$]. Compared to less educated people, those who were more educated scored lower on Disinhibition [$F(1,1055) = 17.4$, $p < 0.001$] and higher on Awareness [$F(1,1055) = 12.4$, $p < 0.001$].

Meditators compared to non-meditators showed higher scores in Disinhibition [$F(1,1065) = 6.7$, $p = 0.01$], Distraction [$F(1,1065) = 4.3$, $p = 0.04$], and Emotional response [$F(1,1065) = 13.1$, $p < 0.001$]. People practicing yoga and yoga-type activities scored higher than those practicing aerobic in both Disinhibition [$F(1,1062) = 4.2$, $p = 0.04$] and Distraction [$F(1,1062) = 4.3$, $p = 0.04$], regardless of exercise intensity. No significant associations were found between MEQ scores and exercise intensity.

Higher BMI was associated with lower score in all MEQ scales: Disinhibition [$F(1,1064) = 26.5$, $p < 0.001$]; Awareness [$F(1,1064) = 7.6$, $p = 0.001$], Distraction [$F(1,1064) = 8.7$, $p < 0.001$]; and Emotional response [$F(1,1064) = 35.7$, $p < 0.001$]. Post hoc Scheffé comparisons showed that both obese and overweight subjects scored lower than normal weight in Disinhibition and Distraction ($p < 0.01$). In Awareness only obese people scored lower than the other groups ($p < 0.01$), and in Emotional response there was a decrease in mindful eating that paralleled the increase in BMI, with significant differences between all groups ($p < 0.01$).

Being on a diet plan was associated with most MEQ scales: Disinhibition [$F(1,1064) = 13.1$, $p < 0.001$], Awareness [$F(1,1064) = 74.3$, $p = 0.01$], and Emotional response [$F(1,1064) = 13.5$, $p < 0.001$]. Post hoc Scheffé tests showed that people on a restrictive diet scored lower in Disinhibition than groups who were not on a diet or followed a vegetarian diet ($p < 0.01$). In

Emotional response people on a restrictive diet scored lower of those who were not on a diet (p <0.01), while the difference in Awareness did not reach statistical significance.

A summary table means and standard deviations in all category groups is reported in Appendix (table 4A).

5.4 DISCUSSIONS

The present research contributes to the advancement of mindfulness measurement by performing both EFA and CFA of the Mindfulness Eating Questionnaire (MEQ). Our findings support the psychometric properties of the Italian MEQ, with a four-factor model showing adequate fit to the data and acceptable internal consistency and test-retest reliability. This is the first study to investigate test-retest reliability and the factor structure of the MEQ across language and culture. It shows that the Italian MEQ is a four-dimensional rather than a five-dimensional instrument.

The most relevant difference between the original and the Italian MEQ consists in the number of factors that were retained as a consequence of the use of parallel analysis (PA) in our study. PA is a Monte Carlo simulation technique that represents one of the most accurate EFA factor retention methods (Bentlen, 2005), EFA forced to a 4-factor solution based on PA resulted in a reduced number of items (i.e., 26 *vs.* 28) loading in accordance with the established 0.35 cut-off. Within the Italian four-factor MEQ, the Distraction and Emotional response scales maintained their original composition, while the Disinhibition and Awareness scales were formed by the original items completed with items derived from the original External cue scale. Specifically, four items of the previous External cues scale were incorporated in the Awareness scale, and one in the Disinhibition scale. Two of the External cues items subsumed in the Awareness scale refer to physiological awareness of satiety and hunger cues (item 14 “When I eat a big meal, I notice if it makes me feel heavy or sluggish”, and item 23 “I recognize when I’m eating and not hungry”) (Kristeleer & Wolver, 2011), while the other two refer to external

cues such as food advertisements or the presence of a dish of candy. Therefore, in our study, awareness of sensation/internal states and awareness of external cues appeared to be part of the same construct. This clustering pattern may reflect a unique characteristic of the study sample or a common response that resulted from the more accurate factor retention method used in this study. Further research in different populations is needed to better understand the eating awareness dimension as measured by MEQ.

Relative validity based on associations with criteria was acceptable. In line with our hypotheses, a positive correlation without an overlap was found between MEQ and FMI scales, indicating that MEQ measures mindfulness in a specific domain such as eating, which thus requires a specific tool to be applied. As expected from the literature (Baer et al, 2009), participants with previous meditation experience showed higher levels of mindful eating than those without such experience. Conversely, aerobic activity was associated with lower mindful eating (Framson et al., 2009; Moor et al., 2013), while the intensity of exercise did not seem to be related to mindful eating. In accordance with other studies (Framson et al., 2009; Moor et al., 2013), a higher BMI was associated with lower mindful eating. Negative association of MEQ scales with BMI and positive association with meditation provide evidence of the construct validity of MEQ. Furthermore, being on a restrictive diet was associated with a lower level of mindful eating, supporting the idea that restrictive diets are not helpful in adopting healthy eating habits (Shaefer et al., 2014).

In this study, both overweight and obese people were vulnerable to external disinhibition and distraction while eating, whereas obese individuals were found to be less aware of both external cues of food and internal signals of hunger and satiety. They also find difficult to experience eating by all senses and eat more in response to emotional states. These findings are in line with the escape theory (Heatherton & Baumeister, 1991) in which overeating in response to negative emotions results from an attempt to escape or shift attention away from an ego-threatening stimulus that causes aversive self-awareness. Results of this study are also in line

with affect regulation models (Heatherton & Baumeister, 1991; Aldao, Nolen-Hoeksema, & Schweizer, 2010; Wedig & Nock, 2010; Spoor et al., 2007; Telch, 1997) in which emotional eaters overeat in response to negative affect because they have learned that it alleviates from aversive mood states.

Finally, these results may contribute to explain why mindful eating interventions could be effective in the treatment of obesity and binge eating (Kristeller et al., 2011; O'Reilly et al., 2014).

Socio-demographic characteristics were partly related to MEQ dimensions, with females showing lower levels of mindful eating in the emotional domain, in line with previous studies (Framson et al., 2009; Oliver & Wardle, 1999).but higher in domains such as disinhibition and awareness. Although women can be more aware of the experience of eating and tend to have a control over it, they may be more likely than men to respond to emotional distress by eating.

Older subjects reported higher mindful eating on Disinhibition than younger people, as in Framson and colleague's study (2009). In contrast with the original study (Framson et al., 2009), education was also associated with mindful eating, with more educated people showing higher eating awareness but also greater inability to stop eating even when full. Although the MEQ was used in other studies (Moor et al., 2013; Kidd et al., 2013; Garautlet et al., 2012; Beshara et al., 2013), it was not possible to compare the results because mean values of MEQ were not reported for subgroups based on demographic variables**.**

5.4.1 Strenghts and Limitations

Although this study has many strengths and contributes not only to extend the validity and reliability of MEQ, but also to better understand the construct of Mindful eating, which is still not well-known, ome limitations and types of bias may have affected the present results:

(a)This study used a convenience sample that was obtained from several clustering of participants. A potential selection bias in the recruitment of participants can not be excluded. In

addiction, estimates of association derived from such a complex sample may be less precise than that derived from a simple random sample.

(b)Despite the large sample size and the variety of specific subgroups, the whole sample cannot be considered representative of the broad educational and social diversity of the Italian population. In addition, although this study sample had a better male-female balance than the original study, female were still prevalent.

(c)The test-retest sample size could have been larger, although it was quite adequate from a statistical point of view. However, a total of 12 subjects withdrew at the second stage of test-retest, a relevant proportion (17%) in a relative small sample such as this (n = 60), and the reasons were not given.

(d)Bias from inaccurate measurement may have affected variables such as BMI, actual dietary practice and physical exercise, as they were self-reported; therefore, future studies should assess these variables more objectively.

(e)The cross-sectional nature of the study did not allow assessing mindful eating before and after a specific mindful eating intervention, and thus this might be the focus of future investigations.

5.5 CONCLUSION

Results from this study contribute to the empirical validation of the concept of mindful eating, supporting the use of the MEQ by clinicians and researchers to assess it in outcome research. These results would also add a better understanding of the interaction between BMI, diet, physical exercise and mindful eating, and would help choosing effective strategies for preventing or addressing overweight and obesity risk.

Chapther 6: STUDY 3

The roles of Mindfulness and Mindful eating as mediators and moderators between overeating and psychological distress

6.1 BACKGROUND

Recent reviews (O' Really et al., 2014; Godfrey, et al., 2014; Godsey, 2013; Wander-Berghe et al., 2011; Katterman, et al., 2014) suggested a positive effect of mindfulness based interventions on disordered eating behaviours such as binge eating, emotional and external eating. However, many of the results of the discussed studies are limited due to the lack of a control group. Therefore, it is not clear whether or not mindfulness can be considered a causal factor in improving eating behaviours.

The associations between mindfulness and disordered eating behaviours have been explored in some studies both in clinical and non clinical populations. In student-based population studies, results showed positive association between mindfulness and eating pathology (Lavender, Lattimore, Fisher, & Malinowski, 2011; Lavender et al., 2009; Masuda, Price, Latzman, 2012). In women, dispositional mindfulness was found to be negatively associated with emotional and uncontrolled eating, but not with cognitive restraint. Ouwens et al. (2014) in a morbid obese sample, also found that independent of socio-demographics, BMI, and affective symptoms, dispositional mindfulness was negatively associated with emotional and external eating, and positively associated with restraint eating. Besides, in a study based on acollege students sample, mindfulness has been shown to moderate the association between disordered eating cognitions and disordered eating behaviors and under higher levels of mindfulness, the positive association between disordered eating cognitions and disordered eating symptoms is attenuated (Masuda, et al., 2012).

Moor, Masuda, Bradley, and Goodnight (2014) reported that body image flexibility moderates the association between disordered eating cognition and disordered eating behavior; for women with greater body image flexibility, disordered eating cognition was not positively associated with disordered eating behavior.

In another study, (Tylka, Russell & Neal, 2014) self-compassion (a component of mindfulness) buffered the links from media thinness-related pressure to disordered eating and thin-ideal internalization. Finally, mindfulness was found to be a partial moderator in reducing the disordered eating symptomatology in na intervention versus control group comparison (Bush, Rossy, Mintz & Schopp, 2014).

As reported in the literature (e.g., Baer et al, 2006; Brown & Ryan, 2003), in the association between mindfulness and eating behaviour patterns, psychological distress (anxious and depressive symptoms) have been found in relation to mindfulness and disordered eating behaviours, even though the direction of causality is still unclear. Another study (Coffey & Hartman, 2013) reported an inverse relationship between mindfulness and psychological distress.

Associations between affective states and eating behaviours have been found in women concerned with their weight (Ouwens et al., 2009) and in obese women with binge eating disorders (Schulz & Laessle, 2010). On the other hand, Owen et al. (2014), in a morbid obese sample, found that anxiety was associated only with emotional eating, but not with restrained or external eating, whereas depressive symptoms were not significantly associated with either of the eating behaviour styles.

Preliminary findings have also demonstrated that mindfulness and psychological flexibility moderate a variety of associations between harmful psychological factors and behavioral health outcomes (Andrew & Dulin 2007; Feltman et al.. 2009; Kashdan & Kane 2011; Kratz et al.. 2007; Saavedra et al.. 2010), so that a greater level of these variables attenuate the strenght of the association between psychological factors and outcomes. For instance, Masuda and Wendell (2010) found that mindfulness was inversely related to disordered eating cognitions and also to

general psychological ill-health and emotional distress in interpersonal contexts. Therefore, Mindfulness was found to partially mediate the relations between disordered eating-related cognitions and the two predicted variables.

Masuda and Latzman (2012) reported that, indipendently to demographic variables and BMI, both self-concealment and psychological flexibility were uniquely related to dieting. Only psychological flexibility was uniquely associated with bulimia/food preoccupation and none of them were uniquely associated with oral control. In addition, mindfulness was also reported to moderate the association between unavoidable distressing events and psychopathological symptoms/negative affect (Bergomi, Strole, Michalak, Funke, & Barking, 2013). Mindfulness and psychological flexibility resulted to be interrelated but not redundant constructs and they were negatively associated with somatization, depression, anxiety and general psychological distress (Masuda & Tully, 2011).

Lastly, mindfulness was negatively associated with neuroticism and positively associated with conscientiousness, while psychological inflexibility was the opposite. Further, conscientiousness evidenced the strongest contribution to mindfulness, and neuroticism to psychological inflexibility (Latzman & Masuda, 2013).

Taken as a whole, studies exploring the role of mindfulness as a mediator or moderator between different variables are only at an onset stage. Moreover, none of the previous studies has analyzed the potential role of mindfulness and mindful eating as mediators or moderators in the relationship between overeating behavior and psychological distress.

6.1.1 Objectives and hypothesis

Aims of the present study were:

– To explore the relationship between mindfulness and mindful eating with others constructs such as emotional overeating, binge eating, psychological distress, body disatisfaction and kental well-being, as well as BMI as a continuous variable.

– To investigate the differences between groups of people with various BMI (normal, overweight and obese) on mindfulness, mindful eating, emotional overeating, body dissatisfaction, and mental well-being.

– To test whether mindfulness and mindful eating might represent respectively a mediator and a moderator in the relationship between overeating and negative outcome (psychological distress, body dissatisfaction and poor mental well-being). Mediator variables, in general, are those that account for the relation between the predictor and the criterion, whereas moderator variables are those that affect the direction and/or strength of the relation between a predictor variable and a criterion variable (Baron & Kenny, 1986).

In particular, based on the literature, we expected that:

– mindfulness and mindful eating were positively associated with mental well-being and negatively associated with BMI, overeating behaviours, psychological distress, and body dissatisfaction;

– compared to normal weight people, the obese reported higher frequency of overeating or emotional eating, higher body dissatisfaction, lower level of quality of life and also lower level of mindfulness and mindful eating;

– mindfulness was a mediator in the relationship between overeating and psychological distress, while mindful eating might more likely represent a moderator in the same relatioship.

6. 2. METHODS

6.2.1 Participants

A total sample of 522 adults (males and females) were recruited from both clinical and general populations using mixed methods. Some data were obtained using an on-line psychometric assessment through exponential non-discriminative snowball sampling. A pool of 17 initial informants (psychology students) were asked to nominate, through their social networks, about 17 other participants who met the eligibility criteria and could potentially contribute to the study (N= 289). Even though the researcher has little control over this sampling method, snowball sampling is a useful tool for building networks and increasing the number of participants, in addition the process is cheap, simple and cost-efficient (Goodman, 1961).

Other data were obtained using a paper version of the same questionnaires among mindfulness centers (N= 116) and weight-loss centers (N= 117).

Eligibility criteria were: ≥18 years of age, male or female, and a large variety of body weight. Underweight people were *a-posteriori* excluded from the study, as their comparisons with the other weight groups was outside the scope of this study. After the exclusion of 20 subjects from the general population who reported a BMI < 18, a final sample of 502 subjects was considered for the present study.

Sample size was established based on epidemiological data on obesity and overweight in Italy (Palmieri et al., 2010). To allow the recruitment of at least 50 obese (50% female), we considered it necessary having at least 200 subjects involved in the study. It is noteworth to specify that not all subjects received the entire tests battery; therefore, depending on the variables selected for each analysis, the sample size varied from 319 to 502.

6.2.2. Procedures

We obtained permission for this study from the Ethical Research Committee of the University of Bologna. Informed consent to participate in the assessment was obtained before entry into the study. Data were collected from January 2013 to September 2014.

6.2.3 Measures

The assessment included socio-demographic variables, self-reported weight and height, and self-report questionnaires assessing eating behaviour, psychological distress and quality of life.

Socio-demographics included gender, age, and school education, factors often found to be associated with disordered eating symptoms (Striegel-Moore & Bulik, 2007). School education was categorized into primary, secondary (high school) and higher (university degree and more). Self-reported height and weight data were used to calculated BMI. Although the use of self-report measures is associated to a general overestimation of height and underestimation of weight resulting in an underestimation of BMI (Krul, Daanen, & Choi, 2011), self-reported measures are valid for identifying relationships in epidemiological studies as they were found to highly correlate with measured height and weight ($r > 0.90$, $p < 0.001$; Spencer et al., 2002). Participants were categorized in three groups according to BMI levels: normal weight ($18.5 < BMI < 25$; 52.99%), overweight ($25 < BMI < 30$; 23.11%) and obese ($BMI > 30$; 23.90%) (WHO, 1995). BMI was also taken as a continuous variable.

Binge and emotional overeating

Binge Eating Scale (BES; Gordmally et al., 1982) was used to measure binge eating. A full description of the questionnaire has been presented in study 1.

Emotional Overeating Questionnaire (EOQ) (Masheb & Grilo, 2006) was used to assess overeating behaviours associated with emotional states. The EOQ is a 6-item self-report questionnaire developed to measure overeating in response to 6 different emotions: anxiety (worry, jittery, nervous), sadness (blue, down, depressed), loneliness (bored, discouraged,

worthless), tiredness (worn-out, fatigued), anger (upset, frustrated, furious), and happiness (good, joyous, excited). The response set for the six items is a 7-point scale reflecting the frequency of days in which the behavior occurred in the past 28 days (i.e., 0= no days, 1=1–5 days, 2= 6–12 days, 3 =13–15 days, 4= 16–22 days, 5 = 23–27 days, and 6 = every day). The total score is obtained by adding the responses of the six items and dividing by six. Higher scores reflect more frequent overeating. The OEQ has a good internal consistency (α= .85), and its items were significantly and moderately correlated (range .32 to .70) with each other, with one factor accounting for 58% of the variance. The EOQ items and total score were characterized by good test-retest reliability (ICCs, ranged from .62 to .73). In the present study Cronbach's alpha values was α= .73

Psychological distress, body dissatisfaction and mental well-being

Symptoms Checklist 90 Revised, (SCL-90-R) (Derogatis, 1983; Prunas et al., 2012; Derogatis, 2011) was used to assess psychological distress. A complete description of the questionnaire has been presented in study 1. In this study, instead of the 9 scales used in Study 1 and 2, we calculated a general summative index, the Global Severity Index (GSI), which represents a combination of the number of symptoms reported with the intensity of each symptom. It is a global measure of the severity of the psychological distress suffered by the individual. It varies from 0 to 4, with 4 indicating the higher level of distress.

Body Image Avoidance Questionnaire (BIAQ; Rosen, et al, 1991) was used to measure body dissatisfaction. BIAQ is a 19-item questionnaire that assesses the behavioral facets of body image and the frequency of body image avoidance behaviors. Scoring is obtained by adding the item responses and a higher score indicates more avoidant behaviors. BIAQ has proven reliability by both test-retest (r = .87) and internal consistency (Cronbach's alpha = .89). In the present study Cronbach's alpha was .85

World Health Organization Well-Being Index (WHO-5; WHO, 1998; Bonsignore, Barkow, Jensen & Heun, 2001) was used to measure mental well-being. It is a selection of five items from

the World Health Organization's short health related quality of life measure, the WHOQOL-BREF. Each of the five items is rated on a 6-point Likert scale from 0 (= not present) to 5 (= constantly present). Scores are summated, with raw score ranging from 0 to 25. Then the scores are transformed to 0-100 by multiplying by 4, with higher scores meaning better well-being. Evidence suggests a score of 50 or below being indicative of low mood, and a score of 28 or below indicates likely depression. Psychometric properties have been examined in 23 countries with internal consistency coefficients lying between .75 and .87. In the present study Cronbach's alpha was .87.

Mindfulness and mindful eating

Freiburg Mindfulness Inventory-14 (FMI; Walach, et al., 2006) was used to measure a general dispositional mindfulness, in the Italian adaptation developed for the purposes of this study. See study 2 for a full description.

Mindful eating was measured by the *Mindful Eating Questionnaire* (MEQ; Framson et al, 2009) in the Italian adaptation of Clementi et al. (submitted). A full description was presented in study 2.

6.2.4 Statistical analysis

A preliminary bivariate correlational analysis was run to investigate the relationship between mindfulness (FMI) and mindful eating (MEQ) with overeating (BES, EOQ), psychological distress (SCL-90R), body disatisfaction (BIAQ), and quality of life (WHO-5) and BMI as a continuous variable.

MANOVA between BMI groups was run using all psychological measures as dependent variables and gender and age as control variables.

A multiple mediator model of regression was used with the PROCESS macro for SPSS (Hayes, 2013; Hayes & Pritcher, 2014) to test if mindfulness (FMI) and mindful eating (MEQ) might be mediators between overeating and psychological distress or well-being, taking into consideration also BMI, gender and age as control variables. Correlations between the predictors

and the criterion variables, between the predictors and the mediator variables, and between the mediator and criterion variables should be significant. The relation between predictors and criterion should be reduced (to zero in the case of total mediation) after controlling the relation between the mediator and criterion variables.

A significance test of the indirect effect was performed through a computer-intensive method, also called “resampling method”. Specifically, a bootstrapping procedure was performed using 5,000 re-samples and a 95% bias corrected and accelerated confidence interval (BCa-CI) was calculated (Preacher & Hayes, 2008). Repeated many times, the distribution of the indirect effects over multiple bootstrap estimations serves as an empirical approximation of the sampling distribution. These estimates are sorted low to high, and a 95% confidence interval for the indirect effect is constructed. Mediation is considered significant if the 95% CI did not include zero (Preacher & Hayes, 2008). We also tested whether there was complete or partial mediation by testing whether the direct effect coefficient was statistically significant, which is a test of whether the association between the independent and dependent variable is completely accounted for by the mediator (James, Mulaik, & Brett, 2006). If the direct effect coefficient is statistically significant and there is significant mediation, then there is evidence for partial mediation. Standardized regression coefficients were presented as they may serve as effect size measures for individual paths in the mediated effect (McKinnon, 2008).

A moderator analysis was also conducted, with mindful eating as a moderator that was expected to affect the correlation between overeating and psychological distress. In this analysis variables such as gender, age and BMI (taken as continuous) were controlled for.

Analyses were conducted using SPSS (version 19.0) and PROCESS, a computational tool available for SPSS developed by Hayes (2012).

A p value of $< .05$ was considered significant.

6.3. RESULTS

6.3.*1 Descriptives characteristics of the sample*

As we can see in table 44, the main characteristics of the sample were being female, mean aged 39 years and highly educated, although 34% of subjects did not indicate their educational level. In this sample, in comparison with epidemiological data (ISTAT, 2013), overweight people were underestimated, whereas obese individuals were overestimated.

Table 44. Characteristics of the whole sample (n = 502)

Characteristics		*Frequency (%)*	*Range*	*Mean ± s.d.*
Gender				
	Male	158 (31.5)		
	Female	344 (68.5)		
Age			18-82 yrs	39.48± 14.17
	≤ 37 yrs[a]	258 (51.4)		
	> 37 yrs[a]	244 (48.6)		
Education				
	Primary	31 (6.2)		
	Secondary	115 (22.9)		
	Higher	184 (36.6)		
	Missing values	172 (34.3)		
BMI			18.50-71.86	29.95 ± 8.69
	Normal weigh[b]	266 (53)		
	Overweight[b]	116 (23.1)		
	Obese[b]	120 (23.9)		

Note. s.d. = standard deviation; BMI = Body Mass Index
[a] categories are based on the median split
[b] categories are based on the WHO classification (1995)

6.3.2 ***Association of mindfulness with other constructs***

The estimates of correlations between MEQ and FMI with other constructs, which are reported in table 45, addressed both behavioral dimensions, such as emotional overeating (EOQ) and binge eating (BES), and outcome dimensions such as psychological distress (SCL-90-R), body dissatisfaction (BIAQ), quality of life (WHO-5), and BMI.

Table 45 Correlations between mindfulness and other variables (n = 502)

	FMI total	*BES*	*EOQ*	*GSI*	*BIAQ*	*WHO-5*	*BMI*
FMI total	-	-.402**	-.197**	-.377**	-.273**	.498**	-.059
MEQ total	.367**	-.661**	-.361**	-.396**	-.524**	.276**	-.183**

** p <0.0001

FMI correlated with MEQ, but correlation was of medium effect size, meaning that mindfulness was not the same construct as mindful eating, which in turn showed its specificity. Both FMI and MEQ correlated negatively with BES, EOQ, GSI index and BIAQ, although only the correlations of MEQ with BES and BIAQ were large, while the remaining correlations were small to medium, except for the one between FMI and BMI that was negligible. Positively correlations were found with WHO-5, with a small effect size with MEQ and medium with FMI.

6.3.3 ***Comparisons between groups***

Preliminary correlation between age and psychological dimensions were performed in order to decide wether or not to enter age as a control variable in comparison between BMI groups. Correlations varied from r = -0.004 (with FMI) to r = 0.16 (with BIAQ), with a meand value of $r = |0.08|$ that was considered negligible, therefore age was not used as a control variable in the subsequent analyses.

Corrrelations were then performed between all the psychological variables measured in the study. Results presented in Appendix (table 5A) showed that some correlations were large (r > 0.50), therefore we preferred to run univariate ANOVAs to investigate the differences between BMI groups in each dependent variable, instead of running a MANOVA.

As regards FMI scores, means and SD of questionnaires scores for different BMI and gender groups and test of between-subject effects, as reported in Appendix, tables 6A, showed that none of the independent variables had a significant effect on the dependent variable, with a non-significant interaction between them.

As regards MEQ scores, descriptive statistics and test of between-subject effects, as reported in table 47, showed that both gender and BMI had statistically significant effects on the dependent variable ($p < 0.0001$ and $p = 0.001$, respectively), although small in effect size, with a non-significant interaction between them (see table 4). Specifically, males scored higher than female in MEQ and the obese scored lower than normal weight people, with contrast analysis (see table 46) showing a significant difference ($p < 0.0001$).

Table 46 Descriptive statistics of MEQ

BMI category	*Gender*	*Mean*	*Std. Deviation*	*N*
Normal weight	Female	4.29	.65	169
	Male	4.49	.66	76
	Total	4.35	.66	245
Obese	Female	3.85	.77	92
	Male	4.27	.69	20
	Total	3.93	.77	112
Overweight	Female	3.98	.73	63
	Male	4.38	.60	43
	Total	4.15	.70	106
Total	Female	4.11	.72	324
	Male	4.42	.65	139
	Total	4.20	.72	463

Table 47 Tests of Between-Subjects Effects of MEQ among BMI groups

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	23.18[a]	5	4.63	9.74	.0001	.096
Intercept	5373.98	1	5373.98	11298.31	.0001	.961
BMI.category	6.59	2	3.29	6.93	**.001**	.029
gender	8.64	1	8.64	18.17	**.0001**	.038
BMI.category * gender	.95	2	.47	1.01	.366	.004
Error	217.37	457	.47			
Total	8432.87	463				
Corrected Total	240.55	462				

a. R Squared = .096 (Adjusted R Squared = .086)

Table 48 Contrast Results (K Matrix) BMI categories Difference Contrast

			MEQ
Level 2 vs. Level 1	Contrast Estimate		-.328
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.328
	Std. Error		.098
	Sig.		**.001**
	95% Confidence Interval for Difference	Lower Bound	-.520
		Upper Bound	-.137
Level 3 vs. Previous	Contrast Estimate		-.041
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.041
	Std. Error		.084
	Sig.		.625
	95% Confidence Interval for Difference	Lower Bound	-.206
		Upper Bound	.124

As regards BES scores, descriptive statistics and test of between-subject effects, as reported in table 50, showed that both gender and BMI had statistically significant effects on the dependent variable (p = 0.001), although small in effect size, with a non-significant interaction between them. Specifically, females scored higher than male in BES and the obese scored higher than normal weight people (see tab. 49), with contrast analysis (see table 51) showing a significant difference ($p < 0.0001$).

Table 49 Descriptive statistics of BES

BMI category	*Gender*	*Mean*	*Std. Deviation*	*N*
Normal weight	Female	7.63	6.17	135
	Male	4.74	4.12	43
	Total	6.93	5.87	178
Obese	Female	16.12	10.07	91
	Male	10.35	7.17	14
	Total	15.35	9.90	105
Overweight	Female	12.67	8.61	52
	Male	5.36	3.61	30
	Total	10.00	7.99	82
Total	Female	11.35	8.92	278
	Male	5.86	4.95	87
	Total	10.04	8.47	365

Table 50 Tests of Between-Subjects Effects of BES among BMI groups

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	6367.514[a]	5	1273.503	23.087	.0001	.243
Intercept	19544.790	1	19544.790	354.324	.0001	.497
BMI.categ	1802.323	2	901.162	16.337	**.0001**	.083
gender	1538.335	1	1538.335	27.888	**.0001**	.072
BMI.categ * gender	249.276	2	124.638	2.260	.106	.012
Error	19802.694	359	55.161			
Total	63011.000	365				
Corrected Total	26170.208	364				

a. R Squared = .243 (Adjusted R Squared = .233)

Table 51 Contrast Results (K Matrix) BMI categories Difference Contrast

			BES
Level 2 vs. Level 1	Contrast Estimate		7.048
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		7.048
	Std. Error		1.249
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	4.593
		Upper Bound	9.504
Level 3 vs. Previous	Contrast Estimate		-.695
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.695
	Std. Error		1.056
	Sig.		.511
	95% Confidence Interval for Difference	Lower Bound	-2.771
		Upper Bound	1.381

As regards EOQ scores, descriptive statistics and test of between-subject effects, as reported in tables 52and 53, showed that only BMI had a statistically significant effect on the dependent variable (p = 0.02), although small in effect size, with a non-significant interaction between independent variables. Specifically, the obese scored higher than normal weight people, with contrast analysis (see table 54) showing a significant difference (p = 0.005).

Table 52 Descriptive statistics of EOQ

BMI category	*Gender*	*Mean*	*Std. Deviation*	*N*
Normal weight	Female	.77	.72	126
	Male	.89	.91	38
	Total	.80	.77	164
Obese	Female	1.25	1.05	91
	Male	1.27	.90	14
	Total	1.25	1.02	105
Overweight	Female	1.04	.96	52
	Male	.83	.73	24
	Total	.97	.90158	76
Total	Female	.99	.91	269
	Male	.94	.86	76
	Total	.98	.90	345

Table 53 Tests of Between-Subjects Effects of MEQ among BMI groups

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	14.16[a]	5	2.83	3.59	.004	.050
Intercept	208.21	1	208.21	264.17	.0001	.438
BMI.categ	6.28	2	3.14	3.98	**.019**	.023
gender	.03	1	.03	.04	.838	.000
BMI.categ * gender	1.12	2	.56	.71	.489	.004
Error	267.18	339	.78			
Total	613.47	345				
Corrected Total	281.35	344				

a. R Squared = .050 (Adjusted R Squared = .036)

Table 54 Contrast Results (K Matrix) BMI categories Difference Contrast

			EOQ
Level 2 vs. Level 1	Contrast Estimate		.427
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		.427
	Std. Error		.152
	Sig.		**.005**
	95% Confidence Interval for Difference	Lower Bound	.129
		Upper Bound	.726
Level 3 vs. Previous	Contrast Estimate		-.111
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-.111
	Std. Error		.133
	Sig.		.403
	95% Confidence Interval for Difference	Lower Bound	-.373
		Upper Bound	.151

As regards GSI scores, descriptive statistics and test of between-subject effects, as reported in table 56, showed that only gender had a statistically significant effect on the dependent variable (p = 0.002), although small in effect size, with a non-significant interaction between independent variables. Specifically, female scored higher than male (see tab. 55)

Table 55 Descriptive statistics of GSI

BMI category	*Gender*	*Mean*	*Std. Deviation*	*N*
Normal weight	Female	.84	.64	159
	Male	.70	.58	73
	Total	.80	.62	232
Obese	Female	.97	.70	85
	Male	.53	.41	19
	Total	.89	.68	104
Overweight	Female	.83	.65	59
	Male	.72	.51	41
	Total	.78	.60	100
Total	Female	.88	.66	303
	Male	.68	.54	133
	Total	.82	.63	436

Table 56 Tests of Between-Subjects Effects of GSI among BMI groups

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	5.11[a]	5	1.02	2.57	.026	.029
Intercept	169.51	1	169.51	427.02	.0001	.498
BMI.categ	.02	2	.01	.02	.975	.000
gender	3.84	1	3.84	9.68	**.002**	.022
BMI.categ * gender	1.19	2	.59	1.50	.223	.007
Error	170.69	430	.39			
Total	469.78	436				
Corrected Total	175.81	435				

a. R Squared = .029 (Adjusted R Squared = .018)

As regards BIAQ scores, test of between-subject effects, as reported in table 58, showed that there was a statistically significant interaction between gender and BMI category (p = 0.015), meaning that, although mean values presented in table 57 showed a general pattern of females scoring higher than males, these differences were not at the same level or of the same intensity among all the BMI groups. We can indeed observe a more accentuated gender difference among the obese than among the other groups. Nevertheless, the effect size of the interaction was so small to be considered negligible. Therefore, we considered effective the differences produced both by gender (p < 0.0001) and BMI (p < 0.0001) and performed the contrasts between BMI

groups. Results (table 59) indicated that the effect of BMI was significant when comparing the obese with the other groups ($p < 0.0001$).

Table 57 Descriptive statistics of BIAQ

BMI category	*Gender*	*Mean*	*Std. Deviation*	*N*
Normal weight	Female	45.78	10.87	135
	Male	40.62	13.32	45
	Total	44.49	11.71	180
Obese	Female	62.38	14.09	70
	Male	47.25	7.84	12
	Total	60.17	14.36	82
Overweight	Female	59.00	12.98	40
	Male	45.24	9.39	25
	Total	53.70	13.46	65
Total	Female	52.68	14.42	245
	Male	43.00	11.76	82
	Total	50.25	14.41	327

Table 58 Tests of Between-Subjects Effects of BIAQ among BMI groups

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	20969.67[a]	5	4193.93	28.80	.0001	.310
Intercept	469027.69	1	469027.69	3221.26	.0001	.909
BMI.categ	5999.56	2	2999.78	20.60	**.0001**	.114
gender	6033.81	1	6033.81	41.44	**.0001**	.114
BMI.categ * gender	1230.39	2	615.19	4.22	**.015**	.026
Error	46738.74	321	145.60			
Total	893630.00	327				
Corrected Total	67708.42	326				

a. R Squared = .310 (Adjusted R Squared = .299)

Table 59 Contrast Results (K Matrix) BMI categories Difference Contrast

			BIAQ
Level 2 vs. Level 1	Contrast Estimate		11.614
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		11.614
	Std. Error		2.152
	Sig.		**.0001**
	95% Confidence Interval for Difference	Lower Bound	7.380
		Upper Bound	15.848
Level 3 vs. Previous	Contrast Estimate		3.109
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		3.109
	Std. Error		1.877
	Sig.		.099
	95% Confidence Interval for Difference	Lower Bound	-.584
		Upper Bound	6.802

As regards WHO-5 scores, descriptive statistics and test of between-subject effects, as reported in tables 60 and 61, showed that only gender had a statistically significant effect on the dependent variable (p = 0.003), although small in effect size, with a non-significant interaction between independent variables (see table 61). Specifically, female scored lower than male.

Table 60 Descriptive statistics of WHO-5

BMI category	*Gender*	*Mean*	*Std. Deviation*	*N*
Normal weight	Female	46.82	19.90	126
	Male	58.81	24.61	37
	Total	49.54	21.58	163
Obese	Female	48.83	21.78	91
	Male	61.71	23.83	14
	Total	50.55	22.38	105
Overweight	Female	49.05	23.62	53
	Male	52.32	25.24	25
	Total	50.10	24.04	78
Total	Female	47.94	21.25	270
	Male	57.21	24.62	76
	Total	49.97	22.33	346

Table 61 Tests of Between-Subjects Effects of WHO-5 among BMI groups

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Corrected Model	6368.32[a]	5	1273.66	2.61	.025	.037
Intercept	572177.80	1	572177.80	1173.57	.000	.775
BMI.categ	598.30	2	299.15	.61	.542	.004
gender	4488.99	1	4488.99	9.20	**.003**	.026
BMI.categ * gender	975.28	2	487.64	1.00	.369	.006
Error	165767.48	340	487.55			
Total	1036336.00	346				
Corrected Total	172135.81	345				

a. R Squared = .037 (Adjusted R Squared = .023)

To complete the investigation of the association between BMI as a continuous variable and mindfulnness as well as the other measured variables, a multiple linear regression was performed, using BMI as the dependent variable and the FMI, MEQ, BES, EOQ, GSI, BIAQ and WHO-5 as the independent variable also controlling for gender as a dummy variable. This model was significant [F (8,272) = 13.04; $p < 0.0001$] and explained 26% of variance of BMI ($R = 0.53$; $R^2 = 0.28$; adjusted $R^2 = 0.25$). Standardized coefficients, presented in table 62, showed that only BES and BIAQ were positively and significantly associated with BMI, while GSI was negatively correlated, although not significantly and the other variables gave a negligible contribution to explain the variance of BMI. Further investigations are needed to undestand the different patterns of relationships between BMI and the other variables that emerged when taking BMI as a categorical or a continuous variable.

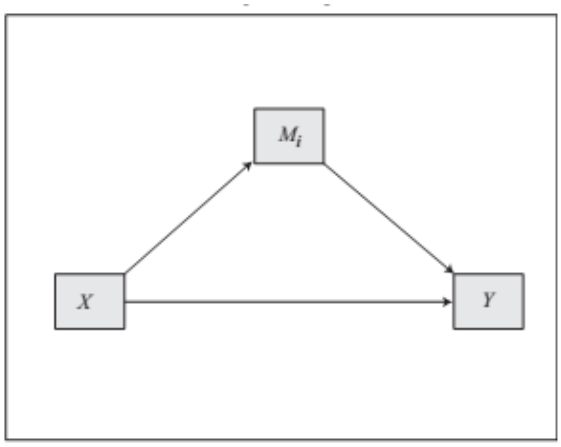
Table 62 Linear regression analysis coefficients

Model		*Unstandardized Coefficients*		*Standardized Coefficients*		
		B	*Std. Error*	*Beta*	*t*	*Sig.*
1	(Constant)	20.081	4.512		4.451	.000
	Gender	-.641	.527	-.063	-1.218	.224
	FMI	.002	.070	.001	.022	.982
	MEQ	-.766	.782	-.072	-.979	.328
	BES	.264	.085	.274	3.113	.002
	EOQ	.462	.564	.050	.818	.414
	GSI	-1.691	.885	-.135	-1.910	.057
	BIAQ	.164	.042	.294	3.909	.000
	WHO-5	.009	.026	.023	.336	.737

Dependent Variable: BMI

6.3.4 Mediation analysis

A series of multiple mediation models were run to explore the mediation effect of FMI in the relationship of overeating (BES and EOQ) with distress (GSI), body dissatisfaction (BIAQ) and quality of life (WHOOL-5). We tested the mediation role of FMI as it is a general ability of an individual that might be influenced by his or her eating habits, such as binge eating or emotional overeating, and, in turn, it might influence the individual well-being in terms of psychological distress, body satisfaction and peceived quality of life. The conceptual diagram is presented below. Fig.1 Mediation conceptual model



In the first mediation model, GSI represented the dependent variable (Y), BES the independent variable (X), FMI the mediator (M), and the control variable was gender, since age had small correlations with the dependent variable and BMI had a controversial effect on outcomes as emerged from this study. In table 20 are reported the results of this model.

Results showed that the total model explained 18% of variance of GSI, with BES being a positive predictor of GSI, without any effect of the control variables. In the mediation model, which explained 24% of variance, the direct effect of BES on GSI was slithly reduced (from .032 to .023), although it still remained significant; therefore, there was a partial mediation, since the indirect effect of the mediator was significant. We should conclude that FMI was a partial mediator in the relashioship between BES and GSI (see table 63).

Table 63 Mediation model between BES and GSI through FMI

```
Model Summary Outcome: FMI_tot
          R       R-sq          F        df1        df2          p
      ,4185      ,1751    36,2011     2,0000   341,0000      ,0000

Model
              coeff         se          t          p
constant    25,7224      ,7026    36,6120      ,0000
BES_tot     -,3927      ,0471    -8,3332      ,0000
sex_2        -,4542      ,5137     -,8843      ,3772

Model Summary Outcome: GSI
          R       R-sq          F        df1        df2          p
      ,4867      ,2369    35,1790     3,0000   340,0000      ,0000

Model
              coeff         se          t          p
constant     1,0081      ,1205     8,3669      ,0000
FMI         -,0213      ,0042    -5,0981      ,0000
BES          ,0233      ,0040     5,8246      ,0000
Sex          ,0352      ,0397      ,8859      ,3763

TOTAL EFFECT MODEL
Model Summary Outcome: GSI
          R       R-sq          F        df1        df2          p
      ,4225      ,1785    37,0574     2,0000   341,0000      ,0000

Model
              coeff         se          t          p
constant      ,4597      ,0562     8,1772      ,0000
BES           ,0316      ,0038     8,3888      ,0000
Sex           ,0449      ,0411     1,0918      ,2757

TOTAL, DIRECT, AND INDIRECT EFFECTS
Total effect of X on Y
     Effect         SE          t          p
      ,0316      ,0038     8,3888      ,0000

Direct effect of X on Y
     Effect         SE          t          p
      ,0233      ,0040     5,8246      ,0000

Indirect effect of X on Y
        Effect    Boot SE   BootLLCI   BootULCI
FMI      ,0084      ,0020      ,0049      ,0131
```

In the second mediation model, GSI represented the dependent variable (Y), EOQ the independent variable (X), FMI the mediator (M), and the control variable was again gender. Table 64 presents the results of this model.

Results showed that the total model explained 13% of variance of GSI, with EOQ being a negative predictor of GSI, without any effect of the control variables. In the mediation model, which explained 23% of variance, the direct effect of EOQ on GSI was slightly reduced (from .026 to .021), although it still remained significant; therefore, there was a partial mediation, since the indirect effect of the mediator was significant. We should conclude that FMI was a partial mediator in the relashioship between EOQ and GSI.

Table 64 Mediation model between EOQ and GSI through FMI

```
Model Summary Outcome: FMI
          R       R-sq          F        df1        df2          p
      ,2185      ,0478     7,9242     2,0000   316,0000      ,0004

Model
              coeff         se          t          p
constant    23,4072      ,7765    30,1440      ,0000
EOQtotal    -1,8763      ,5048    -3,7166      ,0002
sex_2        -,6067      ,5679    -1,0683      ,2862

Model Summary Outcome: GSI
          R       R-sq          F        df1        df2          p
      ,4746      ,2252    30,5270     3,0000   315,0000      ,0000

Model
              coeff         se          t          p
constant     1,1165      ,1123     9,9395      ,0000
FMI_tot      -,0251      ,0041    -6,0779      ,0000
EOQtotal      ,2198      ,0379     5,8009      ,0000
sex_2         ,0264      ,0418      ,6305      ,5289

TOTAL EFFECT MODEL
Model Summary Outcome: GSI
          R       R-sq          F        df1        df2          p
      ,3666      ,1344    24,5301     2,0000   316,0000      ,0000
Model
              coeff         se          t          p
constant      ,5284      ,0602     8,7751      ,0000
EOQtotal      ,2670      ,0391     6,8197      ,0000
sex_2         ,0416      ,0440      ,9446      ,3456

TOTAL, DIRECT, AND INDIRECT EFFECTS
Total effect of X on Y
     Effect         SE          t          p
      ,2670      ,0391     6,8197      ,0000

Direct effect of X on Y
     Effect         SE          t          p
      ,2198      ,0379     5,8009      ,0000

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
FMI_tot      ,0471      ,0156      ,0207      ,0841
```

In the third mediation model, BIAQ represented the dependent variable (Y), BES the independent variable (X), FMI the mediator (M), and gender the control variable. In table 65 are reported the results of this model.

Results showed that the total model explained 45% of variance of BIAQ, with BES being a negative predictor, without any effect of the control variable. In the mediation model, which explained 45% of variance, the direct effect of BES on BIAQ was not reduced, still remaining significant; therefore, there was not a mediation, since the indirect effect of the mediator was not significant. We should conclude that FMI was not a mediator in the relashioship between BES and BIAQ.

Table 65 Mediation model between BES and BIAQ through FMI

```
Model Summary Outcome: FMI_tot
          R       R-sq          F        df1        df2          p
      ,4014      ,1612    30,6437     2,0000   319,0000      ,0000

Model
              coeff         se          t          p
constant    25,7830      ,7245    35,5888      ,0000
BES_tota     -,3672      ,0478    -7,6774      ,0000
sex_2        -,3919      ,5214     -,7515      ,4529

Model Summary Outcome: BIAQtot
          R       R-sq          F        df1        df2          p
      ,6740      ,4543    88,2581     3,0000   318,0000      ,0000

Model
              coeff         se          t          p
constant    39,7661     2,3956    16,5995      ,0000
FMI_tot      -,0454      ,0830     -,5465      ,5851
BES_tota     1,1241      ,0772    14,5579      ,0000
sex_2         ,5979      ,7741      ,7724      ,4404

TOTAL EFFECT MODEL
Model Summary Outcome: BIAQtot
          R       R-sq          F        df1        df2          p
      ,6737      ,4538   132,5292     2,0000   319,0000      ,0000

Model
              coeff         se          t          p
constant    38,5960     1,0734    35,9582      ,0000
BES_tota     1,1407      ,0709    16,0985      ,0000
sex_2         ,6157      ,7725      ,7970      ,4260

TOTAL, DIRECT, AND INDIRECT EFFECTS
Total effect of X on Y
     Effect         SE          t          p
     1,1407      ,0709    16,0985      ,0000

Direct effect of X on Y
     Effect         SE          t          p
     1,1241      ,0772    14,5579      ,0000

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
FMI_tot      ,0167      ,0319     -,0421      ,0836
```

In the fourth mediation model, BIAQ still represented the dependent variable (Y), EOQ the independent variable (X), FMI the mediator (M), and gender the control variable. In table 66 are reported the results of this model.

Results showed that the total model explained only 9% of variance of BIAQ, with EOQ being a negative predictor, without any effect of the control variable. In the mediation model, which explained 13% of variance, the direct effect of EOQ on BIAQ was reduced (from 4.69 to 3.94), still remaining significant; therefore, there was a partial mediation, since the indirect effect of the mediator was significant. We should conclude that FMI was a mediator in the relashioship between EOQ and BIAQ.

Table 66 Mediation model between EOQ and BIAQ through FMI

```
Model Summary Outcome: FMI_tot
          R       R-sq          F        df1        df2          p
      ,2258      ,0510     7,7919     2,0000   290,0000      ,0005

Model
              coeff         se          t          p
constant    23,7003      ,7846    30,2082      ,0000
EOQtotal    -1,8622      ,4986    -3,7346      ,0002
sex_2        -,5073      ,5686     -,8922      ,3730

Model Summary Outcome: BIAQtot
          R       R-sq          F        df1        df2          p
      ,3667      ,1345    14,9691     3,0000   289,0000      ,0000

Model
              coeff         se          t          p
constant    54,6625     2,8615    19,1027      ,0000
FMI_tot      -,4024      ,1052    -3,8258      ,0002
EOQtotal     3,9365      ,9143     4,3054      ,0000
sex_2         ,9292     1,0197      ,9112      ,3630

TOTAL EFFECT MODEL
Model Summary Outcome: BIAQtot
          R       R-sq          F        df1        df2          p
      ,3011      ,0907    14,4557     2,0000   290,0000      ,0000

Model
              coeff         se          t          p
constant    45,1260     1,4379    31,3836      ,0000
EOQtotal     4,6858      ,9138     5,1276      ,0000
sex_2        1,1333     1,0420     1,0876      ,2777

TOTAL, DIRECT, AND INDIRECT EFFECTS
Total effect of X on Y
     Effect         SE          t          p
     4,6858      ,9138     5,1276      ,0000

Direct effect of X on Y
     Effect         SE          t          p
     3,9365      ,9143     4,3054      ,0000

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
FMI_tot      ,7493      ,2911      ,2870     1,4844
```

In the fifth mediation model, WHO-5 represented the dependent variable (Y), BES the independent variable (X), FMI the mediator (M), and gender the control variable. In table 67 are reported the results of this model.

Results showed that the total model explained 11% of variance of WHO-5, with BES being a negative predictor, without any effect of the control variable. In the mediation model, which explained 27% of variance, the direct effect of BES on WHO-5 was reduced (from -.85 to -.40), still remaining significant; therefore, there was a partial mediation, since the indirect effect of the mediator was significant. We should conclude that FMI was a mediator in the relashioship between BES and WHO-5.

Table 67 Mediation model between BES and WHOOL-5 through FMI

```
Model Summary Outcome: FMI_tot
          R       R-sq          F        df1        df2          p
      ,3965      ,1572    30,2276     2,0000   324,0000      ,0000

Model
              coeff         se          t          p
constant    25,3266      ,7344    34,4868      ,0000
BES_tot     -,3502      ,0461    -7,5900      ,0000
sex_2        -,5472      ,5225    -1,0472      ,2958

Model Summary Outcome: WHOOL5to
          R       R-sq          F        df1        df2          p
      ,5225      ,2730    40,4356     3,0000   323,0000      ,0000

Model
              coeff         se          t          p
constant    26,8971     4,2414     6,3415      ,0000
FMI_tot      1,2665      ,1485     8,5310      ,0000
BES_tot     -,4035      ,1338    -3,0153      ,0028
sex_2        -,1143     1,3987     -,0817      ,9349

TOTAL EFFECT MODEL
Model Summary Outcome: WHO-5
          R       R-sq          F        df1        df2          p
      ,3305      ,1092    19,8637     2,0000   324,0000      ,0000

Model
              coeff         se          t          p
constant    58,9744     2,1690    27,1891      ,0000
BES_tot     -,8471      ,1363    -6,2155      ,0000
sex_2        -,8073     1,5433     -,5231      ,6012

TOTAL, DIRECT, AND INDIRECT EFFECTS
Total effect of X on Y
     Effect         SE          t          p
     -,8471      ,1363    -6,2155      ,0000

Direct effect of X on Y
     Effect         SE          t          p
     -,4035      ,1338    -3,0153      ,0028

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
FMI_tot     -,4436      ,0748     -,6260     -,3148
```

In the sixth and last mediation model, WHO-5 represented the dependent variable (Y), EOQ the independent variable (X), FMI the mediator (M), and gender the control variable. In table 68 are reported the results of this model.

Results showed that the total model explained only 4% of variance of WHO-5, with EOQ being a negative predictor, without any effect of the control variable. In the mediation model, which explained 26% of variance, the direct effect of EOQ on WHO-5 was sensibly reduced (from -4.68 to -2.48), still remaining significant at a 0.04 level; therefore, there was a partial mediation, since the indirect effect of the mediator was significant. We should conclude that FMI was a mediator in the relashioship between EOQ and WHO-5.

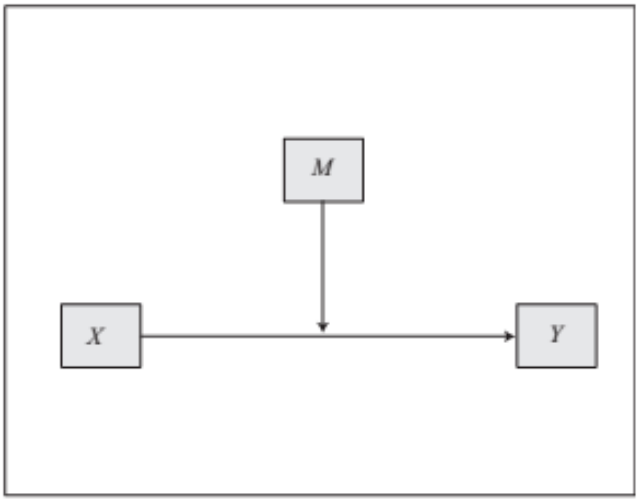
Table 68 Mediation model between EOQ and WHOOL-5 through FMI

```
Model Summary Outcome: FMI_tot
          R       R-sq          F        df1        df2          p
      ,2069      ,0428     7,4938     2,0000   335,0000      ,0007

Model
              coeff         se          t          p
constant    23,2200      ,7551    30,7524      ,0000
EOQtotal    -1,6626      ,4678    -3,5542      ,0004
sex_2        -,6801      ,5635    -1,2069      ,2283

Model Summary Outcome: WHOOL5to
          R       R-sq          F        df1        df2          p
      ,5072      ,2572    38,5585     3,0000   334,0000      ,0000

Model
              coeff         se          t          p
constant    23,5306     3,6858     6,3842      ,0000
FMI_tot      1,3542      ,1364     9,9278      ,0000
EOQtotal    -2,4267     1,1896    -2,0399      ,0421
sex_2        -,0164     1,4098     -,0117      ,9907

TOTAL EFFECT MODEL
Model Summary Outcome: WHO-5
          R       R-sq          F        df1        df2          p
      ,1951      ,0381     6,6270     2,0000   335,0000      ,0015

Model
              coeff         se          t          p
constant    54,9743     2,1420    25,6646      ,0000
EOQtotal    -4,6781     1,3270    -3,5253      ,0005
sex_2        -,9374     1,5985     -,5864      ,5580

TOTAL, DIRECT, AND INDIRECT EFFECTS
Total effect of X on Y
     Effect         SE          t          p
    -4,6781     1,3270    -3,5253      ,0005

Direct effect of X on Y
     Effect         SE          t          p
    -2,4267     1,1896    -2,0399      ,0421

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
FMI_tot    -2,2514      ,6781    -3,7608    -1,1178
```

6.*3.5 Moderation analysis*

In the moderation analysis, mindful eating was used as a moderator in the relationship between overeating and psychological distress, controlling for gender. In the model, which conceptual design is shown below, mindfull eating was entered as a moderator as we expected an effect of this variable on enancing or reducing the effect of overeating behaviours on perceived well-being. The independent variables were mean centered prior to analysis. The moderator was set to various values that represented “low”, “moderate”, and “high” on this variable score, such as a standard deviation below the mean, the mean, and a standard deviation above the mean, respectively. The model estimated the conditional effect of X on Y, that is how much two cases that differ by one unit on X differ on Y when M equals some specific values.

Fig. 2 Moderation conceptual model



In the first moderation model, GSI represented the dependent variable (Y), BES the independent variable (X), MEQ the moderator (M), and gender the control variable. In table 69 are reported the results of this model. Although there was a significant interaction effect (p = 0.006) between BES and MEQ, without any effect of gender, which increased significantly the explained variance of GSI, nevertheless the moderation effect of MEQ did not seem to produce a relevant effect, since the conditional effects of X on Y were very similar when M equals different specific values.

Table 69 Moderation between BES and GSI through MEQ

Model Summary Outcome: GSI

R	R-sq	F	df1	df2	p
,4617	,2131	22,8893	4,0000	338,0000	,0000

Model

	coeff	se	t	p
constant	,8187	,0488	16,7910	,0000
MEQ.TOT	-,1345	,0563	-2,3878	,0175
BES_tot	,0299	,0057	5,2262	,0000
int_1	,0131	,0048	2,7435	,0064
sex_2	,0460	,0404	1,1394	,2553

Interactions:

int_1 BES_tota X MEQ.TOTA

R-square increase due to interaction(s):

	R2-chng	F	df1	df2	p
int_1	,0175	7,5268	1,0000	338,0000	,0064

Conditional effect of X on Y at values of the moderator(s)

MEQ.TOT	Effect	se	t	p
-,7424	,0202	,0051	3,9888	,0001
,0000	,0299	,0057	5,2262	,0000
,7424	,0396	,0081	4,9117	,0000

Values for quantitative moderators are the mean and plus/minus one SD from mean

In the second moderation model, GSI represented the dependent variable (Y), EOQ the independent variable (X), MEQ the moderator (M), and gender the control variable. In table 70 are reported the results of this model. In this model both EOQ and MEQ exerted a significant effect on GSI with an opposite direction; however the interaction between the two was not significant, indicating that MEQ was not a moderator.

Table 70 Moderation between EOQ and GSI through MEQ

Model Summary Outcome: GSI

R	R-sq	F	df1	df2	p
,4505	,2029	19,9221	4,0000	313,0000	,0000

Model

	coeff	se	t	p
constant	,7871	,0506	15,5610	,0000
MEQ.TOTA	-,2351	,0471	-4,9884	,0000
EOQtotal	,1935	,0424	4,5632	,0000
int_1	,0060	,0503	,1194	,9051
sex_2	,0371	,0426	,8710	,3844

Interactions:

int_1 EOQtotal X MEQ.TOTA

R-square increase due to interaction(s):

	R2-chng	F	df1	df2	p
int_1	,0000	,0142	1,0000	313,0000	,9051

Conditional effect of X on Y at values of the moderator(s)

MEQ.TOTA	Effect	se	t	p
-,7538	,1890	,0486	3,8902	,0001
,0000	,1935	,0424	4,5632	,0000
,7538	,1981	,0641	3,0892	,0022

Values for quantitative moderators are the mean and plus/minus one SD from mean

In the third moderation model, BIAQ represented the dependent variable (Y), BES the independent variable (X), MEQ the moderator (M), and gender the control variable. In table 71 are reported the results of this model. Although both the BES and MEQ had a singificant effect on BIAQ, with a positive and negative direction, respectively, the interaction effect was not significant, therefore, MEQ was not a moderator.

Table 71 Moderation between BES and BIAQ through MEQ

Model Summary Outcome: BIAQtot

R	R-sq	F	df1	df2	p
,6810	,4638	68,1057	4,0000	315,0000	,0000

Model

	coeff	se	t	p
constant	50,5197	,9455	53,4303	,0000
MEQ.TOTA	-2,3472	1,0682	-2,1974	,0287
BES_tota	1,0619	,1068	9,9392	,0000
int_1	,1376	,0897	1,5343	,1260
sex_2	,5989	,7710	,7768	,4378

Interactions:
int_1 BES_tota X MEQ.TOTA
R-square increase due to interaction(s):

	R2-chng	F	df1	df2	p
int_1	,0040	2,3541	1,0000	315,0000	,1260

Conditional effect of X on Y at values of the moderator(s)

MEQ.TOTA	Effect	se	t	p
-,7597	,9573	,0977	9,8033	,0000
,0000	1,0619	,1068	9,9392	,0000
,7597	1,1664	,1503	7,7627	,0000

Values for quantitative moderators are the mean and plus/minus one SD from mean

In the fourth moderation model, BIAQ represented the dependent variable (Y), EOQ the independent variable (X), MEQ the moderator (M), and gender the control variable. In table 72 are reported the results of this model. EOQ seemed not to have an effect on BIAQ, while MEQ had a significant negative effect. However the interaction was significant at the 0.05 level and increased, although sligthly, the variance explained by the model. MEQ appeared to be a moderator, which conditioned the relation between EOQ and BIAQ, increasing it when it assumed values around one standard deviation below the mean.

Table 72 Moderation between EOQ and BIAQ through MEQ

Model Summary Outcome: BIAQtot

R	R-sq	F	df1	df2	p
,5404	,2920	29,4920	4,0000	286,0000	,0000

Model

	coeff	se	t	p
constant	49,0876	1,1268	43,5639	,0000
MEQ.TOT	-9,1055	1,0318	-8,8249	,0000
EOQtotal	1,2672	,9128	1,3883	,1661
int_1	-2,2260	1,1094	-2,0065	,0457
sex_2	1,1544	,9314	1,2395	,2162

Interactions:

int_1 EOQtotal X MEQ.TOTA

R-square increase due to interaction(s):

	R2-chng	F	df1	df2	p
int_1	,0100	4,0260	1,0000	286,0000	,0457

Conditional effect of X on Y at values of the moderator(s)

MEQ.TOT	Effect	se	t	p
-,7730	2,9880	1,0695	2,7938	,0056
,0000	1,2672	,9128	1,3883	,1661
,7730	-,4536	1,4119	-,3213	,7482

Values for quantitative moderators are the mean and plus/minus one SD from mean

In the fifth moderation model, WHO-5 represented the dependent variable (Y), BES the independent variable (X), MEQ the moderator (M), and gender the control variable. In table 73 are reported the results of this model. The interaction was not significant, therefore MEQ seemed not to have any effect on the relation between BES and WHO-5. In addiction, MEQ had not any effect on WHO-5 that seemed to be significantly explained only by BES, with higher values in perceived mental quality of life associated with lower binge eating.

Table 73 Moderation between BES and WHO-5 through MEQ

```
Model Summary Outcome: WHO-5
          R       R-sq          F        df1        df2          p
      ,3345      ,1119    10,1128     4,0000   321,0000      ,0000

Model
              coeff         se          t          p
constant    49,9493     1,8993    26,2984      ,0000
MEQ.TOT     3,1874     2,1275     1,4982      ,1351
BES_tot     -,6889      ,2009    -3,4286      ,0007
int_1        -,1120      ,1781     -,6289      ,5299
sex_2        -,7923     1,5502     -,5111      ,6096

Interactions:
int_1    BES_tot    X     MEQ.TOTA
R-square increase due to interaction(s):
         R2-chng          F        df1        df2          p
int_1      ,0011      ,3955     1,0000   321,0000      ,5299

Conditional effect of X on Y at values of the moderator(s)
   MEQ.TOT     Effect         se          t          p
     -,7478     -,6052      ,1888    -3,2057      ,0015
      ,0000     -,6889      ,2009    -3,4286      ,0007
      ,7478     -,7727      ,2839    -2,7218      ,0068

Values for quantitative moderators are the mean and plus/minus one SD from
mean
```

In the sixth moderation model, WHO-5 represented the dependent variable (Y), EOQ the independent variable (X), MEQ the moderator (M), and gender the control variable. In table 74 are reported the results of this model. MEQ had a significant positive effect on WHO-5, while EOQ had a small negative effect. Nevertheless these effects were independent from each other, therefore MEQ was not a moderator in this model.

Table 74 Moderation between EOQ and WHO-5 through MEQ

```
Model Summary Outcome: WHO-5
          R       R-sq          F        df1        df2          p
      ,2973      ,0884     8,0243     4,0000   331,0000      ,0000

Model
              coeff         se          t          p
constant    50,3036     1,8486    27,2115      ,0000
MEQ.TOTA     7,0929     1,7065     4,1563      ,0000
EOQtotal    -2,8730     1,4341    -2,0034      ,0459
int_1        -,5209     1,8436     -,2825      ,7777
sex_2        -,6766     1,5779     -,4288      ,6684

Interactions:
int_1    EOQtotal    X     MEQ.TOTA
R-square increase due to interaction(s):
         R2-chng          F        df1        df2          p
int_1      ,0002      ,0798     1,0000   331,0000      ,7777

Conditional effect of X on Y at values of the moderator(s)
   MEQ.TOTA     Effect          se          t          p
     -,7435    -2,4858     1,7311    -1,4359      ,1520
      ,0000    -2,8730     1,4341    -2,0034      ,0459
      ,7435    -3,2603     2,2077    -1,4768      ,1407

Values for quantitative moderators are the mean and plus/minus one SD from
mean
```

6.4. DISCUSSIONS

The first aim of this study was to analyze the construct validity of MEQ and FMI compared to other constructs (BIAQ, BES; EOQ, GSI, WHO-5). As expected, mindful eating and mindfulness were positive correlated with each other and also to mental well-being, whereas they were negatively correlated with body dissatisfaction, binge eating, emotional overeating, and psychological distress. In accordance with the literature, mindfulness has been shown to be more related to psychological well-being (Coffey & Hartman, 2008; Crane et al., 2010; Shapiro et al, 2006; Williams et al., 2011) and also mindful eating has been found helpful in reducing a variety of negative dimensions including depression (Kristeller & Wolever, 2011; Leahey et al., 2008), anxiety (Smith et al, 2006), and body image concern (Alberts et al, 2012).

No differences between BMI categories and genders were found on mindfulness, whereas mindful eating significantly differ in both BMI categories and genders, where both females and obese people reported lower levels than other groups in line with other studies (Framson et al,

2009; Clementi et al, submitted). Both females and obese category showed a significantly higher level of binge eating in accordance with previous studies (e.g., Legenbauer et al., 2011; Mond et al., 2006; Fandiño et al., 2010). Obese people, compared to overweight and normal weight people, also showed an higher level of emotional overeating, in line with previous studies (Van Strien & Ouwens, 2003; Manzoni et al., 2009). No significant differences were found between BMI category on psychological distress, but females reported higher level of psychopathology than males in accordance with study 1. Moreover, both obese and females reported significantly higher levels of body dissatisfaction in line with other researches (Friedman, Reichmann, Costanzo, & Musante, 2003). Finally, only women scored significantly lower than men on mental well-being, but no differences were reported among BMI categories. This result is in contrast with other study in which obese reported a poorer well-being and quality of life than normal weight (Ogden & Clementi, 2010; Tuthill, Slawik & Finer, 2006; Kushner & Foster, 2000; Mannucci et al., 1999).

Furthermore, it was also found that both binge eating and body dissatisfaction represent positive predictors of BMI and thus, an higher level of binge eating and body dissatisfaction were associated with an higher BMI, in accordance with previous finding (i.e., Grilo, Masheb, Brody Burke-Martindale & Rothschild, 2005). On the other hand, psychological distress was inversely related to BMI, in line with study 1 and the study by Fabricatore and Wadden (2004).

Regarding the investigation of a possible role of mediator for mindfulness and moderator for mindful eating, in the relationship between overeating behaviours and psychological distress, different models have been explored.

Mindfulness was found to be a partial mediator in the relationship between binge eating and psychological distress, where mindfulness reduces the negative effect of BED on GSI.

This result seems to be similar, but non totally compareble with another study (Masuda & Wendell, 2010) in which mindfulness was found to partially mediate the relations between

disordered eating-related cognitions and general psychological ill-health and emotional distress in interpersonal contexts.

Mindfulness resulted to be also a partial mediator in the relationship between emotional overeating and psychological distress. Other studies (Baer et al, 2006; Brown & Ryan, 2003) have found an association between mindfulness and eating behaviour patterns and psychological distress (anxious and depressive symptoms), but they are not comparable with our findings. Therefore, in accordance with other studies, mindfulness contributes to the reduction of overeating behavior and indirectly to psychological distress (Kristaller & Wolver, 2011; Alberts et al, 2010).

On the other hand, mindfulness was not found to represent a mediator in the relationship between binge eating and body disatisfaction, because did not reduce the negative effect of binge eating on body concern, although a direct effect of mindfulness in reducing body dissatisfaction was reported in an other study (Alberts et al, 2010).

In contrast, mindfulness represented a partial mediator in the relationship between emotional overeating and body dissatisfaction.

Finally, mindfulness was found to be a partial nediator both in the relationship between binge eating and mental well-being and in the relationship between emotional overeating and mental well-being. Therefore, mindfulness seems to reduce the negative effect of BED and EOQ on mental well-being. These results could not be compared to the literature for the absence of other similar studies.

Regarding the moderation models, mindful eating did not represent a moderator in both the relationship of binge eating or emotional overeating with psychological distress. This was in contrast with our hypothesis, but not comparable with other studies, for the lack of literature on this issue. Moreover, mindful eating did not act as a moderator in the relationship between binge eating and body dissatisfaction.

On the other hand, mindful eating was found to be a moderator in the relationship between emotional overeating and body dissatisfaction, conditionated this relationship. Even though this result could not be compared with other studies, it still accounts for a positive role of mindful eating interventions, which indirectely reduce body dissatisfaction, targeting overeating behaviours (Alberts et al, 20010; Kristeller & Wolver, 2011).

Eventually, no moderator effect of mindful eating was found between binge eating and mental well-being, in which MEQ did not have any direct or indirect effect on this outcome.

Because research on mindful eating is still at onset stage, particularly on exploring the role of mindfulness and mindful eating as mediator or moderator, further studies are needed on this field.

6.4.1 Strenghts and limits of this study

One of the major strength of this study, is the novelty of the issues investigated.

Although the literature regarding mindfulness and mindful eating has been found on exponential increase in the last 30 years, not much studies have been focussed on the role of them as mediators or moderators between different predictors and outcome variables and none of the previous studies has explored the construc of mindful eating in these terms.

Morover, this study add the construct validity of the Mindful Eating Questionnaire, comparing its score between genders and BMI groups, and also with other constructs.

On the other hand, some limitations has to be highlithed. First, the characteristic of the sample, which is large and eterogenuos, are not strictly representative of the Italian population in terms of sociodemographics characteristics.

Moreover, as discussed earlier in this dissertation, self reported weight might have caused some underreporting in BMI estimates.

Further studies shoud involve larger samples of clinical obese people and more representative samples from the general population in order to compare more in-depth these populations on the various psychological dimensions taken into consideration.

As regards the role of mindfulness on the relationship between eating behaviour and distress, future studies should involve long-term trained mindfulness pratictioners, in order to address not only a general mindful disposition, but effective mindful skills acquired through specific training.

Another important goal should be the development of longitudinal design studies to test more appropriately the role of acquired mindful skills on the evolving or changing relationship between eating behavior patterns and psychological distress/well-being.

6.5 CONCLUSIONS

To summarize, this study improved the understanding of both the constructs of mindfulness and mindful eating, which confirmed to be indipendet to each other, but both negatively correlated with binge eating, emotional overeating, psychological distress and body dissatisfaction.

Binge eating and body dissatisfaction were positively related to BMI, whereas psychological distress was inverserly related.

Obese people, compared to other groups, reported lower level of mindful eating, higher levels of binge eating, emotional overeating, and body dissatisfaction.

Mindfulness represented a partial mediator in: 1) the relationship between binge eating and psychological distress, 2) the relationship between emotional overeating and psychological distress, 3) the relationship between binge eating and quality of life, 4) the relatiomship between emotional overeating and mental well-being.

Mindful eating moderates only the relationship between emotional overeating and body dissatisfaction.

Taken as a whole, these results suggest a promising role of both mindfulness and mindful eating based interventions in obesity treatments in targeting overeating behaviours in order to

reduce psychological distress and increase psychological well-being and quality of life. Further studies are needed to better clarify these findings.

REFERENCES

Agras, W. S., &.Telch, C. F. (1998). The effects of caloric deprivation and negative affect on binge eating in obese binge-eating disordered women. *Behavior Therapy*, 29, 3, 491-503.

Albers, S. (2008). *Eat, drink & be mindful.* Oakland CA: New Harbinger Publications.

Alberts, H., Thewissen, R., Raes, L. (2012). Dealing with problematic eating food cravings, dichotomous thinking and body image concern. *Appetite*, 58, 847–851. doi: 10.1016/j.appet.2012.01.009

Aldao, A., Nolen-Hoeksema, S. & Schweizer, S. (2010). Emotion regulation strategies across psychopathology: a meta-analytic review. *Clinical Psychoogyl Reviews*, 30, 217–237. doi: 10.1016/j.cpr.2009.11.004..

Allison, K. C., Lundgren J. D., O'Reardon, J. P., Geliebter, A., Gluck, M. E, Vinai, P. …& Stunkard, A. J.(2010).Proposed diagnostic criteria for night eating syndrome. *International Journal Eating Disordorders*, 43: 241–247. doi: 10.1002/eat.20693.

Allison, K. C., Crow, S. J., Reeves, R. R., West, D. S., Foreyt, J. P.,Dililllo, V. G…& .Stunkard, A. J. (2007). Binge eating disordeand night eating syndrome in adults with type 2 diabetes. *Obesity (Silver Spring)*; 15, 1287–1293..

Allison, K. C., Engel, S. G., Crosby, R. D., de Zwann, M., O'Readon, J. P.,Wonderlich, S. A….& Wadden, T. A.. (2008). Evaluation of diagnostic criteria for night eating syndrome using item response theory analysis. *Eating Behaviours*, 9, 398–407. doi: 10.1016/j.eatbeh.2008.04.004. .

Allison, K .C., Ahima R. S., O'Reardon, J. P., Dinges, D. F., Sharma, V., Cummings, D. E…..& Stunkard, A. J. (2005). Neuroendocrine profiles associated with energy intake, sleep, and stress in the night eating syndrome. *Journal of Clinical Endocrinology & Metabolism*, 90: 6214–6217. DOI: http://dx.doi.org/10.1210/jc.2005-1018

American Psychiatric Association (APA) (2000). *Diagnostic and Statistical Manual of Mental Disorders, 4th, text revision ed*. Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: American Psychiatric Publishing www.dsm5.org.

Andersen, A. (2007). Stories I tell my patients: Where are you when you are eating? *Eating Disorders*, 15, 279–280.

Andersen, G. S., Stunkard, A. J., Sorensen, T. I., Petersen, L. & Heitmann, B.L. (2004). Night eating and weight change in middle-aged men and women. *International Journal of Obesity Related Metabolic Disordorders*, 28, 1338–1343.

Anderson, J. W., Liu, C. & Kryscio, R. J..(2008). Blood pressure response to transcendental meditation: a meta-analysis. *American Journal of Hypertension.* 21, 3, 310-316.

Anderson, S. E., Cohen, P., Naumova, E. N., & Must, A. (2006). Association of depression and anxiety disorders with weight change in a prospective community-based study of children followed up into adulthood. *Archives of Pediatrics and Adolescence Medicine*, 160, 3, 285-91. doi:10.1001/archpedi.160.3.28.

Andersson I. & Rossner, S. (1996). Meal patterns in obese and normal weight men: the 'Gustaf' study**.** *European Journal of Clinical Nutrition*, 50, 10**,** 639-646.

Andrew, D. H. & Dulin, P. L. (2007). The relationship between self-reported health and mental health problems among older adults in New Zealand: experiential avoidance as a moderator. *Aging & Mental Health*. 11, 596–603.

Appelhans, B. M. (2009). Neurobehavioral inhibition of reward-driven feeding: Implications for dieting and obesity. *Obesity*, 17, 640–647.

Apple, R. A., & Agras, W. S. (1997). *Overcoming eating disorders: A cognitivebehavioral treatment for bulimia and binge-eating disorder*. New York, NY, Psychological Corporation.

Armon, G., Melamed, S., Shirom, A., Shapira, I. & Berliner, S.. (2013). Personality traits and body weight measures: concurrent and acrosstime associations. *European Journal of Personality,* 27, 398–408.

Atlantis, E. & Baker, M. (2008). Obesity effects on depression: systematic review of epidemiological studies *International Journal of Obesity*, 32, 881–891.

Avena, N. M., Rada, P. & Hoebel, B. G./2008). Evidence for sugar addiction: Behavioral and neurochemical effects of intermittent, excessive sugar intake. *Neuroscience. And Biobehavioural. Reviews*. 32, 20–39.

Baer, R.A., Walsh, E. & Lykins, E.L.B.. (2009).Assessment of mindfulness. In: Didonna F, ed. *Clinical Handbook of Mindfulness*, New York, NY: Springer, 153-168.

Baer, R. A., Smith, G. T., & Allen, K .B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, 11, 191-206.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessmen*t, 13, 27-45.

Baer, R. A., Walsh, E., & Lykins, E. L. B. (2009). Assessment of mindfulness. In F. Didonna (Ed.).*Clinical Handbook of Mindfulness,* (pp. 153-168). NY: Springer.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire inmeditating and nonmeditating samples. *Assessment*, 15, 329–342. doi: 10.1177/1073191107313003

Baer, R. A., Fischer, S., & Huss, D. B. (2005a). Mindfulness-based cognitive therapy applied to binge eating: A case study. *Cognitive and Behavioral Practice*, 12, 351–358. doi:10.1016/S1077-7229(05)80057-4.

Balle, J. I. & Gonzalez, M. J. (2011). Psychopathological comorbidity of obesity. *Annale del Sistema Sanitario de Navarra*, 34, 2, 253-61.

Barnhofer, T., Duggan, D., Crane, C., Hepburn, S., Fennell, M. J. V., & Williams, J. M. G. *(*2007*).* Effects of meditation on frontal alpha-asymmetry in previously suicidal individuals. *Neuroreport,* 18, *7*, 709–712.

Barry, D., Clarke, M. & Perry, N. M. (2009) Obesity and Its Relationship to Addictions: Is Overeating a Form of Addictive Behavior? *American Journal of Addiction*; 18, 6, 439–451. doi:10.3109/10550490903205579.

Barry, D., Pietrzak, R. H., & Petry, N. M. (2008). Gender differences in associations between body mass index and DSM-IV mood and anxiety disorders: results from the national epidemiologic survey on alcohol and related conditions. *Annuals of Epidemiology*, 18, 458–466. doi: 10.1097/PSY.0b013e3181651651

BasdeVant, A, Craplet, C. & Guy-Grand, B. (1993). Snacking patterns in obese French women *Appetite*. 21, 1:17-23.

Baumeister, H., & Harter, M. (2007). Mental disorders in patients with obesity in comparison with healthy probands. *International Journal of Obesity*, 31, 1155–1164; doi:10.1038/sj.ijo.080355.

Becker, E. S., Margraf, J., Turke, V., Soeder ,U., Neumer, S**.** (2001). Obesity and mental illness in a representative sample of young women. *International Journal of Obesity Related Metabolic Disorders*, 25, 1, S5–9.

Bjerkeset, O., Romundstad, P. E., Vans, J. & Gunnell, D. (2008). Association of adult body mass index and height with anxiety, depression, and suicide in the general population- *American Journal of Epidemiology*,167, 2,193-202 doi: 10.1093/aje/kwm280.

Beitel, M., Ferrer, E., & Cecero, J. J. (2005). Psychological mindedness and awareness of self and others. *Journal of Clinical Psychology*, 61, 739−750.

Bentler, P. M., Wu, E. J. C. & Encino, C. A. (2005). EQS 6.1 for windows Multivariate software

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychology Bullettin*. 107 , 2, 238.

Bergomi, C., Ströhle, G., Michalak, J., Funke, F., Berking, M. (2013).Facing the dreaded: does mindfulness facilitate coping with distressing experiences? A moderator analysis, 42, 1, 21-30. doi: 10.1080/16506073.2012.713391.

Bergomi, C. Tschacher, W., Kupper, Z. (2013a). The Assessment of Mindfulness with Self-Report measures: existing scales and open issues. *Mindfulness***.**4, 191-202

Bergomi, C. Tschacher, W., Kupper, Z. (2013b). Measuring mindfulness: first steps towards the development of a comprehensive mindfulness scale. *Mindfulness*.doi: 10.1007/sl2671-012-0102-9

Bergomi, C. (2007). Achtsamkeit, buddhistische Meditation und psychische Gesundheit (Unpublished master's thesis). Psychology Department, University of Bern, Switzerland / Retrieved from http://www.upd.unibe.ch/research/papers/Liz_Bergomi.pdf.

Bernardy, K., Füber, N., Köllner, V., Häuser, W. (2010). Efficacy of cognitive-behavioral therapies in fibromyalgia syndrome: a systematic review and metaanalysis of randomized controlled trials. *Journal of Rheumatology*, 37, 10, 1991-2005.

Beshara, M., Hutchinson, A. D. & Wilson, C. (2013). Does mindfulness natter? Everyday mindfulness, mindful eating and self-reported serving size of energy dense foods among a sample of South Australian adults. *Appetite*, 67, 25–29 doi:10.1016/j.appet.2013.03.012

Birketvedt, G. S., Florholmen, J., Sundsfjord, J.. Osterud, B., Dinges, D., Bilker, W. & Stunkard, A. J. (1999). Behavioral and neuroendocrine characteristics of the night-eating syndrome., *JAMA;* 282, 657–663.

Bohlmeijer, E., Prenger, R., Taal, E. & Cuijpers, P. (2010). The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: a meta-analysis. *Journal of Psychosomatic Research,* 68, 6, 539-544 doi: 10.1016/j.jpsychores.2009.10.005..

Bonsignore, M., Barkow, K., Jessen, F. & Heun, R. (2001). Validity of the five-item WHO Well-Being Index (WHO-5) in an elderly population *European Archive of Psychiatry and Clinical Neuroscience*; 251, Suppl, 2, II27-31.

Booth, D. A. (1988). Mechanisms from models–actual effects from real life: the zero-calorie drink-break option**.** *Appetite*, 11**,** Suppl 1, 94-102.

Bouchard, C., Pe´russe, L., Rice, T., & Rao, D. C. (2004). Genetics of human obesity. In G. A. Bray & C. Bouchard (Eds.), *Handbook of obesity: etiology and pathophysiology*, 2nd Edition (pp. 157–200). New York: Marcel Dekker.

Bowen, S., Chawla, N. & Marlatt, G. A. (2011).*Mindfulness based relapse prevention for addictive behaviours: a clinician's guide.* New York, Guilford Press..

Boynton-Jarrett, R., Rosenberg, L., Palmer, J. R., Boggs, D. A., & Wise, L. A. (2012). Child and adolescent abuse in relation to obesity in adulthood: The Black Women's Health Study. *Pediatrics*, 130, 2, 245 -253. doi: 10.1542/peds.2011-1554.

Bray, G.A. (2004). Medical consequences of obesity. *Journal of Clinical Endocrinology & Metabolism*, 89, 2583–2589.

Brogan, A. & Hevey, D. (2013). Eating styles in the morbidly obese: restraint eating, but not emotional and external eating, predicts dietary behavior. *Psychology & Health*., 28, 6, 714-25. doi: 10.1080/08870446.2012.760033.

Brotto L A., Krychman M. & Jacobson P. (2008). Eastern approaches for enhancing women's sexuality: mindfulness, acupuncture, and yoga (CME).*Journal of Sexual Medicine*, 5, 2,:2741-8; quiz 2749. doi: 10.1111/j.1743-6109.2008.01071.x.

Brown, K. W., Ryan, R. M., & Cresswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, 18, 211–237. DOI: 10.1080/10478400701598298

Brown, K. W., & Ryan, R. M. (2004). Perils and promises in defining and measuring Mindfulness: observations from experience. *Clinical Psychology: Science and Practice*, 11, 242-248.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological wellbeing. *Journal of Personality and Social Psychology*, 84, 822–848.

Browne, M.W. & Cudeck, R. (1993). Alternative ways of assessing model fit. In: Boller KA, Long JS, ed. *Testing structural equation models*, Newbury Park CA: Sage; 1993; 136-162.

Brownley, K. A., Berkman, N. D., Sedway, J. A., Lohr, K. N., & Bulik, C. M. (2007). Binge eating disorder treatment: A systematic review of randomized controlled trials. *International Journal of Eating Disorders*, 40, 337–348. doi:10.1002/eat.20370.

Brummett, B. H., Babyak, M. A., Williams, R., Barefoot, J. C., Costa, P. T. & Siegler I. C. (2006). NEO personality domains and gender predict levels and trends in body mass index over 14 years during midlife. *Journal of Research in Personality*, 40, 222–236. doi: 10.3200/BMED.34.1.5-10

Bruch, H. (1973). *Eating disorders*. New York: Basic Books.

Bruffaerts, R., Demyttenaere, K., Vilagut, G., Martinez, M., Bonnewyn, A., De Graaf, R., Haro, J. M., Bernert, S., Angermeyer, M. C., Brugha, T., Roick, C., & Alonso, J. (2008). The relation between body mass index, mental health, and functional disability: a European population perspective. *Canadian Journal of Psychiatry*, 53, 10, 679-88.

Buchheld, N., Grossman, P., & Walach, H. (2001). Measuring mindfulness in insight meditation (Vipassana) and meditation-based psychotherapy: The development of the Freiburg MindfulnessInventory (FMI). *Journal for Meditation and Meditation Research*, 1, 11-34.

Burton, P., Smith, H. J., Lightowler, H. J. (2007).The influence of restrained and external eating patterns on overeating. *Appetite*. 49, 1:191-7. doi: 10.1016/j.appet.2013.02.016.

Bush, H. E., Rossy, L., Mintz, L. B. & Schopp, L. (2014). Eat for life: a work site feasibility study of a novel mindfulness-based intuitive eating intervention. *American Journal of Health Promotion*, 28, 6:380-8. doi: 10.4278/ajhp.120404-QUAN-186.

Canter, P., H. & Ernst, E. (2003). The cumulative effects of transcendental meditation on cognitive function: a systematic review of randomised controlled trials. *Wien Klin Wochensch*,115, 21-22, 758-766.

Carano, A., De Berardis, D., Gambi, F., Salerno, M. R., Campanella, D., Castrovilli, M., Cotellessa, C., & Ferro, F. M. (2005). Psychopathologic patterns in obesity. *Annali Italiani di Chirurgia*, 76, 5,461-4. doi: 10.1002/eat.20238.

Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia Mindfulness Scale. *Assessment*, 15, 204-223.

Carmody, J. & Baer, R. A. (2009). How long does a mindfulness-based stress reduction program need to be? A review of class contact hours and effect sizes for psychological distress. *Journal of Clinical Psycholpgy*, 65, 6:627-38. doi: 10.1002/jclp.20555.

Carmody, J. (2009). Evolving conceptions of mindfulness in clinical settings. *Journal of Cognitive Psychotherapy*, 23, 270-280.

Carmody, J. & Baer, R. A. (2007). Relationships between mindfulness practice and levels ofmindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine*, 31, 23-33.

Carlson, L. E. & Brown, K. W. (2005). Validation of the Mindful Attention Awareness Scale in a cancer population. *Journal of Psychosomatic Research*, 58, 29.33.

Carrard, I., Van der Linden, M., & Golay, A. (2012). Comparison of obese and nonobese individuals with binge eating disorder: Delicate boundary between binge eating disorder and non-purging bulimia nervosa. *European Eating Disorders Review*, 20, 350–354. doi:10.1002/erv.2174.

Carter, F. A., & Jansen, A. (2012). Improving psychological treatment for obesity. Which eating behaviours should we target? *Appetite*, 58, 3, 1063-1069.

Cartwright, M, Wardle, J, Steggles N, Simon, A. E., Croker, H. & Jarvi, M. J. (2003). Stress and dietary practices in adolescents. *Health Psychology*. 22, 4:362-9.

Cassin, S. E., & Von Ranson, K. M. (2007). Is binge eating experienced as an addiction? *Appetite*, 49, 3, 687–690. doi:10.1016j.appet.2007.06.012.

Carpenter, K. M., Hasin, D. S., Allison, D. B., & Faith, M. S. (2000). Relationship between obesity and DSM-IV major depressive disorder, suicide ideation, and suicide attempts: results from a general population study. *American Journal of Public Health*, 90, 251–257.

Carpiniello B., Pinna, Pillai, G., Nonnoi, V., Pisano, E., Corrias, S., Orrù, M. G., Orrù, W., Velluzzi, F., & Loviselli, A. (2009). Psychiatric comorbidity and quality of life in obese patients. Results from a case-control study. *International Journal of Psychiatry in Medicine*, 39,1 ,63-78.

Cepeda-Benito, A., Fernandez, M. C., & Moreno, S. (2003). Relationship of gender and eating disorder symptoms to reported cravings for food: Construct validation of state and trait craving questionnaires in spanish. *Appetite*, 40, 47–54.

Chadwick, P., Hember, M., Symes, J., Peters, E., Kuipers, E., & Dagnan, D. (2008). Responding mindfully to unpleasant thoughts and images: Reliability and validity of the Southampton mindfulness questionnaire (SMQ). *British Journal of Clinical Psychology*, 47, 451-455..

Chambers, R., Gullone, E., Allen, N. B. (2009). Mindful emotion regulation: an integrative review. *Clinical Psychology* Review. 29, 6, 560-572. doi: 10.1016/j.cpr.2009.06.005.

Chaplin, K. & Smith, A. P.(2011). Breakfast and snacks: associations with cognitive failures, minor injuries, accidents and stress. *Nutrients*, 3, 5: 515-528. doi: 10.3390/nu3050515

Chapman, B. P., Fiscella, K., Duberstein, P., Kawachi, I. & Coletta, M..(2009). Can the influence of childhood socioeconomic status on men's and women's adult body mass be explained by adult socioeconomic status or personality? Findings from a national sample. *Health Psychology,* 28, 419–427.

Chen, E. Y., Matthews, L., Allen, C., Kuo, J. R., & Linehan, M. M. (2008). Dialectical behavior therapy for clients with binge-eating disorder or bulimia nervosa and borderline personality disorder. *International Journal of Eating Disorders*, 41, 505–512. doi:10. 1002/eat.20522.

Chiadi, U., Onyike, R. M., Crum, H. B., Hochang, B. L., Lyketsos, C. G., & Eaton, W. W. (2003). Is obesity associated with major depression? Results from the Third National Health and Nutrition Examination Survey. *American Journal of Epidemiology*, 158, 1139–47. doi: 10.1093/aje/kwg275.

Chiesa, A. & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis. *Journal of Alternative and Complementary Medicine*. 15, 5, 593-600. doi: 10.1089/acm.2008.0495.

Chiesa, A, Calati, R. & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Rev*iew, 31, 3:449-464. doi: 10.1016/j.cpr.2010.11.003

Chiesa, A. & Serretti, A. (2011). Mindfulness based cognitive therapy for psychiatric disorders: a systematic review and meta-analysis. *Psychiatry Research*, 187, 3:441-453**.** doi: 10.1016/j.psychres.2010.08.011**.**

Christopher, M. S., Charoensuk, S., Gilbert, B. D., Neary, T. J., & Pearce, K.L. (2009). Mindfulness in Thailand and the United States: A case of apples versus oranges*? Journal of Clinical Psychology*, 65, 590–612. doi: 10.1002/jclp.20580.

Cleaton, J., Abbott, J., Judd, P., Sutton, C. & Wilding, J. P. H. (2012). Night eating syndrome: implications for severe obesity. *Nutrition and Diabetes*, 2, e44; doi:10.1038/nutd.2012.16.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. New Jersey: Lawrence Erlbaum

Coffey, K. A. & Hartman, M. (2008). Mechanisms of action in the inverse relationship between mindfulness and psychological distress. *Complementary Health Practice Review*, 13. 79-91.

Colles, S. L., Dixon, J. B., & O'Brien, P. E. (2007). Night eating syndrome and nocturnal snacking: association with obesity, binge eating and psychological distress. *International Journal of Obesity*, 1, 1, 1722-30. doi:10.1038/sj.ijo.0803664

Compare , A., Callus, E. & Grossi, E. (2012).Mindfulness trait, eating behaviours and body unesness: a case-control study of binge eating disorder. *Eating and Weight Disorders*, 17, e244-e251.

Cooper, Z. & Fairburn, C. G. (2001). A new cognitive behavioural approach to the treatment of obesity. *Behaviour Research and Therapy*, 39, 499–511.

Corsica, J., Hood, M.M., Katterman ,S., Kleinman, B. & Ivan, I. (2014). Development of a novel mindfulness and cognitive behavioral intervention for stress-eating: A comparative pilot study. *Eating Behaviors*. 21, 15, 4:694-699. doi: 10.1016/j.eatbeh.201.

Courbasson, C. M., Nishikawa, Y., & Shapira, L. B. (2011).Mindfulness-action based cognitive behavioral therapy for concurrent binge eating disorder and substance use disorders. *Eating Disorders*, 19, 17–33. doi:10.1080/10640266.2011.533603.

Crafti, N. (1994). *The Moderate Eating Group (MEG): Program manual*. Melbourne: Swinburne University of Technology.

Crafti, N., & Peyton, M. (2005). The Mindful Moderate Eating Group: A manual for the group treatment of binge eating problems. Melbourne: Swinburne University of Technology.

Crane, C., Barnhofer, T., Hargus, E., Winder, R., & Amarasinghe, M. (2010). The relationship between mindfulness and conditional goal setting in depressed patients. *British Journal of Clinical Psychology*, 42, 281–290. doi: 10.1348/014466509X455209.

Crisp, A. H. & McGuiness, B. (1975). Jolly fat: Relation between obesity and psychoneurosis in the general population. *British Medical Journal*, 1, 7–9.

Cross, A. T., Babicz, D. & Cushman, L. F. (1994). Snacking patterns among 1,800 adults and children**.** *Journal of American and Dietetic Associassion*, 94, 12**:**1398-1403.

Cullen, M. (2006). Mindfulness: The heart of Buddhist meditation? A conversation with Jan Chozen Bays, Joseph Goldstein, Jan Kabat-Zinn, and Alan Wallace. Inquiring mind. *A semiannual journal of the Vipassana Community*, 22, 2, 4 –7.

Cussler, E. C., Teixeira, P. J., Going, S. B., Houtkooper, L. B., Metcalfe, L. L., Blew, R. M., …& Lohman, T. G.(2008). Maintenance of weight loss in overweight middle-aged women through the internet. *Obesity*, 16, 1052e1060. doi: 10.1038/oby.2008.19.

Dalen, J., Smith , B. W., Shelley, B. M., Sloan, A. L., Leahigh, L. & Begay, D. (2010). Pilot study: Mindful Eating and Living (MEAL): weight, eating behaviour, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary and Therapeutic Med*icine, 18, 6: 260-264.

Dalle Grave, R., Calugi, S., Ruocco, A., Marchesini, G. (2011). Night eating syndrome and weight loss outcome in obese patients. *International Journal of Eating Disorders*, 44: 150–156. doi: 10.1002/eat.20786.

Darby, A., Hay, P., Mond, J., Rodgers, B., & Owen, C. (2007). Disordered eating behaviours and cognitions in young women with obesity: relationship with psychological Status. *International Journal of Obesity*, 31, 876–882. doi:10.1038/sj.ijo.0803501.

Davis, M. J. M. A. & Addis, M. E. P. (1999). Predictors of attrition from behavioral medicine treatments. *Annuals of Behavioural Medicine*, 21, 4:339—49.

Davis, K. M., Lau M. A. & Cairns, D. R. (2009). Development and preliminary validation of a trait version of the Toronto Mindfulness Scale. *Journal of Cognitive. Psychotherapy.* 23 185–197 10.1891/0889-8391.23.3.185.

de Lauzon, B., Romon, M., Deschamps, V., Lafay, L., Borys, J. M., Karlsson, J….& F.L.V.S. study group (2004).The Three-Factor Eating Questionnaire-R18 is able to distinguish among different eating patterns in a general population. *The Journal of Nutrition*, 134, 2372–2380.

de Lauzon-Guillain, B., BasdeVant, A., Romon, M., Karlsson, J., Borys, J. M., Charles, M. A….& F.L.V.S study group (2006). Is restrained eating a risk factor for weight gain in a general population? *The American Journal of Clinical Nutrition*, 83, 132–138.

de Lisle, S. M., Dowling, N. A. & Allen, J. S. (2012). Mindfulness and problem gambling: a review of the literature. *Journal of Gambling Studies*, 28, 4:719-39. doi: 10.1007/s10899-011-9284-7.

Derogatis, L. (1983). *SCL-90: Administration, scoring and procedures manual for the revised version*. Baltimore: Clinical Psychometric Research.

Derogatis, L. (2011). *Manuale di somministrazione e scoring. Adattamento italiano di SCL-90-R* (Sarno, I., Preti, E., Prunas, A., Madeddu, F., a cura di). Firenze : Giunti, Organizzazioni Speciali.

Devlin, M. J. (2007). Is there a place for obesity in DSM-V? *International Journal of Eating Disorders*, 40:S83–88.

de Wit, L. M., Van Straten, A., Van Herten, M., Penninx, B. W., & Cuijpers, P. (2009). Depression and body mass index, a u-shaped association. *Biomedical Central Public Health*, 13, 9-14.

de Zwaan, M. (2001). Binge eating disorder and obesity. *International Journal of Obesity Related Metabolic Disord*ers, 25 Suppl 1:S51-5.

de Zwaan, M., Roerig, D. B., Crosby, R. D., Karaz, S., Mitchell, J. E. (2006). Nighttime eating: a descriptive study. *International Journal of Eating Disorders*, 39: 224–232.

Didonna, F. *(*2009*). Clinical handbook of mindfulness. New York : Springer.*

Dingemans, A. E., Bruna, M. J., & Van Furth, E. F. (2002). Binge eating disorder: a review. *International Journal of Obesity*, 26, 3, 299-307.

Drummond, S., Crombie , N. & Kirk, T. (1996). A critique of the effects of snacking on body weight status. *European Journal of Clinical Nutrition*. 50, 12:779-83.

Drummond, S. E., Crombie, N. E., Cursiter, M. C., Kirk, T. R. (1998). Evidence that eating frequency is inversely related to body weight status in male, but not female, non-obese adults reporting valid dietary intakes. *International Journal of Obesity Related Metabolic Disord*ers, 22, 2**,** 105-112.

Duarte, C., Pinto-Gouveia J., Ferreira C. (2014). Escaping from body image shame and harsh self-criticism: Exploration of underlying mechanisms of binge eating. *Eating Behaviors*, 15, 4, 638–643. doi: 10.1016/j.eatbeh.2014.08.025.

Dunkley, D. & Grilo, C. (2007). Self-criticism, low self-esteem, depressive symptoms, and over-evaluation of shape and weight in binge eating disorder patients. *Behaviour Research and Therapy*, 45, 139–149 http://dx.doi.org/10.1016/j.brat.2006.01.017.

Dunkley, D., Masheb, R. & Grilo, C. (2010). Childhood maltreatment, depressive symptoms, and body dissatisfaction in patients with binge eating disorder: The mediating role of self-criticism. *International Journal of Eating Disorders*, 43, 274–281 http://dx.doi.org/10.1002/eat.20796.

Elfhag, K., Tholin, S., & Rasmussen, F. (2008). Consumption of fruit, vegetables, sweets, and soft drinks are associated with psychological dimensions of eating behavior in parents and their 12-year-old children. *Public Health Nutrition*, 11, 914–923.

Edenfield, T. M.& Saeed, S. A. (2012). An update on mindfulness meditation as a self-help treatment for anxiety and depression. *Psychological Reseach Behaviour Management*, 5, 131-41. doi: 10.2147/PRBM.S34937.

Fabricatore, A. N., & Wadden, T. S. (2004). Psychological aspects of obesity. *Clinics in Dermatology*, 22, 332–337. . doi:10.1016/j.clindermatol.2004.01.006.

Fabry, P., Fodo, J., Hejl, Z., Braun, T. & Zvolankova, K. (1964**).** The frequency of meals: Its relation to overweight, hypercholesterolaemia, and decreased glucose tolerance**.** *Lancet*, 2, 7360, 614-615.

Fairburn, C. G., & Wilson, G. T. (1993*). Binge eating: Nature, assessment, and treatment.* New York, NY: Guilford Press.

Fairburn, C. G. (2008). *Cognitive Behaviour Therapy for Eating Disorders*. New York: The Guilford Press.

Fairburn, C. G., Cooper Z., Doll, H. A., O'Connor M. E., Bohn, K., Hawker, D. M.…& Palmer, R.L. (2009). Transdiagnostic cognitiveebehavioral therapy for patients with eating disorders: a two-site trial with 60-week follow-up. *American Journal of Psychiatry*, 166, 311e319. doi: 10.1176/appi.ajp.2008.08040608.

Fairburn, C. G., Cooper, Z., Bohn, K., O'Connor, M. E., Doll, H. A., Palmer, R. L. (2007). The severity and status of eating disorder NOS: Implications for DSM-V. *Behavior Research & Therapy.* 45, 8:1705-15.

Fairburn, C. G., Cooper, Z., O'Connor, M. E. (2008). Eating Disorders Examination (Edition 16.0D) In: Fairburn CG, editor. *Cognitive Behavior Therapy and Eating Disorders.* New York: Guilford Press

Faith, M. S, Flint, J., Fairburn, C. G., Goodwin, G. M.,& Allison, D. B. (2001). Gender differences in the relationship between personality dimensions and relative body weight. *Obesity Research*, **9,** 647–650.

Fandiño, J., Moreira, R. O., Preissler, C., Gaya, C. W., Papelbaum, M., Coutinho, W. F., & Appolinario, J. C. (2010). Impact of binge eating disorder in the psychopathological profile of obese women. *Comprensive Psychiatry*, 51,2,110-4. doi:10.1016/j.comppsych.2009.03.011.

Fassino, S., Leombruni, P., Pierò, A., Abbate-Daga, G., & Rovera G. (2003). Mood, eating attitudes, and anger in obese women with and without Binge Eating Disorder. *Journal of Psychosomatic Research*, 54, 6, 559 - 66. doi:10.1016/S0022-3999(02)00462-2.

Feldman, G. C., Hayes, A. M., Kumar, S. M., Greeson, J. G., & Laurenceau, J. P. (2007). Mindfulness and emotion regulation: The development and initial validation of the cognitive and affective mindfulness scale-revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment*.29, 177-190.

Feltman ,R., Robinson, M. D., Ode, S.(2009). Mindfulness as a moderator of neuroticism–outcome relations: a self-regulation perspective. *Journal of Research in Personality*, 43, 6:953–961.

Ferro-Luzi, A., Branca, F. (1995). Mediterranea diet, Italian-style: protype of a healthy diet. *American Journal of Clinical Nutrition*. 61, 6: 13385-13445.

Field, A. E., Austin, S. B., Gillman, M. W., Rosner, B., Rockett, H. R.& Colditz, G. A. (2004). Snack food intake does not predict weight change among children and adolescents**.** *International Journal of Obesity Related Metabolic Disorders.*, 28, 10**,** 1210-1216.

Finkelstein, E. A., Khavjou, O. A., Thompson, H., Trogdon, J. G., Pan, L., Sherry, B. & Dietz, W. (2012). Obesity and severe obesity forecasts through 2030. *American Journal of Preventive Medicine*. 42, 6:563-70. doi: 10.1016/j.amepre.2011.10.026.

Fjorback, L. O. (2012). Mindfulness and bodily distress. *Dan Medical Journal*, 59, 11:B4547.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010). Prevalence and trends in obesity among US adults, 1999-2008. *JAMA*, 303, 3, 235-241. doi: 10.1001/jama.2009.2014

Folope, V., Chapelle, C., Grigioni, S., Coëffier, M., & Déchelotte, P. (2012). Impact of eating disorders and psychological distress on the quality of life of obese people. *Nutrition*, 28, e7–e13. doi:10.1016/j.nut.2011.12.005-

Fonseca, M. J. M., Andreaozzi, V. L., Faertein, E., Chor, D. & Carvalho, M. S. (2008). Alternatives in modeling of body mass index as a continuous response variable and relevance of residual analysis . *Cadernos de Saúde Pública* [online]. 24, 2, 473-478

Foster, G. D., & Wadden, T. A. (1994). The psychology of obesity, weight loss, and weight regain: research and clinical findings. In G. L. Blackburn, & B. S. Kanders, *Obesity: pathophysiology, psychology and treatment* (pp.140–166). New York: Chapman & Hall.

Framson C., Kristal A. R., Schenk J. M., Littman A. J., Zeliadt S. & Benitez D. (2009). Development and validation of the mindful eating questionnaire. *Journal of American Dietetic Associassion*, 109 , 8:1439-44. doi: 10.1016/j.jada.2009.05.006.

Franz, M. J., VanWormer J. J., Crain, A. L.Boucher, J L.,Histon, T., Caplan, W.,...& Pronk, N. P..(2007). Weight-loss outcomes: a systematic review and meta-analysis of weight-loss clinical trials with a minimum 1-year follow-up. *Journal of American Dietetic Associassion*, 107, 1755–1767.

French, S. A., Epstein, L. H., Jeffery, R. W., Blundell, J. E., & Wardle, J. (2012). Eating behavior dimensions. Associations with energy intake and body weight. A review. *Appetite*, 59, 541–549. doi: 10.1016/j.appet.2012.07.001.

Friedman, M. A. & Brownel, K. D. (1995). Psychological Correlates of Obesity:Moving to the Next Research Generation. *Psychological Bulletin*, 117, 1, 3-20.

Friedman, K. E., Reichmann, S. K., Costanzo, P. R., & Musante, G. (2002). Body image partially mediates the relationship between obesity and psychological distress. *Obesity Research*, 10,1, 33-41.

Fuemmeler, B. F., Ostbye, T., Yang, C., Mc Clernon, F. J., & Kollins, S. H. (2010) Association between attention deficit/hyperactivity disorder symptoms and obesity and hypertension in early adulthood: a population based study. *International Journal of Obesity*, 35, 852–862. doi:10.1038/ijo.2010.21.

Gallant, A. R., Lundgren J. .& Drapeau, V. (2012). The night-eating syndrome and obesity. *Obesity Review*. 13, 6:528-36. doi: 10.1111/j.1467-789X.2011.00975.x.

Garaulet M., Ordovas, J. M. & Madrid, J, A. (2010).The chronobiology, etiology and pathophysiology of obesity. *International Journal of Obesity*, 34, 1667–1683. doi: 10.1038/ijo.2010.118

Garaulet, M., Canteras M., Morales E., López-Guimera G., Sánchez-Carracedo D. & Corbalán-Tutau, M. D.(2012). Validation of a questionnaire on emotional eating for use in cases of obesity: the Emotional Eater Questionnaire (EEQ). *Nutrition Hospital*, 27, 2:645-51. doi: 10.1590/S0212-16112012000200043.

Gariepy, G., Nitka, D., & Schmitz, N. (2010). The association between obesity and anxiety disorders in the population: a systematic review and meta-analysis. *International Journal of Obesity*, 34, 407–419. doi:10.1038/ijo.2009.252.

Gerlach G., Herpertz S., Loeber S. (2015). Personality traits and obesity: a systematic review, *Obes Rev*. 16, 1: 32-63. doi: 10.1111/obr.12235.

Gilbert, B. D., & Christopher, M. S. (2009). Mindfulness-based attention as a moderator of the relationship between depressive affect and negative cognitions. *Cognitive Therapy and Research*, 34, 6,514–521.

Gilbert, P. *(*2009*). The compassionate mind.* London, UK*: Constable & Robinson Ltd.*

Gilbert, P. *(*2010*). Compassion focused therapy: Distinctive features. London, UK*: Routledge.

Gleason, P. M., Harris, J., Sheean, P. M., Boushey, C. J. & Bruemmer, B. (2010). Publishing nutrition research: validity, reliability, and diagnostic test assessment in nutrition-related research. *Journal of American Dietic Association*, 110, 3, 409-419.

Gluck, M.E., Venti, C.A., Salbe, A.D.& Krakoff, J. (2008). Nighttime eating: commonly observed and related to weight gain in an inpatient food intake study. *American Journal of Clinical Nutrition*, 88: 900–905.

Gluck, M. E., Geliebter, A. &Satov, T. (2001).Night eating syndrome is associated with depression, low self-esteem, reduced daytime hunger, and less weight loss in obese outpatients. *Obesity Research*, 9, 264–267.

Godfrey, K .M., Gallo, L .C.& Afari, N. (2014). Mindfulness-based interventions for binge eating: a systematic review and meta-analysis. *Journal of Behavioral Medicine*. Nov 23. [Epub ahead of print]

Goel, N., Stunkard, A. J., Rogers, N. L., Van Dongen, H. P., Allison, K. C., O'Reardon J. P. …& Dinges, D. S.(2009). Circadian rhythm profiles in women with night eating syndrome. *Journal of Biological Rhythms*, 24: 85–94 doi: 10.1177/0748730408328914..

Goldsmith, R. Joanisse D. R., Gallagher, D., Pavlovich, K. Shamoon, E. Leibel R.L.& Rosenbaum, M. (2010). Effects of experimental weight perturbation on skeletal muscle work efficiency, fuel utilization, and biochemistry in human subjects *American Journal of Physiology*, 298, R79–R88.

Goleman, D. (1988). *The meditative mind: The varieties of meditative experience*.New York, NY: G. P. Putnam & Sons.

Goossens, L., Braet, L., Van Vlierberghe, S., & Mels, S. (2009). Weight parameters and pathological eating as predictors of obesity treatment outcome in children and adolescents. *Eating Behaviors*, 10, 1, 71-73. doi: 10.1016/j.eatbeh.2008.10.008.

Godsey J. (2013) The role of mindfulness based interventions in the treatment of obesity and eating disorders: An integrative review. *Complementary Therapies in Medicine* 21, 430—439. doi: 10.1016/j.ctim.2013.06.003

Goldney, R. D., Dunn, K. I., Air, T. M., Dal Grande, E., & Taylor, A. W. (2009). Relationships between body mass index, mental health, and suicidal ideation: population perspective using two methods. *Australian and New Zealand Journal of Psychiatry*, 43, 652-58.

Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F, Rowland-Seymour, A., Sharma, R.,… & Bass, E. B., (2014). Meditation programs for psychological stress and well-being: a systematic review and meta-analysis Haythornthwaite JA. *JAMA International Medicine*,174, 3:357-68. doi: 10.1001/jamainternmed.2013.13018.

Gormally, J., Black, S., Daston, S. & Rardin, D. (1982). The assessment of binge eatings severity among obese persons. *Addiction Behaviors*, 7, 1, 47—55.

Green, S. M, Key, B. L., McCabe, R. E. (2014). Cognitive-behavioral, behavioral, and mindfulness-based therapies for menopausal depression: A review. *Maturitas*.; 80,1:37-47. doi: 10.1016/j.maturitas.2014.10.004.

Greeno ,C. G. & Wing, R. R. (1994). Stress-induced eating. *Psychologica Bulletin*, 115, 3, 444–464.

Gremigni, P., Letizia, L, Dalle Grave, R. Il Questionario del comportamento alimentare nell'obesità (QCAO) (in press).

Gremigni, P. & Letizia, L. (2011). *Il problema obesità*. (a cura di). Sant' Arcangelo di Romagna: Maggioli Editore.

Grilo, C. M., Masheb, R. M., Wilson, G. T., Gueorguieva, R., & White, M. A. (2011). Cognitive-behavioral therapy, behavioral weight loss, and sequential treatment for obese patients with binge-eating disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 79, 675–685. doi:10.1037/a0025049.

Grilo C. M., Masheb, R. M., Brody M., Burke-Martindale, C .H., . Rothschild, B. S. (2005). Binge eating and self-esteem predict body image dissatisfaction among obese men and women seeking bariatric surgery. *International Journal of Eating Disorders*, 37, 4, 347-361

Grossman, P. & Van Dam, N. T. (2011). Mindfulness, by any other name: trials and tribulations of sati in western psychology and science. *Contemporary Buddhism*, 12, 219-239.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, 57, 35-43.

Guerdjikova, A. I., McElroy, S. L., Kotwal, R., Stanford, K. & Keck, P. E. Jr. (2007).Psychiatric and metabolic characteristics of childhood versus adult-onset obesity in patients seeking weight management. *Eating Behaviors*, 8, 266–276. doi:10.1016/j.eatbeh.2006.11.001.

Guillemin, F, Bombardier ,C, Beaton, D. (1993). Cross-cultural adaptation of the health-related quality of life measures: literature review and proposed guidelines. *Journal of Clinical Epidemiology*, 46, 212, 1417-1432.

Hach, I., Ruhl, U.E., Klose, M., Klotsche, J., Kirch, W, & Jacobi, F. (2006). Obesity and the risk for mental disorders in a representative German adult sample. *European Journal of Public Health*, 17, 3, 297–305.

Hallings-Pott, C., Waller, G., Watson ,D.& Scragg, P. (2005). State dissociation in Bulimic Eating Disorders: an experimental study. *International Journal of Eating Disorders*, 3837–41.

Hampl, J. S., Heaton, C. L.& Taylor, C. A. (2003). Snacking patterns influence energy and nutrient intakes but not body mass index. *Journal of Human Nutrition Dietetic*, 16, 1, 3-11.

Hart, R., Ivtzan, I. & Hart, D. (2013). Mind the gap in mindfulness research: a comparative account of the leading schools of thought. *Review of. General Psychology.* 17 453–466 10.1037/a0035212.

Hasler, G., Pine, D. S, Kleinbaum, D. G., Gamma, A., Luckenbaugh, D., Ajdacic, V., Eich, D., Rössler, W. & Angst, J. (2005). Depressive symptoms during childhood and adult obesity: the Zurich Cohort Study. *Molecular Psychiatry*, 10,9, 842-50. doi:10.1038/sj.mp.4001671.

Hasler, G., Pine, D. S., Gamma, A., Milos, G., Ajdacic, V., Eich, D., Rossler, W. & Angst, J. (2004). The associations between psychopathology and being overweight: a 20-year prospective study. *Psychological Medicine*, 34, 1047–1057. doi: 10.1017/S0033291703001697.

Hays, N. P. & Roberts, S. B. (2008). Aspects of eating behaviors ‘‘disinhibition’’ and ‘‘restraint’’ are related to weight gain and BMI in women. *Obesity* (Silver Spring 16, 52–58.

Hayes, A. F., & Preacher, K. J. (2014). Statistical mediation analysis with a multicategorical independent variable. *British Journal of Mathematical and Statistical Psychology*, 67, 451-470. DOI: 10.1111/bmsp.12028.

Hayes, A. F.(2013). Introduction to mediation and moderation and conditional process analysis, New York, New York, Guildford Press.

Hayes, A. M. & Feldman, G. (2004). Clarifying the Construct of Mindfulness in the Context of Emotion Regulation and the Process of Change in Therapy. *Clinical Psychology: Science and Practice*, 11,255-262.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: Guilford Press.

Hayton, J. C., Allen, D. G. & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organization Research Methodology*, 7, 2: 191-205.

Heatherton, T. F. & Baumeister, R. F.(1991). Binge eating as escape from self-awareness. *Psychology Bullettin*, 110: 86–108.

Heatherton, T. F., Herman, C. P., & Polivy, J. (1991). Effects of physical threat and ego threat on eating behaviour. *Journal of Personality and Social Psychology*, 60, 138–143.

Heatherington, M. M., & Rolls, B. J. (1996). Sensory-specific satiety: Theoretical frameworks and central characteristics. In E. D. Capaldi (Ed.), *Why we eat what we eat* (pp. 267–290). Washington, DC: American Psychological Association.

Heitmann, B. L.,Westerterp, K. R., Loos, R. J., Sorensen, O., Dea, K. O., McLean, P. …& Westerp-Plantenga, M.S..(2012). Stock conference report/etiology and pathophysiology. Obesity. Lessons from evolution and the environment. *Obesity Reviews*, 13, 910–922. doi: 10.1111/j.1467-789X.2012.01007.x.

Hemmingsson, E. (2014). A new model of the role of psychological and emotional distress in promoting obesity: conceptual review with implications for treatment and prevention. *Obesity Review*, 15, 9:769-79. doi: 10.1111/obr.12197. Epub 2014 Jun 16.

Hemmingsson, E, Johansson, K. & Reynisdottir, S. (2014). Effects of childhood abuse on adult obesity: a systematic review and meta-analysis. *Obesity Review*.15, 11:882-93. doi: 10.1111/obr.12216.

Hemmingsson, E. (2014). A new model of the role of psychological and emotional distress in promoting obesity: conceptual review with implications for treatment and prevention. *Obesity Review*. 15, 9:769-79. doi: 10.1111/obr.12197.

Heo, M., Pietrobelli, A., Fontaine, K. R., Sirey, J. A. & Faith, M. S. (2006). Depressive mood and obesity in US adults: comparison and moderation by sex, age, and race. *International Journal of Obesity*, 30, 513–519.

Herman, P. & Polivy, J. (2004). The self-regulation of eating. Theoretical and practical problems R.F. Baumeister, K.D. Vohs (Eds.), *Handbook of self-regulation. Research, theory andplications*, Guilford Press, New York, pp. 492–508.

Herman, C., & Polivy, J. (1980). Restrained eating. In A. Stunkard (Ed.), *Obesity* (pp. 208–225). Philadelphia, PA: Saunders.

Herman, C. P. (2008). Obese externality. In Darrity, W. A. (Ed.*). International Encyclopedia of the Social Sciences*, 6, 3. Farmington, MI: Thomas/Gale Publishers.

Herman, P., Van Strien T.& Polivy, J. (2008). Undereating or eliminating overeating? *American Psychologist*, 63, 202–203.

Hill, A., Weaver, C. F. L., & Blundell, J. E. (1991). Food craving, dietary restraint and mood. *Appetite*, 17, 187–197.

Hill, A., & Roberts, J. (1998). Body mass index: A comparison between self-reported and measured height and weight. *Journal of Public Health Medicine*, 20, 206−210.

Höfling, V., Moosbrugger, H., Schermelleh-Engel, K., & Heidenreich, T. (2011). Mindfulness or mindlessness? A modified version of the Mindful Attention and Awareness Scale (MAAS). *European Journal of Psychological Assessment*, 27, 1, 59-64.

Hofmann, S. G, Sawyer, A. T, Witt, A. A.& Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: a meta-analytic review. *Journal of Consulting and Clinical Psychology*, 78, 2:169-183. doi: 10.1037/a0018555.

Hormes, J. M. & Rozin, P. (2010). Does "craving" carve nature at the joints? Absence of a synonym for craving in many languages. *Addict. Behav*. 35, 459–463.

Howarth, N. C., Huang, T. T., Roberts, S. B., Lin, B. H. & McCrory, M. A. (2007). Eating patterns and dietary composition in relation to BMI in younger and older adults. *International Journal of Obesity* 31, 4:675-84.

Howarth, N. C., Huang, T. T., Roberts ,S. B., Lin, B. H. & McCrory, M. A. (2007). Eating patterns and dietary composition in relation to BMI in younger and older adults. *International Journal of Obesity*, 31, 4**:**675-684.

Hsu ,L. K. G. , SulliVan, S. P. & Benotti, P. N. (1997). Eating disturbances and outcome of gastric bypass surgery: A pilot study. *International Journal of Obesity*, , 21: 385-90.

Hulbert-Williams, L., Nichols, W., Joy, J., Huibert-Williams, N. (2014). Initial validation of Mindful eating Scale. *Mindfulness*, 5, 719-729.

Hudson, J. I., Hiripi, E., Pope, Jr, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological Psychiatry*, 61, 3, 348-358.

Hu, L.& Bentler, P. M.(1999). Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*; 6:1–55.

Iacovino, J. M., Gredysa, D. M., Altman, M., & Wilfley, D. E. (2012). Psychological treatments for binge eating disorder. *Current Psychiatry Reports*, 14, 432–446. doi:10.1007/s11920-012-0277-8.

IBM SPSS Statistics. (2012). IBM SPSS Statistics 21.0 for Windows. Chicago:

Inelmen, E. M, Toffanello, E. D., Enzi, G., Gasparini, G., Miotto, F., Sergi, G., Basetto, L. (2005). Predictors of drop-out in overweight and obese outpatients. *International Journal of Obesity*, 29, 122-128.

ISTAT (2013). Osservasalute 2013 http://www.epicentro.iss.it/problemi/obesita/EpidItalia.asp

Jahns L, Siega-Riz, A. M. & Popkin, B. M. (2001). The increasing prevalence of snacking among US children from 1977 to 1996. *Journal of Pediatry*. 138, 4:493-8.

Jain, S., Shapiro, S. L., Swanich, S., Roesch, S. C., Mills, P. J., Bell, I. & Shwartz , G.E.S. (2007). A randomized controlled trial of mindfulness meditation versus relaxation training: effects on distress, positive states of mind, rumination, and distraction. *American Behavioral Medicine* , 53, 4, 11- 21.

Javaras, K. N., Pope, H. G., Lalonde, J. K., Roberts, J. L., Nilini, Y. I., Laird, N. M., & Hudson, J. I. (2008). Co-occurrence of binge eating disorder with psychiatric and medical disorders. *Journal of Clinical Psychiatry*, 69, 2, 266-273.

Jimenez, S. S., Niles, B. L., & Park, C. L. (2010). A mindfulness model of affect regulation and depressive symptoms: positive emotions, mood regulation expectancies, and self-acceptance as regulatory mechanisms. *Personality and Individual Differences*, 49, 6, 645–650.

John, U., Meyer, C., Rumpf, H., & Hapke, U. (2005). Relationships of Psychiatric Disorders with overweight and obesity in an adult general population. *Obesity Research*, 13, 1, 101-109.

Jones, D. C., Vigfusdottir, T. H. & Lee, Y. (2004). Body image and the appearance culture among adolescent girls and boys: An examination of friend conversations, peer criticism, appearance magazines, and the internalization of appearance ideals. *Journal of Adolescent Research*, 19. 323–339.

Jones-Corneille, L. R., Wadden, T. A., Sarwer, D. B., Faulconbridge, L. F., Fabricatore, A. N., Stack, R. M., Cottrell, F. A., Pulcini, M. E., Webb, V. L., & Williams, N. N. (2012). Axis I psychopathology in bariatric surgery candidates with and without binge eating disorder: results

of structured clinical interviews. *Obesity Surgery*, 22, 389–397. doi 10.1007/s11695-010-0322-9.

Jones, L, Hastings, R. P, Totsika, V, Keane, L. & Rhule, N. (2014). Child behavior problems and parental well-being in families of children with autism: the mediating role of mindfulness and acceptance. *American Journal of Intellectual Development Disability*, 119, 2:171-85. doi: 10.1352/1944-7558-119.2.171.

Johnson, J. G., Spitzer, R. L. & Williams, J. B. (2001). Health problems, impairment and illnesses associated with bulimia nervosa and binge eating disorder among primary care and obstetric gynaecology patients. *Psychological Medicine*. 31, 1455–66.

Johnson, N. (2007). *Self Report Measures of Mindfulness: A Review of the Literature.* Thesis: Pacific University. Common Knowledge; Retrieved from http://commons.pacificu.edu/cgi/viewcontent.cgi?article=1145&context=spp.

Jones, L. R., Wilson, C. I., & Wadden, T. A. (2007). Lifestyle modification in the treatment of obesity: an educational challenge and opportunity. *Clinical Pharmacology & Therapeutics*, 81, 776e779.

Jöreskog, K. G, Sörbom, D. (2005) LISREL version 8.80**.** Computer software Chicago: Scientific International Streiner & Norman, 2008:.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: past, present, and future. *Clinical Psychology: Science and Practice*, 10, 144–156.

Kabat-Zinn, J. & Hanh, T. (2009). *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness*. New York: Random House Publishing Group .

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, 10, 2, 144–156.

Kabat-Zinn, J. (1990). Full catastrophe living: U*sing the wisdom of your body and mind to face stress, pain, and illness*. New York: Dell.

Kalarchian, M. A., Levine, M. D., Arslanian, S. A., Ewing, L .J., Houck,P, R., Cheng, Y….& Marcus, M. D. (2009). Family-based treatment of severepediatric obesity: randomized, controlled trial.*Pediatrics*, 124, 4:1060—8. doi: 10.1542/peds.2008-3727

Kant, A. K. & Graubard, B. I. (2006). Secular trends in patterns of self-reported food consumption of adult Americans: NHANES 1971-1975 to NHANES 1999-2002. *Amernational Journal of Clinical Nutrition*, 84, 5**,**1215-1223.

Kaplan, H. I., & Kaplan, H. S. (1957). The psychosomatic concept of obesity. The *Journal of Nervous and Mental Disease*, 125, 181–201.

Karasu, S. R, (2013). Psychotherapy-Lite: Obesity and the Role of the Mental Health Practitioner. *American Journal of Psychotherapy*, 67, 1 ,3-22.

Kasen, S., Cohen, P., Chen, H., & Must, A. (2007). Obesity and psychopathology in women: a three decade prospective study. *International Journal of Obesity*, 32, 3, 558-566.

Kashdan, T. B, Kane, J. Q. (2011). Post-traumatic distress and the presence of post-traumatic growth and meaning in life: experiential avoidance as a moderator. *Personality and Individual Differences*, 50, 1:84–89.

Katterman, S. N., Kleinman, B. M. Hood, M. M., Nackers, L. M. & Corsica, J.A. (2014) Mindfulness meditation as an intervention for binge eating, emotional eating, and weight loss: A systematic review *Eating Behaviors*, 15, 197–204 doi: 10.1016/j.eatbeh.2014.01.005.

Katterman, S. N., Goldstein, S. P., Butryn, M. L., Forman, E. M., & Lowe, M. R. (2014a). Efficacy of an acceptance-based behaviora intervention for weight gain prevention in young adult women. *Journal of Contextual Behavioral Science*, 3, 45–50.doi:10.1016/j.jcbs.2013.10.003.

Kalarchian, M. A., Marcus, M. D., Levine, M. D., Courcoulas, A. P., Pilkonis, P. A, Ringham, R. M., Soulakova, J. S., Weissfeld, L. A., & Rofey, D. L. (2007). Psychiatric disorders among bariatric surgery candidates: relationship to obesity and functional health status. *American Journal of Psychiatry*, 164, 328–334.

Kerr, M. A., Rennie, K. L., McCaffrey, T. A., Wallace, J. M., Hannon-Fletcher, M .P.& Livingstone, M. B. (2009). Snacking patterns among adolescents: a comparison of type, frequency and portion size between Britain in 1997 and Northern Ireland in 2005. *British Journal of Nutr*ition.101, 1,122-31. doi: 10.1017/S0007114508994769.

Keski-Rahkonen, A., Bulik, C. M., Pietilainen, K. H., Rose, R. J., Kaprio, J. & Rissanen, A. (2007). Eating styles, overweight and obesity in young adult twins. *European. Journal of Clinical. Nutrition,*. 61:822–29

Keast, D. R., Nicklas, T. A., O'Neil, C. E.. (2009). Snacking is associated with reduced risk of overweight and reduced abdominal obesity in adolescents: National Health and Nutrition Examination Survey (NHANES) 1999-2004. *American Journal of Clinical Nutrition*,92, 2:428-35. doi: 10.3945/ajcn.2009.28421.

Kleiner, K. D., Gold, M. S., Frost-Pineda, K., Lenzbrunsman, B., Perri, M. G., & Jacobs, W. S. (2004). Body mass index and alcohol use. *Journal of Addictive Diseases*, 23, 3, 105–18.

Klein, A. S., Skinner, J. B., & Hawley, K. M. (2012). Adapted group based dialectical behaviour therapy for binge eating in a practicing clinic: Clinical outcomes and attrition. *European Eating Disorders Review*, 20, e148–e153. doi:10.1002/erv.2165.

Kidd, L.I, Graor, C.H. & Murrock, C. J. (2013). A Mindful Eating group intervention for obese women: a mixed methods feasibility study. *Archive of Psychiatry Nursery*, , 27, 5:211–218.

Kelly, S. J., Daniel M., Dal Grande E., Taylor, A. (2011). Mental ill-health across the continuum of body mass index. *BMC Publ Health* 11:765.

Kerver, J. M., Yang, E. J., Obayashi, S., Bianchi, L., Song W. O.: (2006). Meal and snack patterns are associated with dietary intake of energy and nutrients in US adults. *J American Dietetic Association*, 106, 1**:**46-53.

Konttinen, H., Männistö S., Sarlio-Lähteenkorva, S., Silventoinen, K. & Haukkala, A. (2010). Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. *Appetite*. 54, 3:473-9. doi: 10.1016/j.appet.2010.01.014.

Kohols, N., Sauer, S. & Walach, H.. (2009). Facet of mindfulness-results of an online study investigating the Freiburg Mindfulness Inventory. *Pers Indiv Diff*, 46 , 2: 224-230.

Konttinen, H., Haukkala, A., Sarlio-La¨hteenkorva, S., Silventoinen, K., & Jousilahti, P.(2009). Eating styles, self-control and obesity indicators. The moderating role ofobesity status and dieting history on restrained eating. *Appetite*, 53, 131–134.

Kratz, A. L., Davis, M. C. & Zautra, A. J. (2007). Pain acceptance moderates the relation between pain and negative affect in female osteoarthritis and fibromyalgia patients. *Annals of Behavioral Medicine*, 33, 3:291–301.

Krisanaprakornkit, T., Ngamjarus, C., Witoonchart , C. & Piyavhatkul, N. (2010). Meditation therapies for attention-deficit/hyperactivity disorder (ADHD). *Cochrane Database Systematic Review,*. 6:CD006507

Kristeller, J. L & Wolever, R. Q. (2011). Mindfulness-based eating awareness training for treating binge eating disorder: the conceptual foundation. *Eating Disorders*,19, 1, 49-61.

Kristeller, J. L., Baer, R. A., & Quillian-Wolever, R. (2006). Mindfulness-based approaches to eating disorders. In R. A. Baer (Ed.), *Mindfulness-based treatment approaches* (pp. 75–91). Burlington, MA: Academic Press.

Kristeller, J. L., & Hallett, C. B. (1999). An exploratory study of a meditation-based intervention for binge eating disorder. *Journal of Health Psychology*, 4, 3, 357–363.

Kristeller, J. L., Wolever, R. Q.. & Sheets, V. (2014).Mindfulness-based eating awareness training (MB-EAT) for binge eating : a randomized controlled trial. *Mindfulness*, 5, 282-297

Kristeller, J. L. (2007).Mindfulness meditation. In P. Lehrer, R.Wookfolk, &W. E. Simes (Eds.), *Principles and practices of stress management* (3rd ed., pp. 393–427). New York: Guilford.

Krul, A. J., Daanen, H. A., & Choi, H. (2011). Self-reported and measured weight, height and body mass index (BMI) in Italy, the Netherlands and North America. *The European Journal of Public Health*, 21, 4, 414-419.

Kubzansky, L. D., Gilthorpe, M. S., Goodman, E. (2012). A prospective study of psychological distress and weight status in adolescents/young adults. *Annals of Behavioral Medicine*, 43,2, 219-28. DOI 10.1007/s12160-011-9323-8.

Kushner, R. F., Foster, G.D. (2000). Obesity and quality of life. *Nutrition*, 16, 10, 947-952

Ledesma, D., Kumano, H. (2009). Mindfulness-based stress reduction and cancer: a meta-analysis. *Psychooncology*, 18, 6:571-579.

Lane, B., & Szabó, M. (2013). Uncontrolled, repetitive eating of small amounts of Food or 'Grazing': development and evaluation of a New Measure of Atypical Eating. *Behaviour Change*, 30, 02, 57-73.

Larson, N., Laska, M. N, Story, M. & Neumark-Sztainer, D. (2012). Predictors of fruit and vegetable intake in young adulthood. *Journal of Academic and Nutrition Dietic*, 112, 8:1216-22. doi: 10.1016/j.jand.2012.03.035.

Lattimore, P., Fisher, N. & Malinowski, P. (2011). A cross-sectional investigation of trait disinhibition and its association with mindfulness and impulsivity. *Appetite*, 56, 2, 241-8. doi: 10.1016/j.appet.2010.12.007. Epub 2010 Dec 10.

Latzman, R. D., & Masuda, A. (2013). Examining mindfulness and psychological inflexibility within the framework of Big Five personality. *Personality and Individual Differences*, 55 , 2, 129–134, http://dx.doi.org/10.1016/j.paid.2013.02.019.

Lau, M., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., Carmody, J.,Abbey, S., & Devins, G. (2006). The Toronto Mindfulness Scale: Development and validation. *Journal of Clinical Psychology*, 62, 1445-1467.

Lavander, J. M., Jardin, B. F., & Anderson, D. A. (2009). Bulimic symptoms in undergraduate men and women: Contributions of Mindfulness and thoughtsuppression. *Eating Behaviors*, 10, 228–231.

Lavender, J., Gratz, K. L., & Tull, M. T. (2011). Exploring the relationship between facets of mindfulness and eating pathology in women. *Cognitive Behaviour Therapy*, 40, 174–182. . doi: 10.1080/16506073.2011.555485.

Lawrence, M., Boothm J,, Mercerm S, & Crawford, E. (2013). A systematic review of the benefits of mindfulness-based interventions following transient ischemic attack and stroke.. *International Journal of Stroke*. 6, 465-74. doi: 10.1111/ijs.1213.

Leahey, T. M., Crowther, J. H., & Irwin, S. R. (2008). A cognitive behavioral mindfulness group therapy intervention for the treatment of binge eating in bariatric surgery patients. *Cognitive and Behavioral Practice*, 15, 364–375. doi:10.1016/j.cbpra.2008.01.004.

Leary, M. R. & Tate, E. B. (2007). The Multi-Faceted Nature of Mindfulness. *Psychological Inquiry*, 18, 251-255.

Leigh J., Bowen S., & Marlatt, G. A. (2005). Spirituality, mindfulness and substance abuse. *Addictive Behavior*, 30, 1335–1341.

Legenbauer, T., Vocks, S., Betz, S., Puigcerver, M. J. B., Benecke, A., Troje, N. F., & Rüddel, H. (2011). Differences in the nature of body image disturbances between female obese individuals with versus without a comorbid binge eating disorder: An exploratory study including static and dynamic aspects of body image. *Behavior Modification*, 35, 2, 162-186.

Lillis, J., Hayes, S. C., & Levin, M. E. (2011). Binge eating and weight control: The role of experiential avoidance. *Behavioral Modification*, 35, 252–264. doi:10.1177/0145445510397178.

Lluch, A., Herbeth, B., Mejean, L., & Siest, G. (2000). Dietary intakes, eating style and overweight in the Stanislas Family Study. *International Journal of Obesity*, 24, 1493–1499.

Linehan, M. M. (1993). *Cognitive–behavioral treatment of borderline personality disorder*. New York: Guilford.

Lundgren, J. D., Allison, K. C., O'Reardon, J. P., Stunkard, A. J. (2008). A descriptive study of non-obese persons with night eating syndromeand a weight-matched comparison group. *Eating Behaviors*, 9: 343–351.

Luppino, F. S., de Wit, L. M., Bouvy, P. F., Stijnen, T., Cuijpers, P., Penninx, B.W. & Zitman, F. G. (2010). Overweight, obesity, and depression. A systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry*, 67, 3, 220-229. doi: 10.1001/archgenpsychiatry.2010.2.

Lykouras, L .& Michopoulos ,J. (2011). Anxiety disorders and obesity. *Psychiatrike.* 22, 4, 307-13.

Macht, M., Haupt, C., & Ellgring, H. (2005). The perceived function of eating is changed during examination stress: A field study. *Eating Behaviors*, 6, 109–112.

Macht, M. (2008). How emotions affect eating: a five-way model. *Appetite*, 50, 1, 1-11.

Macht, M., & Simons, G. (2000). Emotions and eating in everyday life. *Appetite*, 35, 65–71.

Macht, M., Haupt, C., & Salewsky, A, (2004). Emotions and eating in everyday life. : application of experience sampling method. *Ecology of Food and Nutrition* 43, 4, 11-21.

MacKillp, J. & Anderson, E. J. (2007). Further Psychometric Validation of the Mindful Attention Awareness Scale (MAAS). *Journal of Psychopathology and Behavioral Assessment*, 29, 289-293.

Mamun, A. A., O'Callaghan, M. J., Cramb, S. M, Najman, J. M., Williams, G. M., & Bor, W. (2009). Childhood behavioral problems predict young adults' BMI and obesity: evidence from a birth cohort study. *Obesity*, 17, 4, 761-766 doi:10.1038/oby.2008.594.

Mann, T., Tomiyama, A. J., Westling, E., Lew A. M., Samuels B. & Chatman, J. (2007). Medicare's search for effective obesity treatments: diets are not the answer. *American Psychology*, 62, 3, 220-33.

Mannucci, E., Ricca, V., Barciulli, F., Di Bernardo, M., Travaglini, R., Cabras, P.L.,& Rotella, C. M. (2009). Quality of life and overweight: the obesity related well-being(ORWELL-97) Questionnaire. *Addictive Behaviours*, 24,3, 345-357).

Manzoni, G. M., Pagnini, F., Gorini A., Preziosa A., Castelnuovo, G., Molinari, E., & Riva, G. (2009). Can Relaxation Training Reduce Emotional Eating in Women with Obesity? An Exploratory Study with 3 Months of Follow-Up. *Journal of American Dietetic Association*, 109, 8, 1427–1432.

Marcus, M. D., Wildes, J. E.(2012). Obesity in DSM-5**.** *Psychiatric Annals***,** 42 · 11: 431-435 DOI: 10.3928/00485713-20121105-10.

Marcus, M. D., Kalarchian, M. A., & Courcoulas, A. P. (2009). Psychiatric evaluation and follow-up of bariatric surgery patients. *American Journal of Psychiatry*, 166, 3: 285-91.

Marlatt, G. A. & Kristeller, J. L. (1999). Mindfulness and meditation. In W. R. Miller (Ed.), *Integrating spirituality into treatment* (pp. 67–84). Washington, DC: APA.

Markowitz' S., Friedman, M. A., Arent, S. M. (2008). Understanding the Relation Between Obesity and Depression: Causal Mechanisms and Implications for Treatment. *Clinical Psychology: Science and Practice* 15, 1, 1-20 1 DOI: 10.1111/j.1468-2850.2008.00106.

Marsha, D., Marcus, M. D. & Wildes, J. E. (2009). Obesity: Is it a Mental Disorder? International Journal of Eating Disorders, 42, 739–753 DOI: 10.1002/eat.20725.

Martinelli, V., Colombo, O., Nichini, C., Repossi, I., Vinai, P., & Tagliabue, A. (2010). High frequency of psychopathology in subjects wishing to lose weight: an observational study in Italian subjects. *Public Health Nutrition*, 14,2, 373–376.

Marzocchi, R., Moscatiello, S., Villanova, N., Suppini, A., & Marchesini, G. (2008). Psychological Profile and Quality of Life of Morbid Obese Patients Attending a Cognitive Behavioural Program. *Psychological Topics*, 17, 2, 349-360.

Masheb, R. M., Roberto, C. A., White, M. A. (2013). Nibbling and Picking in obese patients with Binge Eating Disorder. *Eating Behaviors*, 14, 4: 10.1016/j.eatbeh.2013.07.001.

Masheb, R. M., Grilo, C. M.& White, M. A.. (2011).An examination of eating patterns in community women with bulimia nervosa and binge eating disorder. *International Journal of Eating Disorders*. 44, 618–624. doi: 10.1002/eat.20853.

Mason, T. B. & Lewis, R. J. (2014). Profiles of binge eating: the interaction of depressive symptoms, eating styles, and body mass index. *Eating Disorders*, 22, 5, 450-60. doi: 10.1080/10640266.2014.931766.

Masson, P. C., Von Ranson, K. M., Wallace, L. M., & Safer, D. L.(2013). A randomized wait-list controlled pilot study of dialectical behaviour therapy guided self-help for binge eatingdisorder. *Behaviour Research and Therapy*, 51, 723–728. doi:10.1016/j.brat.2013.08.001.

Masuda, A., Price, M., & Latzman, R. D. (2012). Mindfulness moderates the relationship between disordered eating cognitions and disordered eating behaviors in a non-clinical college sample. *Journal of Psychopathology and Behavioral Assessment*, 34, 107–115 . . doi: 10.1016/j.eatbeh.2010.07.001.

Masuda, A. & Latzman, R. D., (2012). Psychological flexibility and self-concealment as predictors of disordered eating symptoms.*Psychology Faculty Publications*. Paper 90. http://scholarworks.gsu.edu/psych_facpub/90.

Masuda, A. & Tully, E.R. (2012). The role of Mindfulness and psychological flexibility in somatization, depression, anxiety, and general psychological distress in a nonclinical college sample. *Journal of evidence based complementary and alternative Medicine*, 10, 11, 2011 2156587211423400.

Masuda, A. & Wendell, J. W. (2010). The role of mindfulness on the relations between disordered eating-related cognition and psychological distress. *Eating Behaviors.* , 11:293–296. doi: 10.1016/j.eatbeh.2010.07.001

Mather, A. A, Cox, B. J., Enns, M. W., & Sareen, J. (2009). Associations of obesity with psychiatric disorders and suicidal behaviors in a nationally representative sample. *Journal of Psychosomatic Research*, 66, 4, 277-85. doi:10.1016/j.jpsychores.2008.09.008.

Matchim, Y., Armer J. M., Stewart B. R. (2011). Mindfulness-based stress reduction among breast cancer survivors: a literature review and discussion. *Oncology Nurse Forum*. 38, 2:E61-E71. doi:10.1188/11.ONF.E61-E71.

McElroy, S. L., Kotwal, R., Malhotra, S., Nelson, E. B., Keck, P. E., & Nemeroff C. B. (2004). Are mood disorders and obesity related? A review for the mental health professional. *Clinical Psychiatry*, 65, 5, 634-51.

McClure, H. H., Eddy, J. M., Kjellstrand, J. M., Snodgrass, J. J., & Martinez, C. R. Jr. (2012). Child and Adolescent Affective and Behavioral Distress and Elevated Adult Body Mass Index. *Child Psychiatry Human Development*, doi:10.1007/s10578-012-0299-9.

Meule, A., Vögele, C. & Kübler, A. (2012). German translation and validation of the Yale Food Addiction Scale. *Diagnostica*, 58, 115–126.

Meule, A., Lutz, A., Vögele, C. & Kübler A. (2012). Women with elevated food addiction symptoms show accelerated reactions, but no impaired inhibitory control, in response to pictures of high-calorie food-cues. *Eating Behaviors*. 13, 4:423-8. doi: 10.1016/j.eatbeh. 08.001.

Meule, A. (2012). Food addiction and body mass index: a non linear relationship, *Medical hypothesis*, 79, 1, 508-511 doi:10.1016/j.mehy.2012.07.005

Miller, B. M., & Brennan, L. (2014). Measuring and reporting attrition from obesity treatment programs: A call to action! *Obesity Research & Clinical Practice*, 4. S1871-403X, 1400530-4. doi: 10.1016/j.orcp.2014.08.007.

Miller, R., Benelam B., Stanner, S., Buttriss, J. (2013). Is snacking good or bad for health: an overview**.** *Nutrition Bullettin*, 38**,** 3**,** 302-322.

Miller, C.K., Kristeller, J. L., Headings, A., Nagaraja, H. & Miser, F..(2012).. Comparative effectiveness of a Mindful Eating Intervention to a diabetes self-management intervention among adults with type 2 diabetes: a pilot study. *Journal of Academy Nutrition Dietetic*, 112 , 11:1835-1842. doi: 10.1016/j.jand.2012.07.036.

Miller, C .K., Kristeller, J. L., Headings, A., & Nagaraja, H. (2014). Comparison of a Mindful Eating Intervention to a Diabetes Self-Management Intervention among adults with Type 2 Diabetes: A Randomized Controlled Trial. *Health, Education & Behavior*. 41, 2: 145–154 doi: 10.1177/1090198113493092.

Mokdad, A. H., Ford, E. S., Bowman, B. A., Dietz, W. H., Vinicor, F., Bales, V. S. & Marks, J. S. (2003). Prevalence of obesity, diabetes, and obesity-related health risk factors, *JAMA*. 1; 289, 1:76-9.

MoldoVan, A. R., David, D. (2011). Effect of obesity treatments on eating behavior: psychosocial interventions versus surgical interventions.A systematic review. *Eating Behaviors*, 12: 161-167.

Mond, J. M. (2013). Classification of bulimic-type eating disorders: from DSM-IV to DSM-5. *Journal of Eating Disorders*, 1:33 http://www.jeatdisord.com/content/1/1/33

Mond, J. M., Hay, P. J., Rodgers, B., Owen, C. Crosby, R. & Mitchell, J. E. (2006). Use of extreme weight control behaviors with and without binge eating in a community sample: implications for the classification of bulimic-type eating disorders. *International Journal of Eating Disorders*, . 39:294–302,

Mitchell, J. E., Devlin, M. J., de Zwaan, M., Crow, S. J., & Peterson, C. B. (2008). *Binge-eating disorder: Clinical foundations and treatment*. New York: The Guilford Press.

Monshat, K., Castle, D. J. (2012). Mindfulness training: an adjunctive role in the management of chronic illness?. *Medical Journal of Australia*, 21, 196, 9: 569-71.

Moor, K. R., Scott, A. J.& McIntosh, W. B. (2013). Mindful eating and its relationship to body mass index and physical activity among University students. *Mindfulness*, 4: 269-274.

Moroshko, I., Brennan, L., O'Brien, P. (2011). Predictors of dropout in weight loss interventions: a systematic review of the liter-ature. *Obesitf Review*, 12, 11: 912—34. doi: 10.1111/j.1467-789X.2011.00915.x.

Moody, R. C., Shanks, J., Stock, M. J., Geissler, C. (1996). Relationship between feeding pattern and body mass index in 220 free-living people in four age groups**.** *Europeam Journal of Clinical Nutrition*, 50, 8**,** 513-519.

Moore, M., Masuda, A., Hill, M. L.& Goodnight, B. L. (2014). Body image flexibility moderates the association between disordered eating cognition and disordered eating behavior in a non-clinical sample of women: a cross-sectional investigation. *Eating Behaviors*, 15, 4, 664-9. doi: 10.1016/j.eatbeh.2014.08.021. Epub 2014 Sep 28.

Murphy, R., Straebler, S., Cooper, Z., & Fairburn, C. G. (2010). Cognitive behavioral therapy for eating disorders. *The Psychiatric Clinics of North America*, 33, 611.

Musial, F., Büssing, A., Heusser, P., Choi, K. E. & Ostermann, T. (2011). Mindfulness-based stress reduction for integrative cancer care: a summary of evidence. *Forsch Komplementmed*., 18, 4:192-202. doi: 10.1159/000330714. Epub 2011 Aug 8.

Nammi, S., Saisudha, K., Chinnala, K. M., & Boini, K. M. (2004).Obesity; An overview on its current perspectives and treatment options. *Nutrition Journal*, 3.

Napolitano, M.A., Head, S., Babyak, M.A.& Blumenthal, J.A.(2001). Binge eating disorder and night eating syndrome: psychological and behavioral characteristics. *International Journal of Eating Disorders*, 30, 193–203.

Nielsen, S. J. & Popkin, B. M. (2003). Patterns and trends in food portion sizes, 1977-1998. *JAMA*, 22-29, 289, 4:450-3.

Niemeier, H. M., Leahey, T., Palm Reed, K., Brown, R. A.& Wing, R. R. (2012). An acceptance-based behavioral intervention for weight loss: a pilot study. *Behavioral Therapy*, 43, 2, 427–435.

Nicklas, T. A., O'Neil, C. E., & Fulgoni ,V. L. 3rd. (2014). Snacking patterns, diet quality, and cardiovascular risk factors in adults. *BMC Public Health*. 23, 14:388. doi: 10.1186/1471-2458-14-388.

Nielsen, S. J. & Popkin, B. M (2003**).** Patterns and trends in food portion sizes, 1977-1998 *JAMA*, 289, 4**:**450-453.

Nolan, L. J., & Geliebter, A. (2012). Night eating is associated with emotional and external eating in college students. *Eating Behaviors*, 13, 3, 202-206 doi: 10.1016/j.eatbeh.2012.02.002..

Nonnally, J. C.(1978).. *Psychometric theory*, New York; Mc Grow-Hill:

Norton, A. R., Abbott, M. J., Norberg, M. M. & Hunt, C. (2014). A Systematic Review of Mindfulness and Acceptance-Based Treatments for Social Anxiety Disorder. *Journal of Clinical Psychology*, doi: 10.1002/jclp.22144.

Nowakowski, M. E., McFarlane, T., & Cassin, S. (2013). Alexithymia and eating disorders: a critical review of the literature *Journal of Eating Disorders* 1: 21. doi: 10.1186/2050-2974-1-21.

O'Brien, R. M. (2007). A Caution Regarding Rules of Thumb for Variance Inflation Factors. *Quality & Quantity* , 41 , 5: 673.

O'Connor, D. B., Jones, F., Conner, M., McMillan, B., & Ferguson, E. (2008). Effects of daily hassles and eating style on eating behavior. *Health Psychology*, 27(1S), S20.

Ogden, J., & Clementi, C. (2010). The experience of being obese and the many consequences of stigma. *Journal of Obesity*, doi:10.1155/2010/429098.

Ogden, J., Clementi, C., Aylwin, S. & Patel, A. (2005). Exploring the impact of obesity surgery on patients' health status: a quantitative and qualitative study. *Obesity Surgery*, 15, 2, 266-72.

Ogden, J., Clementi**,** C. & Aylwin, S. (2006). The impact of obesity surgery and the paradox of control: A qualitative study. *Psychology & Health*. 21, 2, 273-93. doi: 10.1080/14768320500129006

Ohayon, M. M. (2009). Nocturnal awakenings and comorbid disorders in the American general population. *Journal of Psychiatric Research*, 43, 48–54.

Oliver, G., Wardle, J., & Gibson, E. L. (2000). Stress and food choice: a laboratory study.Psychosomatic *Medicine*, 62, 853–865.

Oliver, G. & Wardle, J. (1999). Perceived effects of stress on food choice. *Physiol Behav*, 66 , 3: 511–515.

O'Reardon, J. P., Ringel, B. L, Dinges, D. F., Allison, K. C., Martino, N. S. & Stunkard, A. J. .(2004) Circadian eating and sleeping patterns in the night eating syndrome. *Obesity Research*, 12, 1789–1796.

O'Reilly, G. A., Cook, L., Spruijt-Metz, D., & Black, D. S. (2014). Mindfulness-based interventions for obesity-related eating behaviours: A literature review. *Obesity Review*, 15, 453–461. doi: 10.1111/obr.12156.

Ouwens, M. A., Schiffer, A. A., Visser,. L. I., Raeijmaekers, N. J.& Nyklíček, I. (2014). Mindfulness and eating behaviour styles in morbidly obese males and females *Appetite.* pii: S0195-6663, 1400552-2. doi: 10.1016/j.appet.2014.11.030.

Ouwens, M., Van Strien, T. & Van Leeuwe, J. (2009). Possible pathways between depression, emotional and external eating. A structural equation model. *Appetite*, 53, 2, 245-248.

Ovaskainen, M. L., Reinivuo, H., Tapanainen, H., Hannila, M. L., Korhonen, T. & Pakkala, H. (2006). Snacks as an element of energy intake and food consumption. *European Journal of Clinical Nutrition*, 60, 4**,** 494-501.

Palmieri, L., Noce, C. L., Vanuzzo, D., Dima, F., Donfrancesco, C., Pilotto, L., & Vannucchi, S. (2010). Osservatorio Epidemiologico Cardiovascolare: andamento temporale dei fattori di rischio cardiovascolare. *Giornale Italiano di Cardiologia*, 11(5 Suppl 3), 31S-36S.

Papelbaum, M., Oliveira Moreira, R.. Wust do Nascimento Gaya C., Preissler, C. & Ferreira Coutinho, W. (2010). Impact of body mass index on the psychopathological profile of obese women. *Revista. Brasileira. De Psiquiatria*, 32, 1 http://dx.doi.org/10.1590/S1516-44462010000100009.

Park, T., Reilly-Spong, M. & Gross, C. R. (2013). Mindfulness: a systematic review of instruments to measure an emergent patient-reported outcome (PRO). *Quality of Life Research,* 22 , 10: 2639-2659. doi: 10.1007/s11136-013-0395-8.

Pawlow, L. A., O'Neil, P. M., & Malcolm, R. J. (2003). Night eating syndrome: Effects of brief relaxation training on stress, mood, hunger, and eating patterns. *International Journal of Obesity*, 27, 970–978.

Peirson, P., Douketis, J., Ciliska, D., Muhammad Usman Ali, D., & Raina, P. (2014). Treatment for overweight and obesity in adult populations: a systematic review and meta-analysis. *Canadian Medical Association Journal Open*, 2, 4, E306–E317. doi: 10.9778/cmajo.20140012.

Pelchat, M. L., Johnson, A., Chan, R., Valdez, J. & Ragland, J. D. (2004). Images of desire: Food-craving activation during fmri. *NeuroImage* , 23, 1486–1493.

Phillips, S. M., Bandini, L .G., Naumova, E. N., Cyr., H., Colclough, S., Dietz, W. H. & Must, A. (2004). Energy-dense snack food intake in adolescence: longitudinal relationship to weight and fatness. *Obesity Research*. 12, 3:461-72.

Piernas. C. & Popkin, B. (2010**).** Snacking increased among U.S. adults between 1977 and 2006 *Journal of Nutrition***,** 140**,** 2**,** 325-332**.** doi: 10.3945/jn.109.112763**.**

Pi-Sunyer, F. X. (1998) NHLBI Obesity Education Initiative Expert Panel of the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults-The Evidence Report. *Obesity Research*, 6, 51-209.

Pinaquy, S., Chabrol, H., Simon, C., Louvet, J. P., & Barbe, P. (2003). Emotional eating, alexithymia, and binge-eating disorder in obese women. *Obesity Research*, 11, 195–201. doi:10.1038/oby.2003.31.

Polivy, J. & Herman, P. (1985). Dieting and binging, a causal analysis.*American Psychologist*, 40, 2, 193–201.

Polivy J., Herman C. P., & McFarlane (1994). Effects of anxiety on eating: does palatability moderate distress-induced overeating in dieters? *Journal of Abnormal Psychology*, 103,505-10.

Prunas, A., Sarno, I., Preti, E., Madeddu, F., Perugini, M. (2012). Psychometric properties of the Italian version of the SCL-90-R: A study on a large community sample. *European Psychiatry*, 27, 591–597.

Pagoto, S. L, Schneider, K. L., Bodenlos, J. S. Appelhans, B. M., Whited, M. C., Ma, Y. & Lemon, S. C. (2012). Association of post-traumatic stress disorder and obesity in a nationally representative sample. *Obesity*, 20**,** 200–205. doi:10.1038/oby.2011.318.

Paxton, S. J., Eisenberg, M. E.,& Neumark-Sztainer, D. (2006). Prospective predictors of body dissatisfaction in adolescent girls and boys: A five-year longitudinal study. *Developmental Psychology*, 42, 888–899.

Perry, N. M., Barry, D., Pietrzak, R. H., & Wagner, J. A. (2008). Overweight and obesity are associated with psychiatric disorders: results from the national epidemiologic survey on alcohol and related conditions. *Psychosomatic Medicine*, 70,3, 288-97. DOI: 10.1097/PSY.0b013e3181651651.

Petroni, M. L., Villanova, N., Avagnina, S., Fusco, M. A., Fatati, G., Compare, A., Marchesini, G., & the QUOVADIS Study Group (2007). Psychological distress in morbid obesity in relation to weight history. *Obesity Surgery*, 17, 391-399.

Pickering, R. P., Grant, B. F., Chou, S. P., & Compton, W. M. (2007). Are overweight, obesity, and extreme obesity associated with psychopathology? Results from the national epidemiologic survey on alcohol and related conditions. *Journal of Clinical Psychiatry*, 68, 7, 998-1009.

Phillips, S. M., Bandini, L. G., Naumova, E. N., Cyr, H., Colclough, S., Dietz, W. H. & Must, A. (2004). Energy-dense snack food intake in adolescence: longitudinal relationship to weight and fatness**.** *Obesity Research*, 12, 3**,** 461-472.

Piet, J. & Hougaard, E. (2011). The effect of mindfulness-based cognitive therapy for prevention of relapse in recurrent major depressive disorder: a systematic review and meta-analysis. *Clinical Psycholology Review*. 31, 6:1032-1040. doi: 10.1016/j.cpr.2011.05.002

Pine, D. S., Cohen, P., Brook, J., & Coplan, J. D. (1997). Psychiatric symptoms in adolescence as predictors of obesity in early adulthood: a longitudinal study. *American Journal of Public Health*, 87, 8, 1303-10.

Pocock, S. J., Collier, T. J., Dandreo, K. J., de Stavola, B. L., Goldman, M. B., Kalish, L. A., Kasten, L. E., & McCormack, V. M. (2004). Issues in the reporting of epidemiological studies: a survey of recent practice. *British Medical Journal*, 329, 883-89.

Puhl, R. M. &. Heuer, C. A. (2009). The Stigma of Obesity: A Review and Update. *Obesity*, 17**,** 941–964. doi:10.1038/oby.2008.636.

Quinton, S., & Wagner, H. L. (2005). Alexithymia, ambivalence over emotional expression, and eating attitudes. *Personality and Individual Differences*, 38, 51163-1173.

Quirk, S. E., Williams, L. J., O'Neil, A., Pasco, J. A., Jacka, F. N., Housden, S,…& Brennan, S. L. (2013).The association between diet quality, dietary patterns and depression in adults: a systematic review. *British Medical Clinical Psychiatry*, 13 , 1 175. doi: 10.1186/1471-244X-13-175

Rainforth,V., Schneider, R.H,, Nidich, S.I, Gaylord-King, C,. Salerno, J.W. & Anderson, J.W. (2007).. Stress reduction programs in patients with elevated blood pressure: a systematic review and meta-analysis. Current Hypertensions Reports, 9, 6, 520-528.

Ramacciotti, C. E., Coli, E., Bondi, E., Massimetti, G., & Dell'Osso, L. (2008). Shared psychopathology in obese subjects with and without Binge-Eating Disorder. *International Journal of Eating Disorders*, 41, 643–649. DOI: 10.1002/eat.20544.

Ramacciotti, C. E., Coli, E., Passaglia, C., Lacorte, M., Pea, E., & Dell'Osso, L. (2000). Binge eating disorder: prevalence and psychopathological features in a clinical sample of obese people in Italy. *Psychiatry Research*, 94, 2, 131-138.

Randolph, T. G. (1956). The descriptive features of food addiction: Addictive eating and drinking. *Q. J. Stud. Alcohol*, 17, 198–224.

Ravussin, E. & Gautier, J. F. (1999). Metabolic predictors of weight gain. International Journal of Obesity, related Metabolism disorders, 23(Suppl. 1): 37–41.

Reas, D. L., Wisting, L., Kapstad, H. & Lask, B. (2012). Nibbling: frequency and relationship to BMI, pattern of eating, and shape, weight and eating concerns among university women. *Eating Behaviors*. 13:65–66.

Reavley, N., & Pallant, J. (2009). Development of a scale to assess the meditation experience. *Personality and Individual Differences*, 47, 6, 552. 547.

Reeves, S., Halsey, L. G., McMeel, Y. & Huber, J. W. (2013). Breakfast habits, beliefs and measures of health and wellbeing in a nationally representative UK sample. *Appetite*, 60, 51-57.

Reynoso, M. R., Alegría, M., Chen, C., Laderman, M., & Roberts, R. (2011). The relationship between obesity and psychiatric disorders across ethnic and racial minority groups in the United States. *Eating Behaviors*, 12, 1–8. doi:10.1016/j.eatbeh.2010.08.008.

Richardson, L. P., Davis, R., Poulton, R., McCauley, E., Moffitt, T. E., Caspi, A., & Connell, F. (2003). A longitudinal evaluation of adolescent depression and adult obesity. *Archives of Pediatric Adolescence Medicine*, 157, 8, 739-45.

Rieger, E., Wilfley, D. E. & Stein, R. I. (2005). A comparison of quality of life in obese individuals with and without binge eating disorder. *International Journal of Eaingt Disorders*. 37, 234–240.

Riva, G. (2009). Can relaxation training reduce emotional eating in women with obesity? An exploratory study with 3 months of follow-up. Journal of the *American Dietetic Association*, 109, 8, 1427-32.

Roberts, R. E, Kaplan, G. A, Shema, S. J, & Strawbridge, W. J. (2000). Are the obese at greater risk for depression? American Journal of Epidemiology, 152, 163–170.

Roberts, R. E., Strawbridge, W. J., Deleger, S., & Kaplan, G. A. (2002) Are the fat more jolly? *Annuals of Behavioral Medicine*, 24, 3, 169-80.

Roberts, R. E., Deleger, S., Strawbridge, W. J., & Kaplan, G. A. (2003). Prospective association between obesity and depression: evidence from the Alameda County Study. *International Journal of Obesity*, 27, 514–521. doi:10.1038/sj.ijo.0802204.

Robins, C. J. (2002). Zen Principles and Mindfulness Practice in Dialectical Behavior Therapy.*Cognitive and Behavioral Practice*, 9, 50-57.

Rodin, J. (1981). Current status of the intemal-extemal hypothesis for obesity: What went wrong? *American Psychologist*, 36, 361–372.

Rodríguez-Martín, B. C.& Meule, A. (2015). Food craving: new contributions on its assessment, moderators, and consequences. *Front Psychology*, 22; 6: 21. doi: 10.3389/fpsyg.2015.00021.

Rogers, N. L., Dinges ,D. F., Allison, K. C., Maislin, G., Martino, N., O'Reardon, J. P. & Stunkard. A. J. (2006). Assessment of sleep in women with night eating syndrome. Sleep, 29: 814–819. |

Rolls, E. T. (2006). Brain mechanisms underlying flavour and *Appetite*. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, 361(1471), 1123–1136.

Ruderman, A. J. (1986). Dietary restraint: A theoretical and empirical review. *Psychological Bulletin*, 99, 2, 247–262.

Safer, D. L., Telch, C. F., & Chen, E. Y. (2009). *Dialectical behavior therapy for binge eating and bulimia*. New York, NY: Guilford Press.

Safer, D. L., Robinson, A. H., & Jo, B. (2010). Outcome from a randomized controlled trial of group therapy for binge eating disorder: Comparing dialectical behavior therapy adapted for binge eating to an active comparison group therapy. Behavior Therapy, 41, 106–120. doi:10.1016/j.beth.2009.01.006.

Sallet, P. C., Sallet, J. A., Dixon, J. B., Collis, E., Pisani, C. E., Levy, A., Bonaldi, F. L., & Cordas, T. A.(2007). Eating behavior as a prognostic factor for weight loss after gastric bypass surgery. *Obesity Surgery*, 17, 445–451.

Salloway, S. G., & Fischer, W. P. (2007). Mindfulness practice: a rasch variable construct innovation. *Journal of Applied Measurement*, 8, 4, 359–372.

Sarwer, D. B., Dilks, R. J., & West-Smith, L. (2011). Dietary intake and eating behavior after bariatric surgery. Threats to weight loss maintenance and strategies for success. *Surgery for Obesity and Related Diseases*, 7, 644–651. doi: 10.1016/j.soard.2011.06.016.

Satorra, A. & Bentler, P. M. (1988). A scaled difference chi-square test statistic for moment structure analysis. *Psychometry*, 66, 4, 507-514.

Sauer, S., Walach, H,, Schmidt, S., Hinterberger, T., Lynch, S,, Büssing, A. .& Kohls, N. (2013). Assessment of mindfulness: Review on state of the art. *Mindfulness*, 4, 1: 3-17. doi: 10.1107/s 2671-012-5

Saules, K. K., Collings, A. S., Hoodin, F., Angelella, N. E., Alschuler, K., Ivezaj, V. & Wiedemann, A. A. (2009). The contributions of weight problem perception, BMI, gender, mood, and smoking status to binge eating among college students. *Eating Behaviors*, 10, 1–9. doi:10.1016/j.eatbeh.2008.07.010.

Saunders, R. (2001). Compulsive eating and gastric bypass surgery: What does hunger have to dowith it? *Obesity Surgery*, 11, 757–761.

Saunders, R. (1999). Binge eating in gastric bypass patients before surgery. *Obesity Surgery*, 9, 72–76.

Saunders, R. (2004). 'Grazing': A high-risk behavior. *Obesity Surgery*, 14, 98–12.

Savedra, M. C, Chapman, K. E. & Rogge, R. D. (2010). Clarifying links between attachment and relationship quality: hostile conflict and mindfulness as moderators. *Journal of Family Psychology*, 24, 4:380–390. doi: 10.1037/a0019872.

Schachter, S., Goldman, R. & Gordon, A. (1968). Effect of fear, food deprivation, and obesity on eating. Journal of Personality and Social Psychology, 10, 2, 91–97.

Schachter, S. (1971). Some extraordinary facts about obese humans and rats. *American Psychologist*, 26, 129–144.

Schaefer, J. T. & Magnuson, A. B. (2014). A review of interventions that promote eating by internal cues. *Journal of the Academy of Nutrition & Dietetic* , 114 , 5:734-60. doi: 10.1016/j.jand.2013.12.024.

Schienle, A., Schäfer, A., Hermann, A. & Vaitl, D. (2009). Binge-eating disorder: Reward sensitivity and brain activation to images of food. *Biological. Psychiatry*, 65, 654–661. doi: 10.1016/j.biopsych.2008.09.028.

Schachter, S. & Rodin, J. (1974). *Obese humans and rats*. WashingonDC: Erlbaum/Haltsted.

Schulz, S.& Laessle, R. G. (2010). Associations of negative affect and eating behaviour in obese women with and without binge eating disorder.*Eating and Weight Disorders*, 15, 4:e287-93.

Schwartz, G. E. (1975). Biofeedback, self-regulation, and the patterning of physiological processes. *American Scientist*, 63, 3, 314–324.

Scott, K. M., Bruffaerts, R., Simon, G.E., Alonso, J., Angermeyer, M., de Girolamo, G., …. & Von Korff**,** M. (2008). Obesity and Mental Disorders in the General Population: Results from the World Mental Health Surveys. *International Journal of Obesity*, 32, 1, 192–200. doi:10.1038/sj.ijo.0803701.

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-Based Cognitive Therapy for Depression. A New Approach to Preventing Relapse*. New York: Guilford Press.

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006) Mechanisms of mindfulness. *Journal of Clinical Psychology*, 62, 3 73–86.

Sharma , A. M. & Padwal, R. (2010). Obesity is a sign - over-eating is a symptom: an aetiological framework for the assessment and management of obesity. *Obesity Review*. 11, 5:362-70. doi: 10.1111/j.1467-789X.2009.00689.x.

Shaw, K., O'Rourke, P., Del Mar, C., & Kenardy, J. (2005). Psychological interventions for overweight and obesity. *Cochrane Database of Systematic Reviews*. 18, 2: CD003818.

Sherwood, N. E., Jeffery, R. W. & Wing, R. R. (1999). Binge status as a predictor of weight loss treatment outcome. *International Journal of Obesity Related Metabolic Disorders.* 23, 5:485-93.

Siegling, A. B., & . Petrides, K. V. (2014). Measures of trait mindfulness: Convergent validity, shared dimensionality, and linkages to the five-factor model. *Front Psychol*, 5: 1164.

Siegel, D. J. (2007). *The mindful brain*. New York, NY: W. W. Norton.

Simon, G. E., Von Korff, M., Saunders, K., Miglioretti, D. L., Crane, P. K., Van Belle, G., & Kessler, R. C. (2006). Association Between Obesity and Psychiatric Disorders in the US Adult Population. *Archives of General Psychiatry*, 63, 7.

Smith, B. W., Shelley, B. M., Leahigh, L. & Vanleit, B. (2006). A preliminary study of the effects of a modified mindfulness intervention on binge eating. *Complemary Health Practice Review*, 11 , 3: 133-143.

Snoek, H. M., Van Strien, T., Janssens, J. M. A. M., & Engels, R. C. M. E. (2007b). Emotional, external, restrained eating and overweight in Dutch adolescents. Scandinavian. *Journal of Psychology*, 48, 23–32.

So, K. T., Orme-Johnson, D. W.. (2001). Three randomized experiments on the longitudinal effects of the transcendental meditation technique on cognition. *Intelligence*. 29, 5:419-440.

Spencer, E. A., Appleby, P. N., Davey, G. K., & Key, T. J. (2002). Validity of self-reported height and weight in 4808 EPIC–Oxford participants. *Public Health Nutrition*, 5(04), 561- 565.

Spitzer, L., & Rodin, J. (1981). Human eating behavior: a critical review of studies in normal weight and overweight individuals. *Appetite*, 2, 293–329.

Spoor, S. T. P., Bekker, M. H. J., Van Strien, T. & Van Heck, G. L. (2007). Relations between negative affect, coping, and emotional eating. *Appetite*, 48 , 3: 368–376.

Stice, E., Spoor, S., Ng, J., & Zald, D. H. (2009). Relation of obesity to consummatory and anticipatory food reward. *Physiology and Behavior*, 97, 5, 551–560. doi:10.1016/j.physbeh.2009.03.020.

Stice, E., Yokum, S., Blum, K., & Bohon, C. (2010). Weight gain is associated with reduced striatal response to palatable food. *The Journal of Neuroscience*, 30,39, 13105–13109. doi:10.1523/ jneurosci.2105-10.2010.

Stice, E., Yokum, S., Bohon, C., Marti, N., & Smolen, A. (2010). Reward circuitry responsivity to food predicts future increases in body mass: Moderating effects of drd2 and drd4. *NeuroImage*, 1618–1625. doi:10.1016/j.neuroimage.2010.01.081.

Stice, E., Presnell, K., & Spangler, D. (2002). Risk factors for binge eating onset in adolescent girls: A 2-year prospective investigation. *Health Psychology*, 21, 131–138. doi:10.1037==0278-6133.21.2.131

Stratford, H. J., Cooper, M. J., Di Simplicio, M., Blackwell, S. E. & Holmes, E. A.(2014). Psychological therapy for anxiety in bipolar spectrum disorders: A systematic review. *Clinical Psychoogicall Review*. 8, 35C:19-34. doi: 10.1016/j.cpr.2014.11.002.

Streiner, D. L., & Norman, D. R. (2008). *Health measurement scales: a pratical guide to their development and use*. Oxford University Press.

Striegel-Moore, R. H., Dohm, F. A., Solomon, E. E., Fairburn, C. G., Pike, K.M. & Wilfley, D. E. (200). Subthreshold binge eating disorder. *International journal of Eating Disorders,* 27, 3:270-8.

Striegel-Moore, R. H. Franko, D. L. (2008). Should Binge Eating Disorder Be Included in the DSM-V? A Critical Review of the State of the Evidence. *Annual Review of Clinical Psychology*, 4: 305-324 DOI 10.1146/annurev.clinpsy.4.022007.141149.

Striegel-Moore, R. H., Franko, D. L., Thompson, D., Affenito, S., May, A., & Kraemer, H. C.(2008). Exploring the typology of night eating syndrome. International *Journal of Eating Disorders*, 41, 411–418.

Striegel-Moore, R. H., Rosselli, F., Wilson, G. T., Perrin, N., Harvey, K., & DeBar, L. (2010). Nocturnal eating: Association with binge eating, obesity, and psychological distress. *International Journal of Eating Disorders*, 43, 520–526 doi: 10.1002/eat.20735..

Striegel-Moore, R. H., & Bulik, C. M. (2007). Risk factors for eating disorders. *American Psychologist*, 62, 181–198.

Striegel-Moore, R. H., Franko, D. L, Garcia, J. (2009). The validity and clinical utility of night eating syndrome. *International Journal of Eating Disorders*, 42:720–738.

Ströhle, G. (2006). *Empirische Erfassung der Achtsamkeit*. (Unpublished master's thesis). Jena.

Stunkard, A., Grace, W. J., Wolff, H. G. (1955). The night-eating syndrome; a pattern of food intake among certain obese patients. *American Journal of Medicine* ; 19, 78–86.

Stunkard, A. J., & Allison, K. C. (2003). Two forms of disordered eating in obesity: binge eating and night eating. *International Journal of Obesity*, 27, 1-12.

Summerbell, C. D., Moody R. C., Shanks, J., Stock, M. J. & Geissler C. (1996). Relationship between feeding pattern and body mass index in 220 free-living people in four age groups. *European Journal of Clinical Nutr*ition, 50, 8:513-9.

Swinburn, B. A., Sacks, G., Hall, K. D., McPherson, K., Finegood, D.T., Moodie, M. L., & Gortmaker,S. L. (2011). The global obesity pandemic: shaped by global drivers and local environments. *Lancet*, 378, 9793, 804–814 63, 824-830 doi: 10.1016/S0140-6736(11)60813-1..

Taylor, V. H., McIntyre, R. S., Remington, G., Levitan, R. D., Stonehocker, B., & Sharma, A. M. (2012). Beyond pharmacotherapy: understanding the links between obesity and chronic mental illness. *Canadian Journal of Ps*ychiatry, 57, 1, 5–12.

Tam, L., Bagozzi, R. P., & Spanjol, J. (2010). When planning is not enough: The self-regulatory effect of implementation intentions on changing snacking habits. *Health Psychology*, 29, 3, 284-92. doi: 10.1037/a0019071.

Tang, T. S., Funnell, M. M., & Anderson, R. M. (2006). Group Education Strategies for Diabetes Self-Management. *Diabetes Spectrum*, 19, 2, 99 –105, http://dx.doi.org/10.2337/diaspect.19.2.99.

Tanofsky-Kraff, M., Yanovski, S. Z., Schvey, N. A., Olsen, C. H., Gustafson, J., & Yanovski, J. A. (2009). A prospective study of loss of control eating for body weight gain in children at high risk for adult obesity. *International Journal of Eating Disorders*, 42, 1, 26-30 doi: 10.1002/eat.20580..

Tapper, K., Shaw, C., Ilsley, J., Hill, A. J., Bond, F. W., & Moore, L. (2009). Exploratory randomised controlled trial of a mindfulnessbased weight loss intervention for women. *Appetite*, 52, 396–404. doi: 10.1016/j.appet.2008.11.012

Teasdale, J. D., Segal, Z., & Williams, J. M. G. *(*1995*).* How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help. *Behaviour Research and Therapy,* 33*, 1,* 25–39.

Teasdale, J. D., Segal, Z., Williams, J. M. G., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of Consulting and Clinical Psychology,* 68*, 4,* 615–923.

Telch, C. F., Agras, W. S., & Linehan, M. M. (2001). Dialectical behavior therapy for binge eating disorder. *Journal of Consulting and Clinical Psychology,* 69, 1061–1065.

Telch, C. F. (1997). Skills training treatment for adaptive affect regulation in a woman with binge-eating disorder. *International Journal of Eating Disoders,* 22, 1, 77–81.

Terpitz, C. & Remund, L .(2013). Eating behavior and eating disorders in obesity. T*her Umsch*. 70, 2, 81-4. doi: 10.1024/0040-5930/a000369.

Terwee, C. B., Tokkink, L. B., Knol, D. L., Ostelo, N. J. G., Bouter, L, M. & de Vet, H. C. W. (2012). Rating the methodological quality in systematic review of studies on measurement proprieties: a scoring system for COSMIN checklist. *Quality of Life Review*, 21, 651-657.

Thompson, B. L. & Waltz, J. (2007). Everyday mindfulness and mindfulness meditation: Overlapping constructs or not? *Personality and Individual Differences,* 43, 1875-1885.

Tiffany, S.T. & Wray, J.M. (2012). The clinical significance of drug craving. *Annual New York Academic of Sci*ences, 1248, 1–17

Timmerman. G. M., & Brown A. (2012). The effect of a mindful restaurant eating intervention on weight management in women. *Journak of Nutrition and Educational Behaviors*, 44 , 1:22-28. doi: 10.1016/j.jneb.2011.03.143.

Titchener, K., & Wong, Q. J. (2015). A weighty issue: explaining the association between body mass index and appearance-based social anxiety. *Eating Behavioes,*16, 13-6. doi: 10.1016/j.eatbeh.2014.10.005. Epub 2014 Nov 1.

Tylka, T. L., Russell, H. L., & Neal, A. A. (2014). Self-compassion as a moderator of thinness-related pressures' associations with thin-ideal internalization and disordered eating. , 10, 17C, 23-26. doi: 10.1016/j.eatbeh.2014.12.009.

Travis, F., Grosswald, S., Stixrud, W..(2011) ADHD, brain functioning, and transcendental meditation practice. *Mind and Brain Journal of Psychiatry,* 2, 1,73-81.

Turk, M. W., Yang, K., Hravnak, M., Sereika, S. M., Ewing, L. J., & Burke, L. E. (2009). Randomized clinical trials of weight loss maintenance: a review. *Journal ofCardiovascular Nursing*, 24, 58e80.

Tuthill, A., Slawik, H., O'Rahilly, S., & Finer, N. (2006). Psychiatric co-morbidities in patients attending specialist obesity services in the UK. *Oxford Journal Medicine,* 99, 317–325. doi:10.1093/qjmed/hcl041.

Vander Wal, J. S. (2012). Night Eating Syndrome: a critical review of the literature. *Clinical Psychology R*eview, 32, 1, 49-59. doi: 10.1016/j.cpr.2011.11.001.

Van Dam, N., Earleywine, M., & Danoff-Burg, S. (2009). Differential item function across meditators and non-meditators on the Five Facet Mindfulness Questionnaire. *Personality and Individual Differences*, 47, 516-521.

Van Dam, N. T., Earleywine, M., & Borders, A. (2010). Measuring mindfulness? An item response theory analysis of the mindful attention awareness scale. *Personality and Individual Differences*, 49, 7, 805–810. doi:10.1016/j.paid.2010.07.020

Van der Merwe, M. T. (2007) Psychological correlates of obesity in women *International Journal of Obesity* (2007) 31, S14–S18; doi:10.1038/sj.ijo.0803731.

Van Hout, G. C., Van Oudheusden, I., Van Heck, G. L. (2004). Psychological profile of the morbidly obese. *Obes ity Surg*ery, 14, 5:579-88.

Van Hout, G. C., Verschure, S. K., & Van Heck, G. L. (2005). Psychosocial predictors of success following bariatric surgery. *Obesity Surgery*, 15, 552–560.

Van Strien, T., Herman, C. P., & Verheijden, M. (2009). Eating style, overeating, and overweight in a representative Dutch sample. Does external eating play a role? *Appetite*, 52, 380–387. doi: 10.1016/j.appet.2008.11.010

Van Strien, T., Herman, C. P., Anschutz, D., Engels, R. C., & de Weerth, C. (2012). Moderation of distress-induced eating by emotional eating scores. *Appetit*e, 58, 277–284. doi: 10.1016/j.appet.2011.10.005.

Van Strien, T., Frijters, J. E., Bergers, G. P., & Defares, P. B. (1986). The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional and external eating behavior. The International Journal of *Eating Disorders*, 5, 295–315.

Van Strien T, Cebolla A, Etchemendy, E., Gutiérrez-Maldonado, J., Ferrer-García, M., Botella, C. & Baños, R. (2013). Emotional eating and food intake after sadness and joy. *Appetite*. 66:20-5. doi: 10.1016/j.appet.2013.02.016. Epub 2013 Mar 5.

Van Strien, T., Schippers, G. M., Cox, W. M. (1995). On the relationship between emotional and external eating behavior. *Addictive Behavior*, 20, 5, 585-594.

Van Strien, T., & Ouwens, M. A. (2003). Counter regulation in female obese emotional eaters: Schachter, Goldman, and Gordon's (1968) test of psychosomatic theory revisited. *Eating Behaviors*. 3, 329-340.

Van Strien, T., Cleven, A., & Schippers, G. (2000). Restraint, tendency toward overeating and ice cream consumption. *International Journal of Eating Disorders*, 28, 333-338.

Van Strien, T., & Ouwens, M. A. (2007). Effects of distress, alexithymia and impulsivity on eating. *Eating Behaviors*, 8, 251-257.

Villarejo, C., Fernández-Aranda, F., Jiménez-Murcia, S., Peñas-Lledó, E., Granero, R., Penelo, E., & Menchón, J. M. (2012). Lifetime obesity in patients with eating disorders: increasing prevalence, clinical and personality correlates. *European Eating Disorders Review*, 20, 3, 250-254.

Volkow, N. D, & O'Brien, C. P. (2007). Issues for DSM-V: should obesity be included as a brain disorder? *American Journal of Psychiatry*, 164, 5, 708–10.

Volkow, N. D, Wang, G., Maynard, L. Jayne, M. Fowler, J. S., Zhu, W.Logan, J. …& Pappas, N.. (2003). Brain dopamine is associated with eating behaviours in humans. *International Journal of Eating Disorders*, 33, 136–142. DOI: 10.1002/eat.10118

Von Elm, E., Altman, D. G. & Egger, M..(2007) The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Preventive Medicine*, 45, 4 247-251.

Vogelzangs, N., Kritchevsky, S. B., Beekman, A. T., Brenes, G. A., Newman, A. B., Satterfield, S., Yaffe, K., Harris, T. B., & Penninx, B. W. (2010). Obesity and onset of significant depressive symptoms: results from a prospective community-based cohort study of older men and women. *Journal of Clinical Psychiatry*, 71,4, 391-9. doi: 10.4088/JCP.08m04743blu.

Wadden, T. A., Foster, G. D, Letizia, K. A, Stunkard, A. J. (1992). A multicen-ter evaluation of a proprietary weight reduction programfor the treatment of marked obesity. *Archive International Medicine*,152, 5:961-6.

Wadden ,T. A., & Letizia, K. A. (1992). Predictors of attrition and weight loss in patients treated by moderate and severe caloric restriction. *In:* Wadden TA, VanItallie TB *(eds). Treatment of the Seriously Obese Patient. Guilford Press: New York, pp.* 383–410.

Wadden, T. A. (1993). Treatment of obesity by moderate and severe caloric restriction: results of clinical research trails. *Ann Intern Med*, 229: 688–693.

Walach, H., Buchheld, N., Buttenmüller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring. Mindfulness - The Freiburg mindfulness inventory (FMI). *Personality and Individual Differences*, 40, 1543-1555.

Wander-Berghe, R. G., Sanz-Valero , J. & Wanden-Berghe, C. (2011).The Application of Mindfulness to Eating Disorders Treatment: A Systematic Review**.** *Eating Disorders*, 19:34–48**.** doi: 10.1080/10640266.2011.533604**.**

Wang, G. J., Volkow, N. D., Logan, J., Pappas, N. R., Wong, C. T., Zhu, W., Netusil, N.& Fowler, J.S. (2001). Brain dopamine and obesity. *Lancet*, 357, 354–357.

Wardle, J. (1987). Eating style: a validation study of the Dutch Eating Behaviour. Questionnaire in normal weight subjects and women with eating disorders. *Journal of Psychosomatic Research*, 31, 161–169.

Wedig, M. M., Nock, M. K.(2010). The functional assessment of maladaptive behaviors: a preliminary evaluation of binge eating and purging among women. *Psychiatric Research*, 178: 518–524. doi: 10.1016/j.psychres.2009.05.010.

Webber, J. (2002). Energy balance in obesity. Proc Nutr Soc, 62, 539–543.

Weineland, S., Arvidsson, D., Kakoulidis, T. P., & Dahl, J. (2012b).Acceptance and commitment therapy for bariatric surgery patients, a pilot RCT. *Obesity Research & Clinical Practice*, 6, E21–E30. doi:10.1016/j.orcp.2011.04.004**.**

Weingarten, H.P., Elston, D. (1991). Food cravings in a college population. *Appetite*, 17, 167–175.

WHO (2014). (http://www.who.int/mediacentre/factsheets/fs311/en/).

WHO (2005). World Health Organization. Fact sheet: obesity and overweight. Internet: http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/(accessed 3 January 2005).

Wilfley, D. E., Friedman, M. A., Dounchis, J. Z., Stein, R. I., Welch, R. R., & Ball, S. A. (2000). Comorbid psychopathology in binge eating disorder: Relation to eating disorder severity at baseline and following treatment. *Journal of Consulting and Clinical Psychology*, 68, 4, 641-49.

Wilfley, D. E., Welch, R. R., Stein, R. I., Spurrell, E. B., Cohen, L. R., Saelens, B. E & Matt, G.E. (2002). A randomized comparison of group cognitive-behavioral therapy and group interpersonal psychotherapy for the treatment of overweight individuals with binge-eating disorder. *Archives of General Psychiatry*, 59,713–721.

Williams, M. J., McManus, F., Muse, K., & Williams, J. M. (2011). Mindfulness-based cognitivetherapy for severe health anxiety (hypochondriasis): An interpretative phenomenological analysis of patients' experiences. *British Journal of Clinical Psychology*, 50, 4, 379–397, DOI: 10.1111/j.2044-8260.2010.02000.

Wilson, G.T.(2010). Eating disorders, obesity and addiction. *European Eating Disorders Review*, 18, 341–351

Wilson, G. T. (2004). Acceptance and change in the treatment of eating disorders:The evolution of manual-based cognitive-behavioral therapy. In S. C.Hayes, V. M. Follette & M. M. Linehan (Eds.), *Mindfulness and acceptance:Expanding the cognitive-behavioral tradition*. (pp. 243–260). New York, NY:Guilford Press.

Wilson, G. T., Grilo, C. M., & Vitousek, K. M. (2007). Psychological treatment of eating disorders. *American Psychologist*, 62, 199–216. doi:10.1037/0003-066X.62.3.199 PubMedCrossRef.

Wilson, G. T., Wilfley, D. E., Agras, W. S., & Bryson, S. W. (2010). Psychological treatments of binge eating disorder. *Archives of General Psychiatry*, 67, 94–101. doi:10.1001/ archgenpsychiatry.2009. 170.

Winbush, N. Y, Gross, C, R. & Kreitzer, M. J.(2007). The effects of mindfulness-based stress reduction on sleep disturbance: a systematic review. *Explore*, 3, 6:585-591.

Wolf, E. J, Harrington, K. M., Clark, S. L., Miller, M. W.(2013). Sample size requirements for structural equation models an evaluation of power, bias, and solution propriety. *Educational and Psychological Measures*, 73, 6, 913-934.

Woolhouse, H., Knowles, A. & Crafti, N. (2012). Adding mindfulness to CBT programs for binge eating: a mixed-methods evaluation. *Eating Disorders*, 20, 321–339 doi: 10.1080/10640266.2012.691791..

Wolever, R. Q., & Best, J. L. (2009). Mindfulness-based approaches to eating disorders. In F. Didonna (Ed.), *Clinical handbook of mindfulness* (pp. 259–288). New York: Springer.

Yau, Y,. H. & Potenza, M. N.(2013). Stress and eating behaviors.*Minerva Endocrinoogyl*. 38, 3:255-67.

Young, L A. (2011). Mindfulness meditation: a primer for rheumatologists. *Rheumatic Disorders Clinic of North America*. 37, 1, 63-75. doi: 10.1016/j.rdc.2010.11.010. Review.

Yanovski, S. Z., Leet, M., Yanovski, J. A., Flood, M., Gold, P. W., Kissileff, H. R., & Walsh, B. J. (1992). Food selection and intake of obese women with binge eating disorder. *American Journal of Clinical Nutrition*, 56, 975–980.

Zgierska A, Rabago D, Chawla N, Kushner K, Koehler R, Marlatt A. (2009). Mindfulness meditation for substance use disorders: a systematic review. *Substances Abuse*, 30, 4, 266-294. doi: 10.1080/08897070903250019.

Zhao, G., Ford, E. S., Dhingra, S., Strine, T. W., & Mokdad, A. H. (2009a). Depression and anxiety among US adults: associations with body mass index. *International Journal of Obesity*, 33, 257–266. doi:10.1038/ijo.2008.268.

Zhao, G., Li, C., Ford, E. S., Tsai, J., Dhingra, S. S., Croft, J. B., McKnight-Eily, L. R., & Balluz, L. S. (2012). Associations between overall and abdominal obesity and suicidal ideation among US adult women. *Journal of Obesity*, doi:10.1155/2012/263142.

Zhao, G., Ford, E. S., Li, C., Strine, T. W., Dhingra, S., Berry, J. T., & Mokdad, A. H. (2009b). Serious psychological distress and its associations with body mass index: findings from the 2007 Behavioral Risk Factor Surveillance System. *International Journal of Public Health*, 54, S30–S36. doi:10.1155/2012/263142.

Ziauddeen, H., Farooqi, I. S. & Fletcher P. C. (2012). Obesity and the brain: how convincing is the addiction model? *Nat Review of Neuroscience*, 13, 279–286

Zimmerman, M., Hrabosky, J.I. Francione, C., Young, D., Chelminski, I., Dalrymple, K., & Galione, J. N. (2011). Impact of obesity on the psychometric properties of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria for major depressive disorder. *Comprehensive Psychiatry*, 52, 146–150.

Zizza, C., Xu, B. (2012). Snacking is associated with overall diet quality among adults**.** *Journal of Academic Nutrition Dietetict*, 112, 2**,** 291-296.

APPENDIX A

In this appendices are reported the results of various analyses as addictional data to the three studies (A), as well as the main questionnaires used (B). The assessment is presented in Italian, because all the three studies were conducted in Italian population samples.

Each table is identified with the study number to which it refers followed by an alphabetic letter

Study 1 Table 1A Correlations beteen SCL-90R scales (n = 691)

		Somatization	Ossessive Compulsive	Interpersonal Hypersesitivity	Depression	Anxiety	Hostility	Phobic Anxiety	Paranoid Ideation	Psychoticism
Somatization	Pearson Correlation	1	,810**	,784**	,835**	,861**	,710**	,657**	,775**	,734**
	Sig. (2-tailed)		,000	,000	,000	,000	,000	,000	,000	,000
Ossessive compulsive	Pearson Correlation	,810**	1	,842**	,893**	,869**	,764**	,586**	,829**	,827**
	Sig. (2-tailed)	,000		,000	,000	,000	,000	,000	,000	,000
Interpersonal Hypersesitivity	Pearson Correlation	,784**	,842**	1	,896**	,821**	,767**	,655**	,886**	,876**
	Sig. (2-tailed)	,000	,000		,000	,000	,000	,000	,000	,000
Depression	Pearson Correlation	,835**	,893**	,896**	1	,890**	,769**	,634**	,849**	,853**
	Sig. (2-tailed)	,000	,000	,000		,000	,000	,000	,000	,000
Anxiety	Pearson Correlation	,861**	,869**	,821**	,890**	1	,754**	,673**	,789**	,809**
	Sig. (2-tailed)	,000	,000	,000	,000		,000	,000	,000	,000
Hostility	Pearson Correlation	,710**	,764**	,767**	,769**	,754**	1	,504**	,798**	,744**
	Sig. (2-tailed)	,000	,000	,000	,000	,000		,000	,000	,000
Phobic Anxiety	Pearson Correlation	,657**	,586**	,655**	,634**	,673**	,504**	1	,568**	,613**
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,000		,000	,000
Paranoid ideation	Pearson Correlation	,775**	,829**	,886**	,849**	,789**	,798**	,568**	1	,852**
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,000	,000		,000
Psychoticism	Pearson Correlation	,734**	,827**	,876**	,853**	,809**	,744**	,613**	,852**	1
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,000	,000	,000	

**. Correlation is significant at the 0.01 level (2-tailed).

Study 1 Table 2A Multiple linear regression analysis based on each SCL-90R scale (n = 691)

Somatization

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,237[a]	,056	,055	6,97878	,056	39,817	1	672	,000
2	,296[b]	,088	,084	6,87090	,032	11,634	2	670	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1939,200	1	1939,200	39,817	,000[b]
	Residual	32728,671	672	48,703		
	Total	34667,870	673			
2	Regression	3037,638	3	1012,546	21,448	,000[c]
	Residual	31630,233	670	47,209		
	Total	34667,870	673			

a. Dependent Variable: Somatization
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5,989	,324		18,486	,000	5,353	6,625
	Sex	-3,662	,580	-,237	-6,310	,000	-4,802	-2,523
2	(Constant)	7,639	,968		7,896	,000	5,740	9,539
	Sex	-3,149	,584	-,203	-5,396	,000	-4,296	-2,003
	BED	4,155	,885	,185	4,696	,000	2,417	5,892
	BMI_2	-,079	,032	-,095	-2,447	,015	-,142	-,016

a. Dependent Variable: Somatization

Ossessive Compulsive

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,186[a]	,035	,033	6,80439	,035	24,203	1	673	,000
2	,288[b]	,083	,079	6,64281	,048	17,570	2	671	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1120,589	1	1120,589	24,203	,000[b]
	Residual	31159,711	673	46,300		
	Total	32280,299	674			
2	Regression	2671,164	3	890,388	20,178	,000[c]
	Residual	29609,136	671	44,127		
	Total	32280,299	674			

a. Dependent Variable: Ossessive_compulsive
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5,819	,316		18,442	,000	5,200	6,439
	Sex	-2,783	,566	-,186	-4,920	,000	-3,894	-1,672
2	(Constant)	9,369	,935		10,016	,000	7,532	11,205
	Sex	-2,323	,564	-,155	-4,118	,000	-3,430	-1,215
	BED	4,208	,855	,195	4,920	,000	2,529	5,887
	BMI_2	-,143	,031	-,179	-4,616	,000	-,204	-,082

a. Dependent Variable: Ossessive_compulsive

Interpersonal Hypersensitivity

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,235[a]	,055	,054	6,01738	,055	39,378	1	673	,000
2	,366[b]	,134	,130	5,77018	,079	30,450	2	671	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1425,819	1	1425,819	39,378	,000[b]
	Residual	24368,600	673	36,209		
	Total	25794,419	674			
2	Regression	3453,489	3	1151,163	34,575	,000[c]
	Residual	22340,930	671	33,295		
	Total	25794,419	674			

a. Dependent Variable: Interpersonal_Hypersesitivity
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4,975	,279		17,830	,000	4,427	5,523
	Sex	-3,139	,500	-,235	-6,275	,000	-4,122	-2,157
2	(Constant)	6,279	,813		7,728	,000	4,684	7,875
	Sex	-2,397	,490	-,180	-4,892	,000	-3,359	-1,435
	BED	5,784	,743	,299	7,787	,000	4,326	7,243
	BMI_2	-,075	,027	-,106	-2,802	,005	-,128	-,023

a. Dependent Variable: Interpersonal_Hypersesitivity

Depression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,232[a]	,054	,053	9,84751	,054	38,398	1	673	,000
2	,340[b]	,115	,111	9,53642	,061	23,312	2	671	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3723,565	1	3723,565	38,398	,000[b]
	Residual	65263,075	673	96,973		
	Total	68986,640	674			
2	Regression	7963,730	3	2654,577	29,189	,000[c]
	Residual	61022,910	671	90,943		
	Total	68986,640	674			

a. Dependent Variable: Depression
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	8,396	,457		18,385	,000	7,499	9,292
	Sex	-5,073	,819	-,232	-6,197	,000	-6,681	-3,466
2	(Constant)	12,870	1,343		9,584	,000	10,233	15,507
	Sex	-4,162	,810	-,191	-5,139	,000	-5,752	-2,572
	BED	7,754	1,228	,245	6,316	,000	5,344	10,165
	BMI_2	-,194	,045	-,166	-4,350	,000	-,281	-,106

a. Dependent Variable: Depression

Anxiety

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,227[a]	,052	,050	5,84884	,052	36,574	1	673	,000
2	,316[b]	,100	,096	5,70650	,048	17,997	2	671	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1251,160	1	1251,160	36,574	,000[b]
	Residual	23022,605	673	34,209		
	Total	24273,764	674			
2	Regression	2423,256	3	807,752	24,805	,000[c]
	Residual	21850,508	671	32,564		
	Total	24273,764	674			

a. Dependent Variable: Anxiety
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5,037	,271		18,569	,000	4,504	5,569
	Sex	-2,941	,486	-,227	-6,048	,000	-3,896	-1,986
2	(Constant)	7,711	,804		9,595	,000	6,133	9,288
	Sex	-2,493	,485	-,192	-5,144	,000	-3,444	-1,541
	BED	3,920	,735	,209	5,336	,000	2,478	5,363
	BMI_2	-,112	,027	-,161	-4,200	,000	-,164	-,060

a. Dependent Variable: Anxiety

Hostility

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,183[a]	,033	,032	3,36854	,033	23,359	1	674	,000
2	,255[b]	,065	,061	3,31817	,031	11,310	2	672	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	265,059	1	265,059	23,359	,000[b]
	Residual	7647,941	674	11,347		
	Total	7913,000	675			
2	Regression	514,107	3	171,369	15,564	,000[c]
	Residual	7398,893	672	11,010		
	Total	7913,000	675			

a. Dependent Variable: Hostility
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2,779	,156		17,811	,000	2,473	3,086
	Sex	-1,353	,280	-,183	-4,833	,000	-1,903	-,803
2	(Constant)	4,114	,467		8,809	,000	3,197	5,031
	Sex	-1,158	,282	-,157	-4,111	,000	-1,711	-,605
	BED	1,747	,427	,163	4,089	,000	,908	2,585
	BMI_2	-,055	,015	-,138	-3,532	,000	-,085	-,024

a. Dependent Variable: Hostility

Phobic Anxiety

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,195[a]	,038	,036	2,49300	,038	26,543	1	674	,000
2	,284[b]	,081	,077	2,44029	,043	15,713	2	672	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	164,966	1	164,966	26,543	,000[b]
	Residual	4188,927	674	6,215		
	Total	4353,892	675			
2	Regression	352,106	3	117,369	19,709	,000[c]
	Residual	4001,786	672	5,955		
	Total	4353,892	675			

a. Dependent Variable: Phobic_Anxiety
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1,511	,115		13,084	,000	1,284	1,738
	Sex	-1,067	,207	-,195	-5,152	,000	-1,474	-,661
2	(Constant)	1,214	,343		3,535	,000	,540	1,888
	Sex	-,833	,207	-,152	-4,021	,000	-1,239	-,426
	BED	1,673	,314	,211	5,325	,000	1,056	2,290
	BMI_2	,001	,011	,004	,093	,926	-,021	,023

a. Dependent Variable: Phobic_Anxiety

Parnoid Ideation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,201[a]	,040	,039	3,77499	,040	28,202	1	673	,000
2	,307[b]	,094	,090	3,67226	,054	20,090	2	671	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	401,889	1	401,889	28,202	,000[b]
	Residual	9590,605	673	14,251		
	Total	9992,494	674			
2	Regression	943,726	3	314,575	23,327	,000[c]
	Residual	9048,768	671	13,485		
	Total	9992,494	674			

a. Dependent Variable: Paranoid_ideation
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	3,355	,175		19,164	,000	3,011	3,699
	Sex	-1,667	,314	-,201	-5,311	,000	-2,283	-1,050
2	(Constant)	4,520	,517		8,741	,000	3,505	5,535
	Sex	-1,308	,312	-,157	-4,195	,000	-1,920	-,696
	BED	2,916	,473	,242	6,168	,000	1,988	3,844
	BMI_2	-,055	,017	-,124	-3,225	,001	-,089	-,022

a. Dependent Variable: Paranoid_ideation

Psychoticism

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,172[a]	,030	,028	4,26039	,030	20,447	1	671	,000
2	,324[b]	,105	,101	4,09750	,075	28,205	2	669	,000

a. Predictors: (Constant), Sex
b. Predictors: (Constant), Sex, BMI_2, BED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	371,138	1	371,138	20,447	,000[b]
	Residual	12179,273	671	18,151		
	Total	12550,411	672			
2	Regression	1318,247	3	439,416	26,172	,000[c]
	Residual	11232,164	669	16,789		
	Total	12550,411	672			

a. Dependent Variable: Psychoticism
b. Predictors: (Constant), Sex
c. Predictors: (Constant), Sex, BMI_2, BED

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	3,033	,198		15,320	,000	2,644	3,422
	Sex	-1,603	,354	-,172	-4,522	,000	-2,299	-,907
2	(Constant)	3,940	,577		6,825	,000	2,806	5,073
	Sex	-1,093	,348	-,117	-3,140	,002	-1,777	-,410
	BED	3,954	,528	,293	7,492	,000	2,917	4,990
	BMI_2	-,052	,019	-,105	-2,728	,007	-,090	-,015

a. Dependent Variable: Psychoticism

Study 1 Table 3A Correlations beteen EBQ scales and age (n = 191)

		Uncontrolled/ hypercontrolled overeating	Guilt/restraint	Overeating during meals	Overeating out of meals	Irregular overeating	NES /grazing	Snacking	Age
Uncontrolled/ hypercontrolled overeating	Pearson Correlation	1	-,107	,207**	,358**	,255**	,395**	237**	.211**
	Sig. (2-tailed)		,183	,009	,009	,001	,001	,003	.008
Guilt/restraint	Pearson Correlation	-.107	1	,497**	,400**	,337**	,141*	,170*	.169*
	Sig. (2-tailed)	,183		,000	,000	,000	,077	,032	.019
Overeating during meals	Pearson Correlation	,207**	,497**	1	,524**	,445**	,287**	,279**	.008
	Sig. (2-tailed)	,009	,000		,000	,000	,000	,000	.925
Overeating out of meals	Pearson Correlation	,356**	,400**	,524**	1	,395**	,305**	,243**	195*
	Sig. (2-tailed)	,000	,000	,000		,000	,000	,002	.015
Irregular overeating	Pearson Correlation	,255**	,337**	,445**	,395**	1	,283**	,108	.044
	Sig. (2-tailed)	,001	,000	,000	,000		,000	,170	.584
NES/grazing	Pearson Correlation	,395**	,141	,287**	,305**	,283**	1	,258**	-.012
	Sig. (2-tailed)	,000	,077	,000	,000	,000		,001	.881
Snacking	Pearson Correlation	,237**	,170*	,279**	,343**	,106	,256**	1	-.203*
	Sig. (2-tailed)	,003	,032	,000	,002	,170	,001		.011
Age	Pearson Correlation	-.211**	.189*	.008	.196	-.044	-0.12	-.203	1
	Sig. (2-tailed)	.008	.019	.925	.015	.584	.881	.011	

Study 2 Table 4A Descriptive statistics[a] of MEQ scales among subgroups

	Disinhibition	*Awareness*	*Distraction*	*Emotional*	*MEQ-Summary*
Gender					
Female	2.76 ± 0.68 (0.03)	2.92 ± 0.51 (0.02)	2.68 ± 0.68 (0.03)	2.80 ± 0.99 (0.03)	2.82 ± 0.41 (0.02)
Male	2.57 ± 0.69 (0.03)	2.79 ± 0.49 (0.02)	2.73 ± 0.64 (0.03)	3.12 ± 0.70 (0.03)	2.77 ± 0.39 (0.02)
Age category					
18-30 years	2.62 ± 0.68 (0.3)	2.89 ± 0.50 (0.02)	2.69 ± 0.65 (0.03)	2.89 ± 0.75 (0.03)	2.78 ± 0.36 (0.01)
31-40 years	2.61 ± 0.74 (0.05)	2.83 ± 0.51 (0.04)	2.64 ± 0.64 (0.05)	2.92 ± 0.83 (0.6)	3.75 ± 0.46 (0.03)
>40 years	2.87 ± 0.65 (0.04)	2.87 ± 0.51 (0.03)	2.75 ± 0.72 (0.04)	3.00 ± 0.78 (0.05)	2.88 ± 0.43 (0.03)
Education					
Secondary	2.77 ± 0.68 (0.03)	2.78 ± 0.51 (0.02)	2.71 ± 0.65 (0.03)	2.99 ± 0.74 (0.03)	2.80 ± 0.39 (0.02)
University	2.62 ± 0.69 (0.03)	2.95 ± 0.49 (0.02)	2.69 ± 0.67 (0.03)	2.86 ± 0.79 (0.03)	2.80 ± 0.41 (0.02)
Meditation experience					
None	2.67 ± 0.70 (0.02)	2.88 ± 0.51 (0.02)	2.68 ± 0.68 (0.02)	2.89 ± 0.77 (0.03)	2.79 ± 0.40 (0.01)
Some	2.84 ± 0.61 (0.05)	2.81 ± 0.51 (0.04)	2.81 ± 0.55 (0.05)	3.15 ± 0.70 (0.06)	2.87 ± 0.39 (0.03)
Type of physical activity					
None	2.72 ± 0.69 (0.04)	2.82 ± 0.53 (0.03)	2.70 ± 0.69 (0.04)	2.87 ± 0.80 (0.04)	2.78 ± 0.80 (0.02)
Aerobic	2.65 ± 0.69 (0.03)	2.89 ± 0.50 (0.02)	2.67 ± 0.68 (0.03)	2.93 ± 0.76 (0.03)	2.80 ± 0.40 (0.02)
Yoga-type	2.82 ± 0.69 (0.07)	2.89 ± 0.48 (0.05)	2.84 ± 0.58 (0.06)	3.06 ± 0.73 (0.07)	2.89 ± 0.38 (0.04)
Exercise intensity					
Sedentary (never)	2.72 ± 0.69 (0.04)	2.82 ± 0.53 /0.03)	2.70 ± 0.69 (0.04)	2.87 ± 0.80 (0.04)	2.78 ± 0.40 (0.02)
Moderate (1-3 times/week)	2.68 ± 0.68 (0.03)	2.90 ± 0.51 (0.02)	2.66 ± 0.65 (0.03)	2.91 ± 0.78 (0.04)	2.81 ± 0.40 (0.02)
Strenous (>3 times/week)	2.65 ± 0.71 (0.05)	2.88 ± 0.47 (0.03)	2.78 ± 0.86 (0.04)	3.02 ± 0.70 (0.04)	2.82 ± 0.40 (0.03)
Diet					
No diet	2.73 ± 0.67 (0.02)	2.85 ± 0.51 (0.02)	2.71 ± 0.66 (0.02)	2.98 ± 0.75 (0.05)	2.82 ± 0.39 (0.01)
Restrictive diets	2.45 ± 0.72 (0.06)	2.93 ± 0.52 (0.04)	2.63 ± 0.73 (0.06)	2.64 ± 0.85 (0.07)	2.70 ± 0.41 (0.03)
Vegetarian/vegan/macrobiotic	2.86 ± 0.72 (0.11)	3.04 ± 0.42 (0.06)	2.74 ± 0.56 (0.09)	2.95 ± 0.67 (0.10)	2.94 ± 0.39 (0.06)
Body Mass Index category					
Normal (<25)	2.78 ± 0.68 (0.03)	2.91 ± 0.52 (0.02)	2.75 ± 0.64 (0.02)	3.03 ± 0.73 (0.03)	2.87 ± 0.38 (0.01)
Overweight (25-29.9)	2.53 ± 0.65 (0.04)	2.83 ± 0.46 (0.03)	2.52 ± 0.67 (0.04)	2.83 ± 0.78 (0.05)	2.71 ± 0.38 (0.03)
Obese (>30)	2.36 ± 0.71 (0.07)	2.72 ± 0.52 (0.05)	2.50 ± 0.75 (0.07)	2.41 ± 0.81 (0.08)	2.54 ± 0.44 (0.04)

[a] values are mean ± standard deviation (standard error of mean)

Study 3 Table 5A Correlations between mindfulness and the other psychological constructs measured

Correlations

		FMI	MEQ	BES	EOQ	GSI	BIAQ	WHO-5	BMI
FMI	Pearson Correlation	1	,367**	-,402**	-,197**	-,377**	-,273**	,498**	-,059
MEQ	Pearson Correlation	,367**	1	-,661**	-,361**	-,396**	-,524**	,276**	-,183**
BES	Pearson Correlation	-,402**	-,661**	1	,486**	,414**	,671**	-,316**	,463**
EOQl	Pearson Correlation	-,197**	-,361**	,486**	1	,367**	,295**	-,194**	,241**
GSI	Pearson Correlation	-,377**	-,396**	,414**	,367**	1	,509**	-,528**	,104*
BIAQ	Pearson Correlation	-,273**	-,524**	,671**	,295**	,509**	1	-,267**	,457**
WHO-5	Pearson Correlation	,498**	,276**	-,316**	-,194**	-,528**	-,267**	1	-,009
BMI	Pearson Correlation	-,059	-,183**	,463**	,241**	,104*	,457**	-,009	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Study 3 Table 6A Mean, SD and test of the between-subjects effect. Dependent variable: FMI

BMI category	Gender	Mean	Std. Deviation	N
Normal weight	Female	20.76	7.76	173
	Male	21.67	8.23	82
	Total	21.05	7.91	255
Obese	Female	19.24	6.98	94
	Male	21.90	6.97	21
	Total	19.73	7.03	115
Overweight	Female	18.61	8,22	65
	Male	19,89	8.36	47
	Total	19.15	8.27	112
Total	Female	19.91	7.68	332
	Male	21.14	8.11	150
	Total	20.29	7.82	482

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	543.08[a]	5	108,61	1.78	,114	,018
Intercept	132052.21	1	132052.27	2171.83	,000	,820
BMI.categ	282.75	2	141.37	2.32	,099	,010
gender	207.52	1	207.52	3.41	,065	,007
BMI.categ * gender	40.57	2	20.28	.33	,716	,001
Error	28941.89	476	60.80			
Total	228088.00	482				
Corrected Total	29484,97	481				

a. R Squared = ,018 (Adjusted R Squared = ,008)

Study 3 Table 7A. Mean, SD and test of the between-subjects effect. Dependent variable: MEQ

BMI category	Gender	Mean	Std. Deviation	N
Normal weight	Female	4,29	,65	169
	Male	4,49	,66	76
	Total	4,35	,66	245
Obese	Female	3,85	,77	92
	Male	4,27	,69	20
	Total	3,93	,77	112
Overweight	Female	3,98	,73	63
	Male	4,38	,60	43
	Total	4,1511	,70	106
Total	Female	4,11	,72	324
	Male	4,42	,65	139
	Total	4,20	,72	463

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	23,18[a]	5	4,63	9,74	,000	,096
Intercept	5373,98	1	5373,98	11298,31	,000	,961
BMI.categ	6,59	2	3,29	6,93	,001	,029
gender	8,6	1	8,64	18,17	,000	,038
BMI.categ * gender	,95	2	,47	1,00	,366	,004
Error	217,37	457	,47			
Total	8432,87	463				
Corrected Total	240,55	462				

a. R Squared = ,096 (Adjusted R Squared = ,086)

Contrast Results (K Matrix)

BMI categories Difference Contrast			Dependent Variable
			MEQ.TOTAL2
Level 2 vs. Level 1	Contrast Estimate		-,328
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-,328
	Std. Error		,098
	Sig.		,001
	95% Confidence Interval for Difference	Lower Bound	-,520
		Upper Bound	-,137
Level 3 vs. Previous	Contrast Estimate		-,041
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-,041
	Std. Error		,084
	Sig.		,625
	95% Confidence Interval for Difference	Lower Bound	-,206
		Upper Bound	,124

APPENDIX B: ASSESSMENT
INDAGINE SUL RAPPORTO DELLE PERSONE CON IL CIBO

In quest'indagine sono rispettate le norme etiche della ricerca in psicologia dell'A.I.P. (http://www.aipass.org). Le informazioni ricavate saranno usate in forma anonima solo a scopo di ricerca. La ringraziamo calorosamente per la collaborazione.

Metta una crocetta sul quadratino che corrisponde alle Sue caratteristiche

☐ Uomo ☐ Donna

Qual è la sua età? _____ anni

Qual è il suo titolo di studio?

☐ Licenza elementare ☐ Licenza media ☐ Diploma superiore

☐ Laurea I livello ☐ Laurea II livello ☐ Altro

Qual è la sua professione?_____

Qual è il suo stato civile?

☐ Nubile/Celibe ☐ Sposato/a ☐ Separato/Divorziato ☐ Vedovo/a

Con chi vive attualmente?

☐ da solo/a
☐ con il partner
☐ con i figli. Quanti figli ha?_____
☐ con i miei genitori
☐ con altre persone adulte non di famiglia

Indichi se soffre di qualche malattia tra quelle indicate sotto:

☐ Malattie cardiache o cardiovascolari. Quali?_____
☐ Malattie respiratorie. Quali?_____
☐ Malattie gastrointestinali Quali?_____
☐ Dolori cronici (mal di testa, mal di schiena, dolori muscolari ecc....)
☐ Colesterolo alto
☐ Diabete
☐ Artrosi
☐ Disturbi mestruali
☐ Depressione
☐ Ansia

Usa regolarmente ansiolitici / tranquillanti / antidepressivi / altri psicofarmaci? ☐ ì ☐ o

Nella sua famiglia qualcuno ha mai sofferto delle malattie seguenti?

☐ Diabete. Qual è il grado di parentela?_____
☐ Malattie caridache. Qual è il grado di parentela?_____
☐ Obesità. Qual è il grado di parentela?_____
☐ Artrosi. Qual è il grado di parentela?_____

Le capita di russare quando dorme?

☐ Mai ☐ Raramente ☐ A volte ☐ Spesso ☐ Sempr e

Le capita di aver delle apnee notturne?

☐ Mai ☐ Raramente ☐ A volte ☐ Spesso ☐ Sempre

Qual è la sua altezza?_____

Qual è il suo peso in kg?_____

Qual è il peso minimo che ha raggiunto in età adulta?_____

Qual è il peso massimo che ha raggiunto in età adulta?_____

Ha mai avuto problemi di peso?

☐ No ☐ Sì Se si, a che età sono iniziati? _____

Quante ore alla settimana fa attività fisica? _____

Che tipo di attività fisica pratica? _____

Fuma sigarette?

☐ No, non ho mai fumato ☐ Sono un ex fumatore ☐ Sì fumo. Quante sigarette al giorno?_____

Le capita di saltare la prima colazione?

☐ Mai ☐ Raramente ☐ A volte ☐ Spesso ☐ Sempre

Le capita di mangiare dopo cena e di notte?

☐ Mai ☐ Raramente ☐ A volte ☐ Spesso ☐ Sempre

Indichi il numero totale di pasti che consuma al giorno:_____

Attualmente sta seguendo una dieta?

☐ No, nessuna dieta ☐ Sì, dieta dimagrante ☐ Sì, dieta vegetariana
☐ Si, dieta vegana ☐ Sì, dieta macrobiotica ☐ Sì, dieta senza glutine
☐ Un altro tipo di dieta: spcificare_____

Ha mai fatto in precedenza delle diete per perdere peso? ☐ Sì ☐ No

Si è mai rivolto/a ad un dietologo per problemi di peso? ☐ Sì ☐ No

Ha mai seguito programmi psicologici per problemi di peso?

☐ No, mai ☐ Sì, in precedenza ☐ Sì, lo sto seguendo attualmente

Ha mai pensato alla chirurgia per ridurre l'obesità??

☐ No, mai ☐ No, ma ho in programma di farlo ☐ Sì, ho fatto un trattamento chirurgico.
Indichi quale: _____

Con quale frequenza assume le sostanze indicate sotto?	**Mai**	**1-2 volte/settimana**	**3-6 volte/settimana**	**1-2 volte/giorno**	**2-5 volte/giorno**	**Più di 5 volte/giorno**
Frutta						
Verdura						
Snack dolci o salati (es. patatine, merendine, pizzette …)						
Bevande zuccherate e gassate (es., coca cola, aranciata…)						
Bevande alcoliche (es. vino, birra, superalcolici….)						

Come valuta il suo attuale stato di salute fisica?

Molto scadente	1	2	3	4	5	6	7	8	9	10	Eccellente

Come valuta il suo attuale stato di salute mentale?

Molto scadente	1	2	3	4	5	6	7	8	9	10	Eccellente

MEQ ISTRUZIONI: *Per favore, risponda alle seguenti domande in base a come lei abitualmente si comporta.*	**Mai o Raramente**	***A* volte**	**Spesso**	**Sempre**
1. Mangio così velocemente che non assaporo quello che sto mangiando.	1	2	3	4
2. Quando vado ai buffet tendo a mangiare troppo.	1	2	3	4
3. Se ad una festa ci sono tante cose buone da mangiare, mi accorgo quando sento la voglia di mangiare più di quanto dovrei.	1	2	3	4
4. Quando la porzione del ristorante è troppo grande, smetto di mangiare quando mi sento pieno.	1	2	3	4
5. Riconosco quando la pubblicità del cibo mi invoglia a mangiare.	1	2	3	4
6. Mentre sto mangiando i miei pensieri tendono a vagare.	1	2	3	4
7. Quando mangio uno dei miei piatti preferiti non riesco a riconoscere quando ne ho mangiato abbastanza.	1	2	3	4
8. Noto che il fatto stesso di andare al cinema mi fa venire voglia di mangiare popcorn e dolciumi.	1	2	3	4
9. Se non costa molto di più, prendo la porzione più grande del cibo e della bibita, a prescindere da quanta fame ho.	1	2	3	4
10. Noto quando ci sono sapori impercettibili nei cibi che mangio.	1	2	3	4
11. Se ci sono avanzi che mi piacciono, ne prendo un'altra porzione anche se sono pieno.	1	2	3	4
12. Quando sto mangiando un pasto piacevole, noto se mi fa sentire rilassato.	1	2	3	4
13. Pilucco o spilluzzico senza accorgermi che sto mangiando.	1	2	3	4
14. Quando mangio un abbondante pasto, mi accorgo che mi fa sentire pesante e pigro.	1	2	3	4
15. Smetto di mangiare quando sono pieno anche quando sto mangiando qualcosa che adoro.	1	2	3	4
16. Apprezzo il modo in cui il cibo si presenta nel mio piatto.	1	2	3	4
17. Quando sono stressato al lavoro, vado a cercare qualcosa da mangiare.	1	2	3	4
18. Se c'è del buon cibo ad una festa, continuo a mangiare anche se sono pieno.	1	2	3	4
19. Quando sono triste mangio per sentirmi meglio.	1	2	3	4
20. Noto quando i cibi e le bevande sono troppo dolci.	1	2	3	4
21. Prima di mangiare mi prendo un momento per apprezzare il colore ed il profumo del cibo.	1	2	3	4
22. Assaporo ogni boccone di cibo che mangio.	1	2	3	4
23. Riconosco quando mangio pur non avendo fame.	1	2	3	4
24. Mi accorgo quando sto mangiando da un piatto di dolciumi solo perché è lì a portata di mano.	1	2	3	4
25. Quando sono al ristorante riesco a dire se la porzione che mi è stata servita è troppo grande per me.	1	2	3	4
26. Noto quando il cibo che mangio influenza il mio stato emotivo.	1	2	3	4
27. Ho problemi a non mangiare gelati, biscotti o patatine se ce ne sono in casa.	1	2	3	4
28. Mentre sto mangiando penso alle cose che devo fare.	1	2	3	4

FMI

ISTRUZIONI: *Per favore, risponda ad ogni domanda il più onestamente e spontaneamente possibile, facendo riferimento all'**ultima settimana**.*

	Raramente	**A volte**	**Spesso**	**Quasi sempre**
1. Sono aperto all'esperienza del momento presente.	0	1	2	3
2. Sento il mio corpo mentre mangio, cucino, pulisco o parlo.	0	1	2	3
3. Quando noto che la mia mente è assente, gradualmente ritorno all'esperienza del qui ed ora.	0	1	2	3
4. Sono in grado di apprezzare me stesso.	0	1	2	3
5. Faccio attenzione a ciò che c'è dietro alle mie azioni.	0	1	2	3
6. Vedo i miei errori e difficoltà senza giudicarli.	0	1	2	3
7. Mi sento connesso alla mia esperienza nel qui ed ora.	0	1	2	3
8. Accetto le esperienze spiacevoli.	0	1	2	3
9. Sono amichevole con me stesso quando le cose vanno male.	0	1	2	3
10. Osservo le mie emozioni senza perdermi in esse.	0	1	2	3
11. Nelle situazioni difficili mi posso fermare senza reagire immediatamente.	0	1	2	3
12. Sperimento momenti di agio e pace interiore anche quando le cose diventano frenetiche e stressanti.	0	1	2	3
13. Sono impaziente con me stesso e con gli altri.	0	1	2	3
14. Riesco a sorridere quando mi rendo conto di quanto a volte mi complico la vita.	0	1	2	3

SCL-90

ISTRUZIONI: *Nella lista che segue sono elencati problemi e disturbi che spesso affliggono le persone. Cerchi di ricordare se ne ha sofferto la scorsa settimana, oggi compreso, e con quale intensità.*

In che misura soffre o ha sofferto ***la scorsa settimana*** *di…*

	Per niente	**Un po'**	**Moderatamente**	**Molto**	**Moltissimo**
1. Mal di testa.	0	1	2	3	4
2. Nervosismo o agitazione interna.	0	1	2	3	4
3. Incapacità a scacciare pensieri, parole o idee indesiderate.	0	1	2	3	4
4. Sensazioni di svenimento e di vertigini.	0	1	2	3	4
5. Perdita di interesse e del piacere sessuale.	0	1	2	3	4
6. Tendenza a criticare gli altri.	0	1	2	3	4
7. Convinzione che gli altri possano controllare i suoi pensieri.	0	1	2	3	4
8. Convinzione che gli altri siano responsabili dei suoi disturbi.	0	1	2	3	4
9. Difficoltà a ricordarsi le cose.	0	1	2	3	4
10. Preoccupazione per la sua negligenza e trascuratezza.	0	1	2	3	4
11. Sentirsi facilmente infastidito o irritato.	0	1	2	3	4
12. Dolori al cuore o al petto.	0	1	2	3	4
13. Paura degli spazi aperti o delle strade.	0	1	2	3	4
14. Sentirsi debole o fiacco.	0	1	2	3	4
15. Idee di togliersi la vita.	0	1	2	3	4
16. Udire voci che le altre persone non odono.	0	1	2	3	4
17. Tremori.	0	1	2	3	4
18. Mancanza di fiducia negli altri.	0	1	2	3	4
19. Scarso appetito.	0	1	2	3	4
20. Facili crisi di pianto.	0	1	2	3	4
21. Sentirsi infastidito nei confronti dell'altro sesso.	0	1	2	3	4
22. Sensazione di essere preso in trappola.	0	1	2	3	4
23. Paure improvvise senza ragione.	0	1	2	3	4
24. Scatti d'ira incontrollabili.	0	1	2	3	4
25. Paura di uscire da solo.	0	1	2	3	4
26. Rimproverarsi per qualsiasi cosa.	0	1	2	3	4
27. Dolori alla schiena.	0	1	2	3	4
28. Senso di incapacità a portare a termine le cose.	0	1	2	3	4
29. Sentirsi solo.	0	1	2	3	4
30. Sentirsi giù di morale.	0	1	2	3	4
31. Preoccuparsi eccessivamente per qualsiasi cosa.	0	1	2	3	4
32. Mancanza di interesse.	0	1	2	3	4
33. Senso di paura.	0	1	2	3	4
34. Sentirsi facilmente ferito o offeso.	0	1	2	3	4
35. Convinzione che gli altri percepiscano i tuoi pensieri.	0	1	2	3	4
36. Sensazione di non trovare comprensione o simpatia.	0	1	2	3	4
37. Sensazione che gli altri non le siano amici o l'abbiano in antipatia.	0	1	2	3	4

	Per niente	Un po’	Moderatamente	Molto	Moltissimo
38. Dover fare le cose molto lentamente per essere sicuro di farle bene.	0	1	2	3	4
39. Palpitazioni o sentirsi il cuore in gola.	0	1	2	3	4
40. Senso di nausea o mal di stomaco.	0	1	2	3	4
41. Sentimenti d’inferiorità.	0	1	2	3	4
42. Dolori muscolari.	0	1	2	3	4
43. Sensazione che gli altri la guardino o parlino di lei.	0	1	2	3	4
44. Difficoltà ad addormentarsi.	0	1	2	3	4
45. Bisogno di controllare ripetutamente ciò che fa.	0	1	2	3	4
46. Difficoltà a prendere decisioni.	0	1	2	3	4
47. Paura di viaggiare in autobus, nella metropolitana o in treno.	0	1	2	3	4
48. Sentirsi senza fiato.	0	1	2	3	4
49. Vampate di calore o brividi di freddo.	0	1	2	3	4
50. Necessità di evitare certi oggetti, luoghi o attività perché spaventano.	0	1	2	3	4
51. Senso di vuoto mentale.	0	1	2	3	4
52. Intorpidimento o formicolio di alcune parti del corpo.	0	1	2	3	4
53. Nodo alla gola.	0	1	2	3	4
54. Guardare al futuro senza speranza.	0	1	2	3	4
55. Difficoltà a concentrarsi.	0	1	2	3	4
56. Senso di debolezza in qualche parte del corpo.	0	1	2	3	4
57. Sentirsi teso o sulle spine.	0	1	2	3	4
58. Senso di pesantezza a braccia o gambe.	0	1	2	3	4
59. Idee di morte.	0	1	2	3	4
60. Mangiare troppo.	0	1	2	3	4
61.Senso di fastidio quando la gente la guarda o parla di lei.	0	1	2	3	4
62. Avere dei pensieri che non sono i suoi.	0	1	2	3	4
63. Sentire l’impulso di colpire, ferire o fare male a qualcuno.	0	1	2	3	4
64. Svegliarsi presto al mattino senza riuscire a riaddormentarsi.	0	1	2	3	4
65. Aver bisogno di ripetere lo stesso atto, come toccare, contare, lavarsi le mani.	0	1	2	3	4
66. Sonno inquieto o disturbato.	0	1	2	3	4
67. Sentire l’impulso di rompere gli oggetti.	0	1	2	3	4
68. Avere idee o convinzioni che gli altri non condividono.	0	1	2	3	4
69. Sentirsi penosamente imbarazzato in presenza di altri.	0	1	2	3	4
70. Sentirsi a disagio tra la folla, come nei negozi, al cinema, ecc…	0	1	2	3	4
71. Sensazione che tutto richieda uno sforzo.	0	1	2	3	4
72. Momenti di terrore o di panico.	0	1	2	3	4
73. Sentirsi a disagio quando mangia o beve in presenza di altri.	0	1	2	3	4
74. Ingaggiare frequenti discussioni.	0	1	2	3	4
75. Sentirsi a disagio quando è solo.	0	1	2	3	4
76. Convinzioni che gli altri non apprezzino il suo lavoro.	0	1	2	3	4

	Per niente	Un po'	Moderatamente	Molto	Moltissimo
77. Sentirsi solo e triste anche in compagnia.	0	1	2	3	4
78. Senso di irrequietezza, tanto da non poter stare seduto.	0	1	2	3	4
79. Sentimenti di inutilità.	0	1	2	3	4
80. Sensazione che le cose più comuni e familiari siano estranee e irreali.	0	1	2	3	4
81. Urlare e scagliare oggetti.	0	1	2	3	4
82. Avere paura di svenire davanti agli altri.	0	1	2	3	4
83. Impressione che gli altri possano approfittare di lei o delle sue azioni.	0	1	2	3	4
84. Pensieri sul sesso che la affliggono.	0	1	2	3	4
85. Idea di dover scontare i propri peccati.	0	1	2	3	4
86. Sentirsi costretto a portare a termine ciò che ha iniziato.	0	1	2	3	4
87. Pensiero di avere una grave malattia fisica.	0	1	2	3	4
88. Non sentirsi mai vicino alle altre persone.	0	1	2	3	4
89. Sentirsi in colpa.	0	1	2	3	4
90. Idea che qualcosa non vada bene nella sua mente.	0	1	2	3	4

EOQ

ISTRUZIONI: *Considerando l'ultimo mese, quante volte le è capitato di mangiare tanto rispetto alle circostanze, in risposta a un senso di:*

	Mai	1-5 giorni	6-12 giorni	13-15 giorni	16-22 giorni	23-27 giorni	Tutti i giorni
1. ANSIA (preoccupato, agitato, inquieto).	0	1	2	3	4	5	6
2. TRISTEZZA (giù, avvilito, depresso).	0	1	2	3	4	5	6
3. SOLITUDINE (annoiato, scoraggiato, inutile).	0	1	2	3	4	5	6
4. STANCHEZZA (affaticato, esausto).	0	1	2	3	4	5	6
5. RABBIA (infastidito, irritato, furibondo).	0	1	2	3	4	5	6
6. FELICITÀ (di buon umore, allegro, entusiasta).	0	1	2	3	4	5	6

BES

In questo questionario deve scegliere, per ogni gruppo di 4 affermazioni quella che descrive meglio la sua condizione emotiva.

BES 1 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***

	Non penso consciamente al mio peso ed alle dimensioni del mio corpo quando sono con altre persone.
	Mi preoccupo del mio aspetto, ma questo non mi rende insoddisfatto di me stesso.
	Sono consapevole del mio aspetto e del mio peso e questo mi rende deluso di me stesso.
	Sono molto consapevole del mio peso e spesso provo forte vergogna e disgusto per me stesso. Perciò cerco di evitare di incontrare altre persone.

BES 2 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***

	Non ho difficoltà a mangiare lentamente, seduto/a in maniera corretta.
	Mi sembra di trangugiare il cibo. Nonostante ciò, non finisco per sentirmi troppo pieno/a per aver mangiato eccessivamente.
	Talvolta, tendo a mangiare velocemente e dopo mi sento troppo pieno/a.
	Ho l'abitudine di ingollare il cibo quasi senza masticarlo. Quando faccio così, di solito mi sento scoppiare perché ho mangiato troppo.

BES 3 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***

	Quando voglio, sono capace di controllare i miei impulsi verso il cibo.
	Penso di aver minor controllo sul cibo rispetto alla maggior parte delle persone.
	Mi sento totalmente incapace di controllare i miei impulsi verso il cibo.
	Siccome mi sento totalmente incapace di controllare il mio rapporto con l'alimentazione, sto cercando disperatamente di raggiungere il controllo sul cibo.

BES 4 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***

	Non ho l'abitudine di mangiare quando sono annoiato.
	Qualche volta mangio quando sono annoiato, ma talvolta riesco a distrarmi e a non pensare al cibo.
	Ho una vera abitudine di mangiare quando sono annoiato, ma talvolta riesco a distrarmi e a non pensare al cibo
	Ho una forte abitudine di mangiare quando sono annoiato. Niente riesce a farmi smettere.

	BES 5 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***
	Quando mangio qualcosa, di solito, è perché ho fame.
	Talvolta mangio qualcosa d'impulso, senza avere veramente fame
	Mangio regolarmente per soddisfare una sensazione di fame, pur non avendo davvero bisogno fisicamente del cibo. In queste occasioni, non riesco neanche a gustare quello che mangio.
	Anche se non ho fisicamente fame, avverto il bisogno di mettere qualcosa in bocca e mi sento soddisfatto/a solo quando riesco a mangiare qualcosa per riempirmi la bocca, come un pezzo di pane. Qualche volta, quando questo succede, risputo il cibo per non ingrassare.

	BES 6 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***
	Non mi sento per nulla in colpa, né provo odio per me stesso/a, dopo aver mangiato troppo.
	Talvolta, mi sento in colpa o provo odio per me stesso/a dopo aver mangiato troppo.
	Quasi sempre vivo un forte senso di colpa o provo odio per me stesso/a dopo aver mangiato troppo.

	BES 7 - Quale sceglie fra le 4 affermazioni sotto? ***Metta una sola crocetta***
	Quando sono a dieta, non perdo mai del tutto il controllo sul cibo, anche dopo periodi in cui ho mangiato troppo.

	Quando sono a dieta e mangio un cibo “proibito”, sento che ormai ho “sgarrato” e mangio ancora di più.
	Quando sono a dieta e mangio troppo spesso mi dico: “Ormai hai sgarrato, perché non vai fino in fondo?”. Quando questo succede, mangio ancora di più
	Mi metto regolarmente a dieta stretta, ma poi interrompo la dieta con un’abbuffata. La mia vita è fatta di abbuffate e digiuni.

	BES 8 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Raramente mangio così tanto da sentirmi sgradevolmente pieno/a.
	Circa una volta al mese, mangio così tanto da sentirmi sgradevolmente pieno/a.
	Ci sono periodi regolari durante il mese in cui mangio grandi quantità di cibo, ai pasti o fuori dai pasti.
	Mangio così tanto che di solito, dopo aver mangiato, mi sento piuttosto male ed ho nausea.

	BES 9 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	La quantità di calorie che assumo è abbastanza costante nel tempo.
	Qualche volta, dopo aver mangiato troppo, cerco di ridurre al minimo le calorie, per compensare l’eccesso di calorie che ho mangiato
	Abitualmente mangio troppo di notte. Solitamente non ho fame la mattina e mangio troppo la sera.
	Da adulto, ho avuto periodi di circa una settimana in cui mi sono imposto diete “da fame”, a seguito di periodi in cui avevo mangiato troppo. La mia vita è fatta di abbuffate e digiuni

	BES 10 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Di solito riesco a smettere di mangiare quando voglio. So quando è ora di dire basta.
	Talvolta avverto un impulso incontrollabile a mangiare.
	Frequentemente avverto forti impulsi a mangiare, che sembro incapace di controllare, mentre altre volte riesco a controllarmi.
	Mi sento incapace di controllare i miei impulsi a mangiare. Ho paura di non riuscire a smettere di mangiare volontariamente

	BES 11 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Non ho problemi a smettere di mangiare quando mi sento pieno/a.
	Di solito posso smettere di mangiare quando sono pieno/a, ma talvolta mangio così tanto da sentirmi sgradevolmente pieno/a.
	Per me è un problema smettere di mangiare una volta che ho iniziato e di solito mi sento sgradevolmente pieno/a dopo aver finito di mangiare
	Siccome per me è un problema smettere di mangiare, qualche volta devo provocarmi il vomito per avere sollievo.

	BES 12 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Quando sono con gli altri (incontri familiari, occasioni sociali) mi sembra di mangiare come quando sono solo.
	Talvolta quando sono con gli altri non mangio quanto vorrei, perché sono consapevole del mio disagio verso il cibo.
	Spesso mangio poco quando sono con altre persone, perché mangiare di fronte ad altri mi imbarazza.
	Mi vergogno così tanto di mangiare troppo, che per farlo scelgo i momenti in cui nessuno mi vede. In effetti, mangio di nascosto

	BES 13 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Faccio tre pasti al giorno e occasionalmente uno spuntino.
	Faccio tre pasti al giorno e normalmente anche gli spuntini.
	Quando faccio molti spuntini, salto i pasti regolari.
	Ci sono periodi in cui mi sembra di mangiare continuamente, senza pasti regolari.

	BES 14 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Non penso molto a controllare gli impulsi a mangiare non desiderati.
	Almeno qualche volta, la mia mente è occupata dal pensiero di come controllare i miei impulsi a mangiare.
	Sento che spesso passo molto tempo a pensare a quanto ho mangiato o a come fare per non mangiare più.
	Mi sembra che la maggior parte del mio tempo la mia mente sia occupata da pensieri sul mangiare. Mi sembra di essere continuamente in lotta per non mangiare

	BES 15 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Non penso molto al cibo.
	Mi capita di avere un forte desiderio di cibo, ma solo per brevi periodi di tempo.
	Ci sono giorni in cui non penso ad altro che al cibo.
	La maggior parte delle mie giornate è occupata da pensieri sul cibo. Mi sembra di vivere per mangiare.

	BES 16 - Quale sceglie fra le 4 affermazioni sotto? *Metta una sola crocetta*
	Di solito se sono affamato/a oppure no, prendo la giusta porzione per saziarmi.
	Occasionalmente, sono incerto/a se ho fisicamente fame oppure no. In questi momenti, mi è difficile capire quanto cibo ci vorrebbe per saziarmi
	Anche se sapessi quante calorie dovrei mangiare, non ho idea precisa di quanto sarebbe una "normale" quantità di cibo per me.

WHO-5

ISTRUZIONI: *Per ogni affermazione che segue, Le chiediamo di indicare la risposta che più si avvicina a come si è sentito **nelle ultime due settimane**. Metta una crocetta sul numero checorrisponde alla risposta da lei scelta*

	Mai	**A Volte**	**Meno della metà del tempo**	**Più della metà del tempo**	**Quasi sempre**	**Sempre**
1. Mi sono sentito allegro e di buon umore	1	2	3	4	5	6
2. Mi sono sentito calmo e rilassato	1	2	3	4	5	6
3. Mi sono sentito attivo ed energico	1	2	3	4	5	6
4. Mi sono svegliato sentendomi fresco e riposato	1	2	3	4	5	6
5. La mia vita di tutti i giorni è stata piena di cose che mi interessavano	1	2	3	4	5	6

BIAQ

ISTRUZIONI: *Per ogni affermazione che segue, Le chiediamo diindicare la frequenza con cui al momento attuale lei mette in atto i seguenti comportamenti.indicando con la crocetta la risposta da Lei scelta.*

	Mai	**Rararamente**	**Talvolta**	**Spesso**	**Molto spesso**	**Sempre**
1. Indosso vestiti larghi	1	2	3	4	5	6
2. Indosso vestiti che non mi piacciono	1	2	3	4	5	6
3. Indosso vestiti dai colori scuri	1	2	3	4	5	6
4. Indosso vestiti coprenti	1	2	3	4	5	6
5 Cerco di limitare la quantità di cibo che mangio	1	2	3	4	5	6
6. Mangio solo frutta, verdura e cibi a basso contenuto calorico	1	2	3	4	5	6
7. Digiuno per uno o più giorni	1	2	3	4	5	6
8. Evito situazioni sociali in cui posso essere osservato/a	1	2	3	4	5	6
9. Evito le situazioni sociali in cui temo si possa parlare di peso	1	2	3	4	5	6
10. Evito di uscire con persone più magre di me	1	2	3	4	5	6
11. Evito le feste durante le quali si mangia	1	2	3	4	5	6
12. Mi peso	1	2	3	4	5	6
13. Conduco una vita sedentaria	1	2	3	4	5	6
14. Mi guardo allo specchio	1	2	3	4	5	6
15. Evito di trovarmi in situazioni di intimità fisica	1	2	3	4	5	6
16. Indosso vestiti che distolgano l'attenzione dal mio peso	1	2	3	4	5	6
17. Evito di andare ad acquistare degli abiti	1	2	3	4	5	6
18. Non indosso abiti che rivelino le mie forme (costume da bagno, pantaloni corti)	1	2	3	4	5	6
19. Mi vesto elegantemente e mi trucco	1	2	3	4	5	6

EBQ

ISTRUZIONI: *Di seguito troverà una serie di domande che riguardano le abitudini alimentari. Per rispondere metta una sola crocetta sulla risposta che rispecchia come lei abitualmente si sente o si comporta.*

	Mai	**Raramente**	**Talvolta**	**Spesso**	**Sempre**
1. La mattina non ho fame o voglia di mangiare.	1	2	3	4	5
2. Se una pietanza mi è piaciuta molto, ne prendo un'altra porzione	1	2	3	4	5
3. Mi capita di lavorare fino a tardi e di conseguenza salto la cena	1	2	3	4	5
4. Quando ho voglia di mangiucchiare, scelgo prodotti come snack, merendine, cracker o salatini	1	2	3	4	5
5 Mi capita di mangiare così tanto a pranzo o a cena, che mi viene una forte sonnolenza e mi sdraio sul letto per riprendermi	1	2	3	4	5
6. Durante il giorno tento di stare attento a quello che mangio, ma la sera non riesco a controllare il mio appetito	1	2	3	4	5
7. Mi capita di saltare la cena, per sentirmi più leggero prima di dormire	1	2	3	4	5
8. Se mangio con amici o familiari, davanti a loro mangio normalmente, ma dopo il pasto continuo a mangiare gli avanzi o altri cibi che trovo a portata di mano.	1	2	3	4	5
9. Nella borsa tengo uno spuntino per colmare i miei attacchi di fame.	1	2	3	4	5
10. Faccio fatica ad addormentarmi o a dormire senza interruzioni per tutta la notte	1	2	3	4	5
11. Durante i pasti cerco di tenermi controllato, ma fra un pasto e l'altro mi capita di mangiare.	1	2	3	4	5
12. Quando mi abbuffo, mangio anche le cose che non mi piacciono	1	2	3	4	5
14. Dopo cena consumo più calorie di quelle che assumo durante il giorno	1	2	3	4	5
15. Mi capita di fare delle abbuffate	1	2	3	4	5
16. La mia vita è così frenetica che non mi permette di mangiare ad orari normali, così, quando riesco a mangiare, ho una gran fame e mangio più del dovuto	1	2	3	4	5
17. Non mi rendo conto di quanto mangio durante la giornata, perché mastico sempre qualcosa	1	2	3	4	5
18. Penso al cibo e a come controllarlo e faccio di tutto per mangiarne di meno	1	2	3	4	5
19. Esco di casa col preciso scopo di comprare del cibo per abbuffarmi	1	2	3	4	5
20. Mi capita di stare molte ore senza mangiare	1	2	3	4	5
21. Preferisco mangiare da solo, perché mi vergogno che qualcuno mi veda mangiare così tanto.	1	2	3	4	5
22. Quando ho un attacco di fame, non riesco a trattenermi, anche se mi accorgo di aver già mangiato molto	1	2	3	4	5
23. Tengo qualcosa in bocca, come una caramella o una gomma da masticare	1	2	3	4	5

	Mai	Rararamente	Talvolta	Spesso	Sempre
24. La sera è come se non avessi mai sonno	1	2	3	4	5
26. Non riesco ad assumere un'alimentazione sana	1	2	3	4	5
27. Una volta che ho iniziato ad abbuffarmi, so che per il resto della giornata non avrò il controllo su quello che mangio	1	2	3	4	5
28. Tendo a mangiare finché non mi sento pieno	1	2	3	4	5
29. Ci sono periodi in cui salto i pasti per disintossicarmi e depurare il mio organismo.	1	2	3	4	5
30. Mangio molto rapidamente rispetto alle altre persone	1	2	3	4	5
31. Se sto in compagnia di amici che mangiano, mangio qualcosa con loro, anche se non ho fame	1	2	3	4	5
33. Durante il giorno o ai pasti ho poca fame	1	2	3	4	5
34. Non arrivo a pranzo con la fame, perché mangio qualcosa nelle ore che lo precedono	1	2	3	4	5
35. Non riesco a resistere agli attacchi di fame e tento subito di colmarli con la prima cosa che trovo a portata di mano	1	2	3	4	5
36. Appena vedo qualcosa da mangiare non riesco a controllarmi e inizio subito a mangiare	1	2	3	4	5
37. Mi capita di mangiare fuori pasto fino a sentirmi pieno..	1	2	3	4	5
38. Quando trovo il mio cibo preferito, ne mangio in grandi quantità, anche se so che poco dopo dovrò pranzare o cenare.	1	2	3	4	5
40. Mangio una quantità di cibo abbastanza costante, ma quando vado oltre mi preoccupo subito.	1	2	3	4	5
41. Di notte, se non riesco a dormire, passo il tempo mangiando	1	2	3	4	5
42. Negli spuntini notturni preferisco i cibi che di solito evito di mangiare durante la giornata.	1	2	3	4	5
43. Quando ho fame durante il giorno mangio tranquillamente, pensando che mangerò di meno durante i pasti principali.	1	2	3	4	5
44. Nascondo i miei cibi preferiti per poterli mangiare quando sono solo.	1	2	3	4	5
45. Scelgo accuratamente il cibo che mangio, in modo da soddisfare la mia golosità.	1	2	3	4	5
46. Anche se non ho fame, continuo comunque a mangiare senza riuscire a smettere.	1	2	3	4	5
47. Ho una vita molto intensa e piena di impegni che mi costringe a rinunciare al pranzo.	1	2	3	4	5

	Mai	Rararamente	Talvolta	Spesso	Sempre
48. Durante i pasti mangio una quantità di cibo che le persone che conosco giudicano eccessiva.	1	2	3	4	5
49. Durante i pasti, anche se sono pieno, continuo a mangiare finché il piatto non è vuoto.	1	2	3	4	5
50. Adoro stare a tavola con le persone e cucino o porto in tavola una gran quantità di cibo.	1	2	3	4	5
51. Mi capita di mangiare le pietanze quando sono molto calde, correndo il rischio di scottarmi.	1	2	3	4	5
52. Con il calare della sera mi sento più giù di umore rispetto al giorno.	1	2	3	4	5
53. La mattina non faccio colazione.	1	2	3	4	5
54. Mi capita di saltare i pasti.	1	2	3	4	5
55. Dopo un'abbuffata mi sento in colpa.	1	2	3	4	5
56. Devo avere qualche cosa da mangiare a portata di mano.	1	2	3	4	5
57 Se mi sono abbuffato, tento di rimediare saltando il pasto successivo.	1	2	3	4	5
58 Mi piace mangiare di notte quando tutti dormono e nessuno mi può vedere.	1	2	3	4	5