UNIVERSITÀ DEGLI STUDI DI TRIESTE

XXXII CICLO DEL DOTTORATO DI RICERCA IN

NEUROSCIENZE E SCIENZE COGNITIVE

VULNERABILITY FACTORS AND DEVELOPMENTAL TRAJECTORIES OF EATING DISORDERS-RELEVANT ATTITUDES AND BEHAVIOURS IN NON-CLINICAL ADOLESCENTS

Settore scientifico-disciplinare: M-PSI 08

DOTTORANDA
ELIDE FRANCESCA DE CARO

COORDINATORE
PROF. TIZIANO AGOSTINI

SUPERVISORE DI TESI
PROF. LISA DI BLAS

CO-SUPERVISORE DI TESI
PROF. BARBARA PENOLAZZI

TABLE OF CONTENTS

Abstract 6

Acknowledgements 8

List of Abbreviations 10

Chapter 1 11

Theoretical background and problem statement

1.1 Definition, Epidemiology and Age of Onset of Eating Disorders 11

1.2 Eating disorders behaviours and attitudes: A sex-sensitive approach 13

1.3 Developmental trajectories of eating disorders during adolescence 15

1.4 Vulnerability models: Risk and protective factors for eating disorders 17

1.5 The role of Body Dissatisfaction and Body Image constructs in predicting Eating Disorders 21

1.6 Personality variables as vulnerability factors for Eating Disorders development 23

1.7 Personality variables as complication of Eating Disorders conditions 26

1.8 Environmental factors: Sociocultural influences and seasonality 27

1.9 Methodological issue regarding ED development and vulnerability models 29

1.10 Summary and open issues 31

1.11 Aims of the present research project 32

Chapter 2 34

The present longitudinal study

2.1 Study Design 34

2.2.METHOD 34

2.2.1 Participants 34

2.2.2 Measures 36

2.2.2.1 Eating Disorders Assessment for Man (EDAM) 36

2.2.2.2.Eating Disorder Inventory 2 (EDI-2) 37

2.2.2.3 Minnesota Multiphasic Personality Inventory for Adolescence (MMPI-A) 41

2.2.2.4 Rosenberg Self-Esteem Scale (RSE) 41

2.2.2.5 ED-related variables Cut-Off 41

2.2.2.6 Test-retest reliability 42

2.2.2.7 Body size estimation 46

2.2.2.8 Body Uneasiness Test (BUT) 47

2.2.2.9 Test-retest reliability 48

Chapter 3 52

Predictive validity of perceived body figures and self-esteem for understanding intra-individual and inter-individual changes in eating disordered behaviours and attitudes in adolescents

3.1 Introduction 52

3.1.1 Body figure ratings, Drive for Thinness, and Muscle Dysmorphia 53

3.1.2 Body figure ratings, Binge Eating, and Bulimia 54

3.1.3 Reflected body figure ratings and ED conditions 55

3.1.4 Self-esteem and ED conditions 55

3.1.5 Between people and within-person approaches 56

3.2 Current study: Aims and hypotheses 57

3.3 METHOD 58

3.3.1 Participants and procedures 58

3.3.2 Measures 58

3.4 RESULTS 60

3.4.1 Preliminary analysis: Missing data, Descriptive statistics, and Trajectories and covariations for independent variables 60

3.4.2 Within-person changes across time: Developmental trajectories, predictors and interaction effects for ED outcomes 62

3.4.3 Between- people associations across time: Temporal antecedents, correlated changes, and moderation analysis for ED outcomes, one-year later 67

3.5 Discussion 67

Chapter 4 71

Body Dissatisfaction, Body Uneasiness, Body Figure Perception and Body Weight: Factor Structure in Non-Clinical Adolescents

4.1 Introduction 71

4.1.1 Perceptual body image. 73

4.1.2 Reflected perceptual body image: The others 74

4.1.3 Attitudinal body image 75

4.1.4 Body Weight 76

4.1.5 Current Chapter aims 77

4.2 STUDY 1 78

4.2.1 METHOD 78

4.2.1.1 Participants and procedure 78
4.2.1.2 Measures 78
4.2.2 RESULTS 79
4.2.2.1 Preliminary analysis: Missing data, Descriptive statistics, and correlations for design variables 79
4.2.2.2 Principal Component Analysis (PCA) 84
4.2.2.3 Confirmatory factor analysis on Wave 2 data 87
4.2.2.4 Confirmatory factor analysis of 2-factor model on cross-sectional data 91
4.3 STUDY 2 91
4.3.1 Confirmatory factor analysis across sex and time: Factorial invariance and longitudinal invariance 91
4.3.1.1 RESULTS 93
4.4 Discussion 96
Chapter 5 99

Prospective reciprocal influences between Body Image related constructs and Eating Disorders symptoms among non-clinical adolescents
5.1 Introduction 99
5.1.1 Binge Eating, Muscle Dysmoprhia, Body Image and Body Dissatisfaction 100
5.1.2 Drive for Thinness and Bulimia, Body Image and Body Dissatisfaction 103
5.2 STUDY 1 105
5.2.1 METHOD 105
5.2.1.1 Participants and procedures 105
5.2.1.2 Measures 105
5.2.2 RESULTS 106
5.2.2.1 Bivariate correlation analysis and orthogonal projections of ED-related variables onto the 2-factor space 106
5.2.2.2 Longitudinal data: between-people association across time, antecedents, correlated changes 6 months, 1 year, 18 months, 2 years later 107
5.2.2.2.1 BI-related factors and Body dissatisfaction antecedents of ED-related outcome variables for boys and girls, and correlated changes 108
5.2.2.2.2 ED-related variables antecedents of BI-related factors and Body dissatisfaction 111
5.2.2.2.3 Path Analysis for testing seasonal effects 115
5.2.3 Discussion 117
5.3 STUDY 2 119

5.3.1 Within-person changes across time: Developmental trajectories and predictors 119

5.3.2 Discussion 121

Chapter 6 124

An examination of the temporal associations among body image, body dissatisfaction and eating disorders: Introducing personality and emotion regulation variables as moderators

6.1 Introduction 124

6.2 METHOD 128

6.2.1 Participants and procedures 128

6.2.2 Measures 129

6.3 RESULTS 129

6.3.1 Preliminary analysis: Bivariate concurrent correlations between ED-related outcome and personality variables, and emotion regulation 129

6.3.2 Personality and emotion regulation variables antecedents of ED-related variables 131

6.3.3 Personality variables and emotion regulation as moderators of temporal associations between BI-related constructs and ED-related outcomes 135

6.4 Discussion 140

General discussion 144

REFERENCES 152

APPENDIX 1 183

APPENDIX 2 185

APPENDIX 3 186

Abstract

Eating disorders (EDs) are regarded as a function of pubertal growth, personality, and body image (BI) development, as well as socio-cultural influences, during adolescence. Sex-specificities are getting more attention. However, empirical studies from this broad area of research do not systematically investigate EDs taking into account female and male specificities. The present PhD research project aims to explore vulnerability factors for increases in ED-related behaviours among boys and girls during adolescence, by conducting a 2-year longitudinal study. In literature, the onset and course of ED have been mostly connected with (1) body-related concerns and (dis)satisfaction, and (2) personality variables. However, vulnerability models have mainly been tested on females. Additionally, empirical findings reported mostly on inter-individual differences rather than intra-individual dynamics, with no study systematically investigating them. Body image (BI), and Body Dissatisfaction (BD), moreover, have been often used as interchangeable constructs and operationalized in many different ways, thus contributing to not fully coherent empirical findings. In the current project, we aimed to explore EDs development from an integrative perspective on the role of body-related constructs and personality among adolescent boys and girls, by using 1) a sex-sensitive approach in assessing EDs and 2) between-people and within-person approach simultaneously. In detail, the objectives of the present PhD project were as follows: 1) Defining trends of ED-related behaviours and attitudes, namely Muscle Dysmorphia (MD) and Binge Eating (BE) in males, and Drive for Thinness (DT) and Bulimia (Bu) in females, and their co-variations with BI-related constructs throughout adolescence, 2) Prospectively exploring the unique contribution of BI-related factors and BD in predicting ED outcome, further investigating their reciprocal influences, 3) Exploring multivariate models of ED by testing interaction models among BI-related and personality variables. The PhD thesis presents an introductory chapter providing a framework of prevalence and incidence of EDs in adolescents and vulnerability factors by evidencing the open issues related to sex-specificity. Chapter 2 presents an overview of the

longitudinal study, and constructs and measures assessed in the study. Chapter 3 presents an empirical study on how body self-perceptions contribute to predict within-person changes in adolescent sex-specific ED behaviours and attitudes across 1-yr. With the aim of investigating more in deep the multi-facet and somehow ubiquitous construct of BI, Chapter 4 explored BI-factor structure by conducting a confirmatory factor analysis on all the body-related measures herein involved, across 5 waves, further testing for factorial invariance across gender and longitudinal invariance, across time. Chapter 5 represents an empirical contribution to prospectively inspect the unique impact of BI-related factors and BD on sex-specific ED outcomes. Chapter 6 aimed at further investigating the BI-ED association by including personality variables, as potential unique predictors as well as moderators. Results provided some original contributions, extending BI and ED research, as follows: 1) ED outcomes were moderately stable across 1 year with a general intra-individual attenuating trajectory across a 2-year time span, 2) Individual changes in BE and MD in boys co-varied with their actual body-related self-perceptions across 1 year, and actual body shape and weight perception predicted DT in girls, along with their desired thin ideal body at intra- and inter-individual levels, 3) The support for the Cash's 2-factor model of BI among non-clinical adolescents, 4) Meaningful differences in the predictive validity of BI-related domains and BD for sex-specific ED symptoms, lastly 5) Individual differences in personality and emotion regulation aspects were unique predictors of EDs.

AKNOWLEDGMENTS

The first person I profoundly want to thank is my mentor Prof. Dr. Lisa Di Blas, for accepting research projects since my Master degree to PhD and for her valuable guidance and patience over the past six years, during which she supported me in every step of my training and personal growth. I thank my co-supervisor Prof. Dr. Barbara Penolazzi, and Prof. Dr. Michele Grassi, who provided me valuable support for data analyses.

I would express my gratitude to the high school ITET Gaetano Salvemini, Molfetta (BA) in person of the head teacher Prof. Lafasciano Sabino, the teachers all, and particularly Prof. Elisabetta Minervini, Prof. Maria Turtur and Prof. Caterina Spaccavento for their precious help in allowing me to conduct the research project in the school environment. I thank very much the students and their parents, who took part to the project with high efforts, involvement and motivation.

I am grateful to Prof. Dr. Barbara De Clercq and Filip De Fruyt for giving me the opportunity of staying at Ghent University and working on my PhD thesis, by extending and improving both language and statistical skills. I thank all the members of UGent Advisory Committee who approved my research project and provided me valuables suggestions.

For his friendship and the valuable support in learning new statistical techniques I used for elaborating the current PhD thesis, I profoundly thank Dr. Victor Rouco, who I met at Ghent University during my semester there.

I thank vary much my friend Marco Ruaro, Teacher of English as a foreign language at ILA Vietnam, for the precious help in editing the English language of the PhD thesis.

I am grateful to Dr. Sara Monticolo for giving me the opportunity of a clinical fellowship in the Integrate Clinical Service for Eating Disorders, Trieste, allowing me to extend knowledge and clinical skills of ED diagnosis and treatment.

Thanks to my family, firstly for providing me stable and loving foundation and secondly for installing in me courage, a sense of curiosity and faith in myself, considered as important qualities to cope unpredictable life events.

Finally, thanks to those that I have met along the way.

List of Abbreviations

AN = Anorexia Nervosa

BD = Body Dissatisfaction

BDD = Body Dismorphic Disorder

BE= Binge Eating

BED = Binge Eating Disorder

BF= Body Figure

BI = Body Image

BMI = Body Mass Index

BN = Bulimia Nervosa

Bu = Bulimia

DSM-V = Diagnostic and Statistical Manual of Mental Disorder- 5^{th} edition

DT= Drive for Thinness

ED = Eating Disorder

FD = Feeding Disorder

MD = Muscle Dysmorphia

Chapter 1

Theoretical background and problem statement

1.1 Definition, Epidemiology and Age of Onset of Eating Disorders

Eating disorders are severe and complex mental health conditions characterized by dysfunctional eating-related behaviors and attitudes and excessive concerns towards food, body image, weight and shape. They represent (common) clinical conditions which affect a large part of the general population, further showing high comorbidity levels with other psychopathological conditions and severe health-related problems. In the current Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-V; Edition, 2013), eating disorders are defined as a full syndrome with a specific criteria set. The DSM-V "Feeding and Eating Disorders" section distinguishes among ED categories, namely, Anorexia Nervosa (AN), Bulimia Nervosa (BN) and Binge Eating Disorder (BED), and three feeding disorders (FD) categories, namely, Pica, Rumination disorder and Avoidant/Restrictive Food condition (Edition, 2013; Leme, Thompson, Dunker, Nicklas, Philippi, Lopez et al., 2018).

Difficulties and consequences involved in ED conditions such as emotional distress, depression, suicide, and mortality impact on different aspects of people's life, including psychological functioning, interpersonal relationships, and body perception and satisfaction. Furthermore, these psychopathological conditions tend to become chronic. The relapses after initial ED onset contribute to cross-over different ED categories during the entire lifetime, with the consequence of a "migration" (Favaro, Busetto, Collantoni, Santonastaso, 2019, p. 205) of individuals from one diagnosis to another. However, the cross-over trend does not result in modification in observed patterns of age of onset (Favaro, et al., 2019).

From epidemiological studies, data revealed that incidence and prevalence of EDs vary in phenotype by age, sex, and ethnicity. Epidemiological data from Europe reported increases of Anorexia and Bulimia Nervosa diagnoses, in accordance with DSM-V criteria set, among female

population. The percentages are as follows: 1–4% for AN and 1–2% for BN; 1-4% for Binge eating disorder, and 2-3% for sub-threshold eating disorders (Mustelin, Silén, Raevuori, Hoek, Kaprio, & Keski-Rahkonen, 2016; Keski-Rahkonen, & Mustelin, 2016). Recent studies suggested that between 0.3 and 0.7% of men are affected by EDs (Mitchison, & Mond, 2015).

As to the Italian population, the European Study on the Epidemiology of Mental Disorders reported a similar trend of EDs prevalence in accordance with DSM-V categories: for both men and women, aged ≥ 18 it was by 3.3% (IC: 2.2-5.0). Several epidemiological studies suggest that an increasing trend in prevalence rate of EDs, across years, is likely due to changes in diagnostic criteria from DSM-IV to DSM-V, i.e. the removal of amenorrhea criterion for AN diagnosis (Attia, & Roberto, 2009), and the inclusion of partial-syndromes in the diagnostic process. On one hand the DSM-V criteria contribute to reduce the cross-over percentage and EDNOS diagnosis (i.e. Eating Disorder not otherwise specified) compared with DSM-IV. On the other hand, epidemiological studies highlight that a diagnostic instability (Favaro, et al., 2019) is still significant. Indeed, the number of people requiring and receiving treatment is generally increasing, although only one-third of them is diagnosed (i.e. full-syndromes of EDs) and detected by healthcare. Thus, basing on the full-syndromes diagnosis criteria, ED prevalence and incidence result generally underrated.

The wide variability in EDs estimation in the general population have also been related to the specific Age of Onset (AOO). Typically, the AOO peak of ED symptoms spans from adolescence to early adulthood (Favaro, et al., 2019). However, epidemiological studies have been frequently conducted on general population by involving late teenagers and young adults, thus providing only few systematic data on (subclinical) pathways and risk factors favouring ED development during teenage years (Ornstein, Rosen, Mammel, Callahan, Forman, Susari, et al., 2013). Usually, body dissatisfaction and uneasiness have been reported as core symptoms of ED, often as the first symptom (Fairburn, & Harrison, 2003), and investigated as indicators of ED. However, other studies have emphasized them as risk factors of ED conditions and development rather than ED symptoms. The latter perspective has been supported by evidences that body

dissatisfaction and uneasiness do not systematically involve other typical ED symptoms (i.e. drive for thinness, bingeing, purging), but they rather clinical relevant conditions such as depression, anxiety and mood disturbances (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2010). In the present thesis this perspective was favoured and core sex-specific ED conditions were reported as outcomes.

The next paragraph focuses on eating disorder relevant behaviours and attitudes, namely muscle dysmorphia, binge eating, drive for thinness and bulimia, in order to shed light on partial syndromes and subclinical conditions that may affect both males and females teenagers during school years.

1.2 Eating disorders behaviors and attitudes: A sex-sensitive approach

Dysfunctional eating behaviours and attitudes have generally been classified on a continuum which ranges from body weight and shape concerns, extreme weight-control strategies including fasting, bingeing, purging, and excessive exercise to eating disorders such as anorexia and bulimia nervosa (Shisslak, Crago, & Estes, 1995; Stice, Killen, Hayward, & Taylor, 1998). Specifically, excessive body weight and shape concerns represent the most recurrent factors reported in clinical anamneses. Thus, body dissatisfaction represents a basic risk factor in many etiological models (Cooley & Toray, 2001). However, such etiological models have been developed and tested mostly on young girls and women (Tiggerman, 2005). For instance, when both females and males were involved, empirical studies on the relationship between body dissatisfaction and ED onset have often shown that BD is very common among girls and young females rather than among boys; moreover, only a small percentage of males reported body dissatisfaction and was affected by weight-related behaviours (Murray, Nagata, Griffiths, Calzo, Brown, et al., 2017; Nùnez-Navarro, Aguera, Krug et al., 2012; Ricciardelli & McCabe, 2003). Recently, a growing body of research is reporting that males may suffer from dissatisfaction with their own weight and shape in a different way from females (Cafri, Thompson, Ricciardelli, McCabe, Smolak, & Yesalis, 2005; Calzo, Sonneville, Hainess, Blood, Field, & Austin, 2012). In particular, males are more likely to be

concerned with muscularity (muscle, size, tone and definition) rather than adiposity or weight as typically reported by females who are more likely to drive for thinness. During adolescence, behavioural problems associated with the pursuit of muscularity amid boys range from transitory body and weight concerns to extreme weight control methods which may result in excessive exercise or even in clinical exercise dependence. Such an extreme exercising physical activity among adolescents includes working out and lifting weights beyond limits, and represents a core feature of the construct labelled as m*uscle dysmorphia* (Grieve, 2007; Olivardia, 2007). The prevalence of MD symptomology has increased in the general population, but remained less investigated in pre-adolescents and adolescents (Madden, Morris, Zurynski, Kohn, & Elliot, 2009). Male-related specificities have also emerged when dysfunctional excessive food intakes were taken into account. Studies have shown that adolescent boys are more likely to self-report *binge eating* (BE) rather than *bulimia*. *Binge eating* symptoms include episodes of binge eating without compensatory behaviours (i.e. use of laxative and self-induced vomiting), thus distinguishing it from *Bulimia* (Murray et al., 2017). As a result *drive for muscularity* and *binge eating* can be observed among males.

Focusing on females two main distinct patterns have repeatedly emerged, i.e. a restrictive and a bulimic pattern. The former includes progressive weight-control behaviours (i.e. dieting, fasting and exercising excessively) in order to lose weight and pursue the thin ideal body. The latter includes as well a restrictive control on food intake, but along with binge episodes and compensatory behaviours, such as self-induced vomiting and use of laxatives (Bardone-Cone, Abramson, Vohs, Heatherton, & Joiner, 2006; Murray, et al., 2017; Schwitzer, Rodriguez, Thomas, & Salimi, 2001). Specifically, [1]*drive for thinness* and *bulimic* behavioural pattern represent more typical ED risk indicators among girls. Drive for thinness involves excessive concerns of becoming fat combined with extreme fear of caloric foods and desire to be thin. Bulimic behavioural pattern

[1] Constructs in cursive refer to disordered eating behaviours and attitudes which are the main focus of the current PhD thesis

as already described, combines bingeing, that are overeating episodes with sensations of losing control, and purging methods which adolescents use as weight-control strategy (after bingeing episodes).

Sex-differences have also been observed in the emotional distress related to bingeing episodes, with girls showing greater negative affect levels rather than boys (McCabe, & Ricciardelli, 2003; Murray, et al., 2017). Clinically, binge eating episodes have also been related to body dysmorphic disorders (BID) with recurrent weight/ shape overvaluation among girls and young woman, and in the case of young boys, they were often related with weight-shape underestimation (Cafri, et al., 2005). However, empirical studies on male-related EDs are few and sparse in comparison with those on females.

Studies on developmental ED trends within a specific age frame revealed sex-differences, as well. The next section provides a summary of studies on developmental trajectories across genders.

1.3 Developmental trajectories of eating disorders during adolescence

During adolescence, the onset of eating problems has generally been related to pubertal growth, body image development, meant as a part of self-concept, personality development, and socio-cultural influences (O'Dea, & Abraham, 1999). However, adolescence represents a crucial developmental phase, during which transitory changes in dysfunctional eating patterns are observed as well. For example, Fairweather-Schmidt, & Wade (2016) found that mean level of ED global score did not increase among adolescent females over time, although analyses showed three well-distinguished trajectories of ED, highlighting a significant variability in these scores across adolescence. In fact, they defined three main ED developmental trajectories during adolescence among girls: 1) low static, that is no growth of ED over time, 2) attenuating with a strong decreasing intercept across time and 3) escalating with increasing levels across time. Similarly, Aimè and colleagues (2008) identified five ED trajectories in adolescent boys and girls: 1) no eating problems; 2) stable eating problems across time; 3) initially relevant but a slightly declining ED trajectory, 4) initially relevant ED levels becoming chronic, chronic trajectory, and 5) initially

relevant ED levels with an increasing trajectory (Aimè, Craig, Pepler, et al., 2008). As to sex-differences, findings showed that the proportion of boys and girls within each eating trajectory group was significantly different. The proportion of girls compared to boys was higher in the stable ED trajectory, high-decreasing group, and chronic group. The authors did not find any difference across gender for the increasing ED trajectory. Recently, Verschueren and colleagues (2019) have found a general increase of bulimic symptoms, whereas Drive for Thinness remained stable over a two-year period in both adolescent boys and girls (Verschueren, Claes, Palmeroni, Bogaerts, et al., 2019). Lastly, Keel and colleagues (2007) reported a general within-person drop in DT and BU from late adolescence to midlife in males and females (Keel, Heartherton, Baxter, & Joiner, 2007).

Overall, these studies provided coherent findings which resulted from different analytical approaches, i.e. repeated measures multivariate analysis, growth mixture modelling, and multi-level modelling, for understanding developmental trajectories of ED across adolescence and from late adolescence into midlife. However, their main limit is a lack of sex-sensitive approach in assessing EDs amid boys. In fact, Verschueren, et al. (2019) used 13 items from Eating Attitudes Test -26 for both boys and girls (Verschueren, et al., 2019), and Aimè, et al. (2008) and Fairweather-Schmidt & Wade (2016) administered the Eating Disorder Inventory-3, despite the fact it has been shown that EDI-3 does not systematically capture eating problems in boys (De Caro, & Di Blas, 2016; Standford, & Lemberg, 2012).

As to the co-variation between risk factors and ED developmental trajectories across time, Verschueren and colleagues further showed that body dissatisfaction characterized both asymptomatic and symptomatic groups of adolescent girls, further highlighting that body dissatisfaction may represent either a normal discontent among girls, or a risk factor for ED development, when combined with a strong wish of being thinner. These findings corroborate previous findings by Gardner and colleagues (2000) who showed that body dissatisfaction and larger perceived body size are becoming significant predictors at 11 and 14 years; in addition, a thinner ideal body size at 12 years predicts later ED onset in both boys and girls (Gardner, Stark,

Friedman, & Jackson, 2000), although the authors reported sex-differences of perceived body figures, Body Mass Index (BMI) and weight gain between boys and girls. Girls were found to be more sensitive to the impact of both actual and ideal perceived body figure, but less sensitive to both BMI and weight gain for ED development. Both boys and girls, however, were sensitive to changes in height and weight, especially girls when compared relative to normative data for their age group (Gardner, et al., 2000).

In general, epidemiological data suggest that the incidence of EDs in early adolescence (ages 10-14) is relatively low (i.e. the majority of adolescents show low-static and asymptomatic ED trajectories), but risk factors for ED symptoms start escalating in early adolescence, with a later onset for boys rather than girls (Mithcinson, & Mond, 2015).

These findings suggest the importance of investigating developmental trajectories and correlates in order to detect individual variability and sex-specificities of risk as well as protective factors of stable, increasing and decreasing ED trajectories across time.

1.4 Vulnerability models: Risk and protective factors for eating disorders

During the last decades, several theoretical and methodological models have been developed in order to understand determinants, risk and protective factors, as well as consequences of unhealthy weight-control behaviours and ED conditions. Initially, research on etiological models involved mainly female population and patients affected by ED full syndromes. Thus, developmental precursors of ED partial syndromes remained less investigated. Risk and protective factors that have mainly been investigated are *body dissatisfaction*, *interceptive awareness*, *personality variables* such as *low self-esteem, perfectionism, obsessiveness, depression and ineffectiveness,* and interpersonal factors such as peer and family relationships (Culbert, Racine, & Klump, 2015). Originally, however, they were mostly identified from studies correlational and cross-sectional conducted on clinical population of females with a lifetime diagnosis of ED (Abbate-Daga, Gramaglia, Malfi, Pierò, & Fassino, 2007; Neumark-Sztainer, Wall, Story, & Perry, 2003). Thus, the most common etiological models include variables that were originally observed in

clinical or at risk populations. Later, etiological models started to be tested among high school adolescent girls. For example, Leon and colleagues (1999) found that poor interoceptive awareness and ineffectiveness as well as negative affect predicted increases in ED risk conditions across time (Leon, Fulkerson, Perry, Keel, & Klump, 1999; Striegle-Moore, Silberstein, French, & Rodin, 1989). Button and colleagues, demonstrated that girls who referred low self-esteem at 11-12 years of age were significantly at risk of developing EDs at the age 15-16 years (Button, Sonuga-Barke, Davies, & Thompson, 1996). Other authors corroborated self-esteem as significant predictor of EDs, further including *binge eating* behaviours among adolescent girls (Ghaderi, & Scott, 2001; Stice, Presnell, & Spangler, 2002).

Recently, increasing attention has been focused on the associations between self-esteem and ED onset. For instance, Bjornelv and colleagues (2011) observed that adolescent girls but not boys who were underweight tend to report higher self-esteem, whereas lower self-esteem was associated with overweight and obesity in both boys and girls (Bjornelv, Nordhal, & Holmen, 2011). In fact, the negative association between self-esteem and body weight generally is more consistent among girls rather than boys (Bjornelv, et al., 2011; Stice, 2001). Among adolescents boys, indeed, an overall weak to moderate cross-sectional association between low self-esteem and weight loss and eating behaviours (i.e. binge eating, dieting) were found (Neumark-Szteiner, & Hannan, 2000). Ricciardelli & McCabe (2003) in their longitudinal study showed no association between low self-esteem and weight loss behaviours 8-month apart, amid boys (Ricciardelli, & McCabe, 2003).

Further conceptualizations on vulnerability models for ED onset have been proposed in accordance with its multifactorial etiology (Bakalar, Shank, Vannucci, Radin, & Tanofsky-Kraff, 2015; Culbert, et al., 2015). They included other factors, alongside weight and shape concerns and self-esteem deficits, such as emotional dysregulation and other dimensions of interpersonal functioning such as peers' and parents' pressure to be thin, and parental bonding (Fairburn, 2002; Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004). Nevertheless, only two vulnerability models

turned out to be empirically robust: the Dual Pathway model (Stice, 2001) and the Trans-diagnostic model (Fairburn, Cooper, & Shafran, 2003).

Overall, both models highlight the relevance of the internalization of a thin ideal body as portrayed by the media along with the external pressure to be thin, especially from peers and parents, beyond traditional factors such as self-esteem and perfectionism. The main focus of these recent theories is on internalization processes of the thin ideal body, promoted by the Western culture, where physical appearance has to meet a social standard in order to be acceptable (Stice, 2001; Fairburn, et al., 2003; Polivy, & Herman, 2002), even if difficult and unhealthy to achieve (Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004). Very recently, Stice and his colleagues (2019), in accordance with the Dual Pathway model, investigated the temporal sequencing of risk factors in predicting ED changes, and found that the pressure to be thin predicted body dissatisfaction, which in turn predicted dietary restraint. In the temporal sequencing of risk factors, the authors have also found dietary restraint to anticipate negative affect, which in turn predicted the onset of disordered eating such as bingeing and purging behaviours among young girls (Stice, & Van Ryzin, 2019).

The Trans-diagnostic model (TM) derives from cognitive-behavioural formulations of the maintaining factors and common features of EDs, among patients with anorexia, bulimia and atypical ED under treatment (Fairburn, et al., 2003). Specifically, the model focuses on weight and shape over-evaluation as the main factor, responsible for the tendency to engage in weight-control behaviours, which loads to a progressive restriction of food intake to the binge/purging cycle. Furthermore, this model includes also 4 hypothetical intervening factors (i.e. trans-diagnostic factors) favouring ED development: perfectionism, low self-esteem, mood regulation, and interpersonal difficulties (Fairburn, et al., 2003).

Overall, the majority of available data support the validity of both models, mainly in women at risk of developing an ED and/or with diagnosable ED conditions (Stice, 2016). Few studies, however, have tested these vulnerability models on non-clinical male population (Cafri, &

Thompson, 2004; Dakanalis, Clerici, Caslini, Gaudio, Serino, Riva, & Carrà, 2016; Dakanalis, & Riva, 2013; Olivardia, Pope, Borowiecki, & Cohane, 2004). Dakanalis and colleagues (2014), for instance, have tested the TM among undergraduate men, providing overall support for it, although not all expected associations were found. They observed significant path connecting between weight and shape concerns and exercising, and significant paths from binge eating to exercising and other compensatory behaviours (i.e. purging), whereas no significant path from restriction to binge eating (Dakanalis, Timko, Clerici, Zanetti, & Riva, 2014). As to the maintaining factors, i.e. perfectionism and self-esteem, the authors have found indirect effect via concerns about shape and weight on both binge eating and exercise behaviours (Dakanalis, et al., 2014).

Lamanna and colleagues (2010) have preliminary tested the vulnerability factors postulated in both Dual Pathway and Trans-diagnostic models in university students men. They found that sociocultural influences lead to body dissatisfaction, which has a direct impact on eating disorders including *muscle dysmorphia* (Lamanna, Grieve, Derryberry, et al., 2010). Similar findings have been found by Bégin and colleagues (2019) showing a good fit of Stice's Dual Pathway (2001) model among university students male (Bégin, Turcotte, & Rodrigue, 2019), and Rodgers and colleagues, supporting the model among French adolescent boys (Rodgers, Ganchou, Franko, & Chabrol, 2012).

Overall, both models combine the effects of several factors, i.e. self-esteem, perfectionism, negative affect, including mediation and interaction effects (Friestad, & Rise, 2004) through which the models postulate body dissatisfaction and internalization of thin ideal body having an impact on ED development among both male and female population (Bègin, et al., 2019; Fairburn, et al., 2003; Lamanna, et al., 2010; Stice, 2001). From multivariate models, however, sex-differences emerged as well. Friestad & Rise (2004), for instance, found that body dissatisfaction interacted with self-esteem in predicting dieting among adolescent boys (15-18 years old), while body dissatisfaction was the unique predictor of dieting among girls. These findings suggest the

postulated associations may be different in strength and pathway across gender (Friestad, & Rise, 2004).

Recently, indeed, an increasing attention is directing on testing interaction models for EDs onset (Stice, 2016; Stice, & Desjardins, 2018), and across gender (Bègin, et al., 2019).

However, such multivariate models are mainly tested cross-sectionally, not providing robust longitudinal evidences. Specifically, Stice (2016) reviewed both cross-sectional and longitudinal studies on mediation and moderation models (i.e. those further developed from the originally Dual Pathway and Trans-diagnostic model) highlighting that they did not explain a large variance proportion in ED changes across time (Stice, 2016).

Further investigations are needed, therefore, in order to better understand the processes underlying the development of ED symptoms within male and female population during adolescence, and controlling for baseline levels of EDs (Stice, 2016).

The following paragraphs aimed to examine vulnerability factors mentioned above and their relationship with ED onset and exacerbation.

1.5 The role of Body Dissatisfaction and Body Image constructs in predicting Eating Disorders

Body Dissatisfaction represents well-known risk factor for ED development during adolescence as postulated in vulnerability models such as Dual Pathway and Trans-diagnostic model (Fairburn, et al., 2003; Cooley, & Toray, 2001; Ricciardelli, & McCabe, 2001; Stice, 2001). Such a construct represents a negative evaluation of one's own body figure or parts, and it is conceptually different from body size and shape self-perception and estimation (Cash, & Deagle, 1997). In addition, body dissatisfaction has been found to prospectively predict inter-individual increases in both drive for thinness and bingeing/purging behaviours among male and female adolescents controlling for their baseline levels and BMI (De Caro, & Di Blas, 2016; Cooley & Toray, 2001; Stice, 2001). Further longitudinal studies have shown, however, different findings when body perception and satisfaction were investigated in the same vulnerability model in order to examine their unique contribution. In fact, Keel and his colleagues, in their 20-year-long

longitudinal study, found that lower body weight and shape perception, but not body satisfaction, predicted within-person decreases in Bulimia among women, whereas higher weight and shape perception predicted within-person increases in Drive for Thinness among men (Keel, Baxter, Heatherton, & Joiner, 2007). Their findings highlight two main issues: 1) the importance of systematically investigating both body perception and (dis)satisfaction, because they represent two different elements of body image, and 2) the fact that inter-individual findings may not reflect intra-individual findings, and vice-versa. Regarding the first issue, several studies often overlapped body dissatisfaction and body self-perception on body image construct, and use them in an interchangeable way. As matter of fact, body image construct is more complex. Body image is a multidimensional concept (Cash, 2004) which plays a relevant and well-documented role in the clinical field with regard to the onset of eating disorders (ED) and their development across time. In relation to EDs, body image has been studied from several perspectives, including sociocultural, cognitive-behavioural, and clinical (Cash, and Smolak, 2011). Originally, defined as an individual mental picture of her/his own body, that is the way s/he imagines her/his body appears (Schilder, 1950). In early 2000, BI was defined as a higher-ordered construct which includes, perceptions, thoughts, and feelings about her/his body, including those elements originally considered by Schilder such as body size perceptions and estimation, evaluation of body attractiveness, and emotions such as uneasiness associated with body shape and size (Grogan, 1999). In his model, Grogan proposed body dissatisfaction as an interstitial construct located between purer cognitive (i.e. thoughts and evaluations of body attractiveness), and emotional components (i.e. emotions and specific affection associated with body shape and size). Grogan's proposal stimulated the development of further models, with the aim of clarifying and examining the multi-componential construct of BI, among which, the one currently and mostly implemented, is Cash's model of attitudinal body image (Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002). Cash's model (2002) involves attitudinal (i.e. body image concerns, weight phobia, body uneasiness feelings a etc.) and perceptual domains (i.e. body weight and shape self-perception, discrepancy between

actual and ideal body shape and weight). In Cash's model body dissatisfaction contributes to body image attitudinal factor, although they represent distinct elements of the more complex BI construct (Cash, & Deagle, 1997; Cash, et al., 2002). Furthermore, BI-related factors have been found to play a different role in predicting ED development. Cross-sectional studies have shown attitudinal domain of BI predicting ED better than perceptual BI domain and body dissatisfaction among clinical and non-clinical women (Cash, & Deagle, 1997). However, it is worth mentioning that perceptual factors have been less investigated than attitudinal one and body dissatisfaction (Bibiloni, Pich, Pons, & Tur, 2013; Kling, Kwakkenbos, Diedrichs, Rumsey et al., 2019).

Body dissatisfaction has also been defined as a "normal discontent" amid both boys and girls, suggesting that individuals who experience body dissatisfaction not necessary develop an eating disorder (Lieberman, Gauvin, Bukowski, & White, 2001). Thus, its role in predicting ED has been critically reviewed in light of others body image dimensions which are emerging as relevant in ED development (Allen, Byrne, McLean, & Davis, 2008). For example, Allen and colleagues (2008) in their recent perspective study, have shown that body dissatisfaction and weight and shape concern (i.e. a dimension of attitudinal BI) predicted restraint, while only weight and shape concern predicted binge eating among pre-adolescent boys and girls (8 to 13 year old; Allen, Byrne, McLean, & Davis, 2008). The authors suggested to further investigate, prospectively, specific BI variables, and supported the theoretical differences between BD and BI (Bornioli, Lewis-Smith, Smith, Slater, & Bray, 2019; Cash, et al., 2002; 2004).

Furthermore, given the importance of intervening factors, such as personality variables as posited in multivariate models (i.e. those mentioned in paragraph *1.3*) on the associations between BI-related factors, BD and ED variables, the next paragraph will examine the role of personality variables.

1.6 Personality variables as vulnerability factors for Eating Disorders development

The increased severity levels of eating disorders along a continuum have often been connected with some important personality variables, i.e. *low self-esteem, perfectionism,*

obsessiveness and neuroticism (i.e. depression related conditions, anxiety), ineffectiveness, and the ability of recognizing and identifying bodily stimulus (i.e. anger and satiety) so called "*interoceptive awareness*" (Peck, & Lightsey, 2008; Polivy, & Herman, 2002). Identifying personality traits that make individuals more vulnerable to develop an ED has therefore important implications for both prevention programs and clinical treatments (Klump, Strober, Bulik, & Thornton, 2004; Hopwood, Ansell, Fehon, & Grilo, 2010; Shaw, Stice, & Becker, 2009). Personality variables are implicated in maintaining as well as developing processes of ED conditions, further interacting with external life events, such as long separation experience from the family, parental divorce, death of a parent, sexual abuse (Fairburn, et al., 2003; Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006; Speranza, Atger, Corcos, Loas, Guilbaud, et al., 2003).

Overall, scientific literature has consistently shown that personality variables prospectively predicted ED-related behaviours and attitudes (Tyrka, Waldron, Graber, & Brooks-Gunn, 2002), and emerged in elevations around slopes in personality profiles of patients affected by ED compared with general population (Lilenfeld, et al., 2006).

Nevertheless, findings on personality variables predicting ED development have often derived from studies which did not control for initial or baseline levels of ED. Methodologically, controlling for initial levels is essential in order to ensure that baseline personality variables predicted the onset of ED (Lilenfeld, et al., 2006; Stice, 2016). In fact, only non-clinical samples should be investigated at the baseline in order to explore which personality variables are temporal antecedents of increases in ED across time (Stice, 2016; Stice, & Desjardins, 2018). Longitudinal findings already present in literature have shown that self-critical *perfectionism*, *ineffectiveness*, and urgency are relevant predictors of later onset of dysfunctional restrictive and bulimic pattern (Boone, Soenens, & Luyten, 2014). Referring to other personality variables, studies have demonstrated the role of poor *interoceptive awareness*, *depression* and *negative affect* in predicting

increased ED symptoms among adolescent boys and girls (Leon, Fulkerson, Perry, & Early-Zald, 1995; Leon, Fulkerson, Perry, Keel, & Klump, 1999; Vohs, et al., 1999; De Caro, & Di Blas, 2016).

Interoceptive deficits have been observed as trans-diagnostic feature of EDs, but its role as predictor or consequence of an ED condition is less known (Polivy, & Herman, 2002). Specifically, low interoceptive awareness has often been connected with low impulse regulation (De Caro, & Di Blas, 2016) and emotional distress (Young, Williams, Pink, Freegard, et al., 2017), which in turn predicts dysfunctional eating behaviours in the adult and adolescent population (Fassino, Piero, Gramaglia, & Abbate-Daga, 2004; Giuliani, & Berkman, 2015; Martin, Dourish, Rotshtein, Spetter, & Higgs, 2019). Thus, a direct causal association with ED development has not been demonstrated yet, rather interoceptive awareness has been hypothesized to play a role as intervening factor in mediating and/or moderating the association between body weight and shape concerns and dissatisfaction and EDs (Ouwens, van Strien, van Leeuwe, & van der Staak, 2008; Sim, & Zenan, 2006)

Self-esteem negatively correlates with both restriction and bingeing, in both adolescent girls and boys (Mäkinen, Puukko-Viertomies, Lindberg, Siimes, & Aalberg, 2012; Shea, & Pritchard, 2007). Longitudinal studies showed that low self-esteem predicts bulimic, bingeing and restrictive behaviours among both adolescent girls and boys (Ghaderi, & Scott, 2000; Goldshmidt, Wall, Zhang, Loth, & Neumark-Sztainer, 2016; Vohs, et al., 1999). Furthermore, Dakanalis and colleagues found that low self-esteem predicted the initiation of regular *binge eating* among college men, 9-month apart (Dakanalis, et al., 2016). Conversely, inconsistent findings have been found about the association between self-esteem and *muscle dysmorphia*. Low self-esteem, indeed, has been conceptually included as a risk factor for the development of muscle dysmorphia (Grieve, 2007; McCreary, & Sasse, 2000) and found to predict MD among university students (Murray, Rieger, Karlov, & Touyz, 2013), but not among men bodybuilders and athletes who rather reported high self-esteem levels (Cerea, Bottesi, Pacelli, Paoli, & Ghisi, 2018).

Research has again shown more consistent findings on the role of personality variables in predicting ED-related outcome among females rather than males population (Davis, Karvinen, & McCreary, 2005; McCreary, & Sasse, 2000; Lamanna, et al., 2010).

Thus, given these mixed findings, especially across gender, further studies are necessary for understanding the association of selected personality variables with eating disorders and their interplay with the core risk factors of ED, i.e. body image and body dissatisfaction, in predictive models. The associations among selected personality variables and ED relevant conditions are presented more in deep in Chapter 6.

1.7 Personality variables as complication of Eating Disorders conditions

The so-called complication model is also helpful for understanding the relationship between personality and eating disorders (Lilenfeld, et al., 2006). It assumes that individual changes in personality profiles can be the result or a complication of an initial ED condition. Examining the effects of ED on personality is important in order to prevent the ED relapses due to changes in personality traits (Lilenfeld, Stein, Bulik, Strober, Plotnicov, et al., 2000; Klump, et al., 2004). Nevertheless, no study has systematically addressed both the vulnerability and complication models. Therefore, vulnerability conditions as opposed to the consequent implications in personality characteristics have not been disentangled.

Past research has shown, for example, that *obsessiveness* may be considered the result of a starved state (i.e. a state related to long fasting behaviors), because of it emerged higher among currently ill and recovered individuals when compared with never ill individuals (Kaye, Greeno, Moss, Fernstrom, Fernstrom, et al., 1998). Similar findings were observed for higher levels of ineffectiveness, harm avoidance, and poor interoceptive awareness in women with anorexia nervosa compared with non-ED women (Casper, 1990). However, these studies have the main limit of comparing patients vs. individuals from general population (Lilenfeld, et al., 2006), thus making difficult to definitely ensure which personality variables may be complications and which may be predisposing factors.

Next paragraph describes other relevant variables which may play role in ED development.

1.8 Environmental factors: Sociocultural influences and seasonality

Sociocultural influences. In Western society, there are many environmental sources of factors influencing the development of eating disorders during adolescence. Over the last decades the attention has mainly been focused on socio-cultural influences such as the role of peers, media and parent modelling. These attitudes ranged from pressures to conform body-ideals to criticism to teasing behaviours (McCabe, & Ricciardelli, 2003; Neumark-Szteiner, Wall, Larson, Eisenberg, & Loth, 2011). Particularly, these aspects have been shown to directly impact on body image, body dissatisfaction and weight-control behaviours among adolescents boys and girls, through explicit feedback given by their mothers, fathers and best friends (McCabe, & Ricciardelli, 2003). Whereas these three main sources of pressures may interact as well in predicting body dissatisfaction and weight-control strategies, many studies have investigated them separately as independent agents (Rodgers, & Charbol, 2009). These studies have mainly used perceived measures of sociocultural influences such as the Perceived Sociocultural Pressure Scale (Stice, Ziemba, Margolis, & Filik, 1996). Owing to that, there has been an important issue concerning the use of parent-reported as opposed to adolescent-perceived measures or both of them in order to compare the subjective experiences. In addition, other factors such as personality traits, parenting style as well as beliefs and attitudes towards eating within the family are thought to impact not only on perception but also the process of spreading concerns from parents to offspring (Keel, Heatherton, Harnden, & Hornig, 1997).

Parenting style. The past research based on clinical samples directed attention to the association between an affectionless control pattern of parental bonding and eating disorders development (Calam, Waller, Slade, & Newton, 1989; Jáuregui Lobera, Bolanos Rios, & Garrido Casals, 2011). Specifically, studies revealed that higher levels of parental care, overprotection and control were reported by the adolescents with both anorexia and bulimia nervosa. In general the inadequacy of parental bonding has been found as a precursor of the AN onset (Di Pentima,

Magnani, Tortolani, et al., 1998). Lower levels of parental care, extensively appeared in clinical groups compared with controls (Canetti, Kanyas, Lerer, Latzer, & Bachar, 2008). Moreover, Swanson and colleagues (2010) have shown that lower levels of care and higher control correlated with eating disorders (Swanson, Power, Collin, Deas, Paterson, Grierson, et al., 2010).

Recently, studies have focused on studying the impact of parental bonding on eating disorders in community samples of students. Results have revealed that lower perceived levels of parental care and overprotection were associated with lower self-esteem and higher risks to develop an ED condition (Perry, Silvera, Neilands, et al., 2008).

The role of Peers. During adolescence and young adulthood peers play an important role in the development of identity and self-concept. This is the reason why during this developmental phase, individuals are more vulnerable to the opinions and beliefs of other people about physical appearance and self-worth. Thus, many studies have focused their attention on the relationship between peers and the development of eating disorders, revealing a direct impact of peers' teasing experience and pressures to conform body ideal (Culbert, Racine, & Klump, 2015; McCabe, & Ricciardelli, 2003; Striegle-More, & Cachelin, 1999). Two main mechanisms of peers' influences on unhealthy eating behaviours and attitudes were studied, i.e. the direct messages from peers encouraging to lose weight, and increase muscles, and identification/internalization of media messages of body-ideal size and shape (Stice, 2001).

Less is known about how psychological mechanisms based on reflected appraisals, i.e. self-appraisals from the perspectives of classmates (i.e. same-gender, opposite-gender), influence an individuals' self-perceptions and self-worth during adolescence (Harter, Bresnick, Bouchey, & Whitesell, 1997; Harter, Waters, & Whitesell, 1998). The question on how adolescent self-perceptions are connected to viewing oneself through the eyes of these important others, represents a long-debated issue even if overlooked from experimental studies. Furthermore, it is an important way to examine the association between social context and self-development. Neuroscience provided evidences for the networking between self-reflection activities, i.e. how adolescents come

to perceive themselves in the way they believe peers perceive them (through the eyes of others), and a greater neural activity in self-perception and social cognition areas (Pfeifer, Masten, Borofsky, Dapretto, Fuligni, & Lieberman, 2009). These findings suggest that adolescent self-concept and self-perceptions may refer more on a third-person perspective (i.e. peers) about the self than their own view.

Seasonal effects. Seasonal variation represents a relevant environmental factor involved in several self-views, but it has mainly been explored in terms of absolute continuity levels across seasons. For instance, some studies investigate seasonal variation of mean level stability in different psychological and behavioural processes such as body weight and shape self-perception (Geiselman, Haight, & Kimata, 1984; Kasper, Wehr, Bartko, Gaist, & Rosenthal, 1989), self-esteem and emotional distress (Crockett, Petersen, Graber, Schulenberg, & Ebata, 1989; Kasper, et al., 1989) and showed a higher stability in body-related scores, across seasons, for example from spring to spring rather than spring to autumn. However, less is known about seasonal-dependent effects on rank-order stability levels of self-views across seasons during adolescence. Specifically, few studies have taken into account seasonal effects on changes of risk factors for eating disorders (ED) development, across time (Lam, Goldner, & Grewal, 1996).

Next paragraph aimed at examining methodological features of ED developmental and etiological models mentioned above (i.e. including models for studying developmental trajectories of ED, see paragraph *1.2*)

1.9 Methodological issue regarding ED developmental and vulnerability models.

As already mentioned, ED developmental trajectories have been studied across both between-people and within-person approaches. Specifically, we reported studies showing from three to five class of ED developmental trajectories which resulted from comparison between mean-level across time points (Aimè, et al., 2008), growth curve of changes over time (Fairweather-Schmidt & Wade, 2016; Verschueren, et al., 2019) and within-person changes across time (Keel, et al., 2007). Conversely, vulnerability models have been generally tested by adopting between-people

to within-person approach, and/or adopting one of them (i.e. between-people or within-person approach). To our knowledge no study have systematically addressed within-person and between-people research questions, together.

The majority of studies, indeed, have focused on risk as well as protective factors of inter-individual differences in ED scores by adopting multiple regression analysis to detect temporal antecedents of changes in ED scores. Specifically, regression models help to answer the following questions:

- *how on average, adolescents' level of ED symptoms differ from one other, and this can be referred to as differences in ED symptoms at the inter-individual level.*
- *how much variance of expected ED levels is accounted by unitary changes in predictors at initial level*

However, the within-person approach may help, to answer different but complementary questions as below:

- *how an adolescent' ED levels fluctuate across time with regard to his or her average ED level, and this can be referred to as fluctuations in ED symptoms at the intra-individual level*
- *how intra-individual variability in ED symptoms co-vary with intra-individual variability predictors across time*

Conducting analyses at two levels, has some advantages: an effect at inter-individual level does not necessary yield a similar effect at the intra-individual level, or even an effect at all, and vice versa (Fleeson, 2007). On the one hand, factors identified at the inter-individual level help to identify who is at risk for developing an ED symptom. On the other hand, findings at the intra-individual level help to indicate which factors impact on individual changes.

The current PhD thesis aimed at extending previous findings by adopting both approaches, between-people and within-person, for identifying both inter and intra-individual vulnerability factors of ED.

1.10 Summary and open issues. In brief, several conceptualizations and empirical models have been developed in order to understand ED development. However, these models have originally been tested within the female population, and mainly involved clinical and targeted intervention samples. Thus, despite the comparable incidence and prevalence of ED in the male population and the increasing number of cases among adolescent boys, there are still few studies about male-related EDs in the existing scientific literature. Furthermore, involving non-clinical population is important to identify potential precursors of ED development, with practical implications in the resulting prevention program.

In BI literature, a partial confusion has emerged about body image and the multiple ways through which it has been measured. Indeed, Stice (2016) has evidenced that in ED literature there is a general lack of research on the validity of the scales used to assess putative risk factors. For example, it has been observed a frequent overlap of different BI constructs and measures related to body dissatisfaction and body size and shape perception, and body dissatisfaction and body uneasiness. Thus, further investigations are needed in order to explore BI-related constructs across time and gender among adolescents, and to test theoretical differences between BI and BD (Cash, et al., 2002), by including them simultaneously in the same vulnerability model for ED.

Recently, increasing attention is directed on multivariate models in order to understand the interplay among risk and protective factors in the prediction of ED onset (Stice, 2016; Stice, & Desjardins, 2018). However, perspective studies investigating multivariate models on non-clinical samples of adolescents are still few, and few are those that controlled for initial ED levels (Lilenfeld, et al., 2006; Stice, 2016).

The existent ED literature has provided results regarding traditional etiological variables (i.e. weight and shape concerns, self-esteem, sociocultural influences), but they are mainly cross-sectional. Furthermore, previous studies have often overlooked important facets of traditional constructs such as reflected self-appraisals in developing self-concept and self-perception, during

adolescence. To our knowledge no longitudinal study have investigated the predictive role of reflected self-esteem and self-perception for ED onset.

Overall, studies on vulnerability models conversely to those on developmental ED trajectories, have mainly adopted between-people rather than within-person approach. As mentioned in paragraph *1.9,* the two approach are complementary, although answering different research questions. To our knowledge, however, no study have systematically addressed both approaches in the same study.

Lastly, environmental factors, such as seasonal variation, has been shown to be important in both assessing and studying psychological variables (i.e. body-related). To our knowledge, however, no study have inspected seasonal-dependent effects on changes in body –related variables in the prediction of ED development.

1.11 Aims of the present research project. The present project aimed to extent previous research by contributing to fill main gaps (mentioned above) by pursuing the following objectives:

- examining ED developmental trajectories among a non-clinical prevalently male- sample of adolescents, in order to extent research on male-related ED, by assessing sex-specific indicators of ED
- exploring the predictive validity of perceptual BI factors by including actual, ideal and reflected self-perceptions
- examining the BI factor structure of several BI-related measures included in the current project, among adolescent boys and girls
- investigating the unique contribution of BI-related domains and BD in predicting ED-related variables
- addressing both vulnerability and complication model on non-clinical adolescents. However for the current PhD thesis we started to address vulnerability model in order to identify main risk and protective factors for ED development.

- adopting systematically between-people and within-person approach to explore vulnerability factors of ED development.
- assessing and inspecting adolescents' reflected self-appraisals of BI-related and personality variables (i.e. body figure and self-esteem), and seasonal effects.

Chapter 2

The present longitudinal study

2.1 Study Design

The present longitudinal study was designed in order to assess ED, BI and personality related variables across 5 measurement occasions.

The following sections provide descriptions of participants and procedure, and descriptive statistics of tools used for assessing variables of interest.

2.2 METHOD

2.2.1 Participants

The current project was proposed to school "ITET Gaetano Salvemini" in Molfetta (BA) at the beginning of the academic year 2016/ 2017 and started after that school board approved it.

Participants were non-clinical adolescents, boys and girls, attending the "ITET Gaetano Salvemini" in Molfetta (BA). No inclusion/exclusion criteria were adopted. An informed consent stated that participation in the study was voluntary and briefly described the study project to the participants; both students and their parents had a written copy of the informed consent and signed it. Students were assessed at school, during class hours.

Students filled out self-reports in 5 measurement occasions. Data were collected from May 2017 (T1) to May 2019 (T5) with a 6-month interval. Specifically, in May 2017 data collection started with teenagers attending the first, second, third and fourth high-school years. Table 2.1 reports on participants across the 5 measurements occasions. For example, Table 2.1 shows that 277 teenagers were recruited at T1, and 228 of them took part at T2, 197 at T3 as well, and so fourth with 97 students providing self-reports from T1 to T5. In addition, Table 1 indicates that 117 students started to collaborate at T2 (with a total N= 345 at T2), and 66 of them participated at T3 as well, and so the fourth.

Table 2.1 Longitudinal progression of sample size, from T1 to T5 (left side) and the total number of participants (NTOT; right side) who took part at each measurement occasions (new participants were included)

	T1		T2		T3		T4		T5		
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	N TOT
T1	**277**		-								277
	180	97									
T2	**228**		**117**		-						345
	151	77	87	30							
T3	**197**		**66**		**11**		-				297
	129	68	51	15	7	4					
T4	**117**		**37**		**3**		**125**		-		314
	73	44	29	8	2	1	76	49			
T5	**97**		**25**		**2**		**75**		**21**		265
	62	35	21	4	1	1	44	31	16	5	

Thus, at each measurement occasions new participants were involved in the project.

Table 2.2 Cross-table of sample size (**N**) at each measurement occasions with the total number of participants progressing to the subsequent time point (t +6-month)

	T1		T2		T3		T4		T5	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
T1	**277**		-							
	180	97								
T2	**228**		**345**		-					
	151	77	238	107						
T3	**220**		**263**		**297**		-			
	141	79	180	83	199	98				
T4	**138**		**178**		**164**		**314**		-	
	90	48	123	55	109	55	207	107		
T5	**120**		**159**		**146**		**219**		**265**	
	80	40	113	46	102	44	145	74	180	85

Table 2.2 is a cross-table and presents the total number of participants at each time point and 6-month apart (t+6-month). For instance, Table 2.2 shows that of 345 students valid at T2 (i.e. the total number of students including T1 participants and the additional recruited at T2), 263 were valid at T3 returning questionnaire. Operationally, for the analyses it has been possible to independently select several time pairs beyond the longitudinal span across 2 years (from T1 to T5).

2.2.2.Measures

2.2.2.1 Eating Disorders Assessment for Man (EDAM)

The Eating Disorder Assessment for Men (Stanford, & Lemberg, 2012), currently in validation on an Italian sample of 14 to 65 yr. old men (Folla, De Caro, & Di Blas, in preparation), is a self-report screening tool for the assessment of eating disorders symptoms which are regarded as specific to males.

This screening tool incorporates four scales named Binge Eating, Muscle Dysmorphia, Body Dissatisfaction, and Eating Disorder. These four scales capture the main pattern of symptoms frequently observed in male population.

EDAM presents 50 items and codes answers along a 5-point Likert scale ranging from 1 (never) to 5 (always). Stanford & Lemberg (2012) showed that EDAM items are internally consistent with Cronbach's alpha of .91. The four EDAM scales are as follows:

EDAM Binge Eating (BE). This scale includes recurrent episodes of binge eating without compensatory behaviours (i.e. the use of laxatives and self-induced vomiting); the absence of compensatory behaviours distinguishes BED from Bulimia (E).

EDAM Muscle Dysmorphia (MD). This scale assesses a subcomponent of Body Dysmorphic Disorder (Grieve, 2007) and represents a tendency towards excessive exercising in order to pursuit muscularity (Olivardia, Pope, & Hudson, 2000). The most representative MD items are -I think about gaining more muscle-, -I feel as if I need to appear more muscular,- I have suffered injuries from working out too hard- and -I will allow myself to eat only if I exercise-.

EDAM Body Dissatisfaction (BD). This EDAM subscale takes into account that males are more likely to focus on the upper side of their body and to evaluate muscularity size rather than adiposity. Items taps into these aspect such as -I wish my abdominal muscles were more defined-. Additionally, BD subscale contains items tapping into body appearance and weight importance in daily life such as -I spend much of the day thinking about my weight-.

EDAM Eating Disorder (ED). This subscale presents items directly tapping the ED symptoms such as, restrictive food intake, binging and purging. Items falling into the ED subscales are -I have gone days at a time without eating-, -My day is planned around avoiding food-.

Table 2.3 presents descriptive statistics, mean, standard deviation, skeweness and kurtosis for each measurement occasions (T1 to T5). The Cronbach's alpha is reported as well. Table 2.3 shows that data for EDAM ED scale were not normally distributed. The distribution was leptokurtic (kurtosis > 3). After excluding 11 outliers with values over 95° percentile, kurtosis value still was > 3. EDAM scales scores, however, were transformed into normalized T scores, controlling for age and distinguishing between 14-16 and 17-20 years old. APPENDIX 2 presents normative data based on the validation study of EDAM on a large sample of Italian males (Folla, De Caro & Di Blas, 2018; in preparation).

2.2.2.2 Eating Disorder Inventory 2 (EDI-2)

The Eating disorder Inventory 2 (EDI-2) is a validated screening tool, widely implemented in both clinical and non-clinical populations. The EDI-2 assesses conceptually relevant domains in understanding and treating eating disorders, in females especially. EDI-2 presents three main clinical subscales, labelled Drive for thinness, Bulimia and Body Dissatisfaction, which were administered to girls only, and additional scales which assess inter-individual differences which are relevant in ED conditions, on which self-reported both boys and girls. The psychological subscales used in the current study are Perfectionism, Ineffectiveness and Interoceptive Awareness. EDI-2 uses the six-point Likert scale, but scores are coded from a 0–3. Raw scores were transformed into standardized scores according to normative scores for Italian adolescents (Garner, 1995).

EDI-2 Drive for Thinness (EDI-2 DT). This clinical subscale captures the excessive concern of becoming fat (i.e. I am terrified of gaining weight) combined with fears of caloric foods and desire to be thin (i.e. I am preoccupied with the desire to be thinner; Garner, 1995).

EDI-2 Bulimia (EDI-2 Bu). It evaluates the tendency to overeat and then compensate via self-induced vomiting, use of laxative etc., unhealthy behaviours which are recurrent in Bulimia Nervosa (BN).

EDI-2 Body Dissatisfaction (EDI-2 BD). It measures the dissatisfaction of own body size and shape, with the negative evaluation focusing on thighs, buttocks and belly typically involved in ED women.

E*DI-2 Perfectionism (EDI-2 PF).* It measures the drive to achieve personal and external standard of success. Specifically, the scale refers to excessive personal expectations of achievement.

EDI-2 Ineffectiveness (EDI-2 IN). The scale captures aspects related to feeling inadequate, insecure and being not in control of one's life.

EDI-2 Interoceptive Awareness (EDI-2 IA). It represents a measure of person's lack of confidence in recognizing and identifying emotions and sensations of hunger or satiety. Interoceptive Awareness has been defined as precursors of the capability of recognizing emotional states and emotions regulation (Garner, 1995).

Table 2.3 presents descriptive statistics (raw scores) and Cronbach's alphas of the clinical subscales by measurement occasions. For both EDI-2 Drive for Thinness and Body Dissatisfaction Cronbach's alpha ranged from 0.79 (α_{T2}) to 0.88 (α_{T5}), in line with reliability values reported in Garner (1995) for non-clinical women. Table 2.3 shows that EDI-2 Bulimia was highly skewed in the present non-clinical adolescent female sample. Such a result is in line with Garner (1995), who evidenced that though being a screening tool, EDI-2 Bu contains many clinical featured items which may bring out psychometric problems in non-clinical population; for example with $\geq 50\%$ of girls referring no bulimic symptoms. Cronbach's alpha (Table 2.3) ranged from 0.53 (α_{T4}) to 0.71 (α_{T1}), and are in line with Shore & Porter (1990) for non-clinical women. Table 2.4 and 2.5 report

descriptive statistics and Cronbach's alpha for EDI-2 Perfectionism, Ineffectiveness and Interoceptive Awareness scales for boys and girls, respectively. In line with Garner (1995) Cronbach's alpha values are different for boys (Table 2.4) compared with those among girls group (Table 2.5). In fact, boys present values lower than .70 for EDI-2 Perfectionism (EDI-2 PF) subscale for all time points (Garner, 1995).

In their study on comparability of EDI-2 scales between women and men, Spillane and colleagues (2004) have shown that the EDI-2 scales were generally less reliable for men (Spillane, Boerner, Anderson, & Smith, 2004). Overall, the Cronbach's alphas for boys ranged from 0.43 (EDI-2 PF α_{t4}) to 0.78 (EDI-2 IN α_{t4}).

Furthermore, EDI-2 Interoceptive Awareness scores on wave 1, 2 and 3 showed a leptokurtic distribution (i.e. with Kurtosis > 3) for boys, only. It is probably due to the clinical meaning of scale content. Garner et al. (1983) has evidences that the items may elicit different answer in males, and the difficult in recognizing themselves into such a state among young boys, especially (Garner, Olmstead, & Polivy, 1983).

Table 2.3 Cross-sectional descriptive statistics (N, mean, standard deviation, Skewness and Kurtosis) of EDAM and EDI-2 clinical subscales raw scores for boys and girls, respectively; Internal Consistency (Cronbach's alpha.)

Variables	T1 (N=181)				T2 (N=229)				T3 (N= 156)				T4 (N=203)				T5 (N=179)			
EDAM	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt	α
BE	29.9 (5.3)	0.4	-0.1	0.50	28.7 (6)	0.6	0.8	0.65	28.3 (5.7)	0.3	0.1	0.63	28.6 (6.2)	0.5	0.3	0.68	28.4 (6.5)	0.6	1.5	0.73
MD	32.3 (6.9)	0.8	0.9	0.74	31.9 (7.1)	0.7	0.1	0.74	30.6 (7.1)	0.7	0.2	0.76	32.4 (7.6)	0.5	-0.5	0.79	32.7 (8.2)	0.8	0.7	0.81
BD	25.9 (6.3)	0.6	0.7	0.68	26.1 (6.3)	0.6	0.2	0.69	25.6 (6.3)	0.7	0.3	0.72	26.1 (6.3)	0.5	0.0	0.71	26.3 (6.2)	0.5	-0.2	0.69
ED	13.7 (2.5)	1.3	2.1	0.43	14.9 (5.7)	2.2	4.8	0.85	14.7 (5.5)	2.2	4.4	0.86	14.5 (4.7)	2.8	10.1	0.82	15.5 (7.2)	2.4	0.2	0.92
EDI-2	(N=97)				(N=106)				(N= 84)				(N=108)				(N=85)			
DT	6.8 (6.2)	0.6	0.2	0.84	5.7 (5.9)	0.9	-0.1	0.86	6.5 (6.2)	0.8	-0.4	0.86	6.1 (5.6)	0.9	-0.15	0.81	6.1 (6.3)	0.9	-0.4	0.88
Bu	2.1 (3.3)	2	4.1	0.71	1.7 (2.5)	2.3	7.1	0.60	1.2 (2.1)	2.3	0.3	0.60	1.2 (1.9)	2.6	9.5	0.53	1.58 (2.5)	2.1	4.6	0.65
BD	10.1 (6.9)	0.2	-1.1	0.83	8.8 (6.1)	0.4	-0.7	0.79	9.2 (5.9)	0.6	-0.1	0.81	8.7 (6.7)	0.7	-0.4	0.84	9.7 (6.3)	0.4	-0.8	0.82

Note. EDAM= Eating Disorder assessment for man; EDI-2= Eating Disorder Inventory 2; BE= Binge Eating; MD= Muscle Dysmorphia; BD= Body Dissatisfaction; Bu= Bulimia; DT=Drive for Thinness; ED= Eating Disorder.

2.2.2.3 Minnesota Multiphasic Personality Inventory for Adolescence (MMPI-A)

The Minnesota Multiphasic Personality Inventory-A (MMPI-A) is an empirically based screening measure of psychopathology and personality in adolescence (Butcher, Williams, Graham, Archer, Tellegen, et al., 2001). For the present study, we used the following content-based scales: Obsessiveness and Depression. Raw scores were transformed into standardized scores according to normative scores developed for Italian adolescents (Butcher, et al., 2001).

Obsessiveness (A-OBS). This subscales assesses excessive concerns for imperfections and small details.

Depression (A-DEP). It reveals a chronic tendency to fall into depressive states including hopeless and meaningless feelings.

Table 2.4 and 2.5 report descriptive statistics for MMPI-A Obsessiveness and Depression (T-scores) and show that they were normally distributed among both boys (Table 2.4) and girls (Table 2.5); Cronbach'alpha ranged from 0.66 (Obsessiveness α_{t2}) to 0.86 (Depression α_{t5}).

2.2.2.4 *Rosenberg Self-Esteem Scale (RSES).*

The Rosenberg Self-Esteem Scale (RSES, Rosenberg, 1965) is a well-known and extensively used self-report questionnaire, which is aimed at evaluating an individual general self-worth (i.e. I'm generally satisfied with me) along a 4-point Likert scale format (from *strongly disagree* 0 to *strongly agree* 3). In addition, in order to assess Reflected RSES (R-RSES) levels, we reformulated each item, so as to ask the respondent believes she/he is perceived, i.e. I believe that people are generally satisfied with me.

Descriptive statistics and internal consistency values are displayed in Tables 2.4 and 2.5 for both boys and girls, respectively. For boys (Table 2.4), Global self-esteem Cronbach's alphas ranged from 0.66 (α_{t2}) to 0.83 (αt_1). Reflected self-esteem values were greater than 0.70.

2.2.2.5 ED-related variables Cut-Off

Table 2.6 reports clinical cut-off, corresponding to the 95° percentile score observed in the present sample of adolescents. Adolescent males and females who reported scores > 95° percentile

on EDAM and EDI-2 clinical scales (> 2sd.) at the first measurement occasion were excluded from the analyses on vulnerability models (Lilenfeld, et al., 2006; Stice, 2016).

Cut-off for self-reported actual BMI is reported as well (Table 2.6), both for suspected underweight (-2sd. Cut-off) and overweight (+ 2sd. Cut-off) participants.

2.2.2.6 Test-retest reliability

Table 2.7 shows test-retest Pearson's correlations from T1 to T5. All ED-related variables were moderately stable over time, for both boys and girls, though they also evidence for change.

Specifically, for all EDAM subscales test-retest coefficients are slightly higher over 6-month interval compared with those over 1-yr. interval (Table 2.7). For EDI-2 subscales Drive for thinness and Body Dissatisfaction, test-retest coefficients were more stable over long time-span (1 and 2 yr. interval) rather than over a short time-span (6-month).

For EDI-2 Bulimia no significant test-retest correlation coefficients was found at T4, over 1 yr. and 6-month interval, likely due the highly clinical featured of EDI-2 Bulimia, and the drop of participants in Autumn 2018 (T4) at the beginning of the new academic year.

Table 2.8 presents test-retest correlations presented for EDI-2 PF, IN and IA subscales, Rosenberg self-esteem scales and MMPI-A subscales. Results reveal low to moderate significant test-retest coefficients for all scales. Thus all these scales assessing personality variables appear to be reliable instruments with adequate test-retest reliability; this result represents a precondition for the interpretation of changes over time.

Table 2.4 Cross-sectional descriptive statistics (N, mean, standard deviation, Skewness and Kurtosis) of EDI-2 psychological subscales, RSES and MMPI-A scales; Internal Consistency (Cronbach's alpha.) for boys

Variables	T1 (162< N <178)				T2 (193< N < 228)				T3 (131< N< 180)				T4 (139 < N < 197)				T5 (102 < N < 174)			
EDI-2	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt	α
PF	3.6 (3.2)	1.1	1.2	0.57	3.4 (2.9)	1	0.5	0.53	3.5 (3.1)	1.1	1.5	0.60	3.3 (2.6)	0.7	0.1	0.43	2.8 (2.5)	0.9	0.3	0.42
IN	3.2 (3.7)	1.8	3.6	0.73	3.4 (3.5)	1.2	1.7	0.65	2.8 (3.2)	1.5	1.9	0.65	3.3 (4)	1.5	2.7	0.78	3.6 (3.8)	1.3	1.6	0.72
IA	2.5 (3.4)	2.8	10.6	0.72	2.7 (3.5)	2.2	5.9	0.70	2.7 (3.5)	2.4	6.9	0.72	2.6 (3)	1.5	2.2	0.61	2.5 (3.1)	1.6	2.6	0.67
RSES	18.9 (4.9)	-0.8	1	0.83	19.7 (3.9)	0.1	-0.4	0.66	19.9 (4.1)	0.4	-0.3	0.75	20.1 (4.4)	-0.1	-0.1	0.80	19.5 (4.6)	-0.3	-0.3	0.79
R-RSES	19.1 (4.2)	-0.3	-0.4	0.78	18.9 (4.6)	0.2	-0.3	0.77	19.2 (4.4)	0.3	0.1	0.78	19.7 (4.4)	-0.2	0.3	0.82	19 (4.9)	-0.5	0.7	0.83
MMPI-A																				
A-OBS	52.5 (9.8)	-0.1	-0.6	0.72	52.6 (9.1)	-0.3	-0.2	0.66	51.3 (9.8)	-0.2	-0.3	0.71	50.6 (10.2)	-0.1	-0.6	0.74	50.1 (10.3)	-0.03	-0.9	0.74
A-DEP	50 (8.9)	0.8	0.4	0.75	50.6 (9.6)	0.4	-0.6	0.77	51.1 (10.4)	0.4	-0.5	0.79	51.3 (10.6)	0.4	-0.5	0.83	51.7 (11.9)	0.6	-0.5	0.86

Note. EDI-2= Eating Disorder Inventory 2; PF=Perfectionism; IN= Ineffectiveness; IA= Interoceptive Awareness; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescents; A-OBS= Obsessiveness; A-DEP= Depression; RSES= Rosenberg Self-Esteem scale; R-RSES= Reflected Rosenberg Self-Esteem .

Table 2.5 Cross-sectional descriptive statistics (N, mean, standard deviation, Skewness and Kurtosis) of EDI-2 psychological subscales, RSES and MMPI-A scales; Internal Consistency (Cronbach's alpha.) for girls

Variables	T1 (92 < N < 97)				T2 (74 < N < 106)				T3 (86< N< 93)				T4 (91 < N < 107)				T5 (62 < N < 84)			
EDI-2	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt	α
PF	3.8 (3.4)	1	0.3	0.58	3.4 (3.3)	1	0.7	0.61	3.6 (3.5)	1.5	2.1	0.70	3.8 (3.5)	1.3	1.8	0.65	3.6 (3.6)	0.9	-0.1	0.66
IN	6.6 (5.3)	0.8	0.6	0.76	5.9 (5)	1.2	0.7	0.75	5.3 (4.9)	1.4	2.7	0.78	5.7 (5.1)	1.3	1.9	0.76	6.7 (6.9)	1.3	1.5	0.88
IA	6.1 (5.9)	1.4	1.8	0.80	5.8 (5.9)	1.2	0.6	0.80	5.2 (5.4)	1.6	2.3	0.75	5.4 (5.2)	1.3	2.1	0.77	4.8 (4.3)	1.1	0.4	0.66
RSE	18.1 (5.1)	-.02	-0.6	0.83	18.6 (4.6)	-.01	-0.6	0.81	18.6 (5.2)	-0.3	-0.6	0.87	18.5 (5.2)	-0.3	0.1	0.82	17.1 (5.7)	-0.6	0.3	0.84
R-RSE	18.3 (4.6)	-0.6	0.8	0.85	18.5 (4.4)	-0.7	1.6	0.80	18.2 (4.5)	-0.3	0.1	0.84	18.4 (4.7)	-0.4	-0.1	0.82	18 (4.8)	-1.1	3.4	0.83
MMPI-A																				
A-OBS	52.6 (9.8)	0.1	0.6	0.56	51.9 (9.2)	-0.2	-0.4	0.70	53.2 (9.5)	-0.3	-0.8	0.68	53.5 (10.5)	-0.1	-0.7	0.73	54 (10)	-0.3	-0.4	0.73
A-DEP	52.1 (8.9)	-.03	-0.5	0.77	51.7 (8.9)	-.05	-0.6	0.81	51.9 (9.3)	0.1	-0.4	0.79	51.2 (10.6)	0.2	-0.9	0.84	54.2 (11)	.02	-0.7	0.84

Note. EDI-2= Eating Disorder Inventory 2; PF=Perfectionism; IN= Ineffectiveness; IA= Interoceptive Awareness; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescents; A-OBS= Obsessiveness; A-DEP= Depression; RSES= Rosenberg Self-Esteem scale; R-RSES= Reflected Rosenberg Self-Esteem scale

Table 2.6 ED-related variables clinical Cut-off

Variables	+ 2sd.	-2sd.
Actual BMI girls	27.7	15.5
Actual BMI boys	28.4	14.4
EDAM BD	69.9	29.6
EDAM MD	72.9	35
EDAM BE	69	35.4
EDAM ED	61	35.6
EDI-2 DT	67.1	29.9
EDI-2 Bu	73.9	38.1
EDI-2 BD	61.6	29.4

Note. ± 2sd= ± 2 standard deviation (> 95° percentile); BMI=Body mass index; EDI-2= Eating Disorder Inventory 2; EDAM= Eating Disorder Assessment for Man; EDI-2= Eating Disorder Inventory 2; BE= Binge Eating; MD= Muscle Dysmorphia; BD= Body Dissatisfaction; Bu= Bulimia; DT=Drive for Thinness; ED= Eating Disorder.

Table 2.7 Test-retest reliability across 5 waves; ED related variables

	T2	T3	T4	T5
T1 Variables				
EDAM BE	0.61**	0.57**	0.43**	0.54**
EDAM MD	0.62**	0.57**	0.47**	0.48**
EDAM BD	0.74**	0.66**	0.59**	0.55**
EDAM ED	0.50**	0.49**	0.51**	0.40**
EDI-2 DT	0.63**	0.70**	0.58**	0.70**
EDI-2 Bu	0.62**	0.41**	0.09	0.61**
EDI-2 BD	0.74**	0.71**	0.78**	0.79**

Note. boys $80_{T5} \leq N \leq 149_{T2}$; EDAM= Eating Disorder assessment for man; girls $39_{T5} < N < 76_{T2}$; EDI-2= Eating Disorder Inventory 2; BE= Binge Eating; MD= Muscle Dysmorphia; BD= Body Dissatisfaction; Bu= Bulimia; DT=Drive for Thinness; ED= Eating Disorder. $^{**}p \leq .01$

Table 2.8 Test-retest reliability across 5 waves; Personality variables.

	T2	T3	T4	T5
T1 Variables				
EDI-2 PF	0.59**	0.62**	0.37**	0.36**
EDI-2 IN	0.58**	0.50**	0.54**	0.53**
EDI-2 IA	0.59**	0.52**	0.58**	0.37**
RSES	0.61**	0.56**	0.44**	0.48**
R-RSES	0.58**	0.58**	0.51**	0.48**
MMPI-A OBS	0.61**	0.53**	0.50**	0.43**
MMPI-A DEP	0.54**	0.48**	0.55**	0.36**

Note. $83 \leq N \leq 224$; EDI-2= Eating Disorder Inventory 2; RSS= Rosenberg Self-Esteem scale; SE= Self-Esteem; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescence; OBS= Obsessiveness; DEP= Depression; RSES= Rosenberg Self-Esteem Scale; R-RSES= Reflected Rosenberg Self-Esteem Scale

2.2.2.7 Body Size Estimation

The Contour Drawing Rating Scale (CDRS; Thompson ,& Gray, 1995) is used for assessing body size estimation. Fig. A and B show the selecting body figures sheet, for girls and boys ranged from 1, very thin, to 9 very obese silhouette.

Participants were asked to select the figure that correspond respectively to:

- Actual body figure
- Ideal body figure
- Reflected body figure as: "How other girls see you"(RBF_{GIRLS})
- Reflected body figure as: "How other boys see you"(RBF_{BOYS})

These first two item represent the typical CDRS item, while the last two represent sex-oriented reflected self-perception of body.

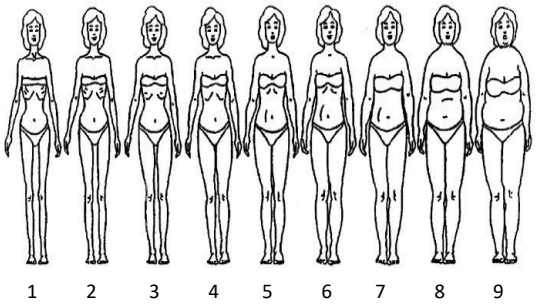


Fig. A Contour Drawing Rating Scale for women

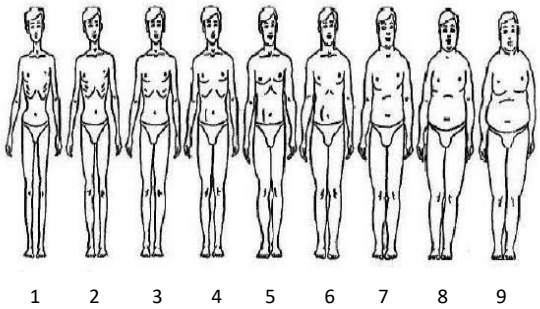


Fig. B Contour Drawing Rating Scale for men

Table 2.9 and 2.10 present descriptive statistics and internal consistency (i.e. Cronbach's alpha) of CDRS scales for boys and girls, respectively. Results show that CDRS scores were normally distributed for both boys and girls.

2.2.2.8 Body Uneasiness Test (BUT)

The Body Uneasiness Test (Cuzzolaro, Vetrone, Marano, & Grafinkel, 2006) represents one of the most used questionnaires to investigate body uneasiness and dissatisfaction that has been validated on a large sample in different age groups. The BUT is composed by 34 item divided in five subscales, named:

Body Image Concern (BIC). concerns related to physical appearance (i.e. I spend a lot of time thinking about some defects of my physical appearance).

Weight Phobia (WP). excessive fear of being or becoming fat (i.e. I'm terrified of putting on weight)

Avoidance (AV). the whole of behaviours aiming to avoid and hide own body image (i.e. I stay at home and avoid others seeing me)

Compulsive Self-Monitoring (CSM). It assesses body related behaviours such as body checking and surveillance (i.e. If I begin to look at myself, I find it difficult to stop)

Depersonalization (D). This subscale measures body related dimensions such as detachment and estrangement feelings towards own body

The 34 items of BUT- A are rated on a six-point Likert type scale (range 0-5, from "never" to "always"). The higher rates indicate a greater body uneasiness. The Global Severity Index was obtained computing the total score of 34 item. Table 2.9 and 2.10 report descriptive statistics and internal consistency of BUT subscales raw scores, for boys (Table 2.9) and girls (Table 2.10). Since the distribution of BUT subscales raw scores deviated from a normal distribution, we transformed them into standardized normalized T scores by controlling for sex differences, thereby ensuring a less skewed distribution for the next studies.

APPENDIX 1 reports the Body Uneasiness Test conversion table. Cronbach's α of BUT subscales resulted comparable with those reported in Cuzzolaro and colleagues (2006) for some subscales such as BUT BIC (α = 0.90), BUT WP (α= 0.84) and BUT CSM (α= 0.82). The Cronbach's alpha for BUT AV and D presents a lower internal consistency, specifically for girls ranged from 0.60 (A α_{T4}) to 0.62 (D α_{T3}).

2.2.2.9 Test-retest reliability

Table 2.11 shows test-retest correlation coefficients for body-related measures: BUT subscales and CDRS body figures.

The results show low to moderate significant test-retest coefficients for BUT subscales, and high significant test-retest correlations for CDRS body figures over 2 years.

Table 2.9 Descriptive Statistics (N, mean, standard deviation, Skewness and Kurtosis) and internal consistency (α) of Body Uneasiness Test (BUT) subscales raw scores and Contour Drawing Rating Scales (CDRS); cross-sectional data for boys

Boys																			
Variables	T1 (N=181)				T2 (N=229)				T3 (N=150)				T4 (N=193)				T5 (N=173)			
	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt	α
BUT BIC	9.3 (8.7)	1.4	1.4	0.89	8.5 (7.7)	1.2	0.9	0.87	9.2 (8.2)	1.3	2.1	0.89	9.2 (8)	0.9	0.2	0.87	9.4 (7.9)	0.9	0.8	0.88
BUT WP	8.6 (6.9)	1.2	1.5	0.81	8.7 (6.7)	0.9	0.2	0.77	8.6 (7.1)	0.9	0.6	0.83	9.4 (6.6)	0.8	0.5	0.78	9.4 (7.2)	0.9	0.7	0.82
BUT AV	1.8 (2.9)	2.4	6.4	0.68	2.7 (4.5)	2	3.5	0.85	2.4 (3.9)	2.1	4.4	0.81	2.5 (3.8)	2	4.6	0.79	3.5 (5.3)	1.6	1.5	0.87
BUT CSM	4.5 (4.2)	1.5	2.5	0.74	4.1 (3.9)	1.2	1.3	0.74	4.2 (3.9)	1.4	2.9	0.73	4.6 (3.9)	0.9	0.6	0.73	4.8 (4.3)	1	0.7	0.76
BUT D	2.4 (3.2)	2.5	7.9	0.73	3.3 (4.5)	1.9	3.5	0.84	3.1 (4.1)	1.7	3	0.79	2.8 (3.9)	2.2	5.6	0.82	3.5 (4.6)	1.5	1.3	0.87
BUT GSI	26.7 (22.4)	1.5	2.1	0.94	27.3 (24)	1.2	0.7	0.95	27.6 (23.9)	1.2	1.2	0.95	28.7 (22.8)	1.3	1.7	0.94	30.8 (26.1)	1.2	1	0.96
	N=179				214< N >226				116 < N >136				154< N >180				98< N >159			
CDRS Actual BF	5.5 (1.3)	0.1	-0.2		5.5 (1.1)	0.5	0.1		5.7 (1.1)	0.3	-0.3		5.6 (1)	0.2	-0.04		5.6 (1)	0.5	0.4	
CDRS Ideal BF	5.4 (0.8)	-0.0	1		5.5 (0.8)	-0.0	0.4		5.4 (0.7)	-0.1	0.4		5.4 (0.65)	-0.3	1.2		5.5 (0.6)	-0.5	0.6	
CDRS RBF_{GIRLS}	5.6 (1.3)	0.5	0.0		5.5 (1.1)	0.5	0.3		5.5 (1.2)	0.4	0.4		5.5 (1.03)	0.6	1		5.4 (1.2)	0.7	0.3	
CDRS RBF_{BOYS}	5.5 (1.3)	0.1	0.3		5.6 (1)	0.4	0.7		5.6 (1.1)	0.3	0.2		5.5 (0.9)	0.2	0.4		5.5 (1.1)	0.8	0.9	

Note. BUT= Body Uneasiness Test; BIC= Body Image Concern; WP=Weight Phobia; AV=Avoidance; D= Depersonalization; CSM=Compulsive Self-Monitoring; GSI=Global Severity Index

Table 2.10 Descriptive Statistics (N, mean, standard deviation, Skewness and Kurtosis) and internal consistency (α) of Body Uneasiness Test (BUT) subscales raw scores and Contour Drawing Rating Scales (CDRS); cross-sectional data for girls

Girls																			
Variables	T1 (N=97)				T2 (N=104)				T3 (N=85)				T4 (N=107)				T5 (N=85)			
	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt.	α	M (sd)	Skw.	Kurt	α
BUT BIC	18.9 (11.9)	0.3	-1	0.92	14.4 (11.4)	0.7	-0.4	0.93	14.8 (10.6)	0.8	-0.2	0.91	15.6 (10.9)	0.7	-0.4	0.89	15.8 (11.2)	0.6	-0.4	0.89
BUT WP	17.4 (10.4)	0.1	-1	0.88	14.5 (10)	0.6	-0.4	0.88	16.2 (9,3)	0.4	-0.6	0.83	16.4 (9.5)	0.5	-0.6	0.85	17.4 (9.5)	0.2	-0.7	0.83
BUT AV	4.3 (5.2)	1.6	2.2	0.81	3.3 (5.1)	1.8	2.7	0.83	3.1 (4.6)	2.2	4.5	0.79	3.5 (5.3)	2.7	8.9	0.84	4.5 (6.01)	1.7	2.5	0.85
BUT CSM	7.4 (4.5)	0.6	0.4	0.66	6.7 (4.7)	0.6	0.2	0.67	7.4 (4.6)	0.6	0.1	0.64	7.1 (4.5)	0.7	0.1	0.60	7 (4.9)	0.6	-0.1	0.69
BUT D	5.4 (5.3)	1.3	1.5	0.79	4.7 (5.5)	1.5	1.5	0.84	4.5 (3.7)	1.1	0.8	0.62	4.6 (4.6)	1.5	2.2	0.68	5.6 (5.5)	1.5	1.8	0.77
BUT GSI	52.7 (33.2)	0.5	-0.6	0.96	43.7 (32.1)	0.7	-0.4	0.96	46.2 (28.2)	0.7	-0.3	0.94	47.1 (29.7)	0.9	0.2	0.94	50.4 (31.6)	0.7	-0.1	0.95
	N=97				N=100				78< N >83				93< N >102				68< N >83			
CDRS Actual	5.6 (1.6)	-0.1	-0.6		5.4 (1.6)	0.07	-0.2		5.5 (1.3)	0.03	0.2		5.5 (1.6)	0.1	-0.1		5.7 (1.4)	0.01	0.6	
CDRS Ideal	4.4 (1.1)	0.1	-0.4		4.4 (1.2)	0.5	0.2		4.5 (1.1)	0.1	-0.0		4.5 (1)	0.1	0.2		4.5 (1.1)	-0.1	0.2	
CDRS RBF_{GIRLS}	5.1 (1.8)	-.03	-0.6		5.2 (1.6)	0.3	-0.3		5.1 (1.5)	-0.1	-0.0		5.1 (1.6)	0.2	0.2		5.1 (1.6)	0.3	0.1	
CDRS RBF_{BOYS}	5.3 (1.7)	-0.1	-0.5		5.4 (1.7)	0.01	-0.2		5.2 (1.5)	-0.2	-0.0		5.1 (1.8)	0.4	0.3		5.1 (1.7)	0.6	0.3	

Note. BUT= Body Uneasiness Test; BIC= Body Image Concern; WP= Weight Phobia; AV= Avoidance; D= Depersonalization; CSM= Compulsive Self-Monitoring; GSI=Global Severity Index

Table 2.11 Body-related variables; test-retest reliability across 5 waves.

	T2	T3	T4	T5
T1 Variables				
BUT BIC	0.55**	0.52**	0.58**	0.48**
BUT WP	0.53**	0.59**	0.47**	0.41**
BUT AV	0.48**	0.45**	0.38**	0.47**
BUT CSM	0.56**	0.58**	0.55**	0.52**
BUT D	0.49**	0.48**	0.56**	0.49**
BUT GSI	0.55**	0.58**	0.54**	0.50**
CDRS actual BF	0.76**	0.74**	0.71**	0.73**
CDRS ideal BF	0.62**	0.67**	0.58**	0.66**
CDRS RBF_{GIRLS}	0.76**	0.74**	0.69**	0.76**
CDRS RBF_{BOYS}	0.70**	0.70**	0.71**	0.75**

Note. $112 \leq N \leq 225$; BUT= Body Uneasiness Test; BIC= Body Image Concern; WP=Weight Phobia; AV=Avoidance; D= Depersonalization; CSM=Compulsive Self-Monitoring; GSI=Global Severity Index; CDRS= Contour Drawing Rating Scale

Chapter 3

Predictive validity of perceived body figures and self-esteem for understanding intra-individual and inter-individual changes in eating disordered behaviours and attitudes in adolescents

3. 1 Introduction

Body image (BI) and body dissatisfaction (BD) represent two well-established risk factors for eating disordered attitudes and behaviours such as weight-control and restrictive as well as excessive food intake, in males and females of different ages, and in clinical and non-clinical samples (Dakanalis, Clerici, Caslini, Gaudio, Serino, Riva, & Carrà, 2016; McCabe, & Ricciardelli, 2003; Polivy, & Herman, 2002; Walker, White, & Srinivasan, 2018). Body image is regarded as a multifaceted construct, which concerns a psychological experience of our own body and related self-perceptions, including thoughts, believes, self-attitudes, and feelings (Cash, 2004). Body dissatisfaction essentially deals with a negative self-evaluation of one's own body silhouette and related thoughts, behaviours, and feelings (Glashouwer, Bennik, de Jong, & Spruyt, 2018). Body figure (BF) represents a core perceptive component of both BD and BI constructs (Cash, 2002; Gardner & Brown, 2010). Though crucial, body figure (BF) has been less systematically investigated than BD and BI have been in relation to ED conditions. The present Chapter was focused on this basic element of BD and BI, with the aim of exploring how different ways of perceiving an individual's body figure, that is, actual, ideal, and reflected, predict changes in sex-specific behaviours and attitudes which are relevant in ED behaviours and attitudes, namely Drive for Thinness (DT) and Bulimia (Bu) in girls, and Muscle Dysmorphia (MD) and Binge Eating (BE) in boys. The present study was conducted on data collected at Waves 1 to 3 (the first three waves of data available when the current Chapter has been written), and analysed the data set from both within-person and between-people approaches simultaneously (i.e. as outlined in Chapter 1). The following sections describe the role of 1) body figures, actual, ideal and reflected, and 2) self-

esteem with regard to ED dysfunctional pattern development by examining both cross-sectional and longitudinal studies, currently available in literature.

3.1.1 Body figure ratings, Drive for Thinness, and Muscle Dysmorphia. Findings on the effect of BFs on the four ED conditions, outlined in Chapter 1, generally parallel findings that emerge when the multifaceted construct of BI is investigated. In fact, a larger perceived actual BF predicts higher ED scores in both women and men, since pre-adolescence (Gardner, Stark, Friedman, & Jackson, 2000). Conversely, a thinner ideal BF correlate and temporally anticipate increases in ED levels, with a larger discrepancy between actual and ideal BF being estimating ED scores in girls especially (Gardner et al., 2000). In addition to account for overall ED conditions, BFs predict sex-specific ED symptoms as well, such as DT and MD. DT as a tendency to adopt very restrictive food consumption and weight control habits, attaching high value to very thin, even emaciated, bodies, is relevant in females mostly. In fact, both non-clinical and clinical women are mostly concerned with their adiposity and they tend to report slimmer ideal body shapes in comparison to their current body shapes since pre-pubertal to old ages as well as cross-culturally (Carfi & Thompson, 2004; De Caro, & Di Blas, 2016; DeLeel, Hughes, Miller, Hipwell, & Theodore, 2009; Gordon, Castro, Sitnikov, & Holm-Denoma, 2010), with the most common ideal BF falling in the range of underweight BMI values (MacNeill, & Best, 2015). Empirically, the thinner the ideal BF and the larger the discrepancy between how a woman perceives her body appearance and how slim she would like to be, the higher DT scores concurrently and the higher the increases across years (DeLeel, et al., 2009). Differently from women, males are more likely to be concerned with their actual body shape and muscularity rather than with adiposity and weight as women generally do (Grieve, 2007; Grieve, Newton, Kelley, Miller, & Kerr, 2005; Olivardia, Pope, Borowiecki, & Geoffrey, 2004). MD represents a personal belief of being muscular not enough and it is often combined with an excessive exercise aimed at maintaining or gaining more and more muscularity (Grieve, 2007; Stanford, & Lemberg, 2012), with MD levels being associated with dysfunctional eating attitudes in bodybuilders as well (Devrim, Bilgic, & Hongu, 2018). A positive

association between MD and actual BF generally emerges, with larger men referring to exercise more and more in order to maintain or gain further muscularity (Cafri, Thompson, Ricciardelli, McCabe, Smolak, & Yesalis, 2005), but MD might be expected in thinner men as well (Olivardia, et al., 2004). Actual/ideal BF discrepancies impact MD levels as well. Ralph-Nearman and Filik (2018) recently found out that MD is more likely to occur when ideal BF is larger than the perceived BF, whereas ED tendencies towards restrictive food intake and weight control are rather expected when ideal BF is slimmer than actual BF as it occurs in females.

3.1.2 Body figure ratings, Binge eating, and Bulimia. Sex-specificities have also emerged when dysfunctional excessive food intake is inspected, with adolescent boys being more likely to self-report BE behaviours and girls rather engaging into bulimic behavioural patterns (Murray, Nagata, Griffiths, Calzo, Brown, et al., 2017). BE behaviours are concurrently associated to higher BMI levels and represent a risk factor for obesity (Amianto, Ottone, Abbate-Daga, & Fassino, 2011; Goldschmidt, Wall, Zhang, Loth, & Neumark-Sztainer, 2016). Nevertheless, BMI levels do not prospectively predict systematically BE and more generally ED symptoms in men, because of the inter-individual differences in their concerns for body fat and muscles (Furnham, Badmin, & Sneade, 2002; Olivardia, et al., 2004). In addition, excessive BE has also been hypothesised in young adolescents with lower BMI levels who want to become larger (McCabe, & Ricciardelli, 2003). Similarly, BE episodes are associated with an individual's belief of being too fat, but they have been shown to depend on shape underestimation as well, in case of young boys especially (Cafri, et al., 2005). Therefore, a non-linear association might link both BMI and BI to BE. As to females, clinical studies suggest that adolescent girls and young women with typical bulimic symptoms, such as binging and purging behaviours, tend to systematically overestimate their weight and body size and refer internalized thinner body shapes, cross-sectionally as well as longitudinally (Counts, & Adams, 1985; MacNeill, & Best, 2015; Vocks, Legenbauer, Ruddel, & Troje, 2007). Differently from girls with high scores on DT who are primarily focused on an ideal even extreme slimness, girls with BU profiles are mostly concerned with their actual body shape

and weight, though they also would like to be slimmer than they are (Williamson, Davis, Goreezny, & Blouin, 1989; Brytek-Matera, & Czepczor, 2017).

3.1.3 Reflected body figure ratings and ED conditions. Peers play a significant role in ED conditions in adolescents and sources of peer effects are several, both objective and subjective, as highlighted in Chapter 1 (Holmqvist, Gattario, & Frisén, 2019; Lieberman, Gauvin, Bukowski & White, 2001; Smink, Hoeken, Dijkstra, Deen, Oldehinkel, & Hoek, 2018). For example, normative beliefs on body shape are significant. In fact, in western societies women generally believe that men prefer slimmer body shapes than the actual figures women report, and vice versa for men, and such a misjudgement has consequences on body dissatisfaction for women especially (Demarest, & Allen, 2000). Furthermore, men are sensitive to how they believe male peers value muscularity normatively, though higher levels of MD symptoms have been demonstrated to rather depended on female peers' muscularity preferences (McCabe, & Ricciardelli, 2003; Lin, & DeCusati, 2016). The way an individual perceives her/his friends' body figure is relevant as well. In fact, such a perception accounts for subjective weight evaluation in young female (Ramirez, & Milan, 2016).

To our knowledge, no systematic attention has instead been paid on reflected body shape, that is, how an individual believes the other perceives her/his body figure/silhouette. Findings from Lieberman and colleagues (2001) however suggest that such a self-perception might be significant. In fact, they found out that externalized self-perceptions, that is, judging ourselves as being sensitive on the reflected perspective of the other, concurrently accounted for restrictive weight control, bulimic behaviours, and body esteem, in adolescent girls. Similarly, a follow-up study on a large male sample of young college students evidenced how initial vulnerabilities in experiencing and monitoring their own body as an object for its appearance from the perspective of a third person predicted initiation and maintenance of BE clinical symptoms, nine months later (Dakanalis, et al., 2016).

3.1.4 Self-esteem and ED conditions. Together with body-related self-views, self-esteem represents a widely investigated risk factor for EDs. Indeed, self-esteem has been found to

negatively correlate with abnormal eating, both restrictive, BE and bulimic behaviours, in both females and males (Goldschmidt, Wall, Loth, Bucchianeri, & Neumark-Sztainer, 2014; Mäkinen, Puukko-Viertomies, Lindberg, Siimes, & Aalberg, 2012; Shea, & Pritchard, 2007). In Chapter 1, longitudinal studies have been examined, showing poor self-esteem to anticipate initiation and increases of both restrictive and overeating and binge eating attitudes and behaviours among adolescent and young females and males (Dakanalis, et al., 2016; Gilbert, & Meyer, 2005; Goldschmidt et al., 2016). However, less consistent findings have emerged on MD. Conceptually included as risk factor for the development of MD (Grieve, 2007; McCreary, & Sasse, 2000), poor self-esteem has been shown to predict higher MD among male students (Murray, Rieger, Karlov & Touyz, 2013) but not among male bodybuilders and athletes (Cerea, Bottesi, Pacelli, Paoli, & Ghisi, 2018).

Poor attention has been instead paid on Self-Esteem x BF interaction effect on ED (Stice, & Desjardins, 2018). For example, Vohs and colleagues (Vohs, Bardone, Joiner, Abramson, & Heatherton, 1999) found out that BU levels depended on an interaction effect involving perfectionism and self-perception of being overweight only in girls with poor self-esteem. Nevertheless, actual, ideal, and reflected BF x Self-Esteem interactions and their effects on sex-specific ED conditions has not been systematically investigated yet.

3.1.5 Between people and within-person approaches. In Chapter 1, studies on vulnerability factors have been examined by outlining that they favoured an inter-individual approach over an intra-individual approach for describing and understanding ED protective and risk factors. Within-person and between people approaches are however complementary and they do not necessarily yield the same findings (Fleeson, 2007). Developmental trajectories have been depicted from a within-person approach (Chapter 1). As to within-person co-variations between ED and predictors considered in the present study, self-esteem has been found to protect from BE exacerbation and helps its cessation (Goldschmidt, et al., 2014; Fairweather-Schmidt, & Wade, 2016); conversely, a thinner ideal BF favours an escalating trajectory (Fairweather-Schmidt, & Wade, 2016). To our

knowledge, a systematic analysis of Self-Esteem and BFs on EDs from within-and between people perspectives has not been proposed yet, though it allows to verify the tenability of their unique and combined contributes to ED development across different data treatments.

3.2 Current study: Aims and Hypotheses. The 1-year longitudinal study here presented explored co-variations between sex-specific core ED indicators, that is, MD and BE for boys and DT and Bu for girls, over 3-time points (Wave 1 to Wave 3), 6 months apart from each other. We analysed both temporal antecedents of between people ED changes across 1 year, via cross-lagged pattern associations, and within-person covariations in ED, SE and BF changes across the 3 measurement occasions, via multilevel modelling. As to BF discrepancies, we explored interactions effects between the different BFs rather than their difference in scores, in order to avoid confounding BF discrepancy with BF ratings. In fact, females ideally prefer slim silhouettes, with rather narrow variability, whereas their actual body shape varies largely, from slim to fat. As a consequence, actual/ideal discrepancy scores depend on actual BF mostly, and discrepancy scores are therefore statistically confounded with actual BF scores. Conversely, investigating interaction effects help estimate the unique effect of each BF, further inspecting the impact of their combination. In detail, we examined the following hypotheses:

H1. Higher actual BF scores at the baseline and their within-person increases predict increases in each ED outcome, being especially relevant for DT and BE (Gardner et al., 2000); a quadratic association might link actual BF and MD and BE in adolescent males (Cafri, et al., 2005; Ralph-Nearman, & Filik, 2018);

H2. Initial slimmer ideal BFs and their within-person further reduction account for increases in DT levels especially (DeLeel, et al., 2009), whereas initial larger BF ratings might account for increases in MD (Olivardia, et al., 2004; Ralph-Nearman, & Filik, 2018);

H3. Larger actual BF ratings combined with thinner ideal BF ratings contribute to account for increases in DT especially (DeLeel, et al., 2009), whereas a reverse pattern might emerge for MD outcome (Ralph-Nearman, & Flick, 2018);

H4. Hypotheses on reflected BFs were tentative, with girls being sensitive to how they believed their female peers perceive their BF (Lieberman et al., 2001; Ramirez & Milan, 2016), but boys on both same- and opposite sex reflected BFs (Dakanalis, et al., 2016; Lin, & De Cusati, 2016; McCabe, & Ricciardelli, 2003);

H5. If adolescents are sensitive to reflected body shapes, then a larger actual BF especially favours increases in DT, Bu and BE when reflected BFs are larger as well; conversely, a larger reflected BF might attenuate MD across time (Lin, & De Cusati, 2016) but also favour increases in its levels (Olivardia, et al., 2004; Ralph-Nearman, & Filik, 2018);

H6. Self-Esteem protects from increases in ED scores in both boys and girls, with reflected SE contributing in the same direction (Lieberman, et al., 2001);

H7. Self-Esteem attenuates the negative impact of actual and reflected BF on EDs (Goldschmidt, et al., 2014; Fairweather-Schmidt, & Wade, 2016).

Self-reported actual and ideal BMI were systematically taken under control and hypothesised to represent risk factors for BE and DT in boys and girls, especially (De Caro, & Di Blas, 2016; Amianto, et al., 2011).

3.3 METHOD

3.3.1 Participants and procedures

In the present study, participants from T1 to T3 were included (N= 193; 66% boys). Sample characteristics and descriptive statistics are reported in Chapter 2 (paragraph 2.2.1; Table 2.1).

3.3.2 Measures

Eating Disorder Assessment for Men (EDAM). Internal consistencies ranged from .60 to .63 for BE and they were equal to.75 for MD, across the three measurement occasions. One-year test-retest stability were equal to .55 and .61 for MD and BE, respectively (Table 3.1). Chapter 2 provides descriptions of scales and descriptive statistics across 2-yrs study.

Eating Disorder Inventory-2 (EDI-2). Cronbach's alphas ranged from .84 to .86 for DT and from .59 to .67 for BU, across 3 time points; test-retest correlations indicated moderate (Bu) to high

stability levels (DT, Table 3.1). Chapter 2 reports descriptive statistics and test-retest reliability for all measurement occasions.

Table 3.1 Test-retest correlations for body figures (BF), self-esteem (RSES) and ED variables

	Whole sample	
T3 scales	T1 matching scale	T2 matching scale
CDRS Actual BF	.74	.71
CDRS Ideal BF	.67	.67
CDRS RBF_{GIRLS}	.74	.76
CDRS RBF_{BOYS}	.67	.71
RSES	.56	.69
Reflected RSES	.58	.64
EDAM Muscle Dysmorphia	.57	.68
EDAM Binge Eating	.55	.65
EDI-2 Drive for Thinness	.70	.66
EDI-2 Bulimia	.41	.70

Note. Whole sample $168 \leq N \leq 193$; boys $76 \leq N \leq 127$; girls $57 \leq N \leq 66$; CDRS = Contour Drawing Ratings Scale; RBF= Reflected Body Figure; RSES= Rosenberg Self-Esteem Scale; EDAM= Eating Disorders Assessment for Man (boys only); EDI-2= Eating Disorder Inventory 2 (girls only). All values are significant at $p \leq .001$

The Contour Drawing Rating Scale. We assessed two different reflected body images: one reflecting -*how boys see me*-(CDRS RBF_{BOYS}), the other -*how girls see me*- (CDRS RBF_{GIRLS}). In the present sample, these four different body shapes were stable across 1- year interval, with test-retest stabilities ranging from .61 (CDRS ideal BF) to .75 (CDRS RBF_{GIRLS}); coefficients are reported in Table 3.1.

Rosenberg Self-Esteem Scale (RSES). Cronbach's alphas for general and reflected RSE scores were in the range of .81 to .83, and test-retest ≥ .57 (Table 3.1). More information are provided in Chapter 2.

3.4 RESULTS

Intra-individual changes in ED levels and co-variations in changes between EDs and predictors were inspected via multi-level modelling by SPSS MIXED MODELS, which provides the restricted maximum likelihood (REML) as default estimation method. REML provides accurate estimates especially when sample size is modest (Hox, 2002; Kwok, Underhill, Berry, Luo, Elliot, et al., 2008; Raudenbush, & Bryk, 2002). First-level independent variables were centered within-person.

3.4.1 Preliminary analysis: Missing data, Descriptive statistics, and Trajectories and covariations for independent variables. Missing data were randomly distributed. All variables were normally distributed except EDI-2 Bulimia (z scores ≥ 3.0 were excluded). Results in Table 3.2 show that actual BMI tended to increase across time, with a second level interaction effect however indicating that it increased for younger boys only; the significant co-variation between intercept and time slope showed that BMI growth rate was higher for boys and girls who were slimmer at the baseline measurement occasion (Table 3.2). Ideal BMI did not vary across time, although a significant co-variation between intercept and slope indicated that the increase rate across time was more rapid for adolescents with initially lower ideal BMI levels; females referred lower mean levels. As to BFs, the results in Table 3.2 indicate that actual BF increased slightly across time, whereas ideal and reflected BFs did not, with girls systematically reporting thinner figures as compared to boys. Lastly, no changes across time for self-esteem levels, with girls again reporting poorer RSES.

Table 3.2 Descriptive statistics at the baseline and trajectories across the three measurement occasions, for the independent variables.

	Actual BMI	Ideal BMI	CDRS Actual BF	CDRS Ideal BF	CDRS RBF_{GIRLS}	CDRS RBF_{BOYS}	RSES	Reflected RSES
Intercept	19.64***	20.17***	5.35***	5.41***	5.51***	5.50***	20.35***	18.96***
(random effect in SD)	(2.81***)	(1.88***)	(1.07***)	(0.61***)	(1.07***)	(1.20***)	(3.42***)	(3.37***)
Slopes:								
Time interval	0.62***	0.10	0.07*					
(random effect in SD)	(0.77***)	(0.39**)						
Sex	0.58	-1.34***		-1.06**	-0.61***	-0.50**	-1.72***	
Age[1]	2.39***	1.66***						
Time by Sex	-0.78**							
Time by Age	-0.47*							
Sex by Age	-1.20							
Time by sex by age	0.81*							
Covariation intercept by time slope	-0.22*	-0.35**						

Note. At the base line, descriptive statistics were observed on 58 / 65 girls and 124 / 128 boys. BF = Body figure based on the *Contour Drawing Rating Scale.* RSES = *Rosenberg Self-Esteem Scale.* [1] Sex and Age were recoded as a dummy variable, with boys and adolescents in the range of 14 to 16 yrs coded as the reference group, respectively. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

At intra-individual level, changes in actual BMI significantly ($p \leq .001$) covaried with changes in ideal BMI (b = 0.38), and vice versa (b = 0.65), and with changes in actual BF (b = 0.55). Actual BF self-ratings varied across time in accordance with variations in actual BMI (b = 0.08), and ideal (b = 0.25) and both reflected BFs (CDRS RBF_{GIRLS} -*how girls see me*- b = 0.25, CDRS RBF_{BOYS} -*how boys see me*- b = 0.28). Ideal BF correlated with actual BF only (b = 0.41); the two reflected BFs were associated substantially (b = 0.44), yet not as high as interchangeable variables, and covaried with actual BF as well. General and reflected RSES variations correlated with each other (b = 0.39). Overall, these preliminary findings helped understand the pattern of co-variations among the predictors and revealed how actual body images are connected to several body size and shape views, but not vice versa.

3.4.2 Within-person changes across time: Developmental trajectories, predictors and interaction effects for ED outcomes. After inspecting developmental trajectories (Model 1), co-variation in changes between actual and ideal BMI and outcomes were analysed (Model 2); BFs and their interaction were then added and selected (Model 3); lastly, RSES variables and Self-Esteem x BF interaction effects were inspected in order to predict within-person changes in EDs (Model 4).

Table 3.3 presents the coefficients for fixed and random effects for the final models predicting respectively EDAM BE and EDAM MD. Initial BE scores were stable (Model 1); we did not find any significant ($p \leq .05$) slope/intercept co-variation (that is, trajectories did not change in function of initial BE scores), time by age interaction, time by initial BMI interaction, or curvilinear trajectories, although adolescents with T1 scores within the 50^{th} percentile referred linearly decreasing levels from T1 to T3 (b = -0.40, $p \leq 0.05$). Intra-individual increases in actual BMI covaried with increases in BE behaviours and attitudes (Model 2), but BMI was no more significant when body figures were entered in the model (Model 3).

Table 3.3 Multi-level model for EDAM Binge Eating among adolescent boys.

	Fixed Effect	Random Effect (SD)
	EDAM Binge Eating	
Model 1: Trajectories		
Intercept	25.72***	4.03***
Slope: Time	-0.03	
Model 2: BMIs		
Intercept	22.76***	3.85***
Slopes		
Actual BMI_{MEAN}	0.67***	
Actual BMI	0.37*	
Ideal BMI_{MEAN}	-0.54*	
Model 3: Body figures		
Intercept	24.91***	3.96***
Slopes:		
Actual BMI_{MEAN}	0.38**	
CDRS Actual BF	0.42	
CDRS RBF_{BOY}	-0.15	
CDRS Actual BF x CDRS RBF_{BOY}	1.52**	
Model 4: Self-Esteem		
Intercept	36.52***	3.83***
Slopes		
Actual BMI_{MEAN}	0.46***	
CDRS Actual BF	0.44	
CDRS RBF_{BOY}	0.36	
CDRS Actual BF x CDRS RBF_{BOY}	1.94***	
Reflected $RSES_{MEAN}$	-0.60***	
RSES	-0.16*	
CDRS RBF_{GIRL}	-0.89	
RSES x CDRS RBF_{GIRL}	-0.81***	
	EDAM Muscle Dysmorphia	
Model 1: Trajectories		
Intercept	32.82***	5.49***
Slopes: Time	-1.19**	
Model 2: Body Images		
Intercept	31.38***	5.71***
Slopes		
CDRS Actual BF	0.46	
CDRS RBF_{BOY}	0.30	3.35**
CDRS Actual BF x CDRS RBF_{BOY}	2.06**	

Note. Random effects were included in models only if significant at $p \leq .05$; RSE= Rosenberg Self-Esteem; BF= Contour Drawing Rating Scale Body Figure; RBF= Reflected Body Figure BMI= Body Mass Index, centered around 20. All predictors were centered within-person (CWP), unless *Mean* is specified. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

However, changes in body figures did not uniquely account for changes in BE, but a significant interaction effect between actual and reflected same-sex shapes (CDRS RBF_{BOYS}) emerged and suggested that intra-individual increases in actual BF predicted intra-individual increases in BE, if the adolescent boy also believed that his male peers see his body silhouette as larger and larger across time. The interaction term improved the model fit significantly (Δ-2log= 9.23, $p \leq .01$) and accounted for an additional 1.5 per cent of the residual variance in comparison to the additive model. Though weak, the interaction term still was significant in Model 4, where increases in RSES further predicted decreases in BE also in interaction with reflected BF_{BOY}, that is, intra-individual increases in self-esteem protected from increases in BE especially when the male participants referred that girls see their body figure as larger and larger from T1 to T3. When added, this second interaction term accounted for a substantial 6.3 per cent of the residual variance (Δ-2log= 9.23, $p \leq .01$). Model 4 also reveals how inter-individual differences in actual BMI accounted for higher BE scores, whereas reflected RSES protected from BE behaviours.

As to EDAM MD, results in Table 3.3 indicate that scores gradually decreased across the measurement occasions; after splitting the sample into two halves (50^{th} percentile), results revealed that the decrease was stronger for boys with initially lower ($b = -1.01$, $p \leq .001$) rather than higher ($b = -0.70$, $p \leq .08$) MD scores. Within-person changes in BMIs, body figures, and RSESs did not uniquely accounted for changes in the outcome. Nevertheless, a significant interaction effect between actual BF and reflected BF_{BOY} suggested that increases in MD were positively associated with individual changes in actual BF in those adolescent boys who also believed that their male peers see their body shape as larger and larger across time. The inclusion of the interaction term accounted for 4.1 per cent of additional variance and enhanced significantly the model fit (Δ-2log= 9.20, $p \leq .01$). A weak quadratic association between actual BF and MD emerged as well (1.2 per cent of accounted variance, (Δ-2log= 5.92 $p \leq .05$), suggesting that intra-individual increases in MD were more rapid when changes in actual BF were greater. Significant associations at between people level did not emerge.

For adolescent girls, intra-individual variations in EDI-2 DT across time did not emerge (Table 3.4). When BMIs were entered, between people differences in both actual and ideal BMI were significant, but no longer when BFs were added.

Table 3.4. Multi-level model for EDI-2 Drive for thinness and Bulimia among adolescent girls.

	Fixed Effect	Random Effect (SD)
	EDI-2 Drive for Thinness	
Model 1: Trajectories		
Intercept	-0.13	0.81***
Slope: Time	-0.04	
Model 2: BMIs		
Intercept	-0.40	0.75***
Slope:		
Actual BMI_{MEAN}	0.21***	
Ideal BMI_{MEAN}	-0.21**	
Model 3: Body figures		
Intercept	-0.40	0.75**
Slopes		
CDRS Actual BF_{MEAN}	0.44***	
CDRS Actual BF	0.14*	
CDRS Ideal BF_{MEAN}	-0.47***	
Model 4: Self-Esteem		
Intercept	0.71	0.66*
Slopes		
CDRS Actual BF_{MEAN}	0.40***	
CDRS Actual BF	0.12*	
CDRS Ideal BF_{MEAN}	-0.43***	
RSE_{MEAN}	-0.06**	
Reflected RSES	-0.04*	
	EDI-2 Bulimia	
Model 1: Trajectories		
Intercept	-0.22*	0.76***
Slopes: Time	-0.07	0.42***
Covariance (Intercept x Slope)	-0.59***	

Note. Random effects were included in models only if significant at $p \leq .05$; RSES= Rosenberg Self-Esteem Scale; BF= Contour Drawing Rating Scale Body Figure; RBF= Reflected BF; BMI= Body Mass Index, centered around 20. All predictors were centered within-person (CWP), unless *Mean* is specified. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

Within-person changes in perceived actual BF were significantly associated with DT across time (Table 3.4). Inter-individual differences in mean scores in both actual and ideal body figures

predicted different DT scores. Model 4 shows that within-person decreases in reflected RSES accounted for increases in DT, in addition to RSES mean levels. Differently from our hypotheses, changes in ideal BF ratings did not predicted DT and they did not moderate the effect of current BF. Nevertheless, a marginally significant interaction effect emerged between ideal BF and reflected RSES ($b = -.11$, $p \leq .07$) and it suggested that the slimmer the ideal BF and the less a girl believes other people appreciate her, the higher the risk for DT.

EDI-2 Bulimia was not normally distributed, with 55 per cent of girls referring no bulimic symptoms at all; we excluded three univariate outliers, with $z \geq 3.0$ at the baseline. Though the slope indicated that Bu levels did not change across one year, the observed co-variation between slope and intercept (Table 3.4) suggests that values decreased more rapidly for those girls who initially reported higher Bu scores. No predictors of intra-individual changes in this outcome variable emerged, neither when we analysed data after excluding girls with no bulimic symptoms.

Table 3.5 T1 Temporal antecedents of changes at T3 sex-specific eating disordered behaviours and attitudes

Step	Predictors at T1	R^2_{change}	sr
		EDAM Binge Eating at T3	
1	EDAM Binge Eating	.31***	.36***
2	Actual BMI	.03*	.29***
	Ideal BMI	.04**	-.21**
3	RSES	.07***	-.27***
		EDAM Muscle Dysmorphia	
1	EDAM Muscle Dysmorphia	.37***	.58***
2	CDRS Actual BF	.03	.20**
	CDRS RBF_{BOY}		.05
5	CDRS Actual BF x CDRS RBF_{BOY}	.02*	-.16*
		EDI-2 Drive for Thinness	
1	EDI-2 Drive for thinness	.52***	.71***
		EDI-2 Bulimia	
1	EDI-2 Bulimia	.18***	.37***

Note. EDAM- Eating Disorder Assessment for Man; RSES = Rosenberg Self-Esteem Scale; BF = Contour Drawing Rating Scale Body Figure; RBF= Reflected Body Figure; BMI= Body Mass Index. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

3.4.3 Between people associations across time: Temporal antecedents, correlated changes, and moderation analysis for ED outcomes, one-year later. A hierarchical multiple regression analysis was conducted in order to inspect how the present set of predictors accounted for changes in ED levels, from T1 to T3. After controlling for T1 same outcome variable (Step 1), predictors were entered at next steps and automatically selected via a Stepwise procedure, with BMIs entered at step 2, BFs at Step 3 and RSES at Step 4. Results are presented in Table 3.5. No antecedents emerged for DT and Bu. Initial higher actual BMI, lower ideal BMI, and poorer RSES levels predicted increases in binge eating behaviours, one year later. Larger current BF at the baseline temporally anticipated increases in MD scores, especially when combined with an adolescent believed that male peers perceived his body as thinner rather than robuster.

When cross-lagged pattern associations were inspected in order to explore correlated changes between ED conditions and each of the independent variables, the results showed that decreases across time in reflected RSES correlated with increases in both bulimic ($pr = -0.29$, $p \leq 0.05$) and restrictive ($pr = -0.44$, $p \leq 0.001$) behaviours and attitudes in girls; furthermore, increases in actual BF correlated with increases in DT scores ($pr = 0.30$, $p \leq 0.05$). Increases in BE were associated with decreases in RSES and increases in actual BMI levels.

3.5 Discussion

The overall aim of the present longitudinal study was to systematically explore how changes in body figure perception and self-esteem predict changes in sex-specific ED outcomes in adolescent students, across one year. Specifically, we took into account reflected self-views, in addition to traditional self-perceptions, and therefore focused on actual, ideal, and sex-oriented reflected body figures, further parallelly distinguishing between self-esteem and reflected self-esteem. Accordingly, we investigated a set of detailed hypotheses in order to reveal the contribution of each predictor in estimating changes in EDI-2 Bu and DT in girls, and EDAM BE and MD in boys. Lastly, we analysed our data set from both inter and intra-individual perspectives.

Initially, we inspected developmental trajectories of predictors and co-variations between predictors, across one year. Overall, the results showed a normative development of actual BMI (Ames, & Wintre, 2016) as well as normative sex-differences in ideal BMI, ideal BF, and self-esteem levels (Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002). The present main findings might therefore be extended to other adolescents as well. Preliminary results also revealed that, no body figure among the four we evaluated was fully redundant. Such a finding implies that adolescents see their body from different perspectives, which are not interchangeable, and each self-view may uniquely contribute to predict ED-related behaviours and attitudes. Nevertheless, the association patterns that emerged among the four figures suggests that actual BF well summarises how an adolescent perceives her/his body shape, being substantially linked to actual BMI as well as to both ideal and reflected BFs.

When we focused our attention on ED scores, rank-ordered ED outcomes were moderately stable across measurement occasions and their intra-individual developmental trajectories indicated room for changes as well. In fact, muscle dysmorphia decreased across time in males, so did bulimic symptoms in females, especially in those girls with higher scores at the baseline. Drive for thinness and binge eating were stable, although for boys with initially lower BE scores a further reduction was observed. Overall, these results suggest an attenuating path across adolescence, in accordance with results from previous studies which indicated that adolescents may adopt ED-like symptoms transitory only (Fairweather-Schmidt, & Wade, 2016; Keel, Heartherton, Baxter, & Joiner, 2007). They also call attention on systematically investigating distinct developmental trajectories for each ED-related condition.

In accordance with literature and the hypotheses here investigated, the present results showed that self-perceived body figures validly estimate both current ED conditions as well as changes across one year, over and above BMI (Amianto, et al., 2011; De Caro, & Di Blas, 2016). In fact, self-perceived actual body shape accounted for inter-individual differences in BE and DT, further covariating with DT changes at between as well as within-person level (DeLeel, et al., 2009;

Gardner, et al., 2000; MacNeill, & Best, 2015). Larger actual BF anticipated increases in MD one year later as well (Olivardia, et al., 2004; Ralph-Nearman, & Filik, 2018). Beyond the unique contribution of actual BF, the present results revealed that the way male adolescents combine such a representation of their shape with their reflected same-sex figure is significant: the larger both actual and reflected body shapes, the higher the increase of binge eating and muscle dysmorphia scores at intra-individual level. In other words, boys with a larger actual self-perceived BF are more vulnerable to both increase binge eating levels and engage in weight-control strategies and exercise behaviours to a greater extent, when they think to be perceived larger/fatter by other males. Such a finding however was not supported when antecedents of BE and MD changes at inter-individual level were investigated. Further studies have hence to be conducted in order to test the present findings which are partially mixed (Dakanalis, et al., 2016; Devrim, et al., 2018; Olivardia, et al., 2004; Ralph-Nearman, & Filik, 2018). Nevertheless, these results represent an extension of studies on the role of actual BF, spanning between thin/emaciated and larger/obese, for the development of ED behaviours such as weight-control behaviours and binge eating in males, by empirically supporting the moderating role of same-sex reflected BF.

Self-esteem was expected to play a protective role from ED development (Dakanalis, et al., 2016; Goldschmidt, Wall, Loth, Bucchianeri, & Neumark-Sztainer, 2014; Mäkinen, Puukko-Viertomies, Lindberg, Siimes, & Aalberg, 2012). The present study confirms that self-esteem contributes to prevent risky levels in both restrictive and over-eating habits also when within person-changes are investigated, further revealing that reflected self-worth is relevant as well, in girls especially. Mostly, the present results showed that self-esteem and reflected body figures act together. Although an interaction between self-esteem and peer influences was previously hypothesised (Ricciardelli, & McCabe, 2001; Stice, & Desjardins, 2018), to our knowledge no empirical support has been previously found. Therefore, the present results indicate that increases in self-esteem may protect from increases in BE, especially when adolescent boys think that girls see their body figure as larger and larger across time. Such an interaction effect needs further

investigation, but it is consistent with research demonstrating how self-attitudes and behaviours on social media have significant effects on an adaptive development in teens who increasingly see and evaluate themselves through the eyes of others (de Vries, Graaf, & Nikken, 2016; Mills, Musto, Williams, & Tiggerman, 2018).

In brief, the present findings indicate that self-esteem and body figure should be routinely taken into account for predicting ED levels and changes. Their effects emerge when inter- as well as intra-individual variations are investigated, concurrently and longitudinally. Beyond further minor results in line with literature such as the quadratic association between MD and actual BF (Cafri, et al., 2005; Ralph-Nearman, & Filik, 2018), the original contribution of the present study consists in revealing that reflected self-perceptions deserve more attention in ED research field (Cash, 2002; Gardner, & Brown, 2010).

The present study has important limitations, which will be outlined in the general discussion at the end of the thesis.

Next Chapter focuses on Body Image (BI) and investigates the factor structure underlying all BI-related measures involved in the present project.

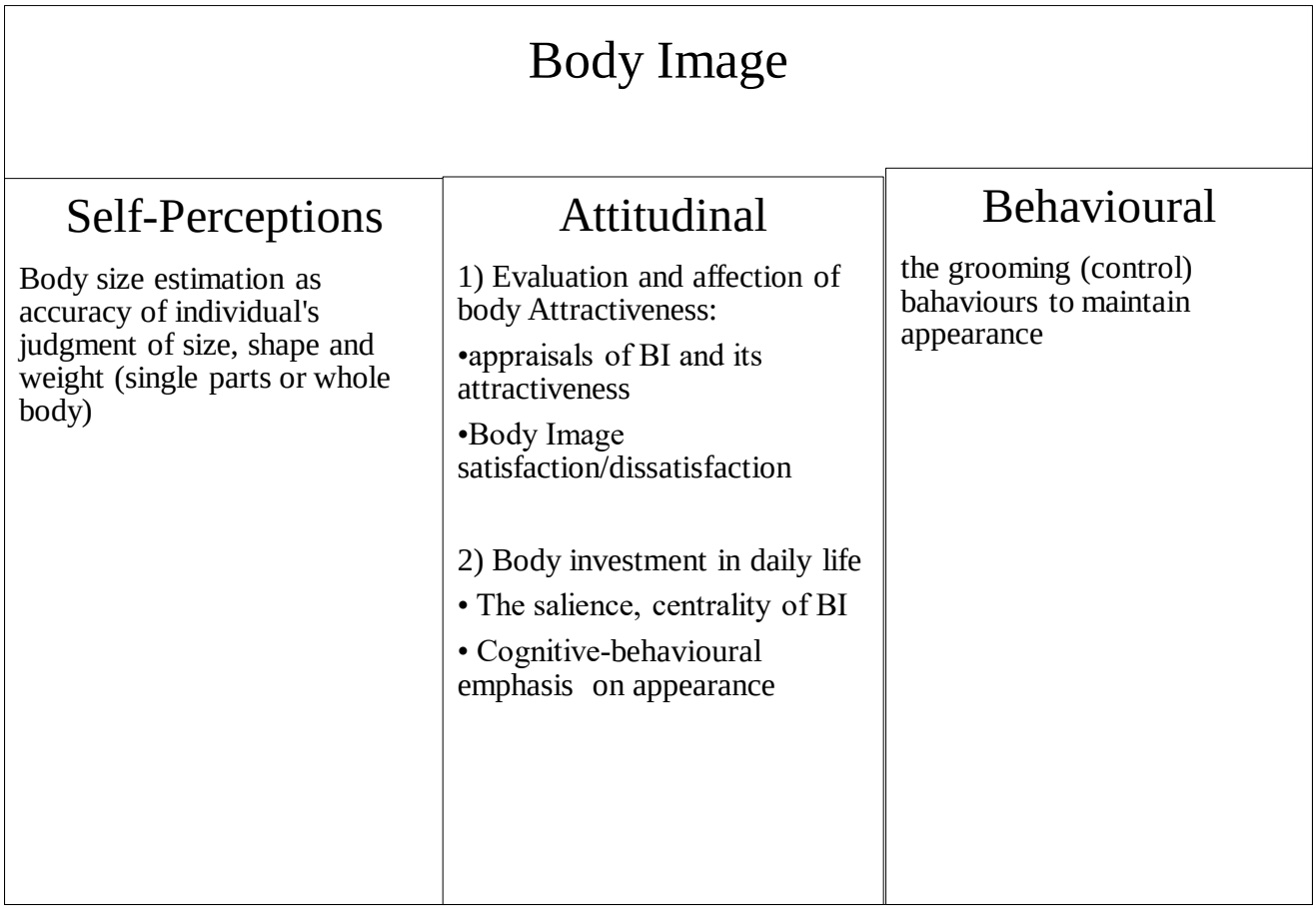
Chapter 4

Body Dissatisfaction, Body Uneasiness, Body Figure Perception and Body Weight: Factor Structure in Non-Clinical Adolescents

4.1 Introduction

Body image (BI) plays a relevant role in ED onset (Fairburn, et al., 2003; Stice, 2001). Cash and colleagues (2002) developed a conceptual model on BI which currently is very prominent (Cash, 1994; Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002). The model distinguishes between two main dimensions: Self-perceptions and Attitudes concerning someone's own physical appearance. In addition, it includes a behavioural component. As illustrated in Figure 4.1, the Self-Perceptions component mainly involves body size estimation, that is, the degree of an individual's accuracy in estimating and judging size, shape and weight of her/his body. The attitudinal BI domain includes 1) an evaluation/affection dimension, which concerns body image appraisals and body (dis)satisfaction, and 2) a body image investment component, that is, salience and emphasis given to appearance and body image in everyday life. The authors also provided some empirical support for additionally including a behavioural component into the BI construct. Such a component consists in grooming and control behaviours aimed to change or maintain one's own appearance, but its inclusion is not fully theoretically accepted. Indeed, some authors evidenced that such behavioural component represents consequences or signals of body image disturbances (BID) (Banfield, & McCabe, 2002; Gleaves, Williamson, Eberenz, Shannon, Sebastian, & Barker, 1995), rather than defining elements of BI per se. Operationally, BI measures mostly tap evaluative/affective components, thus confounding the higher-ordered BI constructs, with its attitudinal or BD component. As to perceptual domain, some instruments included it, but others do not, and rather mix behavioural and attitudinal elements.

Fig.4.1 Cash's model graphical representation



Note. Behavioural component is not definitely involved in BI construct.

In addition, BI-related measures often contain clinical features related to BI, such as depersonalization. Labels change as well, though targeting comparable behavioural and attitudinal components (i.e. jingle-jangle fallacy), also due to inconsistencies in assessment tools.

As a consequence, results from different studies were difficult to compare to each other. Thus, further investigation is needed in order to clearly distinguish the BI components and their related assessment tools to be applied in clinical (i.e. body distortion techniques in patients with Anorexia Nervosa) and non-clinical population (Lydecker, White, & Grilo, 2017; Mitchison, Hay, Griffiths, Murray, Bentley, et al., 2017). In addition, a systematic hierarchical structure of BI would facilitate to figure out the role that each BI component plays in predicting ED conditions as well as

their reciprocal influences across time. It would also help as a map onto which the currently existing BI and BD measures might be projected in order to better understand constructs under assessment.

The aim of the study, herein presented, was to explore the factor structure of body image as an higher-ordered construct subsuming widely implemented assessment tools, in accordance with the Cash's model (Cash, et al., 2002). The following sections aimed to define the BI elements by paying attention on 1) their distinctive clinical and non- clinical features and 2) the tools they have been mainly assessed by.

4.1.1 Perceptual body image. Self-perceptions and body size estimation refer to an individual's perception as well as estimation or judgement of her/his body size, shape and weight. As such, body image accuracy techniques (Gardner, & Boice, 2004; Sands, Maschette, & Armatas, 2004) basically include: 1) body size estimation and 2) body distortion techniques.

Body size estimation methods are further distinguished into two types: Body part size and whole-body size and shape estimation procedures (Gleghorn, Penner, Powers, & Schulman, 1987; Porras Garcia, Ferrer Garcia, Olszewska, Yilmaz, Ibanèz, et al., 2019). When a body part size procedure is applied, a person is asked to draw or mark the width of a specific part of his/her body, so as to estimate its size by using spatial references such as distance between points. Conversely, when the whole body size and shape estimation is considered, then the participants are usually asked to select the body figure among others that represents how they actually are. The Figure Drawing Scale (FDS) method (i.e. the Contour Drawing Rating Scale as described in Chapter 2 and 3) is one of the most widely applied (Gardner, & Brown, 2010). The FDS tool consists in presenting the participants a series of silhouettes, on a single sheet, ordered by increasing sizes, from very thin to obese body shapes, with the central figure representing the average body shape. The main advantage of this assessment tool is its immediacy, which facilitates its administration, for example, during classroom hours at school (Gardner, & Brown, 2010).

Body distortion techniques usually assess body image by adopting software, through which people see an altered human shape and are asked to edit it until it represents how they think they

actually look like. Such modified images are then compared with participants' actual body measures in order to analyse the individual perception's error degree in estimating size and shape (Porras Garcia, et al., 2019). Both body distortion and the discrepancy between actual and ideal BI have often been implemented to capture BD as well. This aspect has led to an empirical overlap between body perception and BD dimensions (Grogan, 1999; 2016). Furthermore, several studies have shown very little or no correlation at all between body distortion and body dissatisfaction (Gardner, Friedman, & Jackson, 1998) suggesting that they are independent components and should be assessed separately thereby (Cash, et al., 2002).

4.1.2 Reflected perceptual body image: The others. Statements such as "Other people make fun of the way I look" (Body Esteem Scale; Mendelson, Mendelson, & White, 2001) or "I feel I am fatter than others tell me" and "I feel different to how others see me" from Body Uneasiness Test, Weight Phobia scale (Cuzzolaro, et al., 2006) directly refer to "other people" in assessing our own body, BI-related appraisals, and feelings. They catch the social dimension as described in the Social Comparison Theory (SCT), which focuses on peers' role in BI development during adolescence (paragraph 1.7; Harter, 2012; Morrison, Kalin, & Morrison, 2004; Morin, Maiano, Scalas, Janosz, & Lialien, 2017). Studies have revealed some gendered peers' influences in social comparison with same-sex peers influencing body images, self-worth and ED behaviours development (i.e. excessive exercise, dieting) among teenagers (McCabe, & Ricciardelli, 2003; Jones, 2001). The potential role of the opposite-gender influences has been conceptualized as well. For example, some studies suggested that opposite-gender peers' comments impact on body dissatisfaction and self-esteem as well (Krayer, Ingledew, & Iphofen, 2008; Ricciardelli, McCabe, & Banfield, 2000; Shroff, & Thompson, 2006). However, studies on SCT mainly used direct and explicit peers' feedback on body appearance, and findings were partially mixed. Conversely, as mentioned in Chapter 1, less is known about how reflected appraisals, i.e. self-appraisals from the perspectives of classmates (i.e. same-gender, opposite-gender) influence an individual's self-perceptions during adolescence

(Harter, Bresnick, Bouchey, & Whitesell, 1997; Harter, Waters, & Whitesell, 1998), and how they are linked to self- or peer BI perceptual elements.

4.1.3 Attitudinal Body Image. The Attitudinal BI component involves both the evaluation of cognitive and affection dimensions as well as BI investment. The following paragraphs will describe these two sub-components in detail.

Body Evaluation: Cognitive and Affective dimensions. The evaluative dimension belongs to the attitudinal BI component combining both cognitive and affective dimensions related to someone's own appearance. It mainly embeds two dimensions: body image appraisals and body (dis)satisfaction (Cash et al., 2002). BI appraisals focus on an individual's thoughts and beliefs about her/his own body attractiveness. The Body Esteem Scale (Mendelson, et al., 2001), for example, captures this component and measures it via three subscales, namely, Appearance (i.e. I am pretty happy with the way I look), Weight (i.e. I really like what I weigh), Attributions (i.e. Other people have fun of the way I look). Also some Body Uneasiness Test (BUT) subscales capture this component as well (Cuzzolaro, et al., 2006), i.e. BUT Weight Phobia (e.g. I am not as people see me , I think I am fatter than what I am being told) BUT Depersonalization (e.g. I feel uncomfortable and weird when I look at myself in the mirror) BUT Body Image Concerns (e.g. I think people laugh at me because of my look). In addition, BUT subscales contain some clinical elements such as depersonalization (i.e. detachment feelings respect with body), and social elements such as the "other people" to which compare, and may elicit body-related shame.

Body dissatisfaction has been the most investigated BI component in both ED and BI research field. EDI-2 BD scale (i.e. Eating Disorder Inventory 2 subscale) has been typically applied in both women and men in order to assess BD, mostly tapping dissatisfaction with adiposity, weight, and specific parts of the body such as hips and thighs. Nevertheless, a growing body of research has recently shown that men may also suffer from dissatisfaction with their own weight and shape (Cafri, Thompson, Ricciardelli, McCabe, Smolak, & Yesalis, 2005; Calzo, Sonneville, Hainess, Blood, Field, & Austin, 2012), but they are concerned with muscularity

(muscle, size, tone and definition) rather than adiposity or weight. The Eating Disorders Assessment for Men (EDAM; Stanford, & Lemberg, 2012) advocates that BD measures for men should require the above mentioned male body-related criteria. EDAM BD captures, indeed, this body image component with statements such as -I am satisfied with the amount of muscle I have- (Stanford, & Lemberg, 2012).

Differently from BD elements, *body uneasiness* has been defined as one of the attitudinal dimension linked to Body Image Disturbance. Body uneasiness dimension contains specific clinical and psychopathological features, alongside the others attitudinal BI elements, that keep it from being interchangeable with the more comprehensive BI construct and body (dis)satisfaction dimension. Nonetheless, in many empirical BI studies, body uneasiness have often been used to measure BI construct in both clinical and non-clinical population, without taking into account its highly clinical content and relevance (Grilo, Crosby, & Machado, 2019).

4.1.4 Body Weight. The role of body weight has often been explored in terms of over or underestimation of BMI in the prediction of unhealthy weight control behaviours (Cafri, et al., 2005). Nevertheless, these studies were mostly correlational and cross-sectional, thus the nature and the direction of the association between body weight and eating disorders have not been systematically investigated. In fact, few studies have explored and shown a longitudinal association between body weight increase and decreases in body satisfaction, but increases in ED scores (De Caro & Di Blas, 2016; Paxton, et al., 2006). Thus, the link of body weight perception, actual and ideal, to BD and other BI-related components has not been disentangled. In fact, to our knowledge no study has systematically included self-reported body weight measures in evaluating the factor structure of BI-related measures, though a relevant indicator of body size perception.

Typically, body weight measures refer to body fat composition. Due to its simplicity, this measure has been widely implemented in screening and clinical contexts in order to diagnose EDs. In addition to an anthropometric measurement, BMI is also calculated on self-reported height and weight (Lohman, Roche, & Martorell, 1988). Cooley & Toray (2001) evidenced that objective

weight measures may be less informative rather than subjective ones, especially in the prediction of ED conditions and development. In fact, girls with restrictive and bulimic patterns usually report a dysmorphic body weight and size perception, despite an objective low BMI. A lot of attention has also been directed to the discrepancy between actual and ideal body weight. It is worth considering that this discrepancy between actual and ideal BMI is typically calculated by simply subtracting the actual BMI from the ideal one. However, such an index does not allow to estimate the variation % in excess or deficit of the ideal body weight estimation against both 1) one's own self-reported actual body weight and 2) the normative body weight for age (as indicated from the World Health Organization normative BMI tables, and given in APPENDIX 3). Thus, in the present study we tentatively investigated the role of the discrepancy between self-reported actual and ideal BMIs and the correspondent normative BMI, as indicated from WHO (World Health Organization), alongside the other BI measures.

Thus, in the current study two discrepancy indices (Δ) were calculated as per below formula:

$$\Delta = (X_f - X_i) / X_i$$

specifically,

1) $\Delta_{I/N}$ = (Ideal BMI – Normative BMI) / Normative BMI

2) $\Delta_{I/A}$ = (Ideal BMI – Actual BMI) / Actual BMI

$\Delta_{I/N}$ may help to integrate the objective estimation of ideal BMI implemented in clinical context.

4.1.5 Current Chapter Aims. BI is a complex multifaceted construct. Specifically, it is still unclear whether each of those BI-related elements, described above, rather represent unique predictors of ED outcome variables among teenagers, and/or they belong to a higher-ordered domain and account for overlapping variability in ED outcome. In the present chapter we aimed to examine the factor structure of different assessment methods to measure BI. Two studies were conducted and herein presented. In Study 1, a principal component analysis (PCA) was conducted on cross-sectional Wave 2 data, in order to explore the structure of BI-related domains and whether

the structure was in accordance with Cash's model (Fig. 4.1). Specifically, we hypothesized that BMI-related measures together with CDRS BFs would load on a perceptual component, whereas BUT scales on an attitudinal component. In addition to PCA, a confirmatory factor analysis tested the factor model that resulted from PCA; factorial invariance across gender was tested as well.

Study 2 aimed to longitudinally test the factor model emerged in Study 1 across seasonal time pairs, from T1 to T3 (Spring to Spring), from T2 to T4 (Autumn to Autumn) and from T3 to T5 (Spring to Spring), 1-year interval. The seasonality is a relevant environmental factor that may impact on the development of BI construct (Geiselman, Haight, & Kimata, 1984; Stein, & Hedger, 1997). Longitudinal invariance across time points was then inspected by comparing four level of measurement invariance: Configural, weak, strong and strict invariance (Putnick, & Bornstein, 2016).

4.2 STUDY 1

4.2.1 METHOD

4.2.1.1 Participants and procedure

Toward the aims of the present study we involved Wave 2 (see Table 2.1; N= 344; 68,9% boys).

4.2.1.2 Measures

Body Mass Index: Self-reported measures on individual's weight, actual and ideal and discrepancy index (Table 4.1). The discrepancy indices, i.e. $\Delta_{I/A}$ and $\Delta_{I/N,}$ were calculated (see paragraph 4.1.4).

Body Uneasiness Test (BUT). The Body Uneasiness test (Cuzzolaro, Vetrone, Marano et al., 2006). Descriptive statistics and test-retest reliability of BUT raw scores were reported in Chapter 2 (paragraph 2.2.2.8). The BUT showed Cronbach's alpha values very high ranged from 0.74 (CSM) to 0.91 (BIC). The BUT raw scores were normalized and standardized in T scores, in order to ensure less skewed distribution (APPENDIX 1). For the present study we used BUT T scores. After

normalization and standardization, the distribution presented Skewness and Kurtosis values lower than “1”.

The Contour Drawing Rating Scale (CDRS). The Contour Drawing Rating Scale (Thompson, & Gray, 1995) consists of nine drawings of a female figure (for female participants) and a male figure (for male participants). The CDRS figures were described in Chapter 2 (paragraph 2.2.2.7).

4.2.2 RESULTS

4.2.2.1 Preliminary analysis: Missing data, Descriptive statistics, and correlations for design variables. Missing data were completely at random (CDRS body figures, Chi-Square$_{(2)}$ = 2.47, p= 0.29; $\Delta_{I/N}$ and $\Delta_{I/A}$, Chi-Square$_{(7)}$ = 2.63, p = 0.92). For BUT subscales no differences for age were found in accordance with Cuzzolaro et al. (2006); the raw scores were transformed in standardized T scores by controlling for sex differences (see Chapter 2 for transformation procedure; APPENDIX 1 conversion tables).

One-way ANOVA was conducted in order to inspect sex differences in mean values (Table 4.1). Sex differences were found for ideal BMI ($F_{(1,327)}$=10.64, $p \leq .001$) and CDRS Ideal Body Figure ($F_{(1,327)}$ = 84.78, $p \leq .001$) with girls reporting a lower ideal BMI as well as selecting a thinner ideal body silhouette in comparison with boys.

As to $\Delta_{I/N}$ and $\Delta_{I/A}$ indices, results presented in Table 4.1 show a significant sex difference in mean levels on both $\Delta_{I/A}$ (F= 13,78$_{(1, 324)}$, $p \leq .001$) and $\Delta_{I/N}$ (F= 14,37$_{(1, 323)}$, $p \leq .001$). Specifically, girls tended to report a higher discrepant value of self-reported ideal body weight with respect to both their own actual and normative BMI, in other words girls systematically referred lower ideal body weight.

Table 4.1 Descriptive Statistics for boys (N=238) and girls (N=107). ANOVA ($F_{(df)}$, p value) for sex differences on each variables.

Variables	Boys					Girls					$F_{(df)}$	p
	N	M	sd	Skew	Kurt.	N	M	sd	Skew	Kurt.		
EDI-2 BD						101	-0.46	0.77	0.44			
EDAM BD	211	26.1	6,32	0.62	0.17							
CDRS Actual BF	227	5.55	1.10	0.49	0.11	103	5.38	1.58	0.07	-0.24	$1.26_{(1,328)}$	0.26
CDRS Ideal BF	227	5.47	0.82	-0.04	0.44	102	4.43	1.18	0.53	0.68	$84.78_{(1,327)}$	≤.001
CDRS RBF_{GIRLS}	218	5.52	1.11	0.55	0.47	100	5.21	1.56	0.35	-0.26	$4.03_{(1,316)}$	0.05
CDRS RBF_{BOYS}	218	5.56	1.05	0.41	0.61	100	5.42	1.74	0.01	-0.16	$0.83_{(1,316)}$	0.36
Actual BMI	233	21.3	3.09	0.42	0.58	105	21.29	3.44	0.82	1.28	$0.02_{(1,336)}$	0.88
Ideal BMI	227	21.1	2.55	-0.31	0.40	102	20.13	2,43	0.69	1.30	$10.64_{(1,327)}$	≤.001
$\Delta_{I/N}$	223	2.57	11.8	-0.26	-0.32	102	-2.77	11.80	0.79	1.07	$14.37_{(1,323)}$	≤.001
$\Delta_{I/A}$	225	-0.22	9,34	-0.76	4,06	101	-4.32	8.97	2.29	12.54	$13.78_{(1,324)}$	≤.001

Note. Body Uneasiness test subscales: BIC= Body Image Concern, WP= Weight Phobia, AV= Avoidance, CSM= Compulsive Self-Monitoring, D= Depersonalization, GSI= Global Severity Index. EDI-2 BD= Eating Disorder Inventory 2 Body Dissatisfaction; EDAM BD= Eating Disorder Assessment for Man Body Dissatisfaction; BF = Body figure based on the *Contour Drawing Rating Scale;* RBF= Reflected Body Figure; $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI;; $p \leq .05$, $p \leq .01$, $p \leq .001$.

Table 4.2 Correlation matrix among design variables. Whole Sample at Wave 2.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 BUT_BIC	1												
2 BUT_WP	.79**	1											
3 BUT_AV	.61**	.58**	1										
4 BUT_CSM	.60**	.62**	.47**	1									
5 BUT_D	.69**	.68**	.65**	.65**	1								
6 BUT_GSI	.91**	.91**	.68**	.76**	.80**	1							
7 CDRS Actual BF	.32**	.22**	.23**	.03	.18**	.24**	1						
8 CDRS Ideal BF	.06	-.03	.12*	-.08	.05	.00	.48**	1					
9 CDRS RBF_{GIRLS}	.24**	.16**	.21**	-.02	.18**	.19**	.82**	.46**	1				
10 CDRS RBF_{BOYS}	.25**	.18**	.24**	-.03	.14*	.19**	.79**	.41**	.81**	1			
12 $\Delta_{I/N}$	.03	.02	.06	-.01	.07	.02	.41**	.34**	.37**	.35**	.77**	1	
13 $\Delta_{I/A}$	-24**	-.26**	- .16**	-.11	-.13*	-.22**	-.53**	.12*	-.46**	-.47**	.08	-.55**	1

Note. BMI= Body Mass Index*;* Body Uneasiness test subscales: BIC= Body Image Concern, WP= Weight Phobia, AV= Avoidance, CSM= Compulsive Self-Monitoring, D= Depersonalization, GSI= Global Severity Index; BF = Body figure based on the *Contour Drawing Rating Scale*; RBF= Reflected Body Figure; $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI.

$303 < N < 334$; ** Correlations were significant at $p \leq .01$; *Correlations were significant at $p \leq .05$

Table 4.3 Correlation matrix among BI-related measures by sex

Variables	1	2	3	4	5	6	7	8	9	10	12	13
						Girls						
1 BUT_BIC	1	.84**	.76**	.57**	.70**	.93**	.39**	.11	.24*	.37**	.21*	-.20*
2 BUT_WP	.77**	1	.66**	.61**	.65**	.92**	.32**	-.04	.15	.24*	.08	-.22*
3 BUT_AV	.59**	55.**	1	.51**	.70**	.79**	.34**	.13	.23*	.32**	.25*	-.11
4 BUT_CSM	.62**	.62**	.47**	1	.69**	.73**	.12	-.19*	.05	.06	.16	-.14
5 BUT_D	.69**	.68**	.64**	.65**	1	.81**	.17	-.03	.11	.14	.20*	-.06
6 BUT_GSI	.90**	.91**	.69**	.76**	.80**	1	.32**	.02	.18	.27**	.20*	-.15
7 CDRS Actual BF	.26**	.16*	.17**	-.01	.14*	.18**	1	.65**	.80**	.83**	.58**	-.65**
8 CDRS Ideal BF	.08	-.00	.15*	-.04	.10	.07	.35**	1	.61**	.57**	.50**	-.08
9 CDRS RBF_{GIRLS}	.24**	.18**	.19**	-.05	.21**	.18**	.83**	.32**	1	.83**	.52**	-.56**
10 CDRS RBF_{BOYS}	.18**	.13	.17*	-.11	.12	.13	.74**	.28**	.82**	1	.53**	-.59**
12 $\Delta_{I/N}$	-.06	.00	-.03	-.08	.03	-.05	.31**	.13*	.25**	.23**	1	-.14
13 $\Delta_{I/A}$	-.28**	-.28**	-.20**	-.09	-.17*	-.26**	-.52**	.08	-.48**	-.46**	.12	1
						Boys						

Note. BMI= Body Mass Index; Body Uneasiness test subscales: BIC= Body Image Concern, WP= Weight Phobia, AV= Avoidance, CSM= Compulsive Self-Monitoring, D= Depersonalization, GSI= Global Severity Index; BF = Body figure based on the *Contour Drawing Rating Scale*. RBF= Reflected Body Figure; $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI. Girls above the main diagonal. $^{*}p \leq .05$, $^{**}p \leq .01$.

Table 4.4 Correlation matrix between ED-related variables and BI-related measures

	EDAM			EDI-2		
	BD	MD	BE	BD	DT	Bu
BUT_BIC	.47**	.32**	.50**	.65**	.66**	.22*
BUT_WP	.48**	.30**	.44**	.60**	.69**	.23*
BUT_AV	.29**	.24**	.45**	.55**	.58**	.34**
BUT_CSM	.36**	.35**	.40**	.30**	.59**	.21*
BUT_D	.45**	.30**	.46**	.39**	.60**	.27**
BUT_GSI	.49**	.35**	.50**	.59**	.70**	.26**
CDRS Actual BF	.28**	.02	.22**	.59**	.39**	.16
CDRS Ideal BF	-.01	-.02	.13*	.26**	.004	.04
CDRS RBF_{GIRLS}	.29**	-.03	.23**	.45**	.30**	.09
CDRS RBF_{BOYS}	.23**	.02	.19**	.55**	.35**	.16
$\Delta_{I/N}$	.03	.03	.003	.25*	.16	.14
$\Delta_{I/A}$	-.30**	-.05	-.20**	-.46**	-.41**	-.07

Note. EDAM= Eating Disorder Assessment for man; EDI-2= Eating Disorder Inventory-2; BD= Body Dissatisfaction; DT= Drive for Thinness; Bu= Bulimia; MD= Muscle Dysmorphia; BE= Binge Eating; Body Uneasiness test subscales: BIC= Body Image Concern, WP= Weight Phobia, AV= Avoidance, CSM= Compulsive Self-Monitoring, D= Depersonalization, GSI= Global Severity Index; BF = Body figure based on the *Contour Drawing Rating Scale*; RBF=Reflected Body Figure; $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI. $^{*}p \leq .05$, $^{**}p \leq .01$

Table 4.2 reports correlations coefficients among design variables for the whole sample at Wave 2. Results show high positive inter-correlations among BUT subscales; CDRS Actual and RBFs positively correlated with all BUT subscales except BUT Compulsive Self-Monitoring. CDRS BFs were all positively correlated to each other. Lastly, $\Delta_{I/N}$ positively correlated with CDRS BFs and $\Delta_{I/A}$, only. All BI-related measures negatively correlated with $\Delta_{I/A}$ (Table 4.2). Overall these findings suggest that the excess of self-reported actual and ideal BMI compared to normative BMI positively correlates with the overall body uneasiness. Correlations were also inspected for boys and girls, separately (Table 4.3). We found that the $\Delta_{I/N}$ positively correlated with BUT Body Image Concern, Avoidance, Compulsive Self-monitoring and Global Severity index in girls only, with a significant $\Delta_{I/N}$ by sex interaction term (BIC, sr =.12, $p \leq .05$; AV, sr =.13, $p \leq .01$; CSM, sr = .11, $p \leq .05$; GSI, sr = .11, $p \leq .05$). In addition, sex was found to moderate also the

association between CDRS Ideal BF and $\Delta_{I/N}$ (sr = .19, p ≤ .001). For girls only, CDRS Ideal BF positively correlated with $\Delta_{I/N.}$ Lastly, we found that BUT GSI positively correlated with CDRS RBF_{BOYS} in girls only. This finding suggest that in girls global body uneasiness positively correlates with a larger body figure that reflect how they think other boys see them. Table 4.4 presents simple correlations between BI-related measures and ED-related variables. CDRS Actual and RBFs were positively correlated with boys and girls BD and with respectively EDAM BE for boys (r= 0.23, p ≤ .01) and EDI-2 DT for girls (r = 0. 39, p ≤ .01).

Furthermore, CDRS Ideal BF positively correlated with Binge Eating for boys and body dissatisfaction for girls, only.

Lastly, $\Delta_{I/A}$ was negatively correlated with BD (boys and girls) and with respectively EDAM BE for boys and EDI-2 DT for girls (Table 4.4).

4.2.2.2 Principal Component Analysis (PCA). We conducted a PCA on the sample at WAVE 2, and examined the factor structure of BUT subscales, CDRS BFs (actual, ideal and reflected), Δ for self-reported ideal BMI.

Parallel Analysis (PA; Franklin, Gibson, Robertson, Pohlmann, & Fralish, 1995; Horn, 1965) indicated a three component solution (Table 4.5), which accounted for 75,5% of total variance. Table 4.5 presents the 3-component solution, after varimax rotation.

The first component accounted for 32, 8% of variance and represents the attitudinal-affective BI component, including all BUT scales. CDRS BFs (actual and reflected) and $\Delta_{I/A}$ loaded on the second component, thus suggesting a perceptual BI component. This second component accounted for 25,6% of total variance. Ideal CDRS BF and $\Delta_{I/N}$ loaded on the third component.

Table 4.5 Component Loadings from Principal Component Analysis; % of Variance, Cumulative Variance, Initial Eigenvalues; factor loadings for the first three rotated principal components

	Component		
Indicators	1	2	3
BUT_D	0.88	0.03	0.09
BUT_BIC	0.87	0.19	0.01
BUT_WP	0.85	0.16	-0.07
BUT_CSM	0.82	-0.08	-0.05
BUT_AV	0.80	0.13	0.06
CDRS Actual BF	0.12	0.86	0.35
CDRS RBF_{BOYS}	0.08	0.85	0.32
CDRS RBF_{GIRLS}	0.07	0.83	0.37
$\Delta_{I/A}$	-0.12	-0.80	0.45
CDRS Ideal BF	0.00	0.23	0.77
$\Delta_{I/N}$	0.01	0.16	0.75
% of Variance	38.2	25.6	11.7
Cumulative %	38.2	63.9	75.6
Initial Eigenvalues	4.2	2.8	1.29

Note. 'varimax' rotation was used; BUT= Body Uneasiness Test; D= Depersonalization, BIC= Body Image Concern, WP= Weight Phobia; CSM= Compulsive Self-Monitoring, AV=Avoidance; $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI.

In accordance with the 2-dimensions model of BI, developed by Cash et al. (2002), we also explored the 2-component varimax rotation solution, which is presented in Table 4.6. Results show that BUT subscales load on the first component, namely, the attitudinal domain, whereas CDRS actual and reflected BFs, Δs of ideal BMI, and CDRS ideal BF load on the second component, a perceptual domain. In brief, the 2-component solution shows that Ideal BI-related measures (including Δs.) load on the second component as well. This 2-component solution is in line with model of BI and distinguishes between attitudinal and perceptual domains.

Further investigation, however, is needed in order to test whether a three or two-dimension solution represents BI, in the present data sample.

The next paragraph presents confirmatory factor analysis (CFA) conducted in order to test both 2 and 3 component solutions on wave 2, firstly, and then on cross-sectional data at each time

point. Lastly, factorial invariance across gender was inspected. CFA analysis was performed using lavaan package (Rosseel, 2012) for R statistical framework (R Core Team, 2019). We implemented a full information maximum likelihood estimation method to manage all cases with missing values. Comparative goodness of fit was evaluated using the following standard measures (Hu, & Bentler, 1999): Likelihood ratio χ^2 statistic (and its p-value); Comparative Fit indices –CFI and Tucker-Lewis index –TLI (values greater than .95 indicate good fit); Root Mean Square Error of Approximation –RMSEA (values of .08 or less indicate good fit); Standardized Root Mean Square Residual –SRMR (values of .08 or less indicate good fit).

Table 4.6. Factor Loadings, % of Variance, Cumulative % and Initial Eigenvalues for 2-Component solution.

	Component	
	1	2
BUT_BIC	0.88	0.16
BUT_WP	0.87	0.09
BUT_D	0.86	0.06
BUT_CSM	0.81	-0.11
BUT_AV	0.79	0.13
CDRS Actual BF	0.15	0.92
CDRS RBF_{GIRLS}	0.10	0.91
CDRS RBF_{BOYS}	0.12	0.89
CDRS Ideal BF	-0-05	0.58
$\Delta_{I/N}$	-0.04	0.51
$\Delta_{I/A}$	-0.22	-0.48
% of Variance	33.3	30.5
Cumulative %	33.3	63.9
Initial Eigenvalues	3.7	3.4

Note. 'varimax' rotation was used; BUT= Body Uneasiness Test; D= Depersonalization, BIC= Body Image Concern, WP= Weight Phobia; CSM= Compulsive Self-Monitoring, AV=Avoidance; $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI; CDRS= Contour Drawing Rating Scales; BF= Body Figure; R= Reflected

4.2.2.3 Confirmatory factor analysis on Wave 2 data. The three-factor model previously emerged from PCA was tested by performing CFA. This model included an attitudinal BI component (i.e. the BUT subscales), a perceptual component (CDRS actual and reflected BFs and $\Delta_{I/A}$) and an ideal BI component (i.e., CDRS ideal BF and the $\Delta_{I/N}$). The model, however, did not fit the data well enough (χ^2 = 275, *df* = 41, p < .001; CFI= 0.89, TLI = 0.86, RMSEA = 0.13, SRMR = 0.07).

Therefore, additional models were tested, with ideal-related measures loading differently across models, also in accordance with the 2-component solution (Table 4.6); residual co-variances among variables were taken into account as well. We further take into account the high error covariance between BUT Body Image Concern and Weight Phobia, likely due to their content overlap. Additionally, CDRS ideal BF and $\Delta_{I/A}$ covariance was taken into account, due to correspondent categories among body figures and BMI.

To summarize, we followed a three-step procedure:

Step 1. We first tested a model with BUT subscales and CDRS actual and reflected body figures, thus excluding CDRS ideal BF and Δ Ideal BMI discrepancy indices, which loaded on the Ideal BI component when 3-component PCA solution was performed. Post-hoc model performance modification indices suggested a 3-higher ordered domains as follows:

1) BUT Body Image Concern and Weight Phobia loaded together on the first factor; 2) CDRS BFs, actual and reflected, and BUT Compulsive Self-Monitoring loaded on factor 2 and 3) BUT Avoidance, Depersonalization and again BUT Compulsive Self-Monitoring subscales loading on a third factor. The model showed an adequate fit to the data (χ^2 = 45, *df* = 16, p < .001; CFI= 0.98, TLI= 0.97, RMSEA= 0.07, SRMR= 0.03) and we referred to it as the baseline model for subsequent steps.

Step 2. We added a new factor to the baseline model, so as to include the ideal BI domain, that is CDRS ideal BF and the Δs ideal BMI. This model did not fit data well (χ^2 = 154, *df* = 38, p < .001; CFI= 0.94, TLI= 0.93, RMSEA= 0.09, SRMR= 0.06).

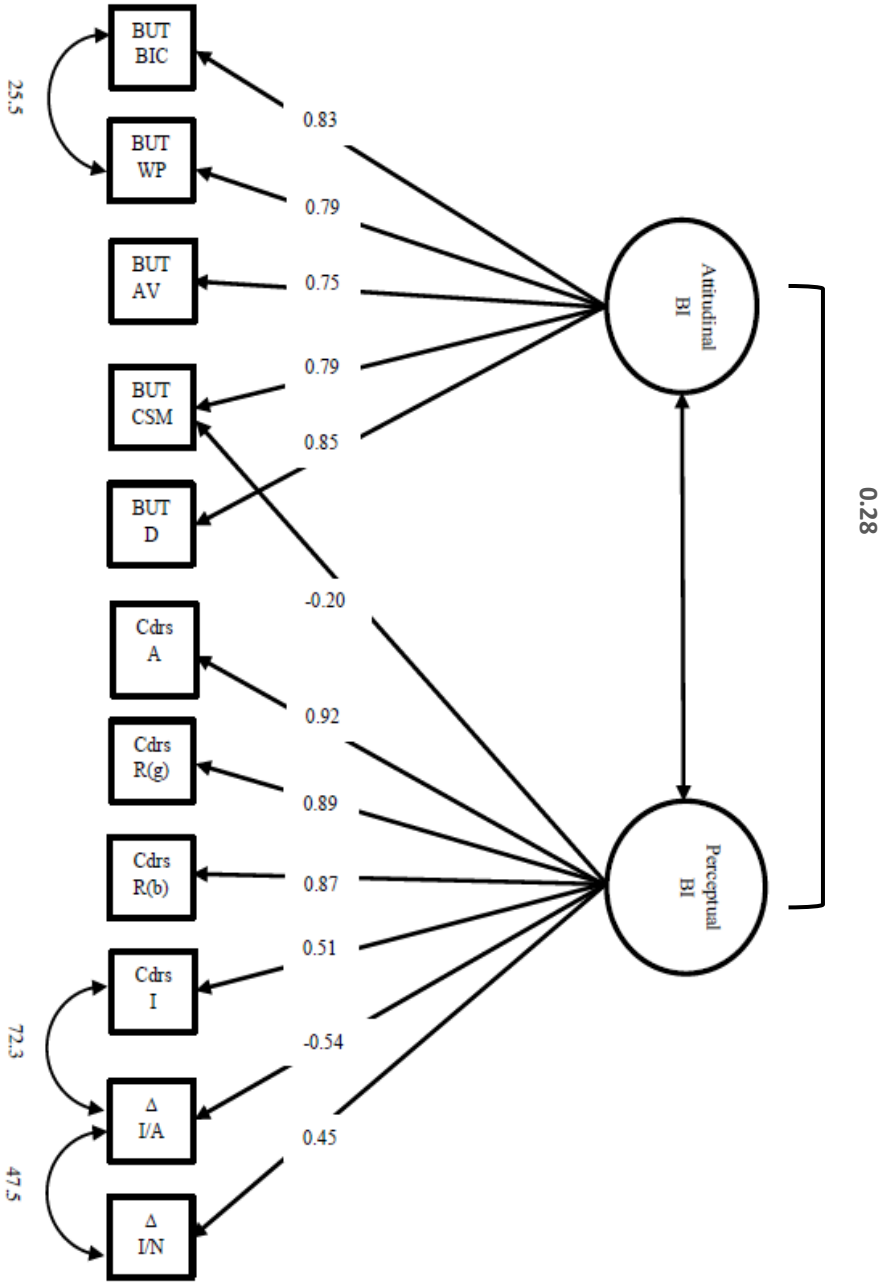
Step 3. Post-hoc model performance modification indices suggested factor loadings for CDRS Ideal BF, $\Delta_{I/N}$ and $\Delta_{I/A}$, and BUT Compulsive Self-Monitoring on factor 2, i.e. the perceptual BI domain, further indicating that BUT Avoidance and Depersonalization BUT subscales rather load on factor 1, i.e. the attitudinal domain. Accordingly, we reorganized the factor structure and tested 2-factor model as shown in Figure 4.2.

The 2-factor model corresponded to 2-component model already emerged from PCA. Additionally, it showed that $\Delta_{I/A}$ and $\Delta_{I/N}$ loaded on the second factor, i.e. perceptual domain, together with the all CDRS BFs.

Finally, CFA was run again in order to test the 2-factor model, further including the residual co-variances as suggested by inspection of significant modification indices. The tested model is presented in Fig 4.2 and factor loading estimates presented in Table 4.7.

CFA indices showed that the 2-factor model reached a good fit to the data ($\chi^2 = 108$, $df = 39$, $p < .001$; CFI= 0.97, TLI= 0.96, RMSEA= 0.07, SRMR= 0.04). Thus, we accepted this final 2-factor solution. We further take into account the high covariance between BUT Body Image Concern and Weight Phobia, likely due to their content overlap.

Fig 4.2. Path Diagram 2-factor model of Body Image



Note. 2-factor model; Attitudinal BI factor; Perceptual BI factor. Body Uneasiness test subscales: BIC= Body Image Concern, WP= Weight Phobia, AV= Avoidance, CSM= Compulsive Self-Monitoring, D= Depersonalization, GSI= Global Severity Index. BF = Body figure based on the Contour Drawing Rating Scale. $\Delta_{I/A}$= Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N=}$ Ideal BMI – Normative BMI/ Normative BMI. All std. estimates significant at $p \leq .001$

Table 4.7 Two-factor solution; Standardized Factor Loadings estimate.

Factor	Indicator	Estimate	SE	Z	p	Stand. Estimate
Attitudinal	BUT_BIC	8.14	0.46	17.8	< .001	0.83
	BUT_WP	7.82	0.47	16.6	< .001	0.79
	BUT_AV	6.32	0.41	15.4	< .001	0.75
	BUT_CSM	7.64	0.49	15.5	< .001	0.79
	BUT_D	7.89	0.42	18.5	< .001	0.85
Perceptual	CDRS Actual BF	1.15	0.05	21.5	< .001	0.92
	CDRS RBF_{GIRLS}	1.15	0.05	20.5	< .001	0.89
	CDRS RBF_{BOYS}	1.13	0.06	19.6	< .001	0.87
	BUT_CSM	-1.97	0.42	-4.64	< .001	-0.20
	CDRS Ideal BF	0.54	0.06	9.66	< .001	0.51
	$\Delta_{I/N}$	5.37	0.66	8.1	< .001	0.45
	$\Delta_{I/A}$	-4.83	0.47	-10.2	< .001	-0.54

Note. BUT= Body Uneasiness Test; D= Depersonalization, BIC= Body Image Concern, WP= Weight Phobia; CSM= Compulsive Self-Monitoring, AV=Avoidance; CDRS= Contour Drawing Rating Scale; RBF= Reflected Body Figure; $\Delta_{I/A}$ = Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N}$ = Ideal BMI – Normative BMI/ Normative BMI

Table 4.8. Sample size for cross-sectional data. Valid BI related measures for boys and girls

TIME	Boys	Girls	N
T1	169	92	261
T2	205	94	299
T3	121	83	204
T4	140	86	226
T5	90	62	152

4.2.2.4 Confirmatory Factor Analysis (CFA) of the 2-factor model on cross-sectional data, for each time point. The 2-factor model illustrated in Fig. 4.2 was then replicated and tested on each single time point, including T2 already presented. Table 4.9 shows multiple fit indices for the two-factor model CFA for each time point. Critical values of model fit indices, previously considered (Study 1), were used in order to interpret the results. Specifically, values > .90 and .95 for the CFI and TLI were defined benchmarks for acceptable and good fit, respectively; and RMSEA values of < .08 and .06 were benchmarks for acceptable and good fit, respectively (Byrne, 2016; Kline, 2005). Overall, fit indices were poor (T5) to adequate (T2, T4), also due to sample size and number of parameters. The 2-factor model presented in Figure 4.2 was tested on T1 to T5 data cross-sectionally as well as longitudinally.

Next study aimed at further replicating the 2-factor configural model, across sex and measurement occasions (1-yr. apart).

Table 4.9 Confirmatory factor analysis on cross-sectional data: Multiple fit indices.

Time	N	$\chi 2$ (*df)*	CFI	TLI	RMSEA (90% CI)	SRMR
T1	277	153(*39*)	0.94	0.91	0.10 (0.08-0.12)	0.06
T2	340	108 (*39)*	0.97	0.96	0.07 (0.05-0.09)	0.04
T3	288	133 (*39*)	0.95	0.93	0.09 (0.07-0.11)	0.06
T4	309	128 (*39*)	0.95	0.93	0.08 (0.07-0.10)	0.06
T5	265	338 (*39)*	0.82	0.75	0.17 (0.15- 0.19)	0.12

Note. $\chi 2$ (df)= Chi-Square (degree of freedom); CFI= comparative fit index; TLI= Tucker-Lewis index; RMSEA=the root mean square error of approximation; SRMR = standardized root mean square residual.

4.*3 STUDY 2*

4.3.1 Confirmatory factor analysis across sex and time: Factorial invariance and longitudinal invariance. Factorial invariance investigates the psychometric equivalence of a construct across groups and/or across time. Thus, four levels of measurement invariance were sequentially performed with additional and progressive more equality constraints across sex and

time: Configural, weak (or metric), strong (or scalar), and strict (most restrictive and optional test) invariance. To summarize, the four levels are described in 4-step procedure, as follows:

Step 1. Firstly, the configural invariance was performed. The equivalence of the number of factors and the pattern of factor-indicator relationships across sex or time.

Step 2. After configural invariance was supported across sex or time, weak or metric invariance was tested that is, the equivalence of (indicators) factor loadings on the 2 factor structure; in other words, weak invariance was tested by constraining factor loadings to be equal across sex (males and females) and (measurement occasions). The weak invariance model with constrained factor loadings was then compared to the configural invariance model or baseline model via chi-square difference ($\Delta\ \chi 2$), in order to determine whether the factor loadings constraining did not weaken the tenability of the model.

Step 3. After supporting metric invariance, scalar invariance was tested that is, the equality of indicator means or intercepts across sex and time points.

Step 4. Lastly, the more restrictive level of measurement invariance, the strict invariance was performed, by examining indicators equality of residual variances (strict invariance) across sex and time points.

Longitudinal invariance analysis was tested on T1 to T3 (Spring to Spring), from T2 to T4 (Autumn to Autumn) and from T3 to T5 (Spring to Spring) interval. The selected time pairs were seasonal in order to take under control the seasonality on the temporal stability of body image construct (Geiselman, Haight & Kimata, 1984; Kasper, Wehr, Bartko, Gaist, & Rosenthal, 1989; Putnick, & Bornstein, 2016). At each step multiple fit indices were used: 1) chi-square statistic ($\chi 2$), 2) Comparative Fit index (CFI), 3) Tucker-Lewis index (TLI), 4) Root mean square error of approximation (RMSEA), and 5) standardized root mean square residual (SRMR), 4) Differences in $\chi 2$ ($\Delta\ \chi 2$) were calculated as well, in order to compare four nested models, sequentially.

4.3.1.1 RESULTS

Factorial invariance across sex. Fit indices for model invariance across boys and girls are presented in Table 4.10. Results indicate that configural invariance was supported, only.

Specifically, factorial loadings of indicators on perceptual higher-ordered domain varied across sexes. Figure 4.3 and 4.4 show that indicators (i.e. CDRS actual, ideal and reflected BFs, BUT Compulsive Self-monitoring and Δs. of ideal BMI) contributed in the same direction amid boys and girls, but associations of CDRS ideal BF and Δs of ideal BMI were more intense in girls rather than in boys.

Longitudinal invariance. Results supported longitudinal configural invariance for T1-T3 and T2-T4, particularly for RMSEA and SRMR indices close to 0.08; in addition, they showed that weak invariance did not perform significantly worse than configural invariance, and that gradually putting further constraints yelded stronger fit indices. As for the T3-T5 configural invariance model, it fell short little beyond cut off values for fit indices, probably due to the limited sample size for this season, and in spite of that it can be considered still tenable (Table 4.11).

Table 4.10 Confirmatory factor analysis across sex. Multiple fit indices; Δ $\chi 2$

	N	$\chi 2$ (*df*)	CFI	TLI	RMSEA (90% CI)	SRMR	Δ $\chi 2$ (Δ*df*)
Configural Invariance	340	174.29 (78)	0.96	0.94	0.08 (0.068-0.102)	0.053	
Weak Invariance		202.69 (88)	0.95	0.94	0.09 (0.072-0.103)	0.072	28.39 (10)**
Strong Invariance		290.30 (97)	0.91	0.90	0.10 (0.093-0.122)	0.095	89.77 (11)***
Strict Invariance		362.46 (108)	0.89	0.89	0.12 (0.104-0.130)	0.112	72.53 (11)***

Note. N for boys = 233, N for girls = 107 $^{*}p \leq .05$, $^{**}p \leq .01$; $^{***}p \leq .001$

Fig. 4.3 Path Diagram 2-factor solution of BI; Boys

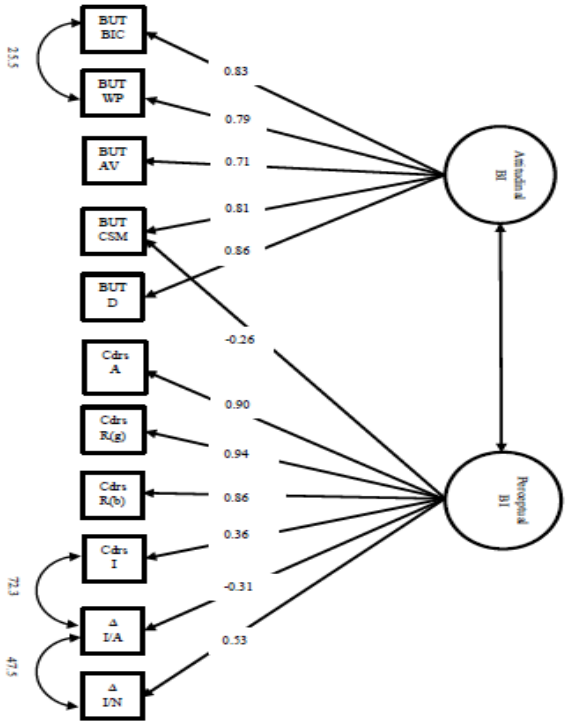
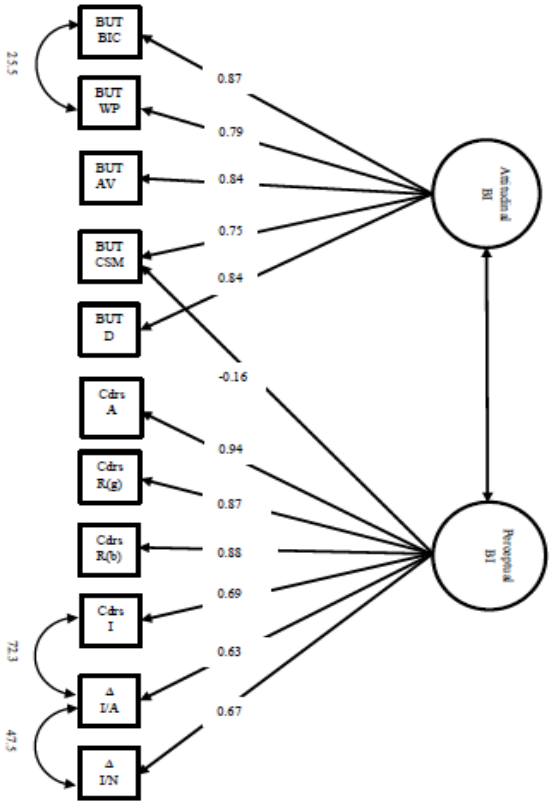


Fig. 4.4. Path Diagram 2-factor structure of BI; Girls



Note. 2-factor model; Attitudinal BI factor; Perceptual BI factor. Body Uneasiness test subscales: BIC= Body Image Concern, WP= Weight Phobia, AV= Avoidance, CSM= Compulsive Self-Monitoring, D= Depersonalization, GSI= Global Severity Index. BF = Body figure based on the Contour Drawing Rating Scale. $\Delta_{I/A}$ = Ideal BMI – Actual BMI/Actual BMI; $\Delta_{I/N}$ = Ideal BMI – Normative BMI/ Normative BMI. All std. estimates significant at $p \leq .001$

Table 4.11 Confirmatory factor analysis on longitudinal data. Multiple fit indices of longitudinal invariance (configural, weak, strong, and strict) three time intervals 1-yr apart; Δ $\chi 2$ test

Time	Model	N	$\chi 2$ (*df*)	CFI	TLI	RMSEA (90% CI)	SRMR	Δ $\chi 2$(Δdf)
T1-T3	Config. I	220	450.719 (184)	0.93	0.91	0.081 (0.072-0.091)	0.08	
	Weak I		462.982 (194)	0.93	0.91	0.079 (0.070-0.089)	0.08	12.263 (10)
	Strong I		486.389 (205)	0.92	0.91	0.079 (0.070-0.088)	0.08	23.407 (11)*
	Strict I		513.761 (216)	0.92	0.91	0.079 (0.070-0.088)	0.08	27.373 (11)**
T2-T4	Config. I	178	388.679 (184)	0.93	0.91	0.079 (0.068-0.090)	0.08	
	Weak I		396.270 (194)	0.93	0.91	0.077 (0.066-0.087)	0.08	7.592 (10)
	Strong I		421.352 (205)	0.92	0.91	0.077 (0.067-0.087)	0.08	25.082 (11)**
	Strict I		434.033 (216)	0.92	0.92	0.075 (0.065-0.086)	0.08	12.680 (11)
T3-T5	Config. I	146	383.728 (184)	0.92	0.89	0.086 (0.074-0.098)	0.09	
	Weak I		402.473 (194)	0.91	0.89	0.086 (0.074-0.098)	0.08	18.745 (10)*
	Strong I		413.204 (205)	0.91	0.90	0.083 (0.072-0.095)	0.10	10.731 (11)
	Strict I		436.330 (216)	0.91	0.90	0.084 (0.072-0.095)	0.10	23.126 (11)*

Note. Config I = Configural Invariance; $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

4.4 Discussion

Body image related dimensions such as cognition, affection and perception represent risk factors for ED development during teenage years and therefore an important target to address in prevention and intervention program. The current chapter aimed at examining the factor structure underlying different body image assessment tools, in order to test their factor structure, and whether it replicated the Cash's model (Cash, et al., 2002), among non-clinical adolescents. To our knowledge no study has empirically tested the model among adolescent boys and girls. In Study 1, a principal component analysis (PCA) was conducted in order to identify higher-ordered domains of the Body Uneasiness Test (BUT) scales, CDRS (i.e. Contour Drawing Rating scale) body figures and Δs. between ideal BMI and both actual and normative BMI, applied in order to assess BI-related constructs. Results from PCA suggested a 3-component solution, with the first component involving all BUT scales, the CDRS Actual BF and CDRS reflected BFs (i.e. CDRS RBF_{GIRLS} -*how other girls see me*- and CDRS RBF_{BOYS} -*how other boys see me*-) loading on the second component and CDRS Ideal BF combined with Δs. (i.e. discrepancy indices of ideal BMI) loading on the third component. When the 2 principal component solution was explored, it replicated the Cash's model. The results from confirmatory factor analysis showed that the 2-factor model provided the best fit to the data compared to the 3-factor model. Overall, our findings support the expected model, although different BI-related measures were analysed respect with those used by Cash and colleagues (i.e. Body Image States Scale). In fact, the present results showed that BUT captures the attitudinal dimensions of BI (Cuzzolaro, et al., 2006). The perceptual BI domain revealed, moreover, relevant findings. All CDRS body figures, actual and ideal and reflected, loaded on the perceptual BI. It suggests that reflected body figures (i.e. how other girls see you, and how other boys see you) are dimensions of perceptual BI together with actual and ideal body figures. Reflected self-perceptions, i.e. how adolescents come to perceive their bodies in the way they believe peers perceive them (through the eyes of others), have been shown to be important dimensions of self-views and self-worth, which should deserve attention in the assessment of BI (Pfeifer, Masten, Borofsky, Dapretto,

et al., 2009). The relevance of reflected BFs was demonstrated and discussed in the study presented in Chapter 3. Additionally, the discrepancy indices of ideal BMI (i.e. Δs.) loaded on perceptual BI domain in combination with CDRS body scales and BUT compulsive self-monitoring. This finding is in accordance with Gardner et al. (1998), and evidences a link between increases in body size and shape estimation and BMI values, thus indicating a correspondence between how individuals estimate their body shape and size and how they self-reported (and/or objective BMI) actual and ideal body weight (Gardner, Friedman, & Jackson, 1998). Furthermore, Kakeshita and Almenida (2006) have demonstrated that an individual's accuracy in estimating body size, shape and weight was associated with the discrepancy between desired BMI and actual BMI, in both male and female population.

Results supported the configural invariance across boys and girls. This finding suggests that the measurement model of the latent BI construct, i.e. the attitudinal and perceptual domains, may be applied among both boys and girls, allowing comparisons between them. This implies that differences in observed scores between boys and girls reflect true differences in BI-related measures, rather than an artefact due to the measurement methods (Putnick, & Bornstein, 2016). Factor loadings of self-perceptions BI measures were found to contribute to perceptual BI domain, in the same directions amid boys and girls, but they varied in intensity (i.e. metric invariance was not supported). In general, the positive factor loadings capture the global degree of adiposity that adolescents perceive of their own bodies (i.e. body size and shape, and actual, with lower ideal BMI), alongside the ideal body shape and weight desired. Findings showed that the associations of ideal body shape and discrepancy indices of ideal BMI and perceptual BI domains were more intense in girls rather than in boys, pointing out again (i.e. a point already discussed in Chapter 3) that perceptual BI domains amid boys (i.e. as well as here assessed and tested) suffer from the absence of an important male-body related aspect, i.e. muscularity (Bozsik, Whisenhunt, Hudson, Bennett, & Lundgren, 2018; Cunningham, Szabo, Kambanis, Murray, et al., 2019).

The longitudinal invariance was also supported for three time intervals which reflected seasonality: T1 to T3 (Spring to Spring), T2 to T4 (Autumn to Autumn) and T3 to T5 (Spring to Spring). Specifically, our results showed that the measurement model was equivalent across seasons. These findings provided evidence for the temporal stability of BI measurement model, in non-clinical adolescents, and for seasonality as an important environmental aspect to consider when assessing BI-related dimensions (Geiselman, Haight, & Kimata, 1984; Kasper, Wehr, Bartko, Gaist, & Rosenthal, 1989; see also Chapter 5).

In addition, the longitudinal invariance contributes to ensure that observed scores over time on attitudinal BI domains, and on perceptual BI domains express true changes in the underlying BI latent constructs rather than changes in the assessment tools and composition of scales.

In summary, the present Chapter extends previous research on Body Image construct by supporting the 2-factor model of body image (Cash et al.,2002) among non-clinical adolescent boys and girls. Indeed, studies in this field have mainly focused on women (Cash, 1994; Cash et al., 2002) without testing the validity of BI structure across gender. Thus, the current chapter contributed to fill an important gap regarding BI construct among both males and females population and during teenage years. Our studies present, however, limitations which will be discussed in General discussion (at the end of thesis).

Chapter 5

Prospective reciprocal influences between Body Image related constructs and Eating Disorders symptoms among non-clinical adolescents.

5.1. Introduction

Findings from Chapter 4 indicated that the Body Image (BI) construct has a 2-factor structure which presents attitudinal and perceptual domains. These findings provided support for the BI model developed by Cash et al. (2002), among adolescents as well.

In the current chapter, we further examined this 2-factor solution underlying the latent BI construct (Fig 4.2), in order to examine how the BI higher-order domains co-varied with ED-related symptoms, concurrently as well as longitudinally. Specifically, the current chapter aimed at 1) preliminary projecting onto the 2-factor BI structure ED clinical scales for both boys and girls, in order to identify their location onto the 2-factor space, 2) examining longitudinal cross-lagged patterns, i.e. temporal antecedents and correlated changes, from baseline to 6 months, 1 year and 2 years later; 3) further inspecting reciprocal influences and seasonal effects via path analysis (Geiselman, Haight, & Kimata, 1984; Stein, & Hedger, 1997), and 4) exploring developmental trajectories of EDs and co-variation with BI domains across time, at intra-individual level. Study 1, analysed data from the between-people perspective and investigated objectives 1 to 3; Study 2 was focused on aim 4.

In Chapter 4, studies showed that the attitudinal BI factor combined all BUT scales, and thereby assessed evaluative, affection and investment (body image importance) elements, whereas the perceptual factor involved CDRS measures, assessing actual, ideal and reflected body figures, as well as ideal BMI discrepancy indices, namely, $\Delta_{I/A}$ (i.e. ideal/actual) and $\Delta_{I/N}$ (ideal/normative), and BUT Compulsive Self-Monitoring. In literature, BI as an intense preoccupation and uneasiness feelings with weight, and body shape have been theoretically distinguished from body dissatisfaction (BD) which rather refers to a subjective evaluation and satisfaction of one's body or

body parts (Allen, Byrne, McLean, & Davis, 2008; Stice, & Shaw, 2002). However, empirical studies have used BI and BD interchangeably (as pointed out in Chapter 1). When prospective studies investigated the unique impact of BD and BI-related components in predicting ED attitudes and behaviours, results suggested that attitudinal BI variables such as excessive preoccupation with body shape and weight were more powerful than BD measures in predicting dietary restraint and binge eating (Cash, et al., 2002; Fairburn, et al., 2003; Hrabosky, Masheb, White, & Grilo, 2007). Attitudinal BI domains were also more robust predictors than perceptual BI in predicting ED symptoms in both clinical and non-clinical samples (Allen, Byrne, McLean, & Davis, 2008; Thompson, Penner, & Altabe, 1990). Nevertheless, attitudinal BI components have generally been more studied in comparison with the perceptual ones (Bibiloni, Pich, Pons, & Tur, 2013; Kling, Kwakkenbos, Diedrichs, Rumsey, et al., 2019). In addition, despite these conceptual and emergent differences among BI-related domains and BD in predicting EDs, to our knowledge no prospective study have systematically investigated the contribution of both BI-related attitudinal and perceptual domains, and BD simultaneously in non-clinical sample.

5.1.1 Binge Eating, Muscle Dysmorphia, Body Image and Body Dissatisfaction.

Between-people studies. Binge eating has been described as common among adolescent boys, but it has not been related to the binge-purging cycle observed in girls (Murray, et al., 2017). Earlier studies on EDs among boys reported that bingeing and fasting are frequent practices to gain and/or lose weight among boys who are dissatisfied with their bodies and desire to increase chest and arm size and decrease abdomen size (Moore, 1990; Keel, Fulkerson, & Leon, 1997). Specifically, the Trans-diagnostic ED model (Chapter 1; Fairburn et al., 2003), indicates that BE episodes are associated with both negative BI attitudes and BD, both cross-sectionally and longitudinally (McCabe, & Ricciardelli, 2003; Mitchison Hay, Griffiths, Murray, Bentley, et al., 2017). In fact, negative body attitudes and behaviours (i.e. concerns about body weight and shape), and poor body satisfaction predicted increases in BE symptoms at follow up period, among men (Dakanalis, Clerici, Caslini, Gaudio et al., 2016). Furthermore, BE was found in turn predicting

increases of concerns about weight and shape (Johnson, & Wardle, 2005; Tabri, Murray, Thomas, & Franko, 2015).

Less consistent findings emerged for the link between the perceptual BI domains and binge eating symptoms. Indeed, on one hand higher adiposity and body fat perception, among men, have been shown to be associated with binge eating (Dakanalis, Timko, Clerici, Zanetti & Riva, 2014; Gardner, Stark, Friedman, & Jackson, 2000; Marcus, & Kalarchian, 2003). On the other hand, binge eating episodes have been reported as a common strategy to gain weight, especially among younger boys, who perceived their bodies too small (Cafri, Thompson, Ricciardelli, McCabe, et al., 2005; Moore, 1990; McCabe, & Ricciardelli, 2003). The association between perceptual BI and binge eating among males remained, however, less clear and controversial (Murray, et al., 2017).

The effects of attitudinal BI elements (i.e. body weight concerns and body checking behaviours) and BD have been observed in the predictive models for muscle dysmorphia, as well (Lamanna, Grieve, Derryberry, Hakman, & McClure, 2010; Dakanalis, et al., 2016; Grieve, 2007; Olivardia, et al., 2004; Skemp, Elwood, & Reineke, 2019). Specifically, an higher concerns with body appearance and shape among males, the higher muscularity-oriented dysfunctional behaviours and attitudes (Ralph-Nearman, & Filik, 2018; Skemp, et al., 2019). Fat-related body dissatisfaction has been shown to predict drive for muscularity and ED among males, 6-weeks later (Ralph-Nearman, & Filik, 2018). However, such findings have been mainly observed in young men, whereas few studies have been conducted on adolescent boys, although most men report to suffer from MD since early adolescence (Ricciardelli, & McCabe, 2003; Olivardia, Pope, & Hudson, 2000).

Grieve (2007) defined MD as an intense preoccupation, in males, with their actual body size and muscularity, which men perceived as too small in comparison with their own muscular/lean bodies ideal. Thus, in line with Grieve's MD conceptualization, perceptual ideal and actual BI elements are expected to play a relevant role in MD-related conditions. Accordingly, Olivardia et al. (2004) found that pursuit of muscularity is associated with muscle belittlement (i.e. individual's

belief that his body is less muscular than it is actually). Furthermore, Ralph-Nearman & Filik (2018) showed that a fatter perceived actual body figure predicts drive for muscularity (i.e. excessive exercise) and EDs among males as well as the desire of being more muscular amid already muscular men. These findings suggest that MD may be observed both among males who desire to increase muscles, even if having already a muscular body, as well as in those who perceive their bodies fatter and want to both lose weight and increase muscles. Furthermore, the reverse association, that is MD impacting on body self-perceptions has been found in bodybuilders and athlete samples, only; MD levels predicted body dysmorphic disorder, poorer physical concept perception and eating disorders (Devrim, Bilgic, & Hongu, 2018; Gonzàlez-Martì, Fernandez-Bustos, Hernandez-Martinez, & Jordan, 2014). However, these findings are correlational and to our knowledge no studies have investigated the reverse association among non-clinical adolescents.

Thus, the role of perceptual BI domain in the prediction of MD and vice-versa among adolescent boys remained less explored.

Developmental Trajectories. As to developmental trajectories, previous studies have shown that BE has been reported to decrease from 14 to 17 years old, and remaining stable around 20-yrs (Allen, Byrne, Oddy, & Crosby, 2013). Furthermore, as outlined in Chapter 3, Goldschmidt and colleagues (2014) found that BE trajectories were not stable across adolescence (Goldschmidt, Wall, Loth, Bucchianeri, & Neumark-Sztainer, 2014). Results from Chapter 3 studies further corroborate previous findings (Goldschmidt, et al., 2014; Fairweather-Schmidt, & Wade, 2016), showing that overall initial intra-individual BE scores were stable across three time points, but adolescents within the 50^{th} percentile presented a linearly decreasing trajectory from T1 to T3. A similar result was found for MD intra-individual scores, which gradually decreased across time, especially in adolescent boys who referred initial lower levels. Despite comparable results between our empirical study and previous studies, which did not assume a within-person approach for detecting developmental trajectories (Chapter 3), further investigations are needed in order to inspect ED development at intra-individual level. As to covariations between BI-related variables

and EDs, Keel and colleagues (2007) found that men's weight perception (i.e. a single item with response options of -Very Underweight-, -Underweight-, -Average- and -Very Overweight-), and dieting increased across time, at intra-individual level.

5.1.2 Drive for thinness and Bulimia, Body Image, and Body Dissatisfaction.

Between-people studies. Several studies have shown that women and adolescent girls tend to report an inaccurate perception of their own bodies, selecting a fatter actual body figure and a thinner body ideal, also when girls are in the range of normal weight or when underweight (Liechty, 2010; Wardle, Haase, & Steptoe, 2005). Thus, the role of perceptual BI domains has been well-documented in the prediction of unhealthy weight control strategies such as dieting, fasting, and binge/purging (Liechty, 2010; Keel, Heatherton, Baxter, & Joiner, 2007). Gardner and colleagues (2000) found that girls larger perceived body size and shape, thinner ideal body size, and BD at 14 years old, predicted later onset of ED, both restrictive and bulimic patterns, 2 years later (Gardner, Stark, Friedman, & Jackson, 2000).

In his cross-sectional study, Sands (2000) examined the contribution of both perceptual and attitudinal BI domains in the prediction of drive for thinness in 11-12-yrs old girls. He found a comparable effect size of attitudinal and perceptual components in predicting increases in DT, across time. Furthermore he showed BD to be an unique predictor of DT, in addition to BI. Research has shown that lower body shape and weight perception were associated with decreases in both Drive for Thinness and Bulimia as well, among adolescents girls and young women, over time (Keel, et al., 2007). Overall, these predictors were found to be more consistent in predicting late adolescence to middle life symptoms, especially for bulimic symptoms (Fairweather-Schmidt, & Wade, 2016; Keel, et al., 2007). More studies, however, are needed for further exploring the contribution of BI-related domains in predicting DT and BU developmental trajectories among non-clinical adolescent girls. As to BU, for example, several studies repeatedly corroborated body dissatisfaction as a core pathological feature alongside dieting, negative affect, and ineffectiveness (Stice, 2001). However, studies on bulimic symptoms in non-clinical sample report not fully

consistent findings, because of the declining or no-symptoms trends of Bulimia during teenage years. Indeed, a peak of bulimic symptoms tends to arise in late adolescence (17-20 years old) and early adulthood (Allen, Byrne, Oddy, & Crosby, 2013). Thus, we expected that both attitudinal and perceptual BI domains contribute to predict later increases of DT and BU, over 2 years (Gardner, et al., 2000; Sands, 2000). BD is expected to additionally contribute in the prediction of girls ED symptoms (Stice, 2001).

Overall, studies considered above highlighted the association between BI related elements, attitudinal and perceptual, and BD with sex-specific ED symptoms. However, studies were mostly cross-sectional and mixed referring to body image constructs. Several authors, as noted earlier, have evidenced the distinctiveness of the two BI related domains with BD (Liechty, 2010; Sands, 2000). To our knowledge no recent studies have systematically investigated the contribution of BI-related domains and BD in the same vulnerability model of ED.

Developmental Trajectories. Keel and colleagues (2007) found a general declining trend of both DT and Bu among women (Keel, et al., 2007). As to covariations with BI-related variables, they found that weight dissatisfaction was associated to DT and Bu among women (i.e. from late adolescence to midlife) rather than men, across time. The authors further showed that intra-individual decreases in both DT and Bu covaried with increases in weight satisfaction, and in women with lower BMI especially in those who perceived themselves weighing less (i.e. a significant interaction effect BMI x weight perception). In Chapter 3, results showed that perceptual BI-related elements, such as actual and ideal body figure, and weight (i.e. actual and ideal BMI) predicted intra-individual increases in DT. Thus, we expected that perceptual BI domains contribute to predict DT as well as attitudinal BI elements and BD.

Seasonal variations. Lastly, as outlined in Chapter 1 and 4, previous studies have suggested to take under control seasonal variations in assessing and studying BI-related components development. Thus, seasonality has mainly been considered as a factor to rule out and/or to impact on mean-level stability of BI-related measures (i.e. self-perceptions and attractiveness; Geiselman,

Haight, & Kimata, 1984) across seasons. However, less is known about season-dependent effects on changes in both BI-related domains and EDs.

In the current study we aimed to contribute in extending previous research by examining the impact of each BI higher ordered domain (i.e. attitudinal and perceptual BI domains and body dissatisfaction) in prospectively predicting sex-specific EDs outcome, namely MD and BE for boys and DT and Bu for girls, by adopting both between-people (Study 1) and within-person approach (Study 2; i.e. addressing both research questions represents a simultaneous investigation of between-people and within-person predictors, never adopted before, as outlined in Chapter 1 and 3). Additionally, the present study aimed at exploring the seasonal effects on the developmental changes in both BI-related constructs and ED symptoms, among adolescents.

5.2 STUDY 1

5.2.1 METHOD

5.2.1.1 Participants and procedures

For the present study we considered adolescents who self-reported valid measures from WAVE 1 to WAVE 5 (Table 2.2; Chapter 2). Towards the aim of testing vulnerability models, we systematically excluded adolescents with scores > 95° percentile on ED-outcome variable at the baseline. These participants were excluded systematically from the analysis. Chapter 2 reports sample characteristics in detail for each measurement occasions.

5.2.1.2 Measures

Dependent Variables. EDI-2 DT, and Bu, the core indicators of ED disturbances (Eating Disorder Inventory 2; Garner, 1995) among girls. Descriptive statistics, test-retest reliability and internal consistency values are presented in Chapter 2.

EDAM MD and BE (Eating Disorder Assessment for Man; Stanford, & Lemberg, 2012) for adolescent boys.

Independent variables. BI-related factors, attitudinal and perceptual respectively, and EDAM Body Dissatisfaction for boys, and EDI-2 Body Dissatisfaction for girls (see Chapter 2,

paragraphs 2.2.2.1 and 2.2.2.2 respectively). Regression factor scores of BI-higher ordered domains were calculated by sex.

5.2.2 RESULTS

5.2.2.1 B*ivariate correlation analysis and orthogonal projections of ED-related variables onto the 2-factor space.* Bivariate correlation analysis was performed on Wave 2 data set in order to assess the relationship between the regression factor scores and sex-specific ED relevant variables. Table 5.1 shows the correlation matrix among the two BI-related factors and EDAM BD, MD and BE for boys, and EDI-2 DT, Bu, and BD for girls.

Table 5.1 Correlation matrix among regression factor scores of BI higher-ordered domains and ED relevant variables for boys and girls. ED relevant variables projection onto 2- factor structure (Wave 2).

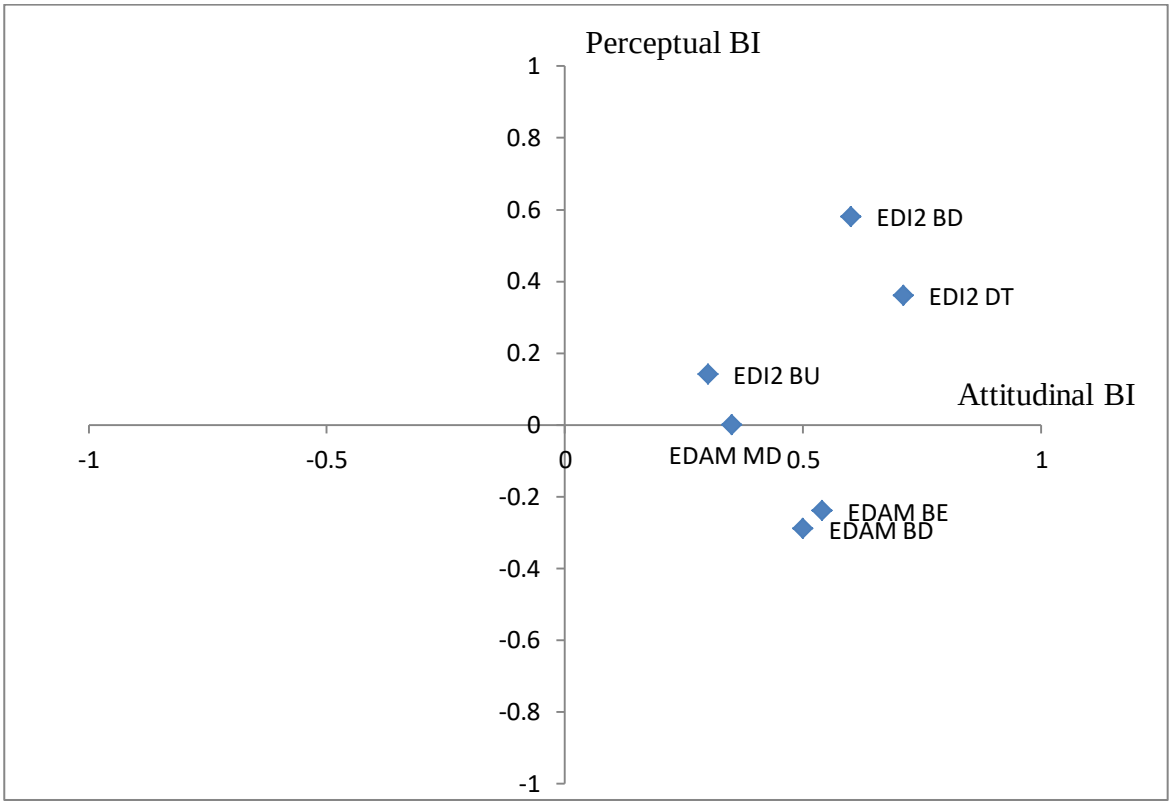
Factor scores	Boys			Girls		
	EDAM			EDI-2		
	BD	MD	BE	DT	Bu	BD
Attitudinal BI	0.50^{***}	0.35^{**}	0.54^{**}	0.71^{**}	0.30^{**}	0.60^{**}
Perceptual BI	-0.29^{**}	.00	-0.24^{**}	0.36^{**}	0.14	0.58^{**}

Note. EDAM= Eating Disorders assessment for man; EDI-2= Eating disorders Inventory 2; BD= Body Dissatisfaction; MD= Muscle Dysmorphia; BE= Binge Eating; DT= Drive for thinness; Bu= Bulimia; BI attitudinal/affect component by BUT subscales; $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

Correlations in Table 5.1 are illustrated in Figure 5.1. The results revealed sex-differences upon the ED variables locations. For instance, girls EDI-2 BD, was located in between the two factors, with positive associations, that is both attitudinal and perceptual components are relevant amid girls with higher EDI-2 BD scores, also reporting larger BMI and BFs, and Δs of ideal BMI in the direction of actual BMI > ideal BMI, and normative BMI > ideal BMI. A similar result is observable for EDI-2 DT. EDI-2 Bu positively correlated with attitudinal factor, only, that is girls with higher levels of bulimia reported higher feelings of uneasiness and negative attitudes towards their own bodies. Conversely, EDAM BD and BE located closer to the attitudinal factor, and negatively correlated with the perceptual one, that is, boys with higher BD, and higher BE reported a negative attitude towards their own bodies combined with a slimmer body size perception and Δs

of ideal BMI, in the direction of actual BMI < ideal BMI, and normative BMI < ideal BMI. Results further showed that EDAM MD was positively correlated with attitudinal factor, only, that is the higher tendency of adolescent boys to perceive their own bodies not enough muscular (and excessive exercising in order to gain muscularity) the higher feelings of uneasiness and body shape concerns.

Fig 5.1. Orthogonal projections of ED related variables onto the Body Image factor structure space



Note. Orthogonal axes; Y= Perceptual BI component; X= Attitudinal BI component; EDAM = Eating Disorders assessment for man; EDI-2= Eating disorders Inventory 2; BD= Body Dissatisfaction; MD= Muscle Dysmorphia; BE= Binge Eating; DT= Drive for thinness; BU= Bulimia

5.2.2.2 Longitudinal data: between-people association across time, antecedents, correlated changes 6 months, 1 year, 18 months, 2 years later. A hierarchical multiple regression analysis was conducted in order to inspect how BI factors at T1 predict ED-related outcome variables. After controlling for T1 same outcome and age (Step 1), at Step 2 regression factor scores of perceptual and attitudinal BI domains were entered, and at Step 3 BD scale was entered, i.e. EDAM BD for boys and EDI-2 BD for girls.

Table 5.2 Antecedents of EDAM and EDI-2 outcome across 6 months, 1 year, 18 months, and 2 years follow up.

Step	Predictors at T1	6 months		1 year		18 months		2 years	
		R^2	sr	R^2	sr	R^2	sr	R^2	sr
					EDAM Binge Eating				
1	EDAM BE	.35***	.40***	.35***	.34***	.18***	.24*	.30***	.36***
	Age		-.05		-.04		-.02		-.03
2	Attitudinal BI	.04*	.16*	.06**	.18**	.04	.20*	.01	.05
	Perceptual BI		.04		.06		-.05		.04
3	EDAM BD.	.00	.03	.01	.09	.00	-.03	.01	.09
					EDAM Muscle Dysmorphia				
1	EDAM MD	.33***	.41***	.29***	.43***	.26***	.43***	.17***	.27**
	Age		-.13		.00		-.07		-.08
2	Attitudinal BI	.02	.07	.03	.17*	.01	.10	.04	.19
	Perceptual BI		-.03		-.03		-.07		.01
3	EDAM BD.	.02*	.13*	.00	-.02	.01	-.01	.01	.01
					EDI-2 Drive for Thinness				
1	EDI-2 DT.	.32***	.26**	.38***	.32***	.31***	.29*	.33**	.24
	Age		-.18		.01		.07		-.07
2	Attitudinal BI	.03	-.05	.02	.03	.03	.01	.03	.06
	Perceptual BI		.10		.06		-.02		-.19
3	EDI-2 BD.	.03	.16	.01	.11	.05	.23	.16**	.39**
					EDI-2 Bulimia				
1	EDI-2 Bu	.28***	.46***	.07	.17	.04	-.25	.21*	.21
	Age		.04		.13		.06		.05
2	Attitudinal BI	.01	.00	.05	-.01	.07	.19	.17*	.29*
	Perceptual BI		-.09		.07		-.15		-.33*
3	EDI-2 BD.	.03	.16	.02	.15	.00	.03	.02	.14

Note. Boys $77 \leq N \leq 147$; Girls $33 \leq N \leq 71$; EDI-2= Eating Disorder Inventory 2; DT= Drive for Thinness; Bu= Bulimia; EDAM= Eating Disorder Assessment for men; MD= Muscle Dysmorphia; BE= Binge Eating; BI= Body Image; BD= Body Dissatisfaction; sr = semi-partial correlations, at $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

5.2.2.2.1 BI-related factors and Body Dissatisfaction, antecedents of ED-related outcome, for boys and girls, and correlated changes. For boys, results are presented in Table 5.2 and show that the attitudinal BI domain accounted for a significant 2.5 to 4 % variance proportion in EDAM BE 6, 12 and 18 months later. Specifically, initial higher levels of negative BI attitudes and behaviours predicted increases in EDAM BE, over a relatively long time period. EDAM BD did not account for additional variance proportion in EDAM BE.

Initial levels of attitudinal BI dimensions (sr = 0.17, p≤ .05) predicted increases in EDAM MD as well, 1 year later. Additionally, EDAM BD (sr = 0.13, p ≤ .05) accounted for a small variance proportion in MD, but after 6 months only.

For girls, results are presented in Table 5.2, as well. No antecedents for both EDI-2 DT and Bu emerged until 2-year follow up. Specifically, we found that initial higher levels of EDI-2 BD (sr = 0.39, p ≤ .01) predicted later increases in EDI-2 DT, 2 years apart. Later increased levels of EDI-2 Bu were predicted by initial higher levels of attitudinal BI domains (sr = 0.29, p ≤ .05) and lower levels of perceptual BI domains (sr = -.33, p ≤ 0.5).

Cross-lagged pattern associations were inspected in order to explore correlated changes, as well, between ED-related outcome and each of the independent variables, the results are showed in Table 5.3. For boys, results show that increases in negative BI attitudes positively correlated with changes in EDAM BE across all time points. Increases in EDAM MD, 6 months and 1-yr later were positively correlated with increases in attitudinal BI domain, as well. Changes in EDAM BD positively correlated with increases in EDAM MD across all time points. Additionally, increases in EDAM BE 1-yr, 18 months and 2 years later, were positively correlated with EDAM BD, as well. Changes in perceptual BI domain positively correlated with changes in EDAM MD, 6 months apart, while they were negatively correlated 1-yr, 18 months and 2 year later. For girls, increases in negative BI attitudes were positively correlated with increases in EDI-2 DT. Short-term (6 months) and long-term (2 years) changes in EDI-2 DT were positively correlated with more adipose self-perception. Changes in EDI-2 BD positively correlated with EDI-2 DT, 6 months, 1-yr and 18 months later, and with EDI-2 Bu, 1-yr later.

Table 5.3 Correlated changes between ED-related outcome and BI-related variables across 2 years

	EDAM MD				EDAM BE				EDI-2 DT				EDI-2 Bu			
Predictors	6 months	1-yr	18 months	2-yr	6 months	1-yr	18 months	2-yr	6 months	1-yr	18 months	2-yr	6 months	1-yr	18 months	2-yr
Attitudinal BI	.28***	.22**	.06	.08	.41***	.29***	.46***	.29**	.56***	.25*	.38*	.55**	.05	.09	.29	.06
Perceptual BI	.17*	-.23**	-.27**	-.21	.05	.09	-.03	-.12	.35**	.17	.21	.61***	-.14	.01	-.18	.11
EDAM BD	.38***	.38***	.65***	.52***	.10	.20*	.28**	.36***								
EDI-2 BD									.35**	.27*	39*	-0.9	.08	.26*	.17	.05

Note. 80 ≤N ≤147boys; 33 ≤ N≤ 76; EDAM= Eating Disorder Assessment for Men; MD= Muscle Dysmorphia; BE=Binge Eating; EDI-2= Eating Disorder Inventory 2; DT= Drive for Thinness; BU= Bu; BD= Body Dissatisfaction; $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

5.2.2.2.2 ED-related variable antecedents of BI-related factors and Body dissatisfaction. Table 5.4 presents results for hierarchical multiple regression analysis with T2 to T5 BI-related domains and Body Dissatisfaction as outcomes and T1 ED-related variables as explanatory variables. For boys, initial levels of EDAM Binge Eating predicted increases in attitudinal BI domains 6 months apart, that is they increased their uneasiness levels towards their own bodies, after controlling for age and BI-related domains at the baseline (T1).

Table 5.4 Antecedents of BI-higher ordered domains and body dissatisfaction across 6 months, 1 year, 18 months and 2 years follow up, for boys

Step	Predictors at T1	6 months		1 year		18 months		2 years	
		R^2	sr	R^2	sr	R^2	sr	R^2	sr
					Attitudinal BI				
1	Attitudinal BI	.33***	.30***	.30***	.32***	.36***	.43***	.28***	.36***
	Age		-.20**		-.05		-.08		-.20**
2	Perceptual BI	.05**	.09	.03*	-.01	.02	-.14	.02	.14
	EDAM Body Diss.		.11		.12		.07		-
3	EDAM Muscle Dysm.	.02	-.01	.00	.04	.00	-.03	.00	.01
	EDAM Binge Eating		.13*		.05		.01		.05
					Perceptual BI				
1	Perceptual BI	.62***	-.63***	.69***	.70***	.52***	.61***	.58***	.66***
	Age		-.04		.01		-.00		-.03
2	Attitudinal BI	.01	-.04	.01	.01	.01	-.02	.06**	-.15*
	EDAM BD.		-.13**		.10*		.06		.21**
3	EDAM MD.	.03***	.17***	.01	-.11*	.00	-.00	.01	-.01
	EDAM BE		-.07		.01		-.03		-.11
					EDAM-Body Dissatisfaction				
1	EDAM Body Diss.	.55***	.47***	.44***	.29***	.34***	.35***	.29***	.17
	Age		-.04		.01		.01		-.08
2	Attitudinal BI	.01	.08	.05**	.09	.01	-.06	.06*	.16
	Perceptual BI		.05		.16**		.11		.17
3	EDAM MD.	.00	.01	.02	.08	.00	.00	.01	.10
	EDAM BE		.03		.09		.05		.06

Note. Boys $80 \leq N \leq 150$; EDAM= Eating Disorder Assessment for men; MD=Muscle Dysmorphia; BE= Binge Eating; BD=Body Dissatisfaction; $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

Previous analysis (Table 5.2) had revealed that attitudinal BI domain was a significant temporal antecedent of changes in EDAM Binge Eating after 6 months, 1-yr and 18 months. Results from Table 5.3 suggest that the temporal association between attitudinal BI domain and EDAM

Binge Eating is bi-directional association for short-term changes, at least. Additionally, higher initial level of EDAM Muscle Dysmorphia predicted small increases 6 months later but marginal decreases in perceptual BI domain. Given that the perceptual BI domain did not account for changes in EDAM Muscle Dysmorphia (Table 5.2), results in Table 5.3 suggest that Muscle Dysmorphia temporally precedes perceptual BI domain. Lastly, ED conditions for boys did not account for changes in EDAM BD.

Furthermore, results presented in Table 5.4 show the temporal associations among BI-related domains and BD. For boys, higher initial levels of EDAM BD predicted decreases in perceptual BI domains 6 months apart, and its increases 1 year and 2 years later.

Table 5.5 Antecedents of BI-higher ordered domains and body dissatisfaction across 6 months, 1 year, 18 months and 2 years follow up, for girls

Step	Predictors at T1	6 months		1 year		18 months		2 years	
		R^2	sr	R^2	sr	R^2	sr	R^2	sr
					Attitudinal BI				
1	Attitudinal BI	.48***	.37***	.48***	.29***	.37***	.21*	.47***	.46***
	Age		-.09		-.01		.05		.03
2	Perceptual BI	.01	-.03	.02	.04	.06	-.07	.12**	-.35**
	EDI-2 BD		.10		.09		.24*		.28**
3	EDI-2 DT	.00	.02	.02	.08	.02	.06	.02	-.14
	EDI-2 BU		.01		-.11		-.15		-.01
					Perceptual BI				
1	Perceptual BI	.69***	.66***	.60***	.63***	.62***	.44***	.32***	.22
	Age		.09		.19**		.14		.20
2	Attitudinal BI	.01	-.09	.02	-.17*	.04	.03	.04	.04
	EDI-2 D.		.05		.07		.19*		.21
3	EDI-2 DT	.00	.03	.01	.11	.02	-.04	.01	-.11
	EDI-2 BU		-.05		-.04		-.13		-.01
					EDI-2 Body Dissatisfaction				
1	EDI-2 Body Diss.	.55***	.38***	.51***	.35***	.60***	.43***	.69***	.52***
	Age		-.03		.01		-.02		.16
2	Attitudinal BI	.03	.02	.02	.08	.02	.12	.01	.12
	Perceptual BI		.16*		.06		-.04		-.10
3	EDI-2 DT	.00	.03	.02	.04	.04	.01	.01	-.07
	EDI-2 BU		.01		-.13		-.21*		-.06

Note. Girls $39 \leq N \leq 79$; EDI-2= Eating Disorder Inventory 2; DT=Drive for Thinness; BU=Bulimia; BD=Body Dissatisfaction

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 5.5 presents results for girls, and shows that neither EDI-2 DT nor EDI-2 Bu accounted for changes in BI- higher ordered domains. Furthermore, results presented in Table 5.5 show that EDI-2 BD predicted increases in attitudinal BI domains across 18 months and 2 years, and that initial lower level of perceptual BI domains predicted its increases across 2 years. Attitudinal BI domains and EDI-2 BD predicted changes in perceptual BI domains after 1-year and 18 months, respectively (Table 5.5).

When cross-lagged pattern associations were inspected in order to explore correlated changes (Table 5.6), results showed that changes in attitudinal BI domains correlated with increases in EDAM BE for all time points, and with increases in EDAM MD 6 months and 1 year later.

After 1 year and 2 years, changes in attitudinal BI correlated with changes in EDAM BD, as well. Changes in perceptual BI domains negatively correlated with changes in EDAM MD, 1 year and 18 months later. Increases in EDAM BD positively correlated with changes in EDAM MD, across all time points. Additionally, they positively correlated with increases in EDAM BE, 1 year and 2 years later. For girls, changes in attitudinal BI domains positively correlated with increases in EDI-2 DT, 6 months and 18 months later, and in EDI-2 BD, over 1 year.

Changes in perceptual BI domains positively correlated with increases in EDI-2 DT, 6 months apart, and EDI-2 BD, 1 year later. Additionally, they positively correlated with increases in both EDI-2 DT and EDI-2 Bu, 2 years later. Lastly, changes in EDI-2 BD positively correlated with changes in both attitudinal and perceptual BI domains, 1 year later, and EDI-2 DT, 6 months and 1-yr apart.

Table 5.6 Correlated changes between BI-related outcome and ED-related variables across 2 years

Predictors	Attitudinal BI				Perceptual BI				EDAM BD				EDI-2 BD			
	6 months	1-yr	18 months	2-yr	6 months	1-yr	18 months	2-yr	6 months	1-yr	18 months	2-yr	6 months	1-yr	18 months	2-yr
Boys																
Perceptual BI	-.20*	.23**	.11	-.02					.02	-.03	.19	.09				
Attitudinal BI					-.20*	.23**	.11	-.02	.10	.31***	.13	.28*				
EDAM MD	.25**	.27**	.01	-.03	.13	-.25**	-.27*	-.16	.35***	.34***	.59***	.41***				
EDAM BE	.35***	.26**	.46***	.29**	.03	.08	-.04	-.09	.06	.20*	.16	.25*				
EDAM BD	.10	.31***	.13	.28*	.02	-.03	.19	.09								
Girls																
Perceptual BI	-.20	.03	-.28	-.17									.17	.30**	.30	.32
Attitudinal BI					-.20	.03	-.28	-.35					.21	.45***	.39**	.64***
EDI-2 DT	.56***	.19	.46**	.06	.29*	.10	.17	.44*					.28*	.25*	.30	.09
EDI-2 BU	.22	.14	.24	.24	.07	.04	-.05	.37*					.07	.15	.14	-.16
EDI-2 BD	.21	.45***	.39**	.62***	.17	.30**	.30	.32								

Note. $80 \leq N \leq 149$ boys; $33 \leq N \leq 79$; EDAM= Eating Disorder Assessment for Men; MD= Muscle Dysmorphia; BE=Binge Eating; EDI-2= Eating Disorder Inventory 2; DT= Drive for Thinness; Bu= Bulimia; BD= Body Dissatisfaction; $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

5.2.2.2.3 Path Analysis for testing seasonal effects. Data from Spring (May 2017) to Autumn (October 2018) were analysed via an autoregressive cross-lagged model (ARCL) in order to both examine the longitudinal associations among the ED and BI-related variables across 4 time points (null Model), and test the seasonal model, according to which, variable at T3 (Spring) was predicted by its T1 levels (Spring) and the variable at T4 (Autumn) was predicted by its T2 levels (Autumn).

Overall, results showed that an autoregressive cross-lagged model (ARCL), in which a given variable at each time point was predicted by its levels at earlier time point (Null model) did not fit the data. Including the seasonal parameters (Seasonal Model) resulted in overall improvement of the model fit for Drive for Thinness and perceptual BI factor, Muscle Dysmorphia and perceptual BI factor, Binge Eating and perceptual BI factor, and Binge Eating and Body Dissatisfaction (Table 5.7).

Table 5.7 Comparison of autoregressive cross-lagged paths for

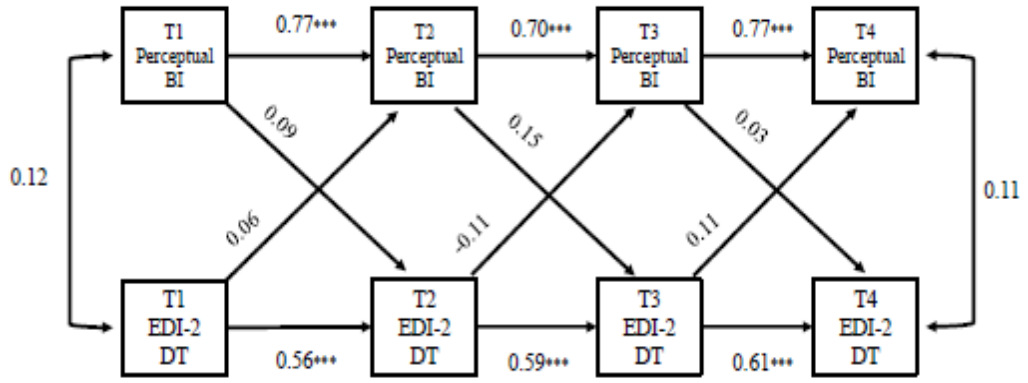
Model	$\chi 2$ (*df*)	CFI	TLI	SRMR	p value
		Binge Eating- Body Dissatisfaction			
Null	45.26(14)	0.90	0.82	0.07	< .001
Seasonal	19.80(10)	0.97	0.92	0.05	<.05
$\Delta \chi 2$ (Δdf)	25.46(4)				<.001
		Binge-Eating-perceptual BI			
Null	55.70(14)	0.89	0.79	0.06	<.001
Seasonal	19.31(10)	0.97	0.94	0.03	<.05
$\Delta \chi 2$ (Δdf)	36.42(4)				<.001
		Muscle Dysmorphia- perceptual BI			
Null	55.8(14)	0.89	0.80	0.08	< .001
Seasonal	22.2(10)	0.97	0.91	0.04	≤ .01
$\Delta \chi 2$ (Δdf)	33.6(4)				< .001
		Drive for Thinness-perceptual BI			
Null	63.1(14)	0.78	0.57	0.13	< .001
Seasonal	17.8(10)	0.97	0.91	0.05	0.06
$\Delta \chi 2$ (Δdf)	45.3(4)				<.001

Note. N=70, boys; N=43, girls. CFI: Comparative Fit Index, TLI: Tucker-Lewis Index, SRMR: Standardized Root Mean Square Error of Approximation

Although seasonal parameters improved significantly model fit for models mentioned above, Figure 5.3 presents standardized estimates for DT and perceptual BI seasonal model, because of it

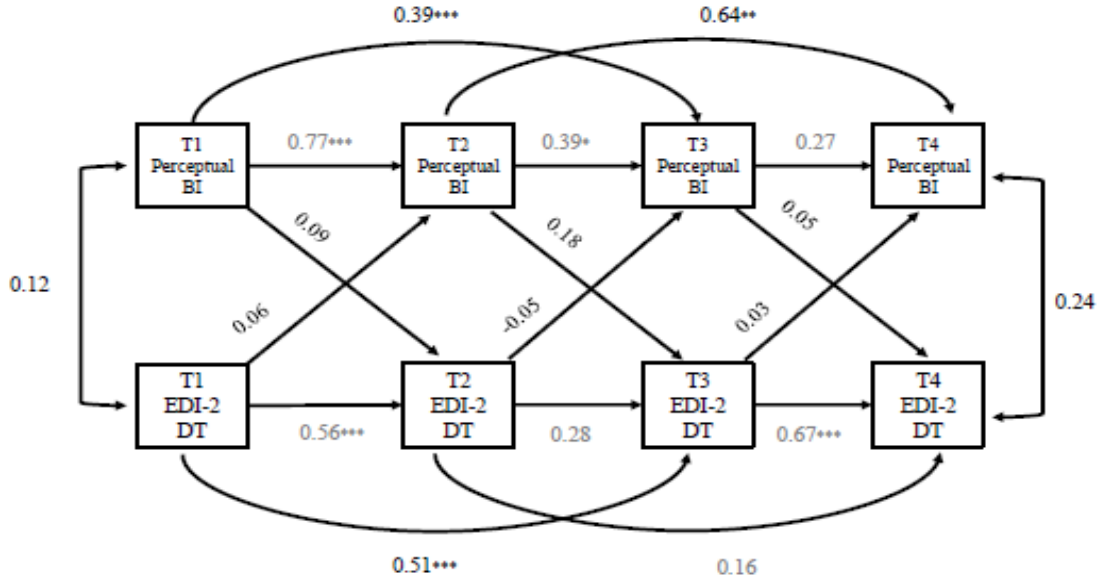
was tested and supported via Monte Carlo replications procedure (R = 1000) with a coverage probability ≥ .95 (PW > .80). This simulation procedure did not support any other models.

Fig. 5.2 Null Model. Autoregressive cross-lagged path of Drive for Thinness and Perceptual BI factor



Note. Horizontal arrows represent autoregressive paths; diagonal arrows represent cross-lagged paths. Regression Coefficients. BI= Body Image; EDI-2= Eating Disorder Inventory 2; DT= Drive for thinness.* p ≤ .05, ** p ≤ .01, *** p ≤ .001 .

Fig. 5.3 Seasonal Model. Autoregressive cross lagged path of Drive for Thinness Perceptual BI factor, with additional seasonal parameters



Note. Horizontal arrows represent autoregressive paths; diagonal arrows represent cross-lagged paths. Curvilinear arrows represent seasonal path. Regression Coefficients. * p ≤ .05, ** p ≤ .01, *** p ≤ .001 . Path coefficients in grey did not achieve the desired level of accuracy in terms of coverage probability [≥ 95; PW > .80] from the simulation procedure [R = 1000]; BI= Body Image; EDI-2= Eating Disorder Inventory 2; DT= Drive for thinness.

5.2.3 Discussion

For the current Chapter we worked on the 2-factor model of BI (i.e. attitudinal and perceptual BI factor) by testing their predictive validity of changes in ED-related outcome across time (i.e. when both short and long-term span were inspected), beyond and above Body Dissatisfaction (Allen, et al., 2008).

In line with previous findings attitudinal BI domain was found to be a stronger predictor than the perceptual one (Cash & Deagle, 1997; Cash, et al., 2002; Thompson, Penner, & Altabe, 1990) of inter-individual increases in Binge Eating across time. Specifically, it was the robust unique short and long-term predictor of increases in Binge Eating. Conversely, attitudinal BI domains showed less consistent association with increases in Muscle Dysmorphia over medium and long time span. In fact, increases in Muscle Dysmorphia were predicted by initial higher levels of Body dissatisfaction, after 1 year. It seems to suggest that a negative attitudes towards body, i.e. body image concerns, may start increasing exercise behaviours, and feelings about not being enough muscular along a short time period, while initial high Body Dissatisfaction may be implied in maintaining Muscle Dysmorphia, longer (Cafri, et al., 2005; Ralph-Nearman, & Filik, 2018; Skemp, et al., 2019).

Consistently with previous studies, changes across time in Muscle Dysmorphia amid boys, and Drive for Thinness amid girls, correlated with perceptual BI domains (Cash, et al., 2002; MacNeill, & Best, 2015; Vocks, Legenbauer, Ruddel, & Troje, 2007). Nevertheless, current findings showed that perceptual and attitudinal BI domains, predicted later onset (i.e. increases in ED levels) of bulimic symptoms among adolescent girls, over 2 years (Gardner, Stark, Friedman, & Jackson, 2000, Stice, 2001). It would suggest that the predictive validity of BI-related factors may depend on the time in which they become predictive of a specific ED symptom. In fact, Gardner and colleagues, investigated when predictors were likely to become relevant to increase ED risk (Gardner, Stark, Friedman, & Jackson, 2000). Accordingly, we found Body Dissatisfaction at baseline (i.e. in girls 14 years old) predicting later increases in Drive for Thinness over 2 years, as

well. These findings seem to highlight that such EDs (i.e. restrictive and bulimic patterns) may onset from late adolescence to young adulthood, although their precursors may be detected earlier (Stice, 2001; Stice, Gau, Rohde, & Heather, 2017).

As to reciprocal influences between BI-related domains and ED, they emerged between Binge Eating and attitudinal BI domains, as expected, with attitudinal BI predicting Binge Eating and vice versa, 6 months apart (Johnson, & Wardle, 2005; Tabri, et al., 2015).

Perceptual BI domain did not predict changes in EDs among adolescent boys, but it was predicted by initial Muscle Dysmorphia, over one year. Furthermore, we found that body dissatisfaction and perceptual BI reciprocally influenced each other across one year, among adolescent boys. Additionally, findings revealed that Body Dissatisfaction and attitudinal BI domains temporally preceded a heavier actual body shape and weight perception combined with thinner ideal weight and shape (i.e. perceptual BI domain) among adolescent girls, over one year.

Overall, these empirical findings support the theoretical differences among BI higher-ordered domains and Body Dissatisfaction, although they contribute to each other (Allen, et al., 2008). Second, they seem to support previous experimental studies on the influence of body and eating related attitudes and behaviours in self-perceptions development (Vocks, Helcher, Rohrig, & Legenbauer, 2009; Vocks, Legenbauer, Heil, 2007); the higher individual's initial Muscle Dysmorphia, Drive for Thinness and Body Dissatisfaction the higher the vulnerabilities to modify his/her own body weight and shape self-perceptions (i.e. perceptual BI domains). It might open to future directions of investigating the moderating role of sport participation and perceived sport ability, since they have been associated with a better body image and greater body satisfaction (Ferron, Narring, Cauderay, & Michaud, 1999; Vocks, et al., 2009).

Lastly, current findings further support the importance of considering seasonal effects (i.e. Spring to Spring, Autumn to Autumn) on developmental trajectories of perceptual BI domains (Stein, & Hedger, 1997) and ED-related patterns such as girls Drive for Thinness (i.e. the Spring seasonal parameters).

5.3 STUDY 2

5.3.1 Within-person changes across time: Developmental trajectories and predictors. Intra-individual changes in ED levels and co-variations between EDs and predictors changes, across 2-year, were inspected via multi-level modelling by SPSS MIXED MODELS. First-level independent variables were centered within-person. After inspecting developmental trajectories (Model 1), co-variation in changes between BI domains, and outcomes were analysed (Model 2); lastly, Body Dissatisfaction was added to the model (Model 3).

Table 5.8 Five-wave Multi-level model for EDAM Binge Eating and Muscle Dysmorphia among adolescent boys

	EDAM Binge Eating		EDAM Muscle Dysmorphia	
	Fixed Effect	*Random Effect*	*Fixed Effect*	*Random Effect*
Model 1: Trajectories				
Intercept	51.8***	6.9***	52.3***	6.5***
Slopes:				
Time	-0.6*		-0.3	
Model 2: Body Image				
Intercept	50.2***	7***	51.5***	6.6***
Slopes:				
Attitudinal BI_{CWP}	3.4***		2.9***	
Perceptual BI_{CWP}	0.6		-0.0	
Model 3: Body Dissatisfaction				
Intercept	50.2***	7.1***	51.5***	6.7***
Slopes:				
Attitudinal BI_{CWP}	2.5***		1.2	
Perceptual BI_{CWP}	0.7		0.0	
EDAM BD_{CWP}	0.2**		0.5***	

Note. 61 upper level units (participants); 303 <N (observations) < 299 per within-person variable; Random effects as SD; Random effects were included in models only if significant at $p \leq .05$; All predictors were centered within-person (CWP). *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 5.8 presents the coefficients for fixed and random effects for the final models predicting respectively EDAM BE and EDAM MD, in adolescent boys. Initial EDAM BE scores gradually decreased ($b = -1.03$, $p \leq .05$) across the five measurement occasions (Model 1). Intra-individual increases in attitudinal BI domains covaried with increases in BE (Model 2). EDAM BD was a significant predictor of intra-individual changes in EDAM BE, in addition to attitudinal BI domains (Model 3).

As to EDAM MD results presented in Table 5.8 indicate a low-static trajectory, that is initial scores were stable across the 5 measurement occasions (Model 1). Intra-individual increases in MD coviaried with increases in attitudinal BI domains (Model 2), and EDAM BD further contributed uniquely (Model 3).

For girls, results are presented in Table 5.9. They show a low-static trajectory for both EDI-2 DT and EDI-2 Bu. Results further indicate that intra-individual increases in attitudinal BI domains covaried with increases in DT (Model 2), as well as in EDI-2 BD (Model 3). No within-person predictors among BI-related domains were found for EDI-2 Bu across 2-year.

Table 5.9 Five-wave Multi-level model for EDI-2 Drive for thinness and Bulimia among adolescent girls

	EDI-2 Drive for Thinness		EDI-2 Bulimia	
	Fixed Effect	*Random Effect*	*Fixed Effect*	*Random Effect*
Model 1: Trajectories				
Intercept	46.8***	6.9***	46.8***	2.7*
Slopes:				
Time	0.3		-0.2	
Model 2: Body Image				
Intercept	48.1***	7.2***	46.3***	2.7*
Slopes:				
Attitudinal BI_{CWP}	5.5***		1.4	
Perceptual BI_{CWP}	1.1		0.7	
Model 3: Body Dissatisfaction				
Intercept	48.1***	7.4***	46.3***	2.7*
Slopes:				
Attitudinal BI_{CWP}	4.4***		1.4	
Perceptual BI_{CWP}	0.5		0.7	
EDI-2 BD_{CWP}	0.3***		0.0	

Note. 32 upper level units (participants); 154 < N(observations) < 161 per within-person variables; Random effects as SD; Random effects were included in models only if significant at $p \leq .05$; All predictors were centered within-person (CWP). *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

5.3.2 Discussion

In accordance with previous findings on ED developmental trajectories, and those from Chapter 3, ED-related outcome showed declining (i.e. Binge Eating) and low-static (i.e. Muscle Dysmorphia, Drive for thinness and Bulimia) trajectories, across 2 years (Fairweather-Schmidt, & Wade, 2016; Keel, et al., 2007).

In support of the theoretical differences between BI-related domains (i.e. attitudinal and perceptual domains) and Body Dissatisfaction (Allen, et al., 2008; Cash, et al., 2002), findings from Study 2 reveal that both attitudinal BI domain and Body Dissatisfaction predicted uniquely intra-

individual increases of Binge Eating, across 2 years. On one hand, these findings confirm attitudinal BI domain as robust predictor of Binge Eating both at intra and inter-individual level (Study 1), across five time points. On the other hand, they provide a greater support for Body Dissatisfaction as unique predictor of intra-individual increases in Muscle Dysmorphia, rather than inter-individual (Study 1). It seems to corroborate the idea that not necessary intra-individual dynamic may reflect inter-individual findings (Fleeson, 2007).

In line with previous findings, both attitudinal BI domain (Fairweather-Schmidt, & Wade, 2016), and Body Dissatisfaction uniquely predicted within-person changes in Drive for Thinness amid girls, across two years (Keel, Heatherton, Baxter, & Joiner, 2007). Overall, current findings are consistent with those obtained by Rodgers and colleagues, showing the co-variation between body image and Body Dissatisfaction with dietary restriction and Drive for Thinness in early adolescent girls (Rodgers, McLean, Marques, Dunstan, & Paxton, 2016).

Conclusion Study 1 and 2. In summary, the results of the current chapter provide theoretical and practical implications. Theoretically, findings support that there are meaningful differences between BI higher-ordered domains and Body Dissatisfaction in adolescents, and offer insight into how BI-related domains and Body Dissatisfaction are related to each other. Furthermore, the current longitudinal study supports the differences in the predictive validity of Body Dissatisfaction and BI-related factors, in predicting sex-specific ED symptoms. Empirically, it is also noteworthy that attitudinal BI domains were better predictors of binge eating at both inter and intra-individual level, among adolescent boys. As expected, it was confirmed as within-person predictor of Drive for Thinness as well, beyond and above Body Dissatisfaction, in girls. Thus, efforts to prevent strict dieting and binge eating could be directed at adolescents, boys and girls, who are at risk for high negative evaluative body image and weight and shape concern (i.e. higher scores on body uneasiness test, see Chapter 4), beyond and above a "common" discontent with their own body (i.e. body dissatisfaction).

Conversely, less consistent findings were found for Muscle Dysmorphia and Bulimia. Thus, further longitudinal investigations are needed in order to better understand the predictive role of BI-related factors and Body Dissatisfaction, in vulnerability models of MD and Bu.

The current study, however, presents several limitations, which are discussed in General discussion.

Chapter 6

An examination of the temporal associations among body image, body dissatisfaction and eating disorders: Introducing personality and emotion regulation variables as moderators

6.1. Introduction

The current chapter aimed at further exploring the temporal associations among BI-related factors and BD, and ED outcome variables emerged from the previous study (see Chapter 5). Consistently with previous research (Allen, et al., 2008), we found that attitudinal BI domains and BD contributed significantly in the prediction of ED outcome variables across time, at both inter and intra-individual level. However, several studies have shown that only a small percentage of individuals who declare to be dissatisfied and feel unease with their own bodies and/or over/under estimate body shape and sizes develop an eating disorder later (Tylka, & Subich, 2002; Tylka, 2004). Thus, further variables contribute to predict EDs, and to moderate the BI-ED and BD-ED relationships. In the present chapter, we aimed to further exploring BI and BD vulnerability models of ED symptoms by including variables related to personality and emotion regulation of adolescents.

Several studies have found that personality traits such as perfectionism, obsessiveness, ineffectiveness, depression and self-esteem (see Chapter 3), and emotion regulation related factors such as interoceptive awareness favour vulnerabilities to develop ED symptoms, further interacting with body-related concerns (Cooley, & Torray, 2001; McGee, Hewitt, Sherry, Parkin & Flett, 2005; Tyrka, Waldron, Graber, & Brooks-Gunn, 2003).

For example, perfectionism was found to moderate the effect of BD in the prediction of bulimic symptoms among college woman (McGee, et al., 2005). Brannan, and colleagues (2008) also reported that socially prescribed perfectionism intensifies the effects of BD on bulimic symptoms; moreover, they found that self-oriented perfectionism moderates BD in the prediction of anorexic symptoms, among undergraduates females, only (Brannan, Petrie, & Trent, 2008). More

recently, Rosewall et al. (2018) further confirmed that both social prescribed and self-oriented perfectionism strengthen the association between BD and restrictive as well as binge eating behaviours, among adolescent girls (Rosewall, Gleaves, & Latner, 2018). They also showed that low self-esteem and negative emotions contribute to intensify the BD-ED association. Despite perfectionism has been included in etiological models of binge eating and muscle dysmorphia among males, it was only hypothesized as potential moderator of BD (Dakanalis, & Riva, 2013; Lamanna, et al., 2010; Minnich, Gordon, Holm-Denoma, & Troop-Gordon, 2014; Murray, Rieger, Karlov, & Touyz, 2013).

Studies on global self-esteem have shown that it contributes to buffer the association of negative BI-related attitudes and eating disorders during adolescence (Beato-Fernández, Rodríguez-Cano, Belmonte-Llario, & Martìnez-Delgado, 2004; Brannan, & Petrie, 2011). In Chapter 3 we found that intra-individual increases in global self-esteem protected from increases in BE, especially when adolescent boys referred that girls see their body figure as larger and larger across 1 year. Conversely, in adolescent girls decreases in reflected self-esteem accounted for increases in DT. Furthermore, a marginally significant interaction effect emerged between ideal BF and reflected self-esteem.

Additional well-studied risk factors have also been shown to interact with BD and enhance the ED vulnerabilities. For example, depression moderates the pathway between BD and bulimic symptoms among adult women (Brannan, & Petrie, 2008; Juarascio, Perone, & Timko, 2011). Negative affect predicts eating disorders over 3 years among adolescent girls (Leon, Fulkerson, Perry, Keel, & Klump, 1999), with depression moderating the impact of sociocultural influences (i.e. peers and media influence) on ED symptoms among both adolescent boys and girls (Rodgers, Paxton, & Chabrol, 2010). Although the effect of depression on EDs has been extensively investigated (Murray, et al., 2017; Paxton, et al., 2006; Stice, Presnell, & Spangler, 2002; Walker, White, & Srinivasan, 2017) less is known on its potential moderating role on BI-related constructs and ED relationship among adolescent boys.

Obsessiveness is a personality trait frequently observed among female patients with Anorexia and Bulimia Nervosa as well as non-clinical adolescents (De Caro, & Di Blas, 2016), and ED-Obsessiveness association has been investigated from a spectrum model framework as well (Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006; Jiménez-Murcia, Fernández-aranda, Raich, Alonso, et al., 2007). In fact, ED-related categories that typically involve compulsive behaviours (i.e. binge eating, bulimia and drive for muscularity) and BI-related attitudes and behaviours (i.e. body uneasiness, body checking behaviours) are described to include obsessional aspects of personality, as well (McElroy, Guerdjikova, Winstanley, O'Melia, Mori, et al., 2011). Also Muscle dysmorphia belongs to obsessive-compulsive disorder spectrum (Edition, 2013), but it shows similarities with EDs (Lamanna, et al., 2010; Murray, et al., 2017). Gulker et al. (2001) found, indeed, a strong association between obsessiveness and compulsiveness with ED-related behaviours and excessive exercise in both male and female populations (Gulker, Laskis, & Kuba, 2001). These findings are consistent with those obtained from etiological studies, reporting that obsessional trait, alongside perfectionism and self-esteem, was common between groups of individuals with EDs and MD (Altman, & Shankman, 2009; Lamanna, et al., 2010; Maida, & Armstrong, 2005). However, to our knowledge, no studies have explored its role in predicting EDs and MD in non-clinical population during adolescence, yet. Additionally, no study has investigated whether it moderates the association between BI-related constructs and ED.

Ineffectiveness also represents a well-documented risk factor (Lilenfeld, et al., 2006). Past studies have shown that ineffectiveness is associated with the onset and worsening of ED symptoms such as dieting, bingeing and purging among college females (Striegel-Moore, Silberstein, & Rondin, 1989). Cooley and Toray (2001) also reported ineffectiveness as significant longitudinal predictor of both bulimic and restrictive symptoms among college females. More recent cross-sectional study showed that ineffectiveness predicted extreme weight loss behaviours and bulimic symptoms among adolescent boys rather than girls (McCabe, & Vincent, 2003). Additionally, Ineffectiveness predicted increases in importance of weight and shape among adolescent girls

(Wilksch, & Wade, 2010). Owing to that, previous studies theorized that feelings of ineffectiveness may enhance negative BI and restrictive patterns association, as a coping strategy to improve feelings of control (Hart, & Ollendick, 1985; Littleton, & Ollendick, 2003). However, no empirical study has explored whether ineffectiveness may strengthened the association between BI-related attitudes and behaviours and ED in both adolescents boys and girls.

Lastly, past research suggested that individuals who suffer from an ED-related condition express difficulties in discriminating between bodily sensations and emotional states (Leon, et al., 1995). Furthermore, deficits in interoceptive awareness have been found to increase problematic eating behaviours such as overeating and weight gain in both male and female late adolescents (Shriver, Dollar, Lawless et al., 2019). Sim and Zeman (2006) reported that a poorer awareness of emotions was associated with restrictive eating patterns among adolescent girls who referred higher level of BD. Despite the cross-sectional nature of their findings, they concluded that BD combined with difficulties in emotional awareness were related to EDs. Specifically, they defined ED symptoms as a strategy that adolescent girls use to cope with negative affect related with BD, because of their poor emotional awareness skills. Similar findings are reported in Ouwens, and colleagues (2008) who found that interoceptive awareness played an important role in the negative affect pathway between body dissatisfaction and overeating among female college students (Ouwens, Van Strien, Van Leeuwe, & Van der Staak, 2008). However, was not tested a moderation model.

These previous findings seem to suggest that more complex multivariate models will be required to properly understand the postulated effect of well-studied risk factors on EDs (Stice, 2016; Stice, & Desjardins, 2018). Because of very limited knowledge of personality and emotion regulation variables that moderate BI and BD-ED sex-specific symptoms associations, it first seemed important to explore association among EDs, predictors and moderators both concurrently and longitudinally.

The chapter herein presented investigates how BI-related factors and BD relevant in EDs, and perfectionism, ineffectiveness, obsessiveness, depression, self-esteem (i.e. global and reflected), and interoceptive awareness uniquely contributed to predict ED symptoms across time points, after 6 months, 1 year, 18 months and 2 years, in a non-clinical sample of adolescents. Considering multiple follow-up aimed at investigating the different predictive validity (Gardner, et al., 2000) of each predictors from the baseline to short (i.e. 6 months apart) and long-term span (i.e. 2 years later). Specifically, we examined personality and emotion regulation variables predicting changes in ED-related variables, beyond and above the contribution of BI-related constructs, previously investigated (see Chapter 5). In accordance with previous findings, depression, interoceptive awareness, self-esteem (i.e. global and reflected), ineffectiveness, perfectionism and obsessiveness are expected to predict changes in several ED-relevant variables, here investigated namely Binge Eating and Muscle Dysmorphia for boys, and Drive for Thinness and Bulimia for girls (Murray, et al., 2017; Dakanalis, et al., 2013; Stice, & Bearman, 2001).

Secondly, the study aimed at exploring the moderating effect of the above-mentioned personality and emotion regulation factors on the relationship between BI-related factor (i.e. attitudinal BI domains), BD and ED-related outcome. For each moderator, we expected that moderators would strengthen the associations.

Overall, we tested models in which both attitudinal BI/BD and the moderating variable independently impact on ED symptomatology in a positive direction and when combined have a stronger effect than the additive effect only (i.e. unique predictor; Frazier, Tix, & Barron, 2004).

6.2. METHOD

6.2.1 Participants and procedure

For the present study we considered adolescents who self-reported valid measures from WAVE 1 to WAVE 5 The adolescents aged from 14 to 20 years old. Chapter 2 (Table 2.2) provided further information on sample characteristics.

Towards the aim of testing vulnerability models we excluded systematically adolescents with ED-related outcome scores > 95° percentile at the baseline.

6.2.2 Measures

ED related outcomes

Eating Disorder Assessment for men (EDAM) Muscle Dyrmorphia and Binge Eating. Descriptive statistics, internal consistency and test-retest reliability are reported in Chapter 2.

Eating Disorder Inventory 2 (EDI-2) Drive for Thinness and Bulimia. Descriptive statistics, internal consistency and test-retest reliability are reported in Chapter 2.

Personality and emotional regulation variables relevant in EDs

EDI-2, Ineffectiveness, Perfectionism and Interoceptive Awareness. Adolescents boys and girls provided self-reported measures on EDI-2 Perfectionism (PF), Interoceptive Awaraness (IA) and Innefectiveness (IN) scales. For more information, Chapter 2 provided descriptive statistics, internal consistency values and test-retest reliability for all EDI-2 scales.

Rosenberg Self-Esteem scales (RSES). Adolescents self-reported on Rosenberg Self-Esteem scale. We administered the traditional global self-esteem scale (RSES) and its reflected form (R-RSES; i.e. I believe that people are generally satisfied with me"). Descriptive statistics, internal consistency and test-retest reliability are reported in Chapter 2.

Minnesota Multiphasic Personality Inventory- A (MMPI-A). For the present study, we used the Minnesota Multiphasic Personality Inventory for Adolescence, Obsessiveness (A-OBS) and Depression (A-DEP) scales (see Chapter 2).

6.3 RESULTS

6.3.1 Preliminary analysis: Bivariate concurrent correlations between ED-related outcome and personality variables, and emotion regulation. Table 6.1 shows bivariate correlations between ED-related outcome variables and predictors of interest at baseline. Overall, results show that EDAM BE positively correlated with EDI-2 psychological variables except for EDI-2 PF, and

negatively correlated with both global and reflected self-esteem. EDAM MD positively correlated with EDI-2 PF as well IA and A-OBS.

For girls, EDI-2 DT positively correlated with all EDI-2 and MMPI-A personality variables, and negatively with global self-esteem. EDI-2 Bu did not correlate with MMPI-A OBS, DEP and R-RSES, only.

Table 6.1 Bivariate correlations between ED outcome and predictors: Psychological and personality variables

	Predictors						
ED outcome	EDI-2 PF	EDI-2 IA	EDI-2 IN	MMPI-A OBS	MMPI-A DEP	RSE	R-RSE
EDAM BE	-.02	.39**	.38**	.25**	.38**	-.41**	-.38**
EDAM MD	.19**	.15*	-.04	.17*	-.07	.02	.05
EDI-2 DT	.42**	.52**	.53**	.33**	.50**	-.43**	-.19
EDI-2 Bu	.28**	.41**	.35**	.15	.20	-.23*	-.15

Note. EDI-2= Eating Disorder Inventory 2; PF= Perfectionism; IN= Ineffectiveness; IA= Interoceptive Awareness; DT= Drive for Thinness; Bu= Bulimia; EDAM= Eating Disorder Assessment for Men; MD= Muscle Dysmorphia; BE= Binge Eating; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescence; OBS= Obsessiveness; DEP= Depression; RSE= Rosenberg Self-Esteem; R-RSE= Reflected Rosenberg Self-Esteem; *p ≤ .05, **p ≤ .01, ***p ≤.001.

Table 6.2 presents bivariate concurrent correlations between predictors. Results show that girls attitudinal BI domains correlated with all personality predictors. For boys, attitudinal BI domains did not correlate with EDI-2 PF, only. Perceptual BI domains did not correlate with psychological and personality variables for boys and girls, except A-OBS in girls. Body Dissatisfaction (i.e. EDI-2 BD for girls, EDAM BD for boys) correlated with all predictors for both boys and girls (Table 6.2).

Table 6.2. Bivariate correlations among predictors: BI-related domains (i.e. attitudinal and perceptual) and Body Dissatisfaction, psychological and personality variables

	Boys			Girls		
	Attitudinal BI	Perceptual BI	EDAM BD	Attitudinal BI	Perceptual BI	EDI-2 BD
EDI-2 PF	.04	-.06	.09	.27**	-.10	.17
EDI-2 IA	.49**	.08	.28**	.46**	.12	.35**
EDI-2 IN	.37**	.06	.24**	.62**	.25*	.56**
A-OBS	.36**	-.02	.26**	.40**	-.04	.23*
A-DEP	.49**	.03	.32**	.56**	.06	.39**
RSES	-.37**	-.07	-.37**	-.58**	-.01	-.50**
R-RSES	-.28**	-.01	-.28**	-.34**	-.17	-.29**

Note. EDI-2= Eating Disorder Inventory 2; PF= Perfectionism; IN= Ineffectiveness; IA= Interoceptive Awareness; DT= Drive for Thinness; Bu= Bulimia; EDAM= Eating Disorder Assessment for Men; MD= Muscle Dysmorphia; BE= Binge Eating; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescence; OBS= Obsessiveness; DEP= Depression; RSES= Rosenberg Self-Esteem Scale; R-RSES= Reflected Rosenberg Self-Esteem Scale. *p ≤ .05, **p ≤ .01, ***p ≤.001.

6.3.2 Personality and emotion regulation variables antecedents of ED-related variables. Temporal antecedents of ED-related outcomes were inspected via cross-lagged patterns in order to identify which psychological and personality variables accounted an additional variance proportions of ED, beyond BI and BD predictors previously emerged (Chapter 5).

We predicted the outcomes at each follow up (i.e. 6, 12, 18 and 24 months) via a hierarchical multiple regression analysis, following 4-step procedure:

Step 1. T1 ED sex-specific variables (i.e. EDAM MD and BE for boys, and EDI-2 DT and Bu for girls) were entered first

Step 2. Next, T1 BI-related measures entered in the model

Step 3. We then entered EDI-2 personality and emotional regulation variables (i.e. Ineffectiveness, Perfectionism, and Interoceptive Awareness) with Self-Esteem (i.e. global and reflected).

Step 4. Lastly, MMPI-A scales entered in the model.

Table 6.3 Hierarchical Regression model for predicting changes in ED-related outcome variables: R^2 change values

Step	EDAM BE				EDAM MD				EDI-2 DT				EDI-2 BU			
	T2 N=137	T3 N=130	T4 N=79	T5 N=73	T2 N=132	T3 N=124	T4 N=78	T5 N=70	T2 N=66	T3 N=68	T4 N=39	T5 N=30	T2 N=67	T3 N=72	T4 N=41	T5 N=33
1.T1 Matching scale	.29***	.34***	.17***	.31***	.31***	.32***	.26***	.26***	.24***	.36***	.29***	.29***	.22***	.04	.04	.09
2.BI-related measures	.05**	.06***	.06**	.01	.02*	.02	.00	.04*	.06*	.04*	.08*	.19**	.00	.06	.08	.18*
3.EDI-2 PF IN IA RSE R-RSE	.06*	.08***	.04	.04	.06*	.07*	.03	.04	.07	.04	.13	.22*	.12	.07	.06	.09
4.MMPI-A scales	.01	.01	.07*	.02	.01	.01	.12**	.07*	.01	.01	.02	.05	.00	.00	.04	.10

Note. EDAM BE= Binge Eating; EDAM MD= Muscle Dysmorphia; EDI-2 DT= Drive for thinness; EDI-2 BU= Bulimia; PF= Perfectionism; IN= Ineffectiveness; IA= Interoceptive Awareness; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescence; RSE= Rosenberg Self-Esteem; R-RSE= Reflected Rosenberg Self-Esteem

*p ≤ .05, **p ≤ .01, ***p ≤.001.

Table 6.3 presents changes in accounted variance (R^2 change) for each ED-related outcome at follow up. Overall, personality and emotion regulation related variables (i.e. EDI-2 IN, PF, IA) and Self-Esteem (i.e. RSES and R-RSES) predicted an additional significant variance proportions of changes in T2 (6 months apart) and T3 (1 year) EDAM BE and EDAM MD, for boys. Personality variables (i.e. MMPI-A Obsessiveness and Depression) accounted for additional variance proportion of T4 (18 months apart) EDAM BE and EDAM MD, and T5 (2 years apart) EDAM MD. For girls, EDI-2 psychological variables predicted additional variance proportion of changes in T5 (2 years apart) EDI-2 DT.

Neither psychological nor personality variables accounted for variance proportions of changes in EDI-2 Bu.

We then selected significant antecedents, which predicted unique variance proportions of ED-related outcomes, after controlling for T1 same outcome variable. Predictors were entered at next steps and automatically selected via a Stepwise procedure, with BI-related predictor at Step 2 (i.e. emerged in Chapter 5) and next the selected predictors among emotional regulation related factor (Step 3) and personality variables (Step 4).

For boys, results for each EDAM outcome variables are presented in Table 6.4. First, results confirm attitudinal BI factor as robust predictor of EDAM BE, uniquely accounting for significant variance proportions. Conversely, lower initial levels of reflected Self-Esteem (R-RSES) predicted short-term increases in both EDAM MD and BE (i.e. 6 months apart). Similarly, EDI-2 Perfectionism and Global Self-esteem predicted short-term increases in both MD and BE (i.e. after 1-year). MMPI-A Obsessiveness revealed to predict long-term increases in both EDAM MD and EDAM BE. Results further show EDI-2 Ineffectiveness as the less robust predictor of short-term changes in EDAM BE, that is, initial higher levels of ineffectiveness predicted short-term decreases in overeating among adolescent boys. Similarly, confusion in recognizing physiological stimuli (i.e. hunger and satiety) and emotions was less robust predictor of later increases in binge eating across 2 years, only.

Table 6. 4 Summary of hierarchical regression analysis for boys.

		Dependent variables at follow up	
Step	T1 predictors	R^2	sr
		T2 EDAM Muscle Dysmorphia	
1	EDAM MD	.31***	.44***
2	EDAM BD	.02*	.10
3	R-RSES	.02*	-.15*
		T3 EDAM Muscle Dysmorphia	
1	EDAM MD	.31***	.53***
2	EDI-2 PF	.03*	.18*
3	RSES	.03*	-.16*
		T4 EDAM Muscle Dysmorphia	
1	EDAM MD	.26***	.47***
2	MMPI-A OBS	.07**	.26**
		T5 EDAM Muscle Dysmorphia	
1	EDAM MD	.26***	.38***
2	Attitudinal BI	.05*	.17
3	MMPI-A OBS	.04*	.20*
		T2 EDAM Binge Eating	
1	EDAM BE	.30***	.30***
2	Attitudinal BI	.04**	.16*
3	R-RSES	.05***	-.22***
		T3 EDAM Binge Eating	
1	EDAM BE	.35***	.37***
2	Attitudinal BI	.06***	.17**
3	EDI-2 PF	.02*	.17**
4	RSES	.03**	-.23***
5	EDI-2 IN	.02*	-.16*
		T4 EDAM Binge Eating	
1	EDAM BE	.18***	.21*
2	Attitudinal BI	.06**	.20*
3	MMPI-A OBS	.06*	.24*
		T5 EDAM Binge Eating	
1	EDAM BE	.32***	.48***
2	EDI-2 IA	.04*	.20*

Note. Boys $69 \leq N \leq 137$; for each EDAM outcome, participants with T scores $\leq 95°$ percentile on the matching EDAM predictor were selected only; Semi-partial correlations (sr) are reported for the full regression model; EDAM= Eating Disorder Assessment for Men; MD= Muscle Dysmorphia; BE= Binge Eating; EDI-2= Eating Disorder Inventory 2; IA= Interoceptive Awareness; BD= Body Dissatisfaction; BI= Body Image; RSES= Rosenberg Self-esteem scale; R-RSES= Reflected Rosenberg Self-Esteem Scale; MMPI-A= Minnesota Multiphasic Personality Inventory for Adolescents; OBS= Obsessiveness; *$p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Overall, predictors were not stable across measurements occasions, with few exceptions, namely, Obsessiveness for EDAM MD on a long time period, and reflected self-esteem for EDAM MD and BE on a shorter time interval.

Table 6.5 presents results for EDI-2 outcome, DT and Bu, for girls. As well as for adolescent boys, reflected self-esteem (R-RSES) was significant predictor of unique variance

proportions in both EDI-2 DT and Bu, 6 months apart. EDI-2 IA accounted for an additional significant variance proportion of changes in DT, only, beyond and above the contribution of BD across 2 years. Specifically, initial lower levels of accuracy in identifying bodily and emotional states predicted later increases of DT. For EDI-2 Bu, neither personality variables nor Interoceptive Awareness accounted for additional variance proportions beyond and above body dissatisfaction and attitudinal BI factor (Table 6.5).

Table 6.5 Summary of hierarchical regression analysis for girls

		Dependent variables at follow up	
Step	T1 predictors	R^2	sr
		T2 EDI-2 Drive for Thinness	
1	EDI-2 DT	.24***	.24*
2	EDI-2 BD	.06*	.28**
3	R-RSES	.04*	.21*
		T3 EDI-2 Drive for Thinness	
1	EDI-2 DT	.36***	.60***
		T4 EDI-2 Drive for Thinness	
1	EDI-2 DT	.29***	.37**
2	EDI-2 BD	.08*	.27*
		T5 EDI-2 Drive for Thinness	
1	EDI-2 DT	.29**	.31*
2	EDI-2 BD	.19**	.39**
3	EDI-2 IA	.11**	.33*
		T2 EDI-2 Bulimia	
1	EDI-2 Bu	.22***	.44***
2	R-RSES	.08**	-.28**
		T3 EDI-2 Bulimia	
1	EDI-2 BU	.04	.17
2	EDI-2 BD	.07*	.26*
		T5 EDI-2 Bulimia	
1	EDI-2 Bu	.09	.11
2	Attitudinal BI	.12*	.34*

Note. Girls $30 \leq N \leq 67$ girls; for each EDI-2 outcome, participants with T scores $\leq 95°$ percentile on the matching EDI-2 predictor were selected only; Semi-partial correlations (sr) are reported for the full regression model; DT= Drive For Thinness; Bu= Bulimia; IA= Interoceptive Awareness; BD= Body Dissatisfaction; BI= Body Image; R-RSES= Reflected Rosenberg Self-Esteem Scale;
*$p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

6.3.3 Personality variables and emotion regulation as moderators of temporal associations between BI-related constructs and ED-related outcomes. After inspecting for the unique contribution of personality and emotion regulation variables in predicting ED-related outcomes, beyond and above each other and BI-related measures, regression analysis was run again for

examining which variables at T1 moderated the temporal association between T1 BI-related constructs (i.e. attitudinal BI factor and BD) and ED-related outcomes at each follow-up. Despite some theoretically relevant variables, such as Depression, did not contribute in the prediction of any ED-related variables (Table 6.4 and 6.5), we explored anyway, its moderating role, given the exploratory nature of the current study. The two-way interactions were tested one at time for each ED-related outcome. Specifically, regression analysis was used to test the hypothesized moderating effects of psychological and personality variables. The follow-up scores for ED symptoms were regressed on the predictors and T1 ED symptoms in Step 1. At Step 2, the robust BI-related predictor for ED (i.e. attitudinal BI domains for Binge Eating, see Chapter 5) and the selected predictor at T1 were entered together. At Step 3, the interaction term of the predictor and moderator was entered.

Table 6.6 Hierarchical Multiple Regression Analyses Predicting EDAM Binge Eating 18 months apart, from Body Dissatisfaction, Hypothesized Moderator variables, and Interactions

	Dependent variable	
Predictor	T4 EDAM BE	
Ineffectiveness	R^2	sr
Step 1	.18***	
EDAM BE		.19*
Step 2	.06*	
Attitudinal BI		.24**
EDI-2 IN		.19*
Step 3	.04*	
Attitudinal BI x EDI-2 IN		-.21*
Depression		
Depression		
Step 1	.18***	
EDAM BE		.21*
Step 2	.07*	
Attitudinal BI		.26**
A-DEP		.06
Step 3	.05*	
Attitudinal BI x A-DEP		-.22*

Note. Boys N= 87; participants with T scores ≤ 95° percentile on the matching EDAM BE predictor were selected only; Semi-partial correlations (sr) are reported for the full regression model; EDI-2 IN= Ineffectiveness; A-DEP= Depression; *p ≤ .05, ** p ≤ .01, *** p ≤ .001

Data analyses were performed using SPSS version 21 with PROCESS (Hayes, 2017) for SPSS 2.16.3. In Table 6.6 and 6.7, respectively for both boys and girls, are reported results for the moderation models, which proved more robust estimates by using bootstrap confidence intervals (i.e. PROCESS allows to quantify and test interaction effects).

Table 6.6 shows regression coefficients of moderation analyses for EDAM BE. Their significance levels are reported in Table 6.8 and conditional effects in Table 6.9. EDI-2 Ineffectiveness and MMPI-A Depression were found to interact significantly with attitudinal BI factor in predicting changes in EDAM BE, across 18 months. Specifically, as Table 6.8 shows, the interaction effect between attitudinal BI factor and EDI-2 Ineffectiveness contributed significantly in the prediction of EDAM BE. Table 6.9 reports the conditional effects for high, medium and low levels of moderators; the positive association between negative BI attitudes and behaviours (i.e. attitudinal BI factor) and increases in BE resulted weakened in boys who referred lower initial levels of ineffectiveness (Table 6.9). Similarly, Depression (Table 6.8) was found to significantly moderate the temporal association between attitudinal BI factor and Binge Eating 18 months apart. The positive association between attitudinal BI factor and increases in BE was less intense in adolescent boys who reported lower initial levels of depression (Table 6.9). No moderators were found for the association between BI-related factor, and BD for EDAM MD.

For girls, significant moderators emerged for temporal association between EDI-2 BD and DT, at T2 (6 months apart) and T5 (2 years) follow up. Regression coefficients for each moderation analyses are presented in Table 6.7 and their level of significance and conditional effects are reported in Table 6.8 and 6.9.

Table 6. 7 Hierarchical Multiple Regression Analyses Predicting EDI-2 Drive for Thinness, 6 months and 2 years later, from Body Dissatisfaction, Hypothesized Moderator variables, and Interactions

	Dependent variable	
Predictor	R^2	sr
Ineffectiveness	T2 EDI-2 DT	
Step 1	.26***	
EDI-2 DT		.19
Step 2	.07*	
EDI-2 BD		-.16
EDI-2 IN		-.24**
Step 3	.06*	
EDI-2 BD x EDI-2 IN		.23**
Reflected Self-Esteem	T5 EDI-2 DT	
Step 1	.28***	
EDI-2 DT		.31*
Step 2	.21**	
EDI-2 BD		.36**
R-RSE		.29*
Step 3	.08*	
EDI-2 BD x R-RSES		-.28*
Interoceptive Awareness	T5 EDI-2 DT	
Step 1	.28***	
EDI-2 DT		.37***
Step 2	.30***	
EDI-2 BD		-.25*
EDI-2 CE		-.28**
Step 3	.12**	
EDI-2 BD x EDI-2 CE		.34**
Obsessiveness	T5 EDI-2 DT	
Step 1	.29***	
EDI-2 DT		.34***
Step 2	.24**	
EDI-2 BD		-.20
A-OBS		-.24*
Step 3	.08*	
EDI-2 BD x A-OBS		.28*

Note. Girls 33 < N < 67; EDI-2= Eating Disorder Inventory 2; BD= Body Dissatisfaction; IA= Interoceptive Awareness; IN= Ineffectiveness; A-OBS= Obsessiveness; A-DEP= Depression; R-RSES= Reflected Rosenberg Self-Esteem Scale; participants with T scores ≤ 95° percentile on the matching EDI-2 Drive for thinness; *p ≤ .05, ** p ≤ .01, *** p ≤ .001

Results in Table 6.7 show that EDI-2 Ineffectiveness moderates short-term association between EDI-2 BD and DT, contributing significantly to improve R^2 change value (Table 6.8). Conditional effect was significant for high and medium levels of Ineffectiveness, which strengthened the short-term BD-DT association (Table 6.9). Long-term BD-DT association (i.e. across 2 years) was moderated by reflected Self-esteem and Obsessiveness. Conditional effect

values showed that BD-DT relationship was strengthened at lower levels of reflected Self-Esteem (R-RSES; Table 6.9). Additionally, it was further strengthened in girls who reported higher levels of Interoceptive awareness (i.e. a greater confusion in recognizing bodily and emotional stimuli) and Obsessiveness. No moderators of the temporal association between BI-related factors and EDI-2 Bu were found. However, since previous analysis has shown that T1 R-RSES was a significant unique predictor of short-term increases in EDI-2 Bu, we tentatively tested for attitudinal BI factor as moderator. Results showed that the association between initial lower levels of R-RSES and increases in Bulimia 6 months apart was less intense in adolescent girls who referred lower levels of negative BI attitudes and behaviours (sr = -.26, $p \leq .01$, $\Delta R^2 = .11$).

Table 6.8. Summary from Multiple Regression Analysis of Individual moderator effects on the BI-elated constructs (i.e. attitudinal BI and Body Dissatisfaction) to Binge Eating and Drive for Thinness symptoms pathway

T1 Predictor	B	SE	ΔR^2	t	p
			T4 EDAM BE		
Attitudinal BI x EDI-2 IN	-.21	.09	.04	-2.2	< .05
Attitudinal BI x A DEP	-.29	.13	.06	-2.3	< .05
			T2 EDI-2 DT		
EDI-2 BD x EDI-2 IN	.03	.01	.08	2.81	< .01
			T5 EDI-2 DT		
EDI-2 BD x R-RSES	-.09	.04	.09	-2.34	< .05
EDI-2 BD x EDI-2 IA	.04	.01	.12	3.4	< .01
EDI-2 BD x A OBS	.04	.01	.08	2.5	< .05

Note. EDAM= Eating Disorder Assessment for Men; BE= Binge Eating; EDI-2= Eating Disorder Inventory 2; BD= Body Dissatisfaction; IA= Interoceptive Awareness; IN= Ineffectiveness; A-OBS= Obsessiveness; A-DEP= Depression; R-RSES= Reflected Rosenberg Self-Esteem Scale

Table 6. 9 Conditional Effects of Attitudinal BI domains on EDAM Binge Eating and EDI-2 Body Dissatisfaction on Drive for thinness at High, Medium and Low levels of each Moderator

Moderator	Level	Effect	se	t	p
			T4 EDAM BE		
EDI-2 IN	High	3.18	1.23	2.57	≤.01
	Med	5.06	1.28	3.95	< .001
	Low	6.67	1.66	4.01	< .001
A-DEP	High	3.71	1.38	2.68	≤ .01
	Med	5.92	1.41	4.19	<.001
	Low	8.13	2.04	3.98	<.001
			T2 EDI-2 DT		
EDI-2 IN	High	.86	.16	5.41	<.001
	Med	.56	.12	4.80	< .001
	Low	.27	.16	1.72	.08
			T5 EDI-2 DT		
R-RSES	High	.30	.22	1.34	.18
	Med	.76	.15	4.88	< .001
	Low	1.2	.27	4.47	< .001
EDI-2 IA	High	.87	.18	4.84	< .001
	Med	.59	.14	4.26	< .001
	Low	.32	.19	1.63	.11
A-OBS	High	.93	.19	4.79	< .001
	Med	.65	.15	4.41	< .001
	Low	.37	.21	1.77	.08

Note. High, medium and low values are one SD above the mean (+ 1SD), the mean and one SD below the mean (- 1SD), respectively; EDI-2= Eating Disorder Inventory 2; BD= Body Dissatisfaction; IA= Interoceptive Awareness; IN= Ineffectiveness; A-OBS= Obsessiveness; A-DEP= Depression; R-RSES= Reflected Rosenberg Self-Esteem Scale

6.4. Discussion

The current Chapter presented an exploratory study on personality and emotion regulation related variables which moderate the relationship between Body Image, Body Dissatisfaction and ED. As noted in previous studies (Tylka, & Subich, 2002; Tylka, 2004), more complex relationships among risk factors should be investigated in order to better understand their

contribution in the prediction of ED. The present study contributed to address two main open issues: 1) which personality and emotion-related variables predict increases in ED among adolescents with negative attitudes towards their bodies and body dissatisfaction, and 2) when their additive and interaction effects become significant in predicting ED, during adolescence.

Firstly, the unique contribution of personality and emotion regulation variables was inspected, beyond and above BI-related factors and Body Dissatisfaction (Chapter 5). In line with findings from previous study (Chapter 5) attitudinal BI factor was the most consistent predictive variable for Binge Eating. Similarly, Body Dissatisfaction has been found to uniquely predict Drive for Thinness among girls across 6, 18 and 24 months. As previously found (Study 1; Chapter 5), BI-related factors and Body Dissatisfaction were less consistent predictors for Muscle Dysmoprhia and Bulimia across time. Reflected self-esteem was found as short-time unique predictor of Binge Eating and Muscle Dysmorphia amid boys, and Drive for Thinness amid girls, beyond and above BI-related factor and body dissatisfaction. In line with previous studies on obsessiveness as common personality trait between ED and muscle dysmorphia (Gulker, et al., 2001; McElroy, et al., 2011), Obsessiveness predicted long-term increases in both Binge Eating and Muscle Dysmorphia in adolescent boys, over 18 months. Ineffectiveness was found to predict decreases in overeating among adolescent boys, beyond attitudinal BI factor. This finding seems to be in opposite direction respect with those from past research (Striegel-Moore, Silberstein, & Rondin, 1989), but it appears in line with McCabe and Vincent (2003), who showed that Ineffectiveness was concurrent predictor of weight loss strategies and not overeating, among adolescents boys. Thus, adolescent boys with initial higher levels of Ineffectiveness, reported decreased levels of Binge Eating, across 1 year likely due to an intention of losing weight. For future research, the desire to lose weight among adolescent boys who engage in overeating behaviours would represent an important variable to take under control in order to better understand Binge Eating development (Cafri, et al., 2005).

Consistently with etiological model of ED among males (Gulker, et al., 2001; McGee, et al., 2005; Lamanna, et al., 2010), Perfectionism predicted increases in both Muscle Dysmorphia and

Binge Eating, after one year, although less consistent across long-time span. Although, Perfectionism has been expected to predict ED development among girls, it did not predict neither Drive for Thinness nor Bulimia. Similarly, Depression did not uniquely contribute in the prediction of ED among adolescents.

As to emotion regulation aspects, Interoceptive awareness predicted long-time increases in both Binge Eating, amid boys, and Drive for Thinness, amid girls. These findings are in line with both past and recent research, which repeatedly reported the link between difficulties in discriminating bodily sensations and emotional states, and both restrictive and overeating pattern (De Caro, & Di Blas, 2016; Leon, et al., 1995).

Previous studies have shown consistent association between Depression, body image related constructs, such as body image concerns and avoidance, and ED (i.e. binge eating and bulimia) among both males and female population. In the current study, depression was not found as unique predictor of EDs among both adolescent boys and girls, but it moderates the temporal association between attitudinal BI factor and Binge Eating, amid boys. Although it was hypothesized that moderators would strengthen BI and BD-ED association, lower depression levels weakened the effect of initial higher levels of negative attitude towards body favouring decreases in Binge Eating. This finding seems to suggest that adolescent boys despite reporting a negative attitudes towards their bodies, decrease their overeating when they are not depressed. Additionally, it further corroborates and extends previous findings on the pathway between depression (or mood regulation), body relevant attitudes and behaviours and ED, in non-clinical adolescent boys (Juarascio, Perone, Timko, 2011; Rosewall, Gleaves, & Latner, 2018; Walker, White, & Srinivasan, 2017). Decreases in overeating were found in adolescent boys who initially felt less ineffective, even if reported initial higher negative attitudes and behaviours towards their bodies.

In contrast, adolescent girls who reported to be dissatisfied with their own bodies, increased their Drive for Thinness, across time, more and more when they feel ineffective. This finding provides support for the hypothesis formulated by Littleton and Ollendick (2003), that is, feelings

of ineffectiveness may strengthen the impact of Body Dissatisfaction in predicting restrictive eating attitudes and behaviours, as a coping strategy to improve feelings of control (Hart, & Ollendick, 1985; Littleton, & Ollendick, 2003). As expected, reflected self-esteem further moderates the association between Body Dissatisfaction and Drive for Thinness (Chapter 3).

Interoceptive awareness further moderates the impact of Body Dissatisfaction in predicting drive for thinness among adolescent girls. It seems in line with previous findings by Sim and Zeman (2006), who showed that poor awareness of emotions was associated with restrictive pattern in girls who referred high level of Body Dissatisfaction, although they did not test moderation effect.

Lastly, findings show that adolescent girls who refer to suffer from Body Dissatisfaction are likely to increase their Drive for Thinness across time, especially when they reported higher on Obsessiveness. It suggests that Obsessiveness represents a personality trait which may favour the negative impact of Body Dissatisfaction in ED development among girls (Lilenfeld, et al., 2016).

Overall, the present findings contribute to extent both BI and ED literature by exploring multivariate models of ED and revealing the important contribution of personality variables, during adolescence. Investigating the multiple relationships among risk factors and sex-specific ED, allowed to identify common and distinctive predictors. For example, perfectionism, global and reflected self-esteem (Chapter 3), and obsessiveness were common predictors of ED-related variables, here considered. Although being explorative, the present results shed light on multiple associations among well-studied risk factors, and reveal the importance of addressing them, earlier, in target prevention programs. Further investigations are needed in order to corroborate the present findings, and inspect whether intra-individual dynamics may reflect inter-individual differences in vulnerability models.

General discussion

The present PhD thesis aimed to contribute extending the broad research areas on Body Image and Eating Disorders. The first aim of the present project was to define developmental trajectories of ED relevant conditions, namely Muscle Dysmoprhia and Binge Eating amid boys, and Drive for Thinness and Bulimia amid girls, and their co-variations with BI-related constructs, during adolescence, by adopting both 1) a sex-sensitive approach in assessing ED and BI, and 2) between-people and within person approaches, simultaneously.

The results showed that ED outcomes were moderately stable across one year, and developmental trajectories indicated intra-individual decreases in EDAM Muscle Dysmorphia and EDI-2 Bulimia, and a low-static trend in EDAM Binge Eating and EDI-2 Drive for Thinness. When a longer time period was inspected, findings revealed that Binge Eating declined across two years, and a low-static trajectory in Muscle Dysmorphia, Drive for Thinness and Bulimia. Consistently with previous findings, ED developmental trajectories were quite stable and tended to attenuate across adolescence, thus indicating room for changes (Fairweather-Schmidt, & Wade, 2016; Keel, et al., 2007).

Given the importance of body image as core aspect of ED development during teenage years (Fairburn, et al., 2003; Hrabosky, Masheb, White, & Grilo, 2007; Stice, 2001), the present thesis systematically focused on co-variations between BI-related constructs and EDs. The introductory chapter outlined several main open issues and gaps currently present in BI literature. First of all, BI construct is multifaceted and includes at least of two middle-level domains, that is, attitudinal and perceptual components in accordance with Cash's model (Cash, et al., 2002); in addition, BI is theoretically distinct from Body Dissatisfaction (Allen, et al., 2008; Cash, et al., 2002;). The attitudinal component, however, has often been overlapped with Body Dissatisfaction, whereas the perceptual one has been less extensively investigated, especially among males. Thus, perceptual BI variables were first investigated in the present work (Chapter 3). Results showed that intra-

individual changes in Binge Eating and Muscle Dysmorphia in adolescent boys, co-varied with their actual body-related self-perceptions, across one year. The role of actual body shape and weight perception in predicting Drive for Thinness in adolescent girls was demonstrated as well, alongside the contribution of a desired thin ideal body, at both intra and inter-individual levels. These findings provide an overall support to the Dual-Pathway vulnerability model among adolescent girls, which posited the role of actual body weight and shape and a thinner ideal body in the onset and exacerbation of ED relevant conditions. Overall, these findings offer an insight on the link between body-related self-perceptions and ED among adolescent boys, which may also be concerned with their body adiposity right as girls generally are, thus being vulnerable to EDs not only because of their body size and muscularity but also because of (perceived) excessive fat (Cafri, et al., 2005; Olivardia, et al., 2004; Olivardia, et al., 2002).

In accordance with classic theories of self-development, which suggest that adolescents define themselves also through internalized perceptions of peers' beliefs about them, the studies here presented focused on reflected self-appraisals alongside traditional measures of self-perceptions, in order to estimate the unique contribution of actual, ideal and reflected appraisals. Results revealed that adolescent boys were more vulnerable of increases in Binge Eating and Muscle Dysmorphia when they thought to be perceived as fatter by other peer males. The present studies provided consistent findings on the unique contribution of reflected self-appraisals in body related self-perceptions, when included in vulnerability models of ED at both intra and inter-individual level, especially in adolescent boys. This finding is in line with previous studies which highlighted that men are more sensitive to other men's rather than other women's beliefs and opinions (Cafri, et al., 2005; Olivardia, et al., 2004; Ricciardelli, & McCabe, 2003). The present findings also indicated that body-related self-perceptions, actual, ideal and reflected should be systematically investigated for predicting ED changes across time.

In the current thesis, in addition to inspect the contribution of each body figure perception, at research interest was also to test the two-factor structure of BI in adolescence, that is, to test the model Cash and colleagues (2002) developed on adult male and female samples (Cash, et al., 2002).

Findings provided support for the two-factor structure of body image-related constructs and revealed a psychometrically robust attitudinal and perceptual domains among adolescents as well. Notably, the structure emerged by assessing BI-related indicators different from those investigated by Cash et al. (2002). In addition, the present findings offer a map onto which projecting and further exploring BI and ED-relevant variables, in order to better understand how each perceptual and attitudinal component contributes to their prediction and prevention.

The robustness of the two-factor model was further tested across seasons. The seasonality of BI-related constructs was taken under control and investigated in accordance with empirical studies which revealed that body-related variables are sensitive to seasonal variations (Geiselman, Haight, & Kimata, 1984; Kasper, Wehr, Bartko, Gaist & Rosenthal, 1989; Lam, Goldner, & Grewal, 1996). Overall, results from the present studies provided support for seasonal effects.

Factorial invariance between girls and boys was tested as well. Although a configural invariance was supported, this indicating a congruence between the two-factor solutions in males and females, a closer inspection, however, suggested some sex specificities. In fact, ideal body shape and discrepancy actual/ideal and normative/ideal BMI indices presented higher loadings on the perceptual component in adolescent girls rather than boys. Such weaker associations between ideal body weight and shape perceptions and the perceptual BI factor amid boys likely depend on the lack of BI-related indicators for muscularity (i.e. spanning from thin-emaciated to more muscular body shape and size) in the present study (Cafri, et al., 2005; Grieve, 2007; Ralph-Nearman, & Filik, 2018). In the future, more attention should be paid on muscularity because it represents a growing concern among adolescents boys but also girls (Bozsik, et al., 2018; Cunningham, et al., 2019).

The second main objective of the present research project was to empirically investigate the unique contribution of BI-related domains and Body Dissatisfaction (Allen, et al., 2008) in predicting ED development, and their reciprocal influences. Results indicated that the BI-related factors uniquely predict sex-specific EDs, beyond and above Body Dissatisfaction. Specifically, the present results showed that attitudinal BI factor robustly anticipate Binge Eating changes at both intra- and inter-individual levels, across short and long time intervals. As to Muscle Dysmorphia, the present results were less consistent across time, and across the two analytical levels. In fact, the results revealed the contribution of the attitudinal BI factor and Body Dissatisfaction across a short time interval, at inter-individual level, but only Body Dissatisfaction emerged as unique predictor at intra-individual level, across both short and long time intervals. Similarly, the results showed Body Dissatisfaction uniquely predicting inter-individual changes in Drive for Thinness, across two years, and attitudinal BI factor to additionally contribute at intra-individual level. Less consistent results also emerged for Bulimia, with the perceptual BI factor contributing to account for inter-individual increases across two years. Such a finding, however, was not supported when intra-individual dynamic was inspected.

Overall, further studies are needed in order to test the tenability of the present findings which are partially mixed across different time points. Nevertheless, the present results extend findings from previous longitudinal studies on the unique role of body image and body dissatisfaction in predicting ED. In fact, they provide support for the theoretical difference among BI-related constructs and between BI and BD and highlight that different BI components have to be simultaneously taken into account in predictive models of ED. For example, such an approach allowed here to reveal that the attitudinal BI factor is a within-person predictor of Binge Eating for boys, and Drive for Thinness for girls, beyond and above Body Dissatisfaction, that is, in terms of prevention program, attention on attitudinal indicators –i.e., weight and body shape concerns beyond a common discontent with their own body – should be directed at greater extend in adolescents, boys and girls, in order to detect those who are at risk for developing ED conditions.

Conversely, Body Dissatisfaction emerged as unique within-person predictor of Muscle Dysmorphia amid boys, although its contribution was less consistent when inter-individual differences were inspected. Anyway, such a finding provides support for previously conducted studies on etiological models of Muscle Dysmorphia which evidenced Body Dissatisfaction as the main risk factor (Lamanna, et al., 2010). Further studies are needed, however, in order to investigate processes underlying Muscle Dysmorphia development in the context of specific male-body related aspects, i.e. self-perceived muscularity and muscle (dis)satisfaction, and by distinguishing adolescents between those who perceive themselves as smaller and less muscular, and desire to gain muscles thereby, those who report to be already muscular but not enough, and those who perceive them fat and want to gain muscularity but also lose weight.

It is worth mentioning that when sex-specific ED conditions were analysed as antecedents of BI components, results showed that Muscle Dysmorphia accounted for inter-individual perceptual BI differences across time, but non vice-versa. These findings point out the need to investigate more in deep whether the effect of Muscle Dysmorphia on body-related perceptions depends on intervening variables (Vocks, et al., 2009) such as sport activity and perceived sport ability, which have been found to shape both body perception and exercising behaviours (Ferron, Narring, Cauderay, & Michaud, 1999; Vocks, et al., 2009; Voelker, et al., 2015). Thus for future research it would be useful to take under control adolescents' perceived physical ability, sport interests and motivation and verify whether they moderate or mediate (or both) the association between Muscle Dysmorphia and body self-perceptions (Ferron, et al., 1999; Vocks, et al., 2009). Lastly, longitudinal reciprocal influences among BI-related factors and Body Dissatisfaction were found in both boys and girls, further supporting them as independent and not interchangeable constructs, although they are reciprocally linked (Allen, et al., 2008; Sands, 2000).

Third aim of the present work was to explore whether personality traits additionally accounted for changes in ED levels across time. Specifically, perfectionism, depression, ineffectiveness, obsessiveness and self-esteem, global and reflected, and emotion regulation aspects

such as interoceptive awareness were here inspected. The present study was explorative and provides preliminary results. Overall, findings indicated that individual differences in personality variables and emotion regulation aspects contributed uniquely to predict ED-related outcome, beyond and above BI-related factors and Body Dissatisfaction. Specifically, both global and reflected self-esteem played a protective role from short-term increases in all ED outcome variables here investigated by uniquely contributing beyond and above BI-related constructs, at both inter and intra-individual levels (Beato-Fernàndez, Rodriguez-Cano, Belmonte-Llario, et al., 2004; Brannan, & Petrie, 2011). Consistently with recent studies on males, obsessiveness uniquely predicted both Binge Eating and Muscle Dismorphia, in accordance with etiological models which include obsessiveness and perfectionism among the main risk factors (Davis, Karvinen, & McCreary, 2005; Lamanna, et al., 2010; Maida, & Amstrong, 2005).

For adolescent girls, findings indicated reflected self-esteem as a unique predictor for both restrictive and bulimic patterns. The present results strengthen the relevance of reflected self-esteem in the onset of sex-specific EDs; conversely they are weaker for those well-studied personality factors such as perfectionism, depression and ineffectiveness (De Caro & Di Blas, 2016; Leon, et al., 1999; Lilenfeld, et al., 2006 Stice, 2001;). Overall, the present findings reveal a new risk and protective factor, that is, reflected self-appraisals. In accordance with Smink and colleagues (2018) peer-related variables are relevant predictors of later eating pathology during pre-adolescence and adolescence (Smink, Hoeken, Dijkstra, Deen, Oldehinkel, & Hoek, 2018).

The present results also showed that emotion regulation aspects such as Interoceptive Awareness, i.e. the difficulty in recognizing physiological and emotional stimuli, predicted later onset of Binge Eating and Drive for Thinness among adolescent boys and girls, respectively. These findings are consistent with past studies which showed how interoceptive skills and emotional awareness represent a vulnerability factor that make individuals less able to cope negative feelings and life events and dysfunctionally use food to overcome them (Leon, Fulkerson, Perry, Keel, & Klump, 1999; Striegle-Moore, Silberstein, French, & Rodin, 1989).

Lastly, in line with recent studies (Stice, 2016; Stice, et al., 2018), the present data yielded significant interactions between risk factors in predicting ED scores. Specifically, Depression and Ineffectiveness moderated temporal association between Binge Eating and attitudinal BI factor. Similarly, Obsessiveness, Reflected Self-Esteem, Ineffectiveness and low Interoceptive Awareness moderated the temporal association between Body Dissatisfaction and Drive for Thinness among adolescent girls. Overall, these results suggest that personality variables and emotion regulation favour vulnerabilities for EDs by strengthening the impact of BI-related attitudes and satisfaction. The present findings do however need further investigations and empirical support .

Limitations of the current research project

The present PhD project presented empirical studies based on variables selected from a larger available set, which included measures related to psycholexical indicators of personality, parental support, and sport activity. Additionally, parents of adolescents who participated to the present project provided self-reported measures of BI-related attitudes and behaviours, personality, and eating habits. The current work thus needs to be further extended in order to inspect additional protective and risk factors as well as define hierarchical vulnerability models for EDs.

In addition, the current research project presents several limitations. Firstly, we assessed body figure perceptions along the continuum thinness-adiposity only. We therefore overlooked self-perceived muscularity, which is relevant in males especially (Cafri, et al., 2005; Grieve, 2007). In fact, CDRS figures did not include the muscularity-related dimensions of body image, i.e. thin-emaciated-obese and thin-emaciated-muscular body figures. Recently, a progressive interest of women and adolescent girls for a lean and muscular body has also been well documented. Thus, for future research directions it will be important to include the muscularity related axis for understanding changes in body image construct over years, among both boys and girls.

Secondly, body figure drawing measures suffer from reliability as any single-item measure, although the present test-retest reliability values indicated consistency across time. We administered this drawing measure for its usability in the school context, but we acknowledge that future research

should involve more complex, valid and reliable measures in order to capture different body image aspects for both boys and girls. Lastly, regarding sample issues, on one hand the male prevalence in the sample allowed us to adopt a sex-sensitive approach and explore how same predictors may play a different role in dynamics underlying the prediction of sex-specific ED outcome. On the other hand, the male prevalence in the sample led to female sample size issues and weaknesses in the results. Sample size also prevented inspecting the moderating role of age.

Also the few BI-related measures, here considered, for testing the 2-factor structure of BI limits the generalizability of the present findings. For future studies additional BI measures should be involved for further examining and validating the body image construct, and by taking into account practical implications in assessing BI in both clinical and non-clinical environment, further inspecting a potential ideal BI component more in deep. Lastly, results need to be replicated in a larger sample of non-clinical and clinical adolescents, in order to test the robustness of the associations. Additional limitations include the low rate of incidence of ED symptoms luckily emerged from the data sample and emerged from the low-static, attenuating/decreasing ED trajectories across time. Such a homogeneity makes difficult to draw firm conclusions about the role of BI-related factors and Body Dissatisfaction in the onset of EDs (Stice, 2016). Overall, more consistent findings were obtained for Binge Eating, Muscle Dysmorphia and Drive for Thinness across studies. The EDI-2 Bulimia emerged as the weakest indicator of ED conditions among adolescent girls. The possible explanations for such a finding are related with two main relevant aspects. First, this clinical scale contains items related to self-induced vomiting, which represents a relevant clinical aspect for diagnosis but not necessary prevalent in non-clinical adolescent girls, who may engage in other purging behaviours, such as weight-control smoking, laxative misuse, and/or non-purging methods, such as excessive exercise, diet pills and dietary restriction. Secondly, as mentioned in introductory Chapter, developmental trajectory of Bulimia has often been shown to increase from late adolescence to young adult, thus contributing to difficulties in detecting bulimic patterns earlier.

REFERENCES

Abbate-Daga, G., Gramaglia, C., Malfi, G., Piero, A., & Fassino, S. (2007). Eating problems and personality traits. An Italian pilot study among 992 high school students. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, *15*(6), 471-478. doi:10.1002/erv.770.

Aimé, A., Craig, W. M., Pepler, D., Jiang, D., & Connolly, J. (2008). Developmental pathways of eating problems in adolescents. *International Journal of Eating Disorders*, *41*(8), 686-696. doi:10.1002/eat.20561

Allen, K. L., Byrne, S. M., Oddy, W. H., & Crosby, R. D. (2013). Early onset binge eating and purging eating disorders: Course and outcome in a population-based study of adolescents. *Journal of Abnormal Child Psychology*, *41*(7), 1083-1096. doi:10.1186/2050-2974-1-32

Allen, K. L., Byrne, S. M., McLean, N. J., & Davis, E. A. (2008). Overconcern with weight and shape is not the same as body dissatisfaction: Evidence from a prospective study of pre-adolescent boys and girls. *Body Image*, *5*(3), 261-270. doi:10.1016/j.bodyim.2008.03.005

Altman, S. E., & Shankman, S. A. (2009). What is the association between obsessive–compulsive disorder and eating disorders?. *Clinical Psychology Review*, *29*(7), 638-646. doi:10.1016/j.cpr.2009.08.001

Ames, M. E., & Wintre, M. G. (2016). Growth mixture modeling of adolescent body mass index development: Longitudinal patterns of internalizing symptoms and physical activity. *Journal of Research on Adolescence*, *26*(4), 889-901. doi:10.1111/jora.12239.

Amianto, F., Ottone, L., Daga, G. A., & Fassino, S. (2015). Binge-eating disorder diagnosis and treatment: a recap in front of DSM-5. *BMC Psychiatry*, *15*(1), 70. doi:10.1186/s12888-015-0445-6

Attia, E., & Roberto, C. A. (2009). Should amenorrhea be a diagnostic criterion for anorexia nervosa?. *International Journal of Eating Disorders, 42*(7), 581-589. doi:10.1002/eat.20720

Banfield, S.S., & McCabe, M.P. (2002). An evaluation of the construct of body image. *Adolescence, 37*(146), 373-393. doi:10536/DRO/DU:30001655

Bakalar, J. L., Shank, L. M., Vannucci, A., Radin, R. M., & Tanofsky-Kraff, M. (2015). Recent advances in developmental and risk factor research on eating disorders. *Current Psychiatry Reports, 17*(6), 42, 1-10. doi:10.1007/s11920-015-0585-x

Bardone-Cone, A. M., Abramson, L. Y., Vohs, K. D., Heatherton, T. F., & Joiner Jr, T. E. (2006). Predicting bulimic symptoms: An interactive model of self-efficacy, perfectionism, and perceived weight status. *Behaviour Research and Therapy, 44*(1), 27-42. doi:10.1016/j.brat.2004.09.009

Beato-Fernández, L., Rodríguez-Cano, T., Belmonte-Llario, A., & Martínez-Delgado, C. (2004). Risk factors for eating disorders in adolescents. *European Child & Adolescent Psychiatry, 13*(5), 287-294. doi:10.1007/s00787-004-0407-x

Bégin, C., Turcotte, O., & Rodrigue, C. (2019). Psychosocial factors underlying symptoms of muscle dysmorphia in a non-clinical sample of men. *Psychiatry Research, 272*, 319-325. doi:10.1016/j.psychres.2018.12.120

Bibiloni, M.d.M., Pich, J., Pons, A. & Tur, J. A. (2013). Body image and eating patterns among adolescents. *BMC Public Health, 13*, 1104-1114. doi:10.1186/1471-2458-13-1104

Bjornelv, S., Nordahl, H. M., & Holmen, T. L. (2011). Psychological factors and weight problems in adolescents. The role of eating problems, emotional problems, and personality traits: the Young-HUNT study. *Social Psychiatry and Psychiatric Epidemiology, 46*(5), 353-362. doi:10.1007/s00127-010-0197-z

Boone, L., Soenens, B., & Luyten, P. (2014). When or why does perfectionism translate into eating disorder pathology? A longitudinal examination of the moderating and mediating role of body dissatisfaction. *Journal of Abnormal Psychology, 123*(2), 412-418. doi: 10.1037/a0036254

Bornioli, A., Lewis-Smith, H., Smith, A., Slater, A., & Bray, I. (2019). Adolescent body dissatisfaction and disordered eating: Predictors of later risky health behaviours. *Social Science & Medicine (1982), 238*, 112458-8. doi:10.1016/j.socscimed.2019.112458

Bozsik, F., Whisenhunt, B. L., Hudson, D. L., Bennett, B., & Lundgren, J. D. (2018). Thin is in? Think again: The rising importance of muscularity in the thin ideal female body. *Sex Roles, 79*(9-10), 609-615. doi:10.1007/s11199-017-0886-0

Brannan, M. E., & Petrie, T. A. (2011). Psychological well-being and the body dissatisfaction–bulimic symptomatology relationship: An examination of moderators. *Eating Behaviors*, *12*(4), 233-241. doi:10.1016/j.eatbeh.2011.06.002

Brannan, M. E., & Petrie, T. A. (2008). Moderators of the body dissatisfaction-eating disorder symptomatology relationship: Replication and extension. *Journal of Counseling Psychology*, *55*(2), 263-275. doi:10.1037/0022-0167.55.2.263

Brytek-Matera, A., & Czepczor, K. (2017). Models of eating disorders: a theoretical investigation of abnormal eating patterns and body image disturbance. *Archives of Psychiatry and Psychotherapy*, *1*, 16-26. doi: 10.12740/APP/68422.

Butcher, J. N., Williams, C. L., Graham, J. R., Archer, R., Tellegen, A., Ben-Porath, Y. S., & Kaemmer, B. (2001). MMPI-A manual for administration, scoring, and interpretation. Italian version. Florence, Italy: Organizzazioni Speciali.

Button, E. J., Sonuga-Barke, E. J. S., Davies, J., & Thompson, M. (1996). A prospective study of self-esteem in the prediction of eating problems in adolescent schoolgirls: Questionnaire findings. *British Journal of Clinical Psychology*, *35*(2), 193-203.

doi:10.1111/j.2044-8260.1996.tb01176.x

Byrne, B. M. (2016). Testing instrument equivalence across cultural groups: Basic concepts, testing strategies, and common complexities. *In N. Zane, G. Bernal, & F. T. L. Leong (Eds.), Cultural, racial, and ethnic psychology book series. Evidence-based psychological practice with ethnic minorities: Culturally informed research and clinical strategies* (p. 125–143). American Psychological Association. doi:10.1037/14940-007

Cafri, G., Thompson, J. K., Ricciardelli, L., McCabe, M., Smolak, L., & Yesalis, C. (2005). Pursuit of the muscular ideal: Physical and psychological consequences and putative risk factors. *Clinical Psychology Review, 25*(2), 215-239. doi:10.1016/j.cpr.2004.09.003

Cafri, G., & Thompson, J. K. (2004). Measuring male body image: a review of the current methodology. *Psychology of Men & Masculinity, 5*(1), 18-29. doi:10.1037/1524-9220.5.1.18

Calam, R., Waller, G., Slade, P., & Newton, T. (1990). Eating disorders and perceived relationships with parents. *International Journal of Eating Disorders, 9*(5), 479-485. doi:10.1002/1098-108X(199009)9:5<479::AID-EAT2260090502>3.0.CO;2-I

Calzo, J. P., Sonneville, K. R., Haines, J., Blood, E. A., Field, A. E., & Austin, S. B. (2012). The development of associations among body mass index, body dissatisfaction, and weight and shape concern in adolescent boys and girls. *Journal of Adolescent Health, 51*(5), 517-523. doi:10.1016/j.jadohealth.2012.02.021

Canetti, L., Kanyas, K., Lerer, B., Latzer, Y., & Bachar, E. (2008). Anorexia nervosa and parental bonding: the contribution of parent–grandparent relationships to eating disorder psychopathology. Journal of Clinical Psychology, 64(6), 703-716. doi:10.1002/jclp.20482

Cash, T. F., & Smolak, L. (Eds.). (2011). *Body image: A handbook of science, practice, and prevention*. Guilford Press.

Cash, T. F. (2004). Body image: Past, present, and future. *Body Image, 1*(1), 1-5. doi:10.1016/S1740-1445(03)00011-1

Cash, T. F. (2002). Cognitive-behavioral perspectives on body image. In T. F. Cash & T. Pruzinsky (Eds.), *Body Image: A Handbook of Theory, Research, and Clinical Practice*, 38-46. doi:10.1080/10640260390218738

Cash, T. F., Fleming, E. C., Alindogan, J., Steadman, L., & Whitehead, A. (2002). Beyond body image as a trait: The development and validation of the Body Image States Scale. *Eating Disorders, 10*(2), 103-113. doi:10.1080/10640260290081678.

Cash, T. F., & Deagle III, E. A. (1997). The nature and extent of body-image disturbances in anorexia nervosa and bulimia nervosa: A meta-analysis. *International Journal of Eating Disorders, 22*(2), 107-126. doi:10.1002/(SICI)1098-108X(199709)22:2<107::AID-EAT1>3.0.CO;2-J

Cash, T. F. (1994). Body-image attitudes: Evaluation, investment, and affect. *Perceptual and Motor Skills, 78*(3_suppl), 1168-1170. doi:10.2466/pms.1994.78.3c.1168

Casper, R. C. (1990). Personality features of women with good outcome from restricting anorexia nervosa. *Psychosomatic Medicine, 52*, 156–170. doi:10.1097/00006842-199003000-00004

Cerea, S., Bottesi, G., Pacelli, Q. F., Paoli, A., & Ghisi, M. (2018). Muscle dysmorphia and its associated psychological features in three groups of recreational athletes. *Scientific Reports, 8*(1), 1-8. doi:10.1038/s41598-018-27176-9

Cooley, E., & Toray, T. (2001). Body image and personality predictors of eating disorder symptoms during the college years. *International Journal of Eating Disorders*, *30*(1), 28-36. doi:10.1002/eat.1051

Counts, C. R., & Adams, H. E. (1985). Body image in bulimic, dieting, and normal females. *Journal of Psychopathology and Behavioral Assessment, 7*(3), 289-300. doi:10.1007/BF00960759.

Crockett, L. J., Petersen, A. C., Graber, J. A., Schulenberg, J. E., & Ebata, A. (1989). School transitions and adjustment during early adolescence. *The Journal of Early Adolescence, 9*(3), 181-210. doi:10.1177/0272431689093002

Culbert, K. M., Racine, S. E., & Klump, K. L. (2015). Research Review: What we have learned about the causes of eating disorders–a synthesis of sociocultural, psychological, and biological research. *Journal of Child Psychology and Psychiatry, 56*(11), 1141-1164. doi:10.1111/jcpp.12441

Cunningham, M. L., Szabo, M., Kambanis, P. E., Murray, S. B., Thomas, J. J., Eddy, K. T., ... & Griffiths, S. (2019). Negative psychological correlates of the pursuit of muscularity among women. *International Journal of Eating Disorders*, 52(11), 1326-1331. doi:10.1002/eat.23178

Cuzzolaro, M., Vetrone, G., Marano, G., & Garfinkel, P. E. (2006). The Body Uneasiness Test (BUT): development and validation of a new body image assessment scale. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *11*(1), 1-13. doi:10.1007/BF03327738

Davis, C., Karvinen, K., & McCreary, D. R. (2005). Personality correlates of a drive for muscularity in young men. *Personality and Individual Differences*, *39*(2), 349-359. doi:10.1016/j.paid.2005.01.013

Dakanalis, A., Clerici, M., Caslini, M., Gaudio, S., Serino, S., Riva, G., & Carrà, G. (2016). Predictors of initiation and persistence of recurrent binge eating and inappropriate weight compensatory behaviors in college men. *International Journal of Eating Disorders*, *49*(6), 581-590. doi:10.1002/eat.22535

Dakanalis, A., Timko, C. A., Clerici, M., Zanetti, M. A., & Riva, G. (2014). Comprehensive examination of the trans-diagnostic cognitive behavioral model of eating disorders in males. *Eating Behaviors, 15*(1), 63-67. doi:10.1016/j.eatbeh.2013.10.003

Dakanalis, A., & Riva, G. (2013). Current considerations for eating and body-related disorders among men. *In handbook on Body Image: Gender Differences, Sociocultural Influences and Health implications*, 195-215.

De Caro, E. F., & Di Blas, L. (2016). A prospective study on the reciprocal influence between personality and attitudes, behaviors, and psychological characteristics salient in eating disorders in a sample of non-clinical adolescents. *Eating Disorders, 24* (5), 453-468. doi:10.1080/10640266.2016.1207454.

DeLeel, M. L., Hughes, T. L., Miller, J. A., Hipwell, A., & Theodore, L. A. (2009). Prevalence of eating disturbance and body image dissatisfaction in young girls: An examination of the variance across racial and socioeconomic groups. *Psychology in The Schools*, *46*(8), 767-775. doi:10.1002/pits.20415

Demarest, J., & Allen, R. (2000). Body image: Gender, ethnic, and age differences. *The Journal of Social Psychology*, *140*(4), 465-472. doi:10.1080/00224540009600485.

de Vries, D. A., Peter, J., Graaf, H., & Nikken, P. (2016). Adolescents' social network site use, peer appearance-related feedback, and body dissatisfaction: Testing a mediation model. *Journal of Youth and Adolescence, 45*(1), 211–224. doi:10.1007/s10964-015-0266-4

Devrim, A., Bilgic, P., & Hongu, N. (2018). Is there any relationship between body image perception, eating disorders, and muscle dysmorphic disorders in male bodybuilders?. *American Journal of Men's Health*, *12*(5), 1746-1758. doi:10.1177/1557988318786868.

Di Pentima, L., Magnani, M., Tortolani, D., Montecchi, F., Ardovini, C., & Caputo, G. (1998). Use of the Parental Bonding Instrument to compare interpretations of the parental bond by adolescent girls with restricting and binge/purging anorexia nervosa. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *3*(1), 25-31. doi:10.1007/BF03339983

Edition, F. (2013). Diagnostic and statistical manual of mental disorders. *American Psychiatric Association*. doi:10.1176/appi.books.9780890425596

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: A "transdiagnostic" theory and treatment. *Behaviour Research and Therapy, 41*(5), 509-528. doi:10.1016/S0005-7967(02)00088-8

Fairburn, C. G., & Harrison, P.J. (2003). Eating disorders. *The Lancet, 361*, 407-416. doi:10.1016/S0140-6736(03)12378-1

Fairburn, C. G. (2002). Cognitive-behavioral therapy for bulimia nervosa. *Eating Disorders and Obesity: A Comprehensive Handbook, 2*, 302-307.

Fairweather-Schmidt, A. K., & Wade, T. D. (2016). Characterizing and Predicting Trajectories of Disordered Eating Over Adolescence. *Journal of Abnormal Psychology, 125*, 369-380. doi:10.1037/abn0000146.

Fassino, S., Pierò, A., Gramaglia, C., & Abbate-Daga, G. (2004). Clinical, psychopathological and personality correlates of interoceptive awareness in anorexia nervosa, bulimia nervosa and obesity. *Psychopathology*, *37*(4), 168-174. doi:10.1159/000079420

Favaro, A., Busetto, P., Collantoni, E., & Santonastaso, P. (2019). The Age of Onset of Eating Disorders. In: de Girolamo G., McGorry P., Sartorius N. (eds) *Age of Onset of Mental Disorders* (pp. 203-216). Springer, Cham. doi:10.1007/978-3-319-72619-9_1

Ferron, C. F. N. A., Narring, F., Cauderay, M., & Michaud, P. A. (1999). Sport activity in adolescence: associations with health perceptions and experimental behaviours. *Health Education Research, 14*(2), 225-233. doi:10.1093/her/14.2.225

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*(2), 117-140. doi:10.1177/001872675400700202

Fleeson, W. (2007). Studying personality processes: Explaining change in between-persons longitudinal and within-person multilevel models. In R. W. Robins, R. C. Fraley, & R. F. Krueger (Eds.), *Handbook of Research Methods in Personality Psychology* (pp. 523–542). The Guilford Press.

Folla, M., De Caro, E. F., Di Blas, L. (2018). Eating disorders and personality correlates in men: A validity study of the Eating Disorder Assessment for Men (EDAM) in the Italian language. pp. 294-294. Poster presentation. In Book of Abstract version 16th July - ISBN:978-953-331-210-1. *European Conference on Personality 2018* at University of Zadar, Corazia, 17-21 July.

Franklin, S. B., Gibson, D. J., Robertson, P. A., Pohlmann, J. T., & Fralish, J. S. (1995). Parallel analysis: a method for determining significant principal components. *Journal of Vegetation Science*, *6*(1), 99-106. doi:10.2307/3236261

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology*, *51*(1), 115-134. doi:10.1037/0022-0167.51.1.115

Friestad, C., & Rise, J. (2004). A longitudinal study of the relationship between body image, self-esteem and dieting among 15–21 year olds in Norway. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, *12*(4), 247-255. doi:10.1002/erv.570

Furnham, A., Badmin, N., & Sneade, I. (2002). Body Image Dissatisfaction: Gender Differences in Eating Attitudes, Self-Esteem, and Reasons for Exercise. *The Journal of Psychology*, *136*(6), 581-596. doi:10.1.1.331.2864.

Gardner, R. M., & Brown, D. L. (2010). Body image assessment: A review of figural drawing scales. *Personality and Individual Differences*, *48*(2), 107-111. doi:10.1016/j.paid.2009.08.017.

Gardner, R. M., & Boice, R. (2004). A computer program for measuring body size distortion and body dissatisfaction. *Behavior Research Methods, Instruments, & Computers*, *36*(1), 89-95. doi:10.3758/BF03195553

Gardner, R. M., Stark, K., Friedman, B. N., & Jackson, N. A. (2000). Predictors of eating disorder scores in children ages 6 through 14: A longitudinal study. *Journal of Psychosomatic Research, 49*(3), 199-205. doi:10.1016/S0022-3999(00)00172-0

Gardner, R. M., Friedman, B. N., & Jackson, N. A. (1998). Methodological concerns when using silhouettes to measure body image. *Perceptual & Motor Skills, 86*, 387–395. doi:10.2466/pms.1998.86.2.387.

Garner, D. M. (1995). Eating Disorder Inventory-2. Italian version. Florence, Italy: Organizzazioni Speciali.

Garner, D. M., Olmstead, M. P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International journal of eating disorders, 2*(2), 15-34. doi:10.1002/1098-108X(198321)2:2<15::AID-EAT2260020203>3.0.CO;2-6

Geiselman, R. E., Haight, N. A., & Kimata, L. G. (1984). Context effects on the perceived physical attractiveness of faces. *Journal of Experimental Social Psychology, 20*(5), 409-424. doi:10.1016/0022-1031(84)90035-0

Ghaderi, A., & Scott, B. (2000). The big five and eating disorders: A prospective study in the general population. *European Journal of Personality*, *14*(4), 311-323. doi:10.1002/1099-0984(200007/08)14:4<311::AID-PER378>3.0.CO;2-8

Gilbert, N., & Meyer, C. (2005). Fear of negative evaluation and the development of eating psychopathology: A longitudinal study among nonclinical women. *International Journal of Eating Disorders*, *37*(4), 307-312. doi:10.1002/eat.20105.

Giuliani, N. R., & Berkman, E. T. (2015). Craving is an affective state and its regulation can be understood in terms of the extended process model of emotion regulation. *Psychological Inquiry*, *26*(1), 48-53. doi:10.1080/1047840X.2015.955072

Glashouwer, K. A., Bennik, E. C., de Jong, P. J., & Spruyt, A. (2018). Implicit Measures of Actual Versus Ideal Body Image: Relations with Self-Reported Body Dissatisfaction and Dieting Behaviors. *Cognitive Therapy and Research,* 42, 622-635. doi:10.1007/s10608-018-9917-6.

Gleaves, D. H., Williamson, D. A., Eberenz, K. P., Sebastian, S. B., & Barker, S. E. (1995). Clarifying body-image disturbance: Analysis of a multidimensional model using structural modeling. *Journal of Personality Assessment, 64*(3), 478-493. doi:10.1207/s15327752jpa6403_7

Gleghorn, A. A., Penner, L. A., Powers, P. S., & Schulman, R. (1987). The psychometric properties of several measures of body image. *Journal of Psychopathology and Behavioral Assessment*, *9*(2), 203-218. doi:10.1007/BF00960575

Goldschmidt, A. B., Wall, M. M., Zhang, J., Loth, K. A., & Neumark-Sztainer, D. (2016). Overeating and binge eating in emerging adulthood: 10-year stability and risk factors. *Developmental Psychology*, *52*(3), 475-483. doi:10.1037/dev0000086

Goldschmidt, A. B., Wall, M. M., Loth, K. A., Bucchianeri, M. M., & Neumark-Sztainer, D. (2014). The course of binge eating from adolescence to young adulthood. *Health Psychology*, *33*(5), 457-460. doi:10.1037/a0033508.

González-Martí, I., Bustos, J. G. F., Hernández-Martínez, A., & Jordán, O. R. C. (2014). Physical perceptions and self-concept in athletes with muscle dysmorphia symptoms. *The Spanish Journal of Psychology*, *17*(43) 1-7. doi:10.1017/sjp.2014.45

Gordon, K. H., Castro, Y., Sitnikov, L., & Holm-Denoma, J. M. (2010). Cultural body shape ideals and eating disorder symptoms among White, Latina, and Black college women. *Cultural Diversity and Ethnic Minority Psychology*, *16*(2), 135-143. doi:10.1037/a0018671

Grieve, F. G. (2007). A conceptual model of factors contributing to the development of muscle dysmorphia. *Eating Disorders*, *15*(1), 63-80. doi:10.1080/10640260601044535

Grieve, F. G., Newton, C. C., Kelley, L., Miller, R. C., Jr., & Kerr, N. A. (2005). The Preferred Male Body Shapes of College Men and Women. *Individual Differences Research, 3*(3), 188-192.

Grilo, C. M., Crosby, R. D., & Machado, P. P. (2019). Examining the distinctiveness of body image concerns in patients with anorexia nervosa and bulimia nervosa. *International Journal of Eating Disorders, 52*(11), 1229-1236. doi:10.1002/eat.23161

Grogan, S. (2016). Body image: Understanding body dissatisfaction in men, women and children. Taylor & Francis.

Grogan, S. (1999). Body image: Understanding body dissatisfaction in men, women, and children. London: Routledge.

Gulker, M. G., Laskis, T. A., & Kuba, S. A. (2001). Do excessive exercisers have a higher rate of obsessive-compulsive symptomatology?. *Psychology, Health & Medicine, 6*(4), 387-398. doi:10.1080/13548500126535

Hart, K. J., & Ollendick, T. H. (1985). Prevalence of bulimia in working and university women. *The American Journal of Psychiatry, 142*(7), 851-854. doi:10.1176/ajp.142.7.851

Harter, S. (2012). Self-perception profile for adolescents: Manual and questionnaires. *Denver, CO: Univeristy of Denver, Department of Psychology.*

Harter, S., Waters, P., & Whitesell, N. R. (1998). Relational self-worth: Differences in perceived worth as a person across interpersonal contexts among adolescents. *Child Development, 69*(3), 756-766. doi:10.1111/j.1467-8624.1998.tb06241.x

Harter, S., Bresnick, S., Bouchey, H. A., & Whitesell, N. R. (1997). The development of multiple role-related selves during adolescence. *Development and Psychopathology, 9*(4), 835-853. doi:10.1017/S0954579497001466

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional Process analysis a regression-based approach second edition. New York, NY: Guildford Press.

Holmqvist Gattario, K., & Frisén, A. (2019). From negative to positive body image: Men's and women's journeys from early adolescence to emerging adulthood. *Body Image,* 53-65. doi:10.1016/j.bodyim.2018.12.002.

Hopwood, C. J., Ansell, E. B., Fehon, D. C., & Grilo, C. M. (2010). Personality heterogeneity in female adolescent inpatients with features of eating disorders. *Comprehensive Psychiatry, 51*(6), 585-591. doi:10.1016/j.comppsych.2010.03.006

Horn, J.L. 1965. A rationale and test for the number of factors in factor analysis. *Psychometrica, 30,* 179-185. doi:10.1007/BF02289447

Hox, J. Multilevel analysis: techniques and applications. Mahwah, NJ: Erlbaum; 2002.

Hrabosky, J. I., Masheb, R. M., White, M. A., & Grilo, C. M. (2007). Overvaluation of shape and weight in binge eating disorder. *Journal of Consulting and Clinical Psychology, 75*(1), 175-180. doi:10.1037/0022-006X.75.1.175

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1–55.

Jacobi, C., Hayward, C., de Zwaan, M., Kraemer, H. C., & Agras, W. S. (2004). Coming to terms with risk factors for eating disorders: application of risk terminology and suggestions for a general taxonomy. *Psychological Bulletin, 130*(1), 19-65. doi:10.1037/0033-2909.130.1.19

Jáuregui Lobera, I., Bolanos Rios, P., & Garrido Casals, O. (2011). Parenting styles and eating disorders. *Journal of Psychiatric and Mental Health Nursing, 18*(8), 728-735. doi:10.1111/j.1365-2850.2011.01723.x

Jiménez-Murcia, S., Fernández-Aranda, F., Raich, R. M., Alonso, P., Krug, I., Jaurrieta, N., ... & Vallejo, J. (2007). Obsessive-compulsive and eating disorders: Comparison of clinical and personality features. *Psychiatry and Clinical Neurosciences, 61*(4), 385-391. doi:10.1111/j.1440-1819.2007.01673.x

Johnson, F., & Wardle, J. (2005). Dietary restraint, body dissatisfaction, and psychological distress: a prospective analysis. *Journal of Abnormal Psychology, 114*(1), 119-125.

doi:10.1037/0021-843X.114.1.119

Jones, D. C. (2004). Body image among adolescent girls and boys: a longitudinal study. *Developmental Psychology*, *40*(5), 823-835. doi:10.1037/0012-1649.40.5.823

Jones, D. C. (2001). Social comparison and body image: Attractiveness comparisons to models and peers among adolescent girls and boys. *Sex Roles*, *45*(9-10), 645-664. doi:10.1023/A:1014815725852

Juarascio, A. S., Perone, J., & Timko, C. A. (2011). Moderators of the relationship between body image dissatisfaction and disordered eating. *Eating Disorders*, *19*(4),346-354. doi:10.1080/10640266.2011.584811

Kakeshita, I. S., & de Sousa Almeida, S. (2006). Relationship between body mass index and self-perception among university students. *Revista de Saúde Pública*, *40*(3), 497-504. https://www.redalyc.org/articulo.oa?id=672/67240153019

Kasper, S., Wehr, T. A., Bartko, J. J., Gaist, P. A., & Rosenthal, N. E. (1989). Epidemiological findings of seasonal changes in mood and behavior: a telephone survey of Montgomery County, Maryland. *Archives of General Psychiatry*. *46*(9), 823–833. doi:10.1001/archpsyc.1989.01810090065010

Kaye, W. H., Greeno, C. G., Moss, H., Fernstrom, J., Fernstrom, M., Lilenfeld, L. R., ... & Mann, J. J. (1998). Alterations in serotonin activity and psychiatric symptoms after recovery from bulimia nervosa. *Archives of General Psychiatry*, *55*(10), 927-935. doi:10.1001/archpsyc.55.10.927

Keel, P. K., Baxter, M. G., Heatherton, T. F., & Joiner Jr, T. E. (2007). A 20-year longitudinal study of body weight, dieting, and eating disorder symptoms. *Journal of Abnormal Psychology*, *116*(2), 422-432. doi:10.1037/0021-843X.116.2.422

Keel, P. K., Heatherton, T. F., Harnden, J. L., & Hornig, C. D. (1997). Mothers, fathers, and daughters: Dieting and disordered eating. *Eating Disorders*, *5*, 216–228. doi:10.1080/10640269708249227

Keel, P. K., Fulkerson, J. A., & Leon, G. R. (1997). Disordered eating precursors in pre-and early adolescent girls and boys. *Journal of Youth and Adolescence*, *26*(2), 203-216. doi:10.1023/A:1024504615742

Keski-Rahkonen, A., & Mustelin, L. (2016). Epidemiology of eating disorders in Europe: prevalence, incidence, comorbidity, course, consequences, and risk factors. *Current Opinion in Psychiatry*, *29*(6), 340-345. doi:10.1097/YCO.0000000000000278

Killen, J. D., Taylor, C. B., Hayward, C., Wilson, D. M., Haydel, K. F., Hammer, L. D., ... & Kraemer, H. (1994). Pursuit of thinness and onset of eating disorder symptoms in a community sample of adolescent girls: A three-year prospective analysis. *International Journal of Eating Disorders*, *16*(3), 227-238. doi:10.1002/1098-108X(199411)16:3<227::AID-EAT2260160303>3.0.CO;2-L

Kline, T. J. (2005). Psychological testing: A practical approach to design and evaluation. *Sage Publications.*

Kling, J., Kwakkenbos, L., Diedrichs, P. C., Rumsey, N., Frisén, A., Brandão, M. P., ... & Fitzgerald, A. (2019). Systematic review of body image measures. *Body Image, 30,* 170-211. doi:10.1016/j.bodyim.2019.06.006

Klump, K. L., Strober, M., Bulik, C. M., Thornton, L., Johnson, C., Devlin, B., ... & Crow, S. (2004). Personality characteristics of women before and after recovery from an eating disorder. *Psychological Medicine*, *34*(8), 1407-1418. doi:10.1017/S0033291704002442

Krayer, A., Ingledew, D. K., & Iphofen, R. (2008). Social comparison and body image in adolescence: A grounded theory approach. *Health Education Research*, *23*(5), 892-903. doi:10.1093/her/cym076

Kwok, O., Underhill, A. T., Berry, J. W., Luo, W., Elliot, T. R., & Yoon, M. (2008). Analyzing Longitudinal Data with Multilevel Models: An Example with Individuals Living with Lower Extremity Intra-articular Fractures. *Rehabilitation Psychology, 53(3),* 370-386.

doi:10.1037/a0012765

Lam, R. W., Goldner, E. M., & Grewal, A. (1996). Seasonality of symptoms in anorexia and bulimia nervosa. *International Journal of Eating Disorders, 19*(1), 35-44. doi:10.1002/(SICI)1098-108X(199601)19:1<35::AID-EAT5>3.0.CO;2-X

Lamanna, J., Grieve, F. G., Derryberry, W. P., Hakman, M., & McClure, A. (2010). Antecedents of eating disorders and muscle dysmorphia in a non-clinical sample. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *15*(1-2), e23-e33. doi:10.1007/BF03325277

Leme, A. C. B., Thompson, D., Dunker, K. L. L., Nicklas, T., Philippi, S. T., Lopez, T., ... & Baranowski, T. (2018). Obesity and eating disorders in integrative prevention programmes for adolescents: protocol for a systematic review and meta-analysis. *BMJ Open*, *8*(4), 1-6. doi:10.1136/bmjopen-2017-020381

Leon, G. R., Fulkerson, J. A., Perry, C. L., Keel, P. K., & Klump, K. L. (1999). Three to four year prospective evaluation of personality and behavioral risk factors for later disordered eating in adolescent girls and boys. *Journal of Youth and Adolescence*, *28*(2), 181-196. doi:10.1023/A:1021649314458

Leon, G. R., Fulkerson, J. A., Perry, C. L., & Early-Zald, M. B. (1995). Prospective analysis of personality and behavioral vulnerabilities and gender influences in the later development of disordered eating. *Journal of Abnormal Psychology*, *104*(1), 140-149. doi:10.1037//0021-843x.104.1.140

Leon, G. R., Fulkerson, J. A., Perry, C. L., & Cudeck, R. (1993). Personality and behavioral vulnerabilities associated with risk status for eating disorders in adolescent girls. *Journal of Abnormal Psychology, 102*(3), 438-444. doi:10.1037/0021-843X.102.3.438

Lieberman, M., Gauvin, L., Bukowski, W. M., & White, D. R. (2001). Interpersonal influence and disordered eating behaviors in adolescent girls: The role of peer modeling, social reinforcement, and body-related teasing. *Eating Behaviors, 2*(3), 215-236.

doi:10.1016/S1471-0153(01)00030-7

Liechty, J. M. (2010). Body image distortion and three types of weight loss behaviors among nonoverweight girls in the United States. *Journal of Adolescent Health, 47*(2), 176-182. doi:10.1016/j.jadohealth.2010.01.004

Lilenfeld, L. R., Wonderlich, S., Riso, L. P., Crosby, R., & Mitchell, J. (2006). Eating disorders and personality: A methodological and empirical review. *Clinical Psychology Review, 26*(3), 299-320. doi:10.1016/j.cpr.2005.10.003

Lilenfeld, L. R. R., Stein, D., Bulik, C. M., Strober, M., Plotnicov, K., Pollice, C., ... & Kaye, W. H. (2000). Personality traits among currently eating disordered, recovered and never ill first-degree female relatives of bulimic and control women. *Psychological Medicine, 30*(6), 1399-1410. doi:10.1017/S0033291799002792

Lin, L., & DeCusati, F. (2016). Muscle dysmorphia and the perception of men's peer muscularity preferences. *American Journal of Men's Health, 10*(6), NP78-NP88. doi:10.1177/1557988315598367.

Littleton, H. L., & Ollendick, T. (2003). Negative body image and disordered eating behavior in children and adolescents: what places youth at risk and how can these problems be prevented?. *Clinical Child and Family Psychology Review, 6*(1), 51-66. doi:10.1023/A:1022266017046

Lohman TG, Roche AF, Martorell R (eds). Anthropometric standardization reference manual. *Human Kinetics*: Champaign, IL, 1988.

Lydecker, J. A., White, M. A., & Grilo, C. M. (2017). Form and formulation: Examining the distinctiveness of body image constructs in treatment-seeking patients with binge-eating disorder. *Journal of Consulting and Clinical Psychology, 85*(11), 1095-1103. doi:10.1037/ccp0000258

MacNeill, L. P., & Best, L. A. (2015). Perceived current and ideal body size in female undergraduates. *Eating Behaviors, 18*, 71-75. doi:10.1016/j.eatbeh.2015.03.004.

Madden, S., Morris, A., Zurynski, Y. A., Kohn, M., & Elliot, E. J. (2009). Burden of eating disorders in 5–13-year-old children in Australia. *Medical Journal of Australia*, *190*(8), 410-414. doi:10.5694/j.1326-5377.2009.tb02487.x

Maida, D. M., & Armstrong, S. L. (2005). The Classification of Muscle Dysmorphia. *International Journal of Men's Health, 4*(1), 73-91. doi:10.3149/jmh.0401.73

Mäkinen, M., Puukko-Viertomies, L., Lindberg, N. et al., (2012). Body dissatisfaction and body mass in girls and boys transitioning from early to mid-adolescence: additional role of self-esteem and eating habits. *BMC Psychiatry 12*, 35, 1-8. doi:10.1186/1471-244X-12-35

Marcus, M. D., & Kalarchian, M. A. (2003). Binge eating in children and adolescents. *International Journal of Eating Disorders, 34*(S1), S47-S57. doi:10.1002/eat.10205

Martin, E., Dourish, C. T., Rotshtein, P., Spetter, M. S., & Higgs, S. (2019). Interoception and disordered eating: a systematic review. *Neuroscience & Biobehavioral Reviews, 107*, 166-191. doi:10.1016/j.neubiorev.2019.08.020

McCabe, M. P., & Vincent, M. A. (2003). The role of biodevelopmental and psychological factors in disordered eating among adolescent males and females. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, *11*(4), 315-328. doi:10.1002/erv.500

McCabe, M. P., & Ricciardelli, L. A. (2003). Sociocultural influences on body image and body changes among adolescent boys and girls. *The Journal of Social Psychology, 143*(1), 5-26. doi:10.1080/00224540309598428

McCreary, D. R., & Sasse, D. K. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health*, 48(6), 297-304. doi:10.1080/07448480009596271

McElroy, S. L., Guerdjikova, A. I., Winstanley, E. L., O'Melia, A. M., Mori, N., McCoy, J., ... & Hudson, J. I. (2011). Acamprosate in the treatment of binge eating disorder: A placebo-controlled trial. *International Journal of Eating Disorders, 44*(1), 81-90. doi:10.1002/eat.20876

McGee, B. J., Hewitt, P. L., Sherry, S. B., Parkin, M., & Flett, G. L. (2005). Perfectionistic self-presentation, body image, and eating disorder symptoms. *Body Image, 2*(1), 29-40. doi:10.1016/j.bodyim.2005.01.002

Mendelson, B. K., Mendelson, M. J., & White, D. R. (2001). Body-esteem scale for adolescents and adults. *Journal of Personality Assessment, 76*(1), 90-106. doi:10.1207/S15327752JPA7601_6

Mills, J. S., Musto, S., Williams, L., & Tiggemann, M. (2018). "Selfie" harm: Effects on mood and body image in young women. *Body Image, 27*, 86-92. doi:10.1016/j.bodyim.2018.08.007.

Minnich, A. M., Gordon, K. H., Holm-Denoma, J. M., & Troop-Gordon, W. (2014). A test of an interactive model of binge eating among undergraduate men. *Eating Behaviors, 15*(4), 625-631. doi:10.1016/j.eatbeh.2014.08.016

Mitchison, D., Hay, P., Griffiths, S., Murray, S. B., Bentley, C., Gratwick-Sarll, K., et al. (2017). Disentangling body image: The relative associations of overvaluation, dissatisfaction, and preoccupation with psychological distress and eating disorder behaviors in male and female adolescents. *International Journal of Eating Disorders, 50*(2), 118-126. doi:10.1002/eat.22592.

Mitchison, D., & Mond, J. (2015). Epidemiology of eating disorders, eating disordered behaviour, and body image disturbance in males: a narrative review. *Journal of Eating Disorders, 3*(1), 20, 1-9. doi:10.1186/s40337-015-0058-y

Moore, C. D. C. (1990). Body image and eating behavior in adolescent boys. *American Journal of Diseases of Children, 144*(4), 475-479. doi:10.1001/archpedi.1990.02150280097020

Morin, A. J., Maïano, C., Scalas, L. F., Janosz, M., & Litalien, D. (2017). Adolescents' body image trajectories: A further test of the self-equilibrium hypothesis. *Developmental Psychology, 53*(8), 1501-1521. doi:10.1037/dev0000355

Morrison, T. G., Kalin, R., & Morrison, M. A. (2004). Body-Image Evaluation And Body-Image Among Adolescents: A Test Of Sociocultural And Social Comparison Theories. *Adolescence, 39*(155), 571-591.

Murnen, S. K., & Smolak, L. (2019). The Cash effect: Shaping the research conversation on body image and eating disorders. *Body Image, 31*, 288-293. doi:10.1016/j.bodyim.2019.01.001

Murray, S. B., Nagata, J. M., Griffiths, S., Calzo, J. P., Brown, T. A., Mitchison, D., …& Mond, J. M. (2017). The enigma of male eating disorders: A critical review and synthesis. *Clinical Psychology Review, 57*, 1-11. doi:10.1016/j.cpr.2017.08.001

Murray, S. B., Rieger, E., Karlov, L., & Touyz, S. W. (2013). An investigation of the transdiagnostic model of eating disorders in the context of muscle dysmorphia. *European Eating Disorders Review, 21*(2), 160-164. doi:10.1002/erv.2194

Mustelin, L., Silén, Y., Raevuori, A., Hoek, H. W., Kaprio, J., & Keski-Rahkonen, A. (2016). The DSM-5 diagnostic criteria for anorexia nervosa may change its population prevalence and prognostic value. *Journal of Psychiatric Research, 77*, 85-91. doi:10.1016/j.jpsychires.2016.03.003

Neumark-Sztainer, D., Wall, M., Larson, N. I., Eisenberg, M. E., & Loth, K. (2011). Dieting and disordered eating behaviors from adolescence to young adulthood: findings from a 10-year longitudinal study. *Journal of the American Dietetic Association, 111*(7), 1004-1011. doi:10.1016/j.jada.2011.04.012

Neumark-Sztainer, D., Wall, M. M., Story, M., & Perry, C. L. (2003). Correlates of unhealthy weight-control behaviors among adolescents: implications for prevention programs. *Health Psychology, 22*(1), 88-98. doi:10.1037/0278-6133.22.1.88

Neumark-Sztainer, D., & Hannan, P. J. (2000). Weight-related behaviors among adolescent girls and boys: results from a national survey. *Archives of Pediatrics & Adolescent Medicine, 154*(6), 569-577. doi:10.1001/archpedi.154.6.569

Núñez-Navarro, A., Agüera, Z., Krug, I., Jiménez-Murcia, S., Sánchez, I., Araguz, N., & Moragas,L.(2012). Do men with eating disorders differ from women in clinics, psychopathology and personality?. *European Eating Disorders Review, 20*(1), 23-31. doi:10.1002/erv.1146

O'Dea, J. A., & Abraham, S. (1999). Association between self-concept and body weight, gender, and pubertal development among male and female adolescents. *Adolescence, 34*(133), 69-79.

Olivardia, R. (2007). Muscle Dysmorphia: Characteristics, Assessment, and Treatment. In J. K. Thompson & G. Cafri (Eds.), *The muscular ideal: Psychological, Social, and Medical Perspectives*, 123–139. American Psychological Association. doi:10.1037/11581-006

Olivardia, R., Pope Jr, H. G., Borowiecki III, J. J., & Cohane, G. H. (2004). Biceps and body image: the relationship between muscularity and self-esteem, depression, and eating disorder symptoms. *Psychology of Men & Masculinity, 5*(2), 112-120. doi:10.1037/1524-9220.5.2.112

Olivardia, R., Pope Jr, H. G., & Hudson, J. I. (2000). Muscle dysmorphia in male weightlifters: a case-control study. *American Journal of Psychiatry, 157*(8), 1291-1296. doi:10.1176/appi.ajp.157.8.1291

Ornstein, R. M., Rosen, D. S., Mammel, K. A., Callahan, S. T., Forman, S., Jay, M. S., ... & Walsh, B. T. (2013). Distribution of eating disorders in children and adolescents using the proposed DSM-5 criteria for feeding and eating disorders. *Journal of Adolescent Health, 53*(2), 303-305. doi:10.1016/j.jadohealth.2013.03.025

Ouwens, M. A., Van Strien, T., Van Leeuwe, J. F. J., & Van der Staak, C. P. F. (2009). The dual pathway model of overeating. Replication and extension with actual food consumption. *Appetite, 52*(1), 234-237. doi:10.1016/j.appet.2008.07.010

Paxton, S. J., Neumark-Sztainer, D., Hannan, P. J., & Eisenberg, M. E. (2006). Body dissatisfaction prospectively predicts depressive mood and low self-esteem in adolescent girls and boys. *Journal of Clinical Child and Adolescent Psychology*, *35*(4), 539-549. doi:10.1207/s15374424jccp3504_5

Peck, L. D., & Lightsey Jr, O. R. (2008). The eating disorders continuum, self-esteem, and perfectionism. *Journal of Counseling & Development*, *86*(2), 184-192. doi:10.1002/j.1556-6678.2008.tb00496.x

Perry, J. A., Silvera, D. H., Neilands, T. B., Rosenvinge, J. H., & Hanssen, T. (2008). A study of the relationship between parental bonding, self-concept and eating disturbances in Norwegian and American college populations. *Eating Behaviors*, *9*(1), 13-24. doi:10.1016/j.eatbeh.2007.01.007

Pfeifer, J. H., Masten, C. L., Borofsky, L. A., Dapretto, M., Fuligni, A. J., & Lieberman, M. D. (2009). Neural correlates of direct and reflected self-appraisals in adolescents and adults: When social perspective-taking informs self-perception. *Child Development*, *80*(4), 1016-1038. doi:10.1111/j.1467-8624.2009.01314.x

Polivy, J., & Herman, C. P. (2002). Causes of eating disorders. *Annual Review of Psychology*, *53*(1), 187-213. doi:10.1146/annurev.psych.53.100901.135103

Porras Garcia, B., Ferrer Garcia, M., Olszewska, A., Yilmaz, L., González Ibañez, C., Gracia Blanes, M., ... & Gutiérrez Maldonado, J. (2019). Is This My Own Body? Changing the Perceptual and Affective Body Image Experience among College Students Using a New Virtual Reality Embodiment-Based Technique. *Journal of Clinical Medicine*, *8*(7), 925-938. doi:10.3390/jcm8070925

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review, 41*, 71-90. doi:10.1016/j.dr.2016.06.004.

Ralph-Nearman, C., & Filik, R. (2018). New body scales reveal body dissatisfaction, thin-ideal, and muscularity-ideal in males. *American Journal of Men's Health*, *12*(4), 740-750. doi:10.1177/1557988318763516.

Ramirez, J. C., & Milan, S. (2016). Perceived size of friends and weight evaluation among low-income adolescents. *Journal of Behavioral Medicine*, *39*(2), 334- 345. doi:10.1007/s10865-015-9682-x.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods* (Vol. 1). Sage.

R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. http://www.r-project.org/index.html

Ricciardelli, L. A., & McCabe, M. P. (2003). A longitudinal analysis of the role of biopsychosocial factors in predicting body change strategies among adolescent boys. *Sex Roles, 48*(7-8), 349-359. doi:10.1023/A:1022942614727

Ricciardelli, L. A., & McCabe, M. P. (2001). Self-esteem and negative affect as moderators of sociocultural influences on body dissatisfaction, strategies to decrease weight, and strategies to increase muscles among adolescent boys and girls. *Sex Roles, 44*(3-4), 189-207. doi:10.1023/A:1010955120359

Ricciardelli, L. A., McCabe, M. P., & Banfield, S. (2000). Body image and body change methods in adolescent boys: Role of parents, friends and the media. *Journal of Psychosomatic Research*, *49*(3), 189-197. doi:10.1016/S0022-3999(00)00159-8

Robins, R. W., Trzesniewski, K. H., Tracy, J. L., Gosling, S. D., & Potter, J. (2002). Global self-esteem across the life span. *Psychology and Aging*, *17*(3), 423-434. doi:10.1037/0882-7974.17.3.423

Rodgers, R. F., McLean, S. A., Marques, M., Dunstan, C. J., & Paxton, S. J. (2016). Trajectories of body dissatisfaction and dietary restriction in early adolescent girls: A latent class growth analysis. *Journal of Youth and Adolescence, 45*(8), 1664-1677. doi:10.1007/s10964-015-0356-3

Rodgers, R. F., Ganchou, C., Franko, D. L., & Chabrol, H. (2012). Drive for muscularity and disordered eating among French adolescent boys: A sociocultural model. *Body Image, 9*(3), 318-323. doi:10.1016/j.bodyim.2012.03.002

Rodgers, R. F., Paxton, S. J., & Chabrol, H. (2010). Depression as a moderator of sociocultural influences on eating disorder symptoms in adolescent females and males. *Journal of Youth and Adolescence*, *39*(4), 393-402. doi:10.1007/s10964-009-9431-y

Rodgers, R., & Chabrol, H. (2009). Parental attitudes, body image disturbance and disordered eating amongst adolescents and young adults: A review. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, *17*(2), 137-151. doi:10.1002/erv.907

Rodin, J., Silberstein, L., & Striegel-Moore, R. (1984). Women and weight: A normative discontent. *Nebraska Symposium on Motivation, 32,* 267–307.

Rosenberg, M. (1965). Rosenberg self-esteem scale (RSES). *Society and The Adolescent Self-Image*.

Rosewall, J. K., Gleaves, D. H., & Latner, J. D. (2018). An examination of risk factors that moderate the body dissatisfaction-eating pathology relationship among New Zealand adolescent girls. *Journal of Eating Disorders*, *6*(1), 1-10. doi:10.1186/s40337-018-0225-z

Rosseel, Y. (2012). Lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software, 48(2),* 1-36.

Sands, R., Maschette, W., & Armatas, C. (2004). Measurement of body image satisfaction using computer manipulation of a digital image. *The Journal of Psychology*, *138*(4), 325-338. doi:10.3200/JRLP.138.4.325-338

Sands, R. (2000). Reconceptualization of body image and drive for thinness. *International Journal of Eating Disorders, 28*(4), 397-407. doi:10.1002/1098-108X(200012)28:4<397::AID-EAT7>3.0.CO;2-U

Schilder, P. (1935/1950). The image and appearance of the human body. New York: International Universities Press.

Schwitzer, A. M., Rodriguez, L. E., Thomas, C., & Salimi, L. (2001). The eating disorders NOS diagnostic profile among college women. *Journal of American College Health*, *49*(4), 157-166. doi:10.1080/07448480109596298

Shaw, H., Stice, E., & Becker, C. B. (2009). Preventing eating disorders. *Child and Adolescent Psychiatric Clinics*, *18*(1), 199-207. doi:10.1016/j.chc.2008.07.012

Shea, M. E., & Pritchard, M. E. (2007). Is self-esteem the primary predictor of disordered eating?. *Personality and Individual Differences*, *42*(8), 1527-1537. doi:10.1016/j.paid.2006.10.026

Shisslak, C. M., Crago, M., & Estes, L. S. (1995). The spectrum of eating disturbances. *International Journal of Eating Disorders*, *18*(3), 209-219. doi:10.1002/1098-108X(199511)18:3<209::AID-EAT2260180303>3.0.CO;2-E

Shore, R. A., & Porter, J. E. (1990). Normative and reliability data for 11 to 18 year olds on the Eating Disorder Inventory. *International Journal of Eating Disorders, 9*(2), 201-207. doi:10.1002/1098-108X(199003)9:2<201::AID-EAT2260090209>3.0.CO;2-9

Shriver, L. H., Dollar, J. M., Lawless, M., Calkins, S. D., Keane, S. P., Shanahan, L., & Wideman, L. (2019). Longitudinal associations between emotion regulation and adiposity in late adolescence: indirect effects through eating behaviors. *Nutrients*, *11*(3), 517-530. doi:10.3390/nu11030517

Shroff, H., & Thompson, J. K. (2006). Peer influences, body-image dissatisfaction, eating dysfunction and self-esteem in adolescent girls. *Journal of Health Psychology*, *11*(4), 533-551. doi:10.1177/1359105306065015

Sim, L., & Zeman, J. (2006). The contribution of emotion regulation to body dissatisfaction and disordered eating in early adolescent girls. *Journal of Youth and Adolescence*, *35*(2), 207-216. doi:10.1007/s10964-005-9003-8

Skemp, K. M., Elwood, R. L., & Reineke, D. M. (2019). Adolescent Boys are at Risk for Body Image Dissatisfaction and Muscle Dysmorphia. *Californian Journal of Health Promotion, 17*(1), 61-70. doi:10.32398/cjhp.v17i1.2224

Smink, F. R. E., Van Hoeken, D., Dijkstra, J. K., Deen, M., & Hoek, H. W. (2018). Self-esteem and peer-perceived social status in early adolescence and prediction of eating pathology in young adulthood. *International Journal of Eating Disorders, 51,* 852-862. doi:10.1002/eat.22875.

Speranza, M., Atger, F., Corcos, M., Loas, G., Guilbaud, O., Stéphan, P., ... & Lang, F. (2003). Depressive psychopathology and adverse childhood experiences in eating disorders. *European Psychiatry*, *18*(8), 377-383. doi:10.1016/j.eurpsy.2003.04.001

Spillane, N. S., Boerner, L. M., Anderson, K. G., & Smith, G. T. (2004). Comparability of the Eating Disorder Inventory-2 between women and men. *Assessment*, *11*(1), 85-93. doi:10.1177/1073191103260623

Stanford, S. C., & Lemberg, R. (2012). Measuring eating disorders in men: development of the eating disorder assessment for men (EDAM). *Eating Disorders, 20*(5), 427-436. doi:10.1080/10640266.2012.715522.

Stanford, S. C., & Lemberg, R. (2012). A clinical comparison of men and women on the Eating Disorder Inventory-3 (EDI-3) and the Eating Disorder Assessment for Men (EDAM). *Eating Disorders, 20*(5), 379-394. doi:10.1080/10640266.2012.715516

Stein, K. F., & Hedger, K. M. (1997). Body weight and shape self-cognitions, emotional distress, and disordered eating in middle adolescent girls. *Archives of Psychiatric Nursing*, *11*(5), 264-275. doi:10.1016/S0883-9417(97)80017-9

Stice, E., & Van Ryzin, M. J. (2019). A prospective test of the temporal sequencing of risk factor emergence in the dual pathway model of eating disorders. *Journal of Abnormal Psychology, 128(*2), 119-128. doi:10.1037/abn0000400

Stice, E., & Desjardins, C. D. (2018). Interactions between risk factors in the prediction of onset of eating disorders: Exploratory hypothesis generating analyses. *Behaviour Research and Therapy, 105*, 52-62. doi:10.1016/j.brat.2018.03.005

Stice, E., Gau, J. M., Rohde, P., & Shaw, H. (2017). Risk factors that predict future onset of each DSM–5 eating disorder: Predictive specificity in high-risk adolescent females. *Journal of Abnormal Psychology*, *126*(1), 38-51. doi:10.1037/abn0000219

Stice, E. (2016). Interactive and mediational etiologic models of eating disorder onset: Evidence from prospective studies. *Annual Review of Clinical Psychology, 12*, 359-381. doi:10.1146/annurev-clinpsy-021815-093317

Stice, E., Presnell, K., & Spangler, D. (2002). Risk factors for binge eating onset in adolescent girls: a 2-year prospective investigation. *Health Psychology*, *21*(2), 131-138. doi:10.1037/0278-6133.21.2.131

Stice, E., & Shaw, H. E. (2002). Role of body dissatisfaction in the onset and maintenance of eating pathology: A synthesis of research findings. *Journal of Psychosomatic Research*, *53*(5), 985-993. doi:10.1016/S0022-3999(02)00488-9

Stice, E. (2001). A prospective test of the dual-pathway model of bulimic pathology: mediating effects of dieting and negative affect. *Journal of Abnormal Psychology*, *110*(1), 124-135. doi:10.1037/0021-843X.110.1.124

Stice, E., & Bearman, S. K. (2001). Body-image and eating disturbances prospectively predict increases in depressive symptoms in adolescent girls: a growth curve analysis. *Developmental Psychology*, *37*(5), 597-607. doi:10.1037/0012-1649.37.5.597

Stice, E., Killen, J. D., Hayward, C., & Taylor, C. B. (1998). Age of onset for binge eating and purging during late adolescence: a 4-year survival analysis. *Journal of Abnormal Psychology, 107*(4), 671-675. doi:10.1037//0021-843x.107.4.671

Stice, E., Ziemba, C., Margolis, J., & Flick, P. (1996). The dual pathway model differentiates bulimics, subclinical bulimics, and controls: Testing the continuity hypothesis. *Behavior Therapy, 27*(4), 531-549. doi:10.1016/S0005-7894(96)80042-6

Striegel-Moore, R. H., & Cachelin, F. M. (1999). Body image concerns and disordered eating in adolescent girls: Risk and protective factors. In N. G. Johnson, M. C. Roberts, & J. Worell (Eds.), *Beyond Appearance: A new look at adolescent girls*, 85–108. American Psychological Association. doi:10.1037/10325-003

Striegel-Moore, R. H., Silberstein, L. R., Frensch, P., & Rodin, J. (1989). A prospective study of disordered eating among college students. *International Journal of Eating Disorders, 8*(5), 499-509. doi:10.1002/1098-108X(198909)8:5<499::AID-EAT2260080502>3.0.CO;2-A

Swanson, H., Power, K., Collin, P., Deas, S., Paterson, G., Grierson, D., ... & Taylor, L. (2010). The relationship between parental bonding, social problem solving and eating pathology in an anorexic inpatient sample. European Eating Disorders Review: *The Professional Journal of the Eating Disorders Association, 18*(1), 22-32. doi:10.1002/erv.967

Tabri, N., Murray, H. B., Thomas, J. J., Franko, D. L., Herzog, D. B., & Eddy, K. T. (2015). Overvaluation of body shape/weight and engagement in non-compensatory weight-control behaviors in eating disorders: is there a reciprocal relationship?. *Psychological Medicine, 45*(14), 2951-2958. doi:10.1017/S0033291715000896

Taylor, G. J., Parker, J. D., Bagby, R. M., & Bourke, M. P. (1996). Relationships between alexithymia and psychological characteristics associated with eating disorders. *Journal of Psychosomatic Research, 41*(6), 561-568. doi:10.1016/s0022-3999(96)00224-3

Tiggemann, M. (2005). Body dissatisfaction and adolescent self-esteem: Prospective findings. *Body Image, 2*(2), 129-135. doi:10.1016/j.bodyim.2005.03.006

Thompson, J. K., Van Den Berg, P., Roehrig, M., Guarda, A. S., & Heinberg, L. J. (2004). The sociocultural attitudes towards appearance scale-3 (SATAQ-3): Development and validation. *International Journal of Eating Disorders, 35*(3), 293-304. doi:10.1002/eat.10257

Thompson, M. A., & Gray, J. J. (1995). Development and validation of a new body-image assessment scale. *Journal of Personality Assessment, 64*(2), 258-269. doi:10.1207/s15327752jpa6402_6

Thompson, J. K., Penner, L. A., & Altabe, M. N. (1990). Procedures, problems, and progress in the assessment of body images. In T. F. Cash & T. Pruzinsky (Eds.), *Body Images: Development, Deviance, and Change* (p. 21–48). Guilford Press.

Tylka, T. L. (2004). The Relation Between Body Dissatisfaction and Eating Disorder Symptomatology: An Analysis of Moderating Variables. *Journal of Counseling Psychology*, *51*(2), 178-191. doi:10.1037/0022-0167.51.2.178

Tylka, T. L., & Subich, L. M. (2002). Exploring young women's perceptions of the effectiveness and safety of maladaptive weight control techniques. *Journal of Counseling & Development, 80*(1), 101-110. doi:10.1002/j.1556-6678.2002.tb00172.x

Tyrka, A. R., Waldron, I., Graber, J. A., & Brooks-Gunn, J. (2002). Prospective predictors of the onset of anorexic and bulimic syndromes. *International Journal of Eating Disorders, 32*(3), 282-290. doi:10.1002/eat.10094

Verschueren, M., Claes, L., Palmeroni, N., Bogaerts, A., Gandhi, A., Moons, P., & Luyckx, K. (2020). Eating Disorder Symptomatology in Adolescent Boys and Girls: Identifying Distinct Developmental Trajectory Classes. *Journal of Youth and Adolescence*, *49*(2), 410-426. doi:10.1007/s10964-019-01174-0

Vohs, K. D., Bardone, A. M., Joiner Jr, T. E., & Abramson, L. Y. (1999). Perfectionism, perceived weight status, and self-esteem interact to predict bulimic symptoms: A model of bulimic symptom development. *Journal of Abnormal Psychology, 108*(4), 695-700.

doi:10.1037//0021-843x.108.4.695

Vocks, S., Hechler, T., Rohrig, S., & Legenbauer, T. (2009). Effects of a physical exercise session on state body image: The influence of pre-experimental body dissatisfaction and concerns about weight and shape. *Psychology and Health, 24*(6), 713-728. doi:10.1080/08870440801998988

Vocks, S., Legenbauer, T., & Heil, A. (2007). Food intake affects state body image: impact of restrained eating patterns and concerns about eating, weight and shape. *Appetite, 49*(2), 467-475. doi:10.1016/j.appet.2007.03.006

Vocks, S., Legenbauer, T., Rüddel, H., & Troje, N. F. (2007). Static and dynamic body image in bulimia nervosa: mental representation of body dimensions and biological motion patterns. *International Journal of Eating Disorders, 40*(1), 59-66. doi:10.1002/eat.20336.

Voelker, D. K., Reel, J. J., & Greenleaf, C. (2015). Weight status and body image perceptions in adolescents: current perspectives. *Adolescent Health, Medicine and Therapeutics*, 6, 149-158. doi:10.2147/AHMT.S68344.

Vohs, K. D., Bardone, A. M., Joiner, T. E. Jr., Abramson, L. Y., & Heatherton, T. F. (1999). Perfectionism, Perceived Weight Status, and Self-Esteem Interact to Predict Bulimic Symptoms: A Model of Bulimic Symptom Development. *Journal of Abnormal Psychology, 108* (4), 695-700. doi:10.1037//0021-843x.108.4.695

Walker, D. C., White, E. K., & Srinivasan, V. J. (2018). A meta-analysis of the relationships between body checking, body image avoidance, body image dissatisfaction, mood, and disordered eating. *International Journal of Eating Disorders, 51*(8), 745-770. doi:10.1002/eat.22867

Wardle, J., Haase, A. M., & Steptoe, A. (2006). Body image and weight control in young adults: international comparisons in university students from 22 countries. *International Journal of Obesity, 30*(4), 644-651. doi:10.1038/sj.ijo.0803050

Wheeler, L., & Miyake, K. (1992). Social comparison in everyday life. *Journal of Personality and Social Psychology*, *62*(5), 760-773. doi:10.1037/0022-3514.62.5.760

Wilksch, S. M., & Wade, T. D. (2010). Risk factors for clinically significant importance of shape and weight in adolescent girls. *Journal of Abnormal Psychology, 119*(1), 206-215. doi:10.1037/a0017779

Williamson, D. A., Davis, C. J., Goreczny, A. J., & Blouin, D. C. (1989). Body-image disturbances in bulimia nervosa: Influences of actual body size. *Journal of Abnormal Psychology, 98*(1), 97. doi:10.1037/0021-843X.98.1.97

Young, H. A., Williams, C., Pink, A. E., Freegard, G., Owens, A., & Benton, D. (2017). Getting to the heart of the matter: Does aberrant interoceptive processing contribute towards emotional eating?. *PloS One*, *12*(10), 1-18. doi:10.1371/journal.pone.0186312

APPENDIX 1

Body Uneasiness Test (BUT) Conversion Table. T scores distribution (mean= 50; sd= 10). D= Depersonalization; AV= Avoidance

Raw scores	Body Image Concern		Weight Phobia		AV		Compulsive Self-Monitoring		D		Global Severity Index			
	M	F	M	F	M	F	M	F	M	F	Raw scores	M	Raw scores	F
0	34	28	30	28	44	43	37	31	40	38	**0**	28	**0-1**	20
1	39	34	36	32	53	51	44	37	48	45	**1**	32	**2**	25
2	42	37	39	36	55	53	48	40	52	48	**2**	33	**3**	30
3	44	40	41	38	56	55	50	43	55	51	**3**	34	**4-5**	32
4	47	42	44	41	58	56	52	45	57	52	**4**	35	**6**	35
5	49	44	46	42	59	57	55	48	58	54	**5**	37	**7**	37
6	50	45	49	43	60	58	56	50	59	56	**6**	39	**8**	38
7	52	46	50	44	61	59	59	52	60	57	**7**	41	**9**	40
8	53	47	52	45	62	60	61	54	61	58	**8**	42	**10-12**	41
9	54	49	53	46	63	61	62	56	62	58	**9-10**	43	**13-16**	42
10	55	50	54	47	63	63	64	57	62	60	**11**	44	**17**	43
11	56	51	55	48	63	65	66	58	63	61	**12**	46	**18**	44
12	57	51	56	49	64	65	66	60	65	62	**13**	47	**19-21**	45
13	58	52	57	50	65	65	67	63	66	63	**14**	48	**22-24**	46
14	59	52	58	51	67	66	69	65	68	63	**15**	49	**25**	47
15	59	53	59	52	68	67	72	67	68	63	**16-17**	50	**26-28**	48
16	60	53	60	54	70	68	72	69	69	64	**18-19**	51	**29-30**	49
17	61	54	61	54	72	68	74	71	71	66	**20-21**	52	**31-34**	50
18	62	54	62	55	73	69	76	71	72	68	**22-23**	53	**35-38**	51
19	63	54	63	56	74	71	76	72	72	69	**24-26**	54	**39**	52
20	63	54	64	56	75	72	78	73	72	69	**27-28**	55	**40-41**	53
21	64	55	65	57	76	76	80	76	73	70	**29-30**	56	**42-45**	54
22	64	56	66	57	78			80	76	73	**31-33**	57	**46-55**	55
23	65	56	67	58	80				80	80	**34-36**	58	**56-57**	56
24	66	57	69	59							**37-45**	59	**58-64**	57
25	67	58	71	59							**46-50**	60	**65-70**	58
26	68	59	71	60							**51-54**	61	**71-73**	59
27	70	60	71	61							**55-59**	62	**74-82**	60
28	70	61	73	62							**60-62**	63	**83-84**	61
29	71	61	76	63							**63-68**	64	**85-87**	62
30	72	62	76	64							**69-72**	65	**88-92**	63
31	72	62	78	64							**73-75**	66	**93-100**	64
32	72	62		65							**76-80**	67	**101-104**	65
33	72	63		65							**81-87**	68	**105**	66
34	72	64		65							**88**	69	**106**	67
35	73	65		67							**89-90**	70	**107-108**	68
36	74	67		70							**91-92**	71	**109**	69
37	75	68		72							**93-95**	72	**110-113**	70
38	76	69		73							**96-104**	73	**114**	71
39	78	70		73							**105**	74	**115-130**	73

40	80	70		76							**106**	76	**131**	75
41		70									**107**	78	**132**	80
42		70									**108**	80		
43		70												
44		70												
45		73												
46														
47														
48														

APPENDIX 2

Eating Disorders Assessment for man (EDAM) conversion Table for boys aged 14-20 yrs. T scores distribution (mean= 50; sd= 10).

Raw scores	Binge Eating	Muscle Dysm.	Body Diss.	Eating Disorder
11				39
12				45
13			25	50
14			29	54
15			32	57
16	23		32	58
17	27		34	60
18	29	25	36	61
19	32	29	38	61
20	34	31	39	63
21	36	34	42	64
22	38	36	44	65
23	40	39	46	65
24	43	42	48	66
25	45	44	50	66
26	47	46	52	67
27	49	47	54	67
28	51	49	55	67
29	53	50	56	67
30	54	51	58	68
31	56	53	59	68
32	58	55	61	69
33	59	56	62	70
34	60	57	64	71
35	62	58	65	71
36	63	60	67	71
37	64	61	68	72
38	66	63	69	75
39	67	64	70	80
40	69	64	71	
41	72	65	72	
42	75	65	72	
43	75	66	72	
44	75	67	75	
45	77	69	80	
46	80	71		
47		73		
48		75		
49		75		
50		75		
51		77		
52		80		

APPENDIX 3

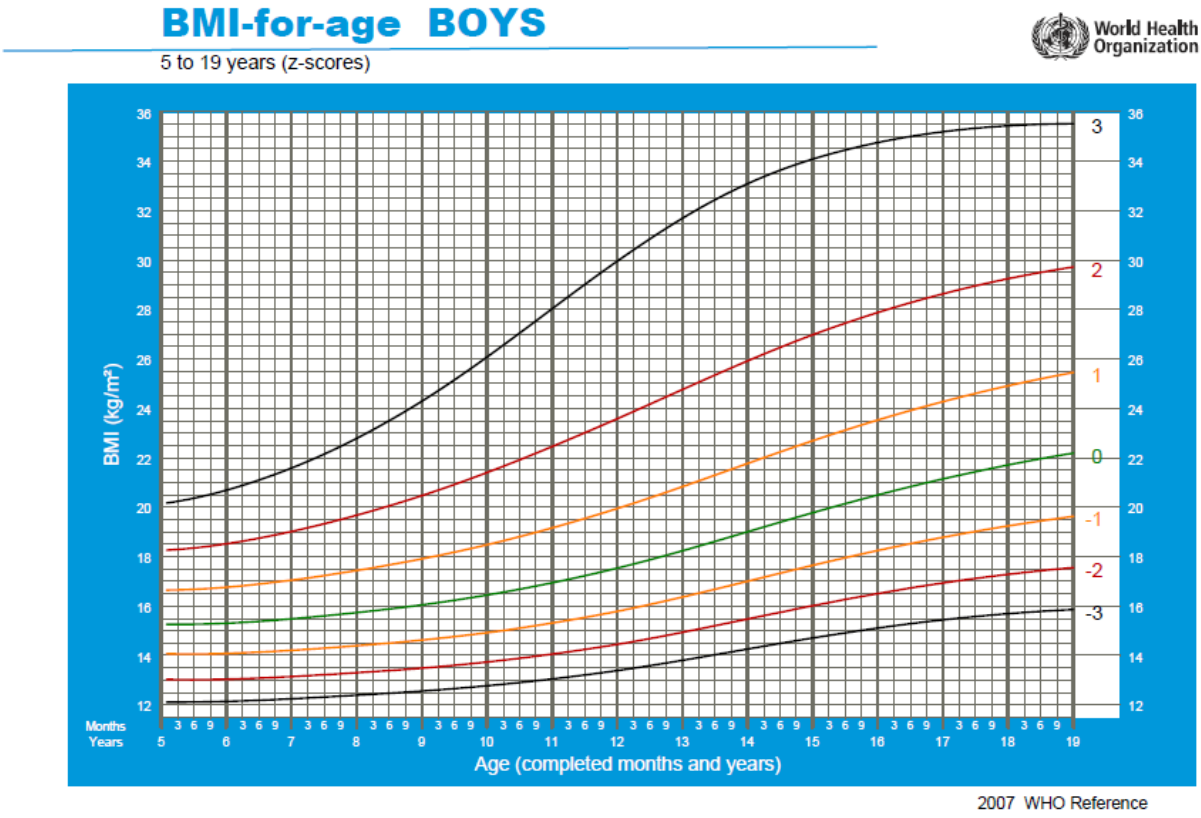
WHO (World Health Organization) Growth references Body Mass Index (BMI) for age (15-19 years).

A. WHO Normative BMI.

Normative BMI-for age and by sex.

Age and 6 month	Boys	Girls
13	18.6	19.2
14	19.4	19.9
15	20.1	20.5
16	20.8	20.9
17	21.4	21.2
18	22	21.3
19	22.2	21.4

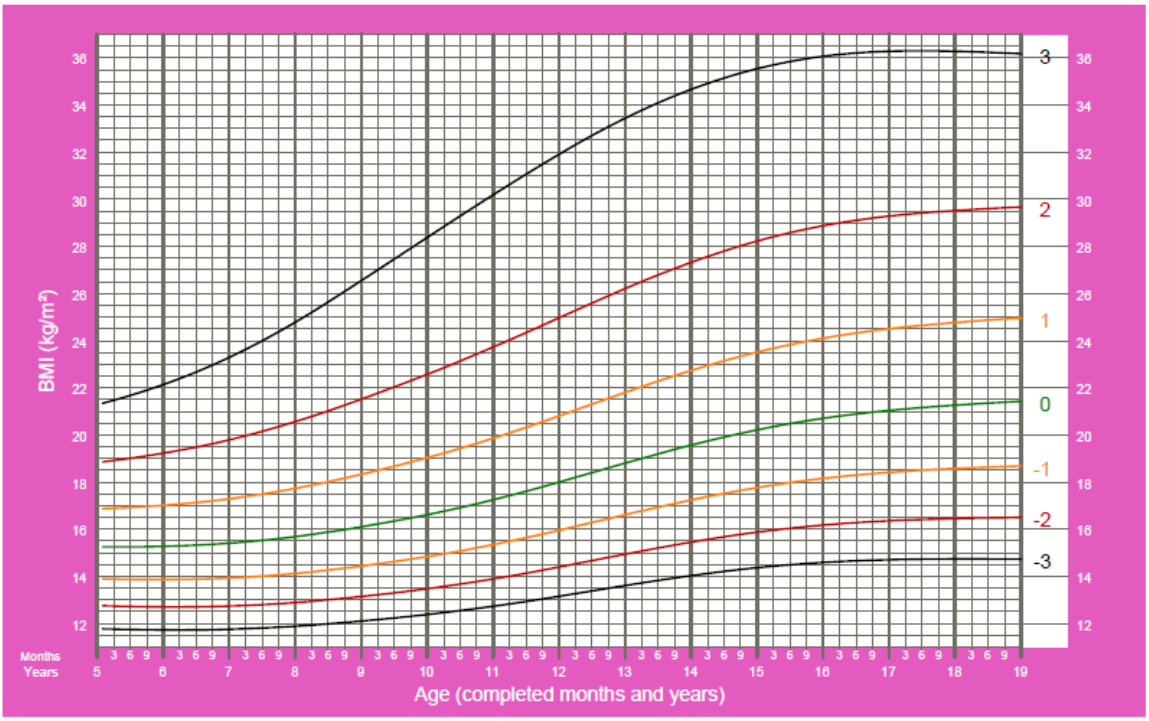
B. WHO Growth charts Normative BMI for age by sex



BMI-for-age GIRLS

5 to 19 years (z-scores)

World Health Organization



2007 WHO Reference