A prospective study on reciprocal influence between personality and

attitudes, behaviors and psychological characteristics salient in eating disorders,

in a sample of non-clinical adolescents

Elide Francesca De Caro

Lisa Di Blas

University of Trieste, Italy

Correspondence to be addressed to:

Lisa Di Blas, Department of Life Sciences, Psychology Unit "G. Kanizsa",

University of Trieste, Via Weiss, 2 (pal Q), 34123 Trieste, Italy

e-mail: diblali@units.it

May 30th, 2016

Abstract

Eating disorders have a substantial occurrence in adolescents. Delineating vulnerable personality profiles of unhealthy conditions helps prevent their onset and development. This study investigated a non-clinical sample of 142 adolescents and how some theoretically salient individual differences in personality contribute to predict changes in behaviors, attitudes and psychological characteristics that are clinically significant in eating disorders (ED). The results from cross-lagged pattern analyses supported the influence of Depression, Obsessiveness, and Self-Esteem in the trajectories favoring the development of psychological characteristics, such as ineffectiveness and interoceptive awareness which are salient in the ED risk process. Results also confirmed that BMI (Body Mass Index), Perfectionism, and Body Dissatisfaction predict increases in dysfunctional concerns with weight control and food consumption. Empirical support for an impact of ED-relevant variables on personality self-views emerged as well. Trajectories linking ED and personality in relation to sex differences and permeability to transitory psychological conditions in adolescence were also confirmed.

*Key words***:** personality, eating disorders, cross-lagged patterns, EDI-2, MMPI-A

Introduction

Eating disorders represent a heterogeneous group of pathological conditions with severe physical and psychological consequences for the individual. They are prevalent among female adolescents and young women, and the earlier eating disorders emerge the higher the likelihood that they become chronic (White, Reynolds-Malear, & Cordero, 2011). Furthermore, disordered eating conditions have a considerable impact on the population when clinical as well as partial-syndrome and subclinical conditions are taken into account (Shisslak, Crago & Estes, 1994). Anticipating vulnerable profiles is crucial thereby in order to prevent the development of such pathological conditions (Peck & Lightsey, 2008). Our longitudinal study investigated how individual differences in a selected set of personality variables contributes to predicting increases in psychological characteristics, attitudes and behaviors relevant in eating disorders (EDs), in a non-clinical sample of adolescents, and vice versa.

Several models and methodological approaches have been developed in order to describe and understand the relationship between personality and EDs (Lilenfeld, Wonderlich, Riso, Crosby, & Mitchell, 2006). Among them, the spectrum model posits that personality characteristics and eating attitudes and disorders share the same underlying etiology and are quantitative variations on the same psychobiological profile. From this perspective, empirical research has shown that clinical samples of women, when compared to non-clinical ones, reveal higher levels of impulsivity and emotional instability, and lower levels of cooperativeness and self-esteem. People suffering from anorexia nervosa also show higher persistence, perfectionism, and obsessive-compulsive disorders, with MMPI 2/7 and 7/2 profiles (Cumella, Wall, & Kerr-Almeida, 1999, 2000; Fassino, Amianto, Gramaglia, Facchini, Abbate-Daga, 2004; Klump, Strober, Bulik et al., 2004; Polivy & Herman, 2002). Developmentally, the spectrum model suggests that increases in those personality domains, which characterize patients with eating disorders, should predict changes from a less to a more risky eating disordered condition in non-clinical samples (Shisslak et al., 1995).

As an alternative perspective, the vulnerability model proposes that personality represents a risk factor, which temporally precedes the onset of eating disturbances (Lilenfeld et al., 2006). Non-clinical samples should only be investigated at the baseline measurement occasion (T1) in order to observe which personality domains are antecedents of increases in eating disordered conditions across time. If (sub-)clinical conditions are already present at the baseline time, longitudinal findings rather reveal how personality contributes to the course and outcome of EDs. In adolescence, findings from this perspective show that depression, self-critical perfectionism, self-esteem, urgency and ineffectiveness are significant temporal antecedents of later dysfunctional eating conditions (Boone, Soenens, & Luyten, 2014; O'Dea, 2004; Pearson, Combs, Zapolski, & Smith, 2012).

Adolescence represents a critical age for the study of associations between personality and ED associations, because these developmental years are especially vulnerable to the onset of EDs (White et al., 2011) and are years of considerable changes (Donnellan, Trzesniewski, & Robins, 2006). As for personality, adolescents are concerned with the task of identity development, with physical appearance and social appeal playing a crucial role, and their self-concept gradually changes from less to more differentiated, coherent, and stable self-views (Harter, 1999). Accordingly, self-reported personality traits and self-esteem show increasing levels of internal consistency, and distinct personality domains are more and more differentiated, from early to late adolescence. In addition, ranking-order stability correlations are in the range of moderate size and absolute stability mean levels indicate remarkable changes across adolescence (Allik, Laidra, Realo, & Pullmann, 2004; Donnellan et al., 2006; Soto, John, Gosling, & Potter, 2008). In brief, personality is malleable across adolescence. It is therefore possible that not only personality affects the onset and course of EDs, but also that ED-relevant behaviors, attitudes, and self-perceptions have an impact on the development of personality. Research has shown some support for the so-called complication model by comparing personality profiles in clinical vs. recovered people (Lilenfeld et al., 2006). Much less is known on how ED-relevant psychological and behavioral

variables affect personality development in non-clinical adolescents. Findings from Stice and Bearman (2001), for example, support the hypothesis of an effect of ED levels on personality. In fact, they show that body dissatisfaction and bulimic behaviors are temporal antecedents of increases in depression levels in young girls. Thereby, the association between personality and EDs has to be investigated in both directions.

Research has also evidenced sex differences in EDs. The onset of eating disordered symptoms comes later for adolescent boys than for girls, ED males report more vomiting, but less laxative abuse episodes, are less dissatisfied with their bodies, and show lower levels of drive for thinness than girls (Leon, Fulkerson, Perry, & Early-Zald, 1995; Nùnez-Navarro, Aguera, Krug et al, 2012; O'Dea, 2004). Sex differences have emerged in the associations between ED-relevant conditions and personality as well, although not consistently across studies. BMI, for example, is a significant antecedent of increases in body dissatisfaction across time in girls, but not in boys. Negative effect levels anticipate changes in body dissatisfaction in boys, but not in girls (Presnell, Bearman & Stice, 2004), but Ghaderi & Scott (2000) reported that Neuroticism predicts ED development in young girls, over a 2-year period.

The present study investigated how self-perceptions of behaviors and psychological characteristics, relevant in EDs, are associated with self-perceptions in a selected set of personality variables across a 7-month interval, in a non-clinical sample of adolescents. Specifically, the study first examined how BMI contributes to predict changes in ED-related outcomes. According to Presnell and colleagues (2004), higher BMI levels should anticipate increases in concerns with dieting and body dissatisfaction, especially in girls. Secondly, the study explored how personality variables predict changes in ED-related variables. In accordance with previous findings, depression, self-esteem and obsessiveness should predict changes in several ED-relevant variables, including body dissatisfaction, concerns with weight, and disordered behaviors, such as binge eating or purging (Boone et al., 2014; Cumella et al., 2000; Stice & Bearman, 2001). Thirdly, the

study investigated whether personality dimensions are vulnerable to dysfunctional changes as a consequence of more risky self-reported conditions in ED-relevant domains. Depression should increase when adolescents reports higher levels of body dissatisfaction initially (Stice & Bearman, 2004). Lastly, the present study explored how changes in personality domains predict changes toward more risky ED conditions in non-clinical adolescents. Increases in depression, self-esteem and obsessive thoughts especially should correlate with increases towards more risky conditions for the onset of EDs.

Method

Participants and Procedure

Adolescents who took part at both measurement occasions were 76 boys and 66 girls. They were 15.6 years old on average (range 13-18 yrs; 45 per cent 14-15 yrs, 48 per cent 16-17 yrs) and were attending high school. Their involvement was voluntary. Students completed psychological measures in classroom, during class time, under the supervision of the first author. We excluded 8 participants due to $16 < BMI > 30$ values.

Measures

EDI-2. The Eating Disorder Inventory-2 (Garner, 1995) is a self-report questionnaire, developed in order to assess behaviors and psychological characteristics that typically distinguish ED individuals. The scales are labeled as Drive for Thinness, Bulimia, Body Dissatisfaction, Ineffectiveness, Interpersonal Distrust, low Interoceptive Awareness, Maturity Fears, Ascetism, Low Impulse Regulation, Perfectionism and Social Insecurity. The first three scales assess behaviors and attitudes toward food, weight, and body shape. For the present sample, Cronbach's Alphas reflected values reported for the Italian normative sample (Garner, 1995) and ranged from .42 (Ascetism) to .85 (Body Dissatisfaction). Due to the low Alpha, Ascetism was not further considered. Inter-scale correlations ranged between -.01 (Maturity Fears and Drive for Thinness) and .68 (Ineffectiveness and Social Insecurity), with the majority of values ranging from .10 to .30. Raw scores were transformed into standardized scores according to normative scores for Italian

adolescents (Garner, 1995). EDI-2 does not provide clear cut-off scores to distinguish between non-clinical and (sub-)clinical patients.

MMPI-A. The Minnesota Multiphasic Personality Inventory-A is an empirically based screening measure of psychopathology in adolescence (Butcher, Williams, Graham, Archer, Tellegen, Ben-Porath, Kaemmer, 2001). For the present study, we used the following content scales: Obsessiveness, Depression, Health Concerns, Low Self-esteem and Social Discomfort. Cronbach's Alphas were higher than .70, and inter-scale correlations ranged from .14 (Social Discomfort and Health Concerns) to .72 (Depression and Low Self-esteem). Raw scores were transformed into standardized scores according to normative scores developed for Italian adolescents (Butcher et al., 2001).

Analyses

Temporal antecedents and correlated changes were inspected via cross-lagged pattern associations (Asendorpf & Van Aken, 2003). Accordingly, we predicted the T2 outcome entering the T1 outcome together with the T1 predictor, thus systematically controlling for the indirect effect of the T1 antecedent on the dependent variable via the T1 outcome. Such an approach yields a semi-partial correlation between T2 outcome and T1 antecedent which represents the unique impact of the T1 antecedent on the T2 outcome variability, that is, the effect of the T1 antecedent on change levels in the dependent variable from T1 to T2. Furthermore, when in the regression model, the T2 explanatory variable is further added, the partial correlation between T2 outcome and T2 predictor represents the association between changes in the two variables across time, controlling for all the investigated antecedents.

In our analyses, we included only non-clinical participants and selected a cut-off of z-score ≤ 1.29 ($\leq 90°$ percentile) on the T1 variable matching the T2 dependent variable, in order to explore effects of antecedents on increases in characteristics which are at risk for onset of EDs (Lilenfeld et al., 2006).

Results

Descriptives. T1 BMI mean (M = 21.4, SD = 2.68) did not statistically differ (p > .05) from the BMI mean reported in Abbate-Daga and colleagues (2007) research on a large sample of Italian adolescents. BMI did not significantly increase (p > .05) from T1 to T2, but it slightly increased with age (r = .21, p ≤ .05). Mean values observed for EDI-2 scales were statistically comparable with data reported for the Italian normative sample, although T1 Maturity Fears and T2 Perfectionism were slightly higher (p ≤ .01). Ineffectiveness (r = -.27, p ≤ .01) and Maturity Fears (r = -.20, p ≤ .05) tended to decrease with age. Conversely, participants reported higher scores (p ≤ .01) on MMPI-A Low Self-esteem, Social Discomfort, and Health Concerns when compared with the Italian normative sample of adolescents.

BMI predicts changes in EDI-2. Table 1 presents test-retest correlations for EDI-2 scales controlling for T1 BMI values. Results show that self-reported eating-related behaviors and psychological characteristics were rather consistent across the two measurement occasions, although change prevailed over stability for the EDI-2 scales Bulimia, Maturity Fears and Perfectionism. Furthermore, on average, girls provided more consistent self-views across time than boys, with significant differences in R^2 values on Bulimia (95% CI of the difference in R^2s .03-.48), Interpersonal Distrust (95% CI of the difference in R^2s .04-.54) and low Interoceptive Awareness (90% CI of the difference in R^2s .04-.46). Results in Table 1 also show that T1 BMI accounted for a significant unique proportion of change in T2 Drive for Thinness, with higher levels of T1 BMI predicting an increase in Drive for Thinness scores. Results showed no significant increases in R^2, when squared BMI*s* were included in the predictive model (Presnell et al., 2004). No psychological variables predicted changes in BMI. Age had no effects, when included among the predictors in the inspected models.

Partial correlations between T2 EDI-2 scales and T2 BMI showed that an increase in BMI over a 7-month period positively correlated with increased levels in Body Dissatisfaction (pr = .26, p ≤ .01), Ineffectiveness (pr = .24, p ≤ .05) and low Interoceptive Awareness (pr = .23, p ≤ .05). Results also revealed that increases in BMI were associated with increases in Maturity Fears for

boys (pr = .32, p ≤ .05), but not for girls (pr = -.25, p > .05), with an interaction effect between changes in BMI from T1 to T2 and sex that accounted for 4 per cent of the total variance of changes in the T2 outcome (R^2_{change} = .04, p ≤ .05).

TABLE 1

Test-retest correlations ranged from .43 (Low Self-esteem) to .60 (Depression) for the MMPI-A scales investigated here; lower BMI levels predicted increases in Social Discomfort (sr = -.32, p ≤ .001), controlling for initial levels of social uneasiness in adolescents. On average, stability levels were slightly higher for MMPI-A scales in comparison to EDI-2 scales.

MMPI-A antecedents of EDI-2 variables and correlated changes. Personality antecedents of changes in T2 EDI-2 scales were first examined via a hierarchical multiple regression analysis, with T1 EDI-2 scales entered first and all T1 MMPI-A scales entered last. Table 2 presents changes in accounted variance (R^2_{change}) for each T2 EDI-2 variable. Overall, personality variables predicted significant proportions of changes in T2 EDI-2 Ineffectiveness, Interpersonal Distrust, and Low Interoceptive Awareness. We then selected significant antecedents using the automatic backward procedure. We ran multiple regression analyses again entering the selected predictors only along with the T1 matching outcome variable in order to select a parsimonious model and increase statistical test power. Results for each EDI-2 scale are presented in Table 3. MMPI-A scales did not account for changes in the EDI-2 scales that assess individual attitudes towards food, weight and body shape, with MMPI-A Health Concerns significantly predicting increases in Body Dissatisfaction in boys (sr = .30, p ≤ .01) only. Rather, EDI-2 Perfectionism predicted increases in Bulimia, and changes in the two variables were correlated across time (pr = .23, p ≤ .05). In addition, EDI-2 Body Dissatisfaction anticipated increases in Drive for Thinness, but not vice versa, and changes in the two variables from T1 to T2 were associated (pr = .42, p ≤ .001). The direction of the association between Body Dissatisfaction and Drive for Thinness, the impact of the initial BMI on later Drive for Thinness levels (Table 1), and the positive correlation between BMI and Body Dissatisfaction at T1 (sr = .26, p ≤ .001, controlling for Drive for Thinness at T1) suggested

that T1 Body Dissatisfaction may mediate the association between T1 BMI and T2 Drive for Thinness, controlling for T1 Drive for Thinness. Results from regression analyses (Chaplin, 2007) indicated that the effect of T1 BMI on T2 Drive for Thinness was mediated, with z test = 1.99 for the indirect effect being significant at $p \leq .05$ thereby.

<div align="center">TABLES 2 and 3</div>

Table 3 shows that T1 MMPI-A Depression uniquely accounted for 11 per cent of the total variance of T2 Ineffectiveness. Moreover, correlated change analyses revealed that increases in Depression across time correlated with higher scores than initial ones in feelings of ineffectiveness (pr = .28, $p \leq .01$). Yet, the correlated change was significant for girls only (pr = .45, $p \leq .01$), with a sex by changes in Depression levels interaction effect accounting for 3 per cent of the variance (sr = .16, $p \leq .10$) in Ineffectiveness. Association levels did not change in function of age. MMPI-A Obsessiveness accounted for a substantial variance proportion of T2 Interpersonal Distrust, in addition to the variance that the EDI-2 scales of Low Interoceptive Awareness, Social Insecurity, Ineffectiveness accounted for the outcome. However, T1 Ineffectiveness (β = -.62, $p \leq .001$) was a significant antecedent for boys only, with 90% CI of the difference in βs being equal to .02-.82, that is, equating boys on the other predictors; the higher their initial feelings of personal worth, the higher the increase in their reluctance to form close relationships. Moreover, increases in MMPI-A Obsessiveness (pr = .22) as well as in Social Insecurity (pr =.22) predicted increases in Interpersonal Distrust ($p \leq .05$).

Self-esteem was a significant predictor of EDI-2 variables as well. In fact, initial MMPI-A Low Self-esteem scores predicted a substantial variance proportion of EDI-2 low Interoceptive Awareness and Social Insecurity; in addition, increases from T1 to T2 levels in Low Self-esteem were correlated with increases in both Low Interoceptive Awareness (pr = .31, $p \leq .001$) and Social Insecurity (pr = .28, $p \leq .001$). These results indicated that the lower the initial Self-esteem scores the higher the increase in the difficulty girls and boys referred to discriminate between their bodily sensations and the lower their confidence in social situations, 7 months later. Similarly, the higher

their change in self-esteem, the higher their change in interoceptive awareness and in social insecurity.

Lastly, Table 3 shows that EDI-2 lower initial Impulse Regulation scores predicted increases in Maturity Fear scores from T1 to T2, but not vice versa. In fact, EDI-2 Interoceptive Awareness anticipated EDI-2 Impulse Regulation, with higher difficulty in discriminating among bodily sensations predicting increasing difficulty in emotional and behavioural control; changes in the two variable across time were strongly correlated (pr = .52, p ≤ .001), and sex moderated the association, with R_{change} = .03 (p ≤ .05) due to the interaction term, with a higher correlation for boys (pr = .61, p ≤ .01) than for girls (pr = .39, p ≤ .05). No significant results emerged for EDI-2 Perfectionism. In addition, Perfectionism interacted neither with Low Self-esteem in predicting Bulimia (Vohs, Bardone, Joiner, Abramson, & Heatherton, 1999) nor with Body Dissatisfaction in estimating Drive for Thinness (Boone et al., 2014).

EDI-2 antecedents of MMPI-A variables and correlated changes. Table 4 presents results for hierarchical regression analyses with T2 MMPI-A scales as outcomes and T1 EDI-2 scales as explanatory variables entered last in the model. ED conditions accounted for substantial variance proportions of MMPI-A variables, yet not significantly. Table 5 reports results from the automatic backward procedure and shows how EDI-2 scales predicted change in individual differences in personality. T1 EDI-2 Ineffectiveness, for example, predicted changes in Obsessiveness across time. Since previous analyses had revealed that Obsessiveness was a significant temporal antecedent of changes in EDI-2 Interpersonal Distrust (Table 3), we verified whether Ineffectiveness accounted for changes in the personality outcome variable controlling for T1 Interpersonal Distrust. Results confirmed that only Ineffectiveness estimated changes in Obsessiveness levels across time. In other words, the direction of temporal associations between these MMPI-A and EDI-2 variables were not bi-directional . Similarly, results revealed that higher scores in T1 EDI-2 Interpersonal Distrust, but not in Ineffectiveness, predicted increases in Depression (Table 5), although Depression anticipated increases in EDI-2 Ineffectiveness (Table 3).

Furthermore, increases in Depression levels correlated with increases in Ineffectiveness only, also when changes in Interpersonal Distrust where taken under control (pr = . 20, $p \leq .05$).

TABLES 4 AND 5

Results in Table 5 also show that lower initial BMI values, equating participants on EDI-2 Social Insecurity, anticipated increases in self-reported Social Discomfort levels. Since boys and girls however are expected to live their thinness differently (Harvey & Robinson, 2003), we hypothesized a moderation model with the impact of initial BMI levels on changes in later Social Discomfort varying in function of T1 Drive for Thinness. Results showed a significant BMI by Drive for Thinness interaction effect ($p \leq .05$), which uniquely accounted for 7.1 per cent of the variance in T2 Social Discomfort. Results however revealed different association patterns when inspected for boys and girls, separately. In fact, BMI (sr = -.29) and Drive for Thinness (sr = -.27), but not their interaction (sr = .07), had unique effects on the outcome in girls ($p \leq .05$). Conversely, the interaction effect was only significant for boys (sr = 0.29, $p \leq .05$), with lower initial BMI levels predicting decreases in social uneasiness when boys were afraid of gaining weight (Figure 1). Further sex differences emerged when we inspected correlated changes. Increases in Social Discomfort and BMI from T1 to T2 were correlated in girls only (pr = .34, $p \leq .05$).

FIGURE 1

Discussion

This prospective study focused on the relevance of individual differences in a selected set of personality variables for the onset of ED-relevant conditions, and vice-versa, in a non-clinical sample of adolescents. Results showed that although MMPI-A Depression, Self-esteem and Obsessiveness did not anticipate changes in excessive concerns for dieting or dysfunctional food consumption, it nevertheless predicted changes in EDI-2 Ineffectiveness, Interpersonal Distrust, and Low Interoceptive Awareness, over and above any other EDI-2 variable. Furthermore, increases in the same MMPI-A variables correlated with increases in EDI-2 Ineffectiveness (although in girls only), Interpersonal Distrust, and decreases in Interoceptive Awareness. Overall, these findings are

consistent with clinical and non-clinical research supporting the vulnerability model and suggesting that depressive conditions, poor self-worth, and some cognitive and behavioural compulsions may expose adolescents to psychological conditions which play a central role in the ED risk process (Combs, Smith, Flory, Simmons, & Hill, 2010; Klump et al., 2004; Leon et al., 1995; Peck & Lightsey, 2008; Polivy & Herman, 2002).

Focussing on the distinguishing conditions in EDs, the results presented here confirmed that EDI-2 Perfectionism and Body Dissatisfaction, in addition to BMI represent the major vulnerabilities for the development of excessive concerns with weight control and food (Boone et al., 2014; Stice et al., 1998). Specifically, the results indicated that Body Dissatisfaction predicts increases in Drive for Thinness, but not vice versa, further mediating the impact of the initial BMI on increases in excessive concerns for dieting. Our findings are partially in accordance with Presnell and colleagues (2004), because we found a concurrent association only between BMI and Body Dissatisfaction, both in boys and girls; furthermore, in our sample, we found support for a mediation of dissatisfaction with body between initial BMI and later concerns for dieting. In addition, our findings showed that increases in BMI correlated with increases in Body Dissatisfaction, Ineffectiveness, and Interoceptive Awareness, thus confirming that BMI its self is a signal for the onset of psychological profiles which are vulnerable to ED conditions (Boone et al., 2014; Presnell et al., 2004; Stice & Whitenton, 2002). Lastly, Perfectionism anticipated changes towards bulimic-like behaviors and correlated changes in the two variables provide additional support for the relevance of strive for perfectionism for the onset of dysfunctional attitudes towards food consumption (Boone et al., 2014; Cumella et al. 2000; Joiner, Katz, & Heatherton, 2000; Vohs et al., 1999).

Some sex differences in the association patterns emerged. In fact, girls were generally more consistent across time in reporting on themselves in comparison with boys, with significant differences in the EDI-2 scales of Bulimia, Interoceptive Awareness and Interpersonal Distrust. This finding may reflect the salience of bodily sensations and physical appearance in girls earlier

than in boys (Harter, 1999; Leon et al., 1995). Furthermore, Depression emerged as a vulnerability factor for changes towards more intense feelings of inadequacy, insecurity and decreasing control over one's life in girls mostly (Johnson, Cohen, Kolter, Kasen, & Brook, 2002). Lastly, decreases in Interoceptive Awareness predicted decreases in one's capability to control impulses, including binge eating (Lech, Anderson, & Holmqvst, 2008; Leon et al., 1995), in boys especially. These findings partially replicate results already observed in literature and further confirm that vulnerabilities and mechanisms favoring the onset of risky ED conditions should be separately investigated in men and women, also by routinely administering specific assessment instrument for males (Harvey & Robinson, 2003; Nùnez-Navarro et al., 2014).

The cross-lagged patterns inspected here also revealed an impact of EDI-2 variables on personality. In fact, Interpersonal Distrust and Ineffectiveness predicted increases in MMPI-A Depression and Obsessiveness levels and decreases in Self-esteem. It therefore emerged as a reciprocal influence between these variables. In addition, the results presented here showed that lower initial BMI levels correlated with increases in reported difficulties in social interaction in girls, whereas Drive for Thinness moderated the association between the two variables in boys, with slimmer boys only reporting decreases in uneasiness in social situations, when their degree of concerns with dieting and weight was higher. Such a difference between girls and boys might depend on the relevance of muscularity in boys (Harvey & Robinson, 2003), but not in girls, and indicates that weight and weight control is a signal of a more general psychological discomfort in adolescence. Overall, our findings support the hypothesis that relevant variables in ED conditions, at least temporarily, affect how non-clinical adolescents perceive and develop aspects of their personality, which in fact is permeable to changes during these years (Donnellan et al., 2006; Soto et al., 2008). However, it could be too early to make a conclusion. In fact, self-reported ED conditions and personality characteristics were moderately stable across a 7-month interval, in the present sample. Although normative, psychometrically, such stability levels weaken the generalizability of the results. Mostly, empirical research has paid less attention on the impact of

ED transitory and sub-clinical conditions on personality development and more work is needed in order to better describe and understand possible short or long term effects of ED-relevant profiles on individual differences in personality, in non-clinical adolescents (Stice & Bearman, 2001; Lilenfeld et al., 2006).

The present study has several limitations. Sample size is the main one because of the moderate statistical test power. For example, different paths linking personality to eating disordered conditions across time might depend on the limited statistical test power rather than accurately reflect specificities. In addition, our results showed that girls were more stable across time in self-reporting on ED-related variables. Yet we could not systematically explore the impact of maturation processes on personality-ED state associations in boys and girls, nor could we investigate differences between non-clinical vs. borderline adolescents in temporal patterns linking personality and ED conditions. Measurement occasions and time interval, with a relatively short distance between the two measurement occasions, represent a further limit of the present study. In fact, we conducted a two-wave study but we could not test chain effects in order to better describe and understand the personality-eating disorder relationship across a longer time period. Lastly, we restricted our attention to a selected set of personality variables rather than adopting a more comprehensive personality system (Ghaderi & Scott, 2000) and did not assess other risk factors for the development of ED conditions, such as peer pressure, family, and drive for muscularity (Polivy & Herman, 2002).

References

Abbate-Daga, G., Gramaglia, G., 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*, *15*, 471-478.

Allik, J., Laidra, A., Realo, A., & Pullmann, H. (2004). Personality development from 12 to 18 years of age: Changes in mean levels and structure of traits. *European Journal of Personality, 18,* 445-462.

Asendorpf, J.B. &Van Aken, M.A.G. (2003). Personality-relationship transaction in adolescence: Core versus surface personality characteristics: *Journal of Personality*, *71*, 629-666.

Attie, I. & Brooks-Gunn, J. (1989). Development of eating problems in adolescent girls: A longitudinal study. *Developmental Psychology, 25*, 70–79.

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*, 412-418.

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.* Organizzazioni Speciali, Florence, Italy.

Cervera, S., Lahortiga, F., Martinez-Gonzalez, M.A., Gual, P., de Irala-Estevez, J., & Alonso, Y. (2003). Neuroticism and low self-esteem as risk factors for incident eating disorders in a prospective cohort study. *International Journal of Eating Disorders, 33*(3), 271– 280.

Chaplin, W.F. (2007). Moderator and mediator models in personality research: A basic introduction. In R.W. Robins, R.C. Fraley, R.F. Krueger (Eds), *Handbook of research methods in personality psychology* (pp. 602-632). New York: The Guilford Press.

Combs, J.L., Smith, G.T., Flory, K., Simmons, J.R., & Hill, K.K. (2010). The acquired preparedness model of risk for bulimic symptoms development. *Psychology of Addictive Behaviors, 24,* 475-486.

Cumella, E.J., Wall, A.D., & Kerr-Almeida, N. (1999). The MMPI-A in the inpatients assessment of adolescents with eating disorders. *Journal of Personality Assessment, 73*, 31-44.

Cumella, E.J., Wall, A.D., & Kerr-Almeida, N. (2000). MMPI-2 in the inpatient assessment of women with eating disorders. *Journal of Personality Assessment, 75*, 387-403.

Donnellan, M.B., Trzesniewski, K.H., & Robins, R.W. (2006). Personality and self-esteem development in adolescence. In D.K. Mroczek e T.D. Little (Eds), *handbook of personality development*, (pp. 285-310). Mahwah, NJ: LEA.

Fassino, S., Amianto, F., Gramaglia, C., Facchini, F., & Abbate-Daga, G. (2004). Temperament and character in eating disorders: Ten years of studies. *Eating and Weight Disorders, 9*, 81-90.

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

Ghaderi, A. & Scott, B. (2000). The big five and eating disorders: A prospective study in the general population. *European Journal of Personality, 14*, 311 – 323.

Harter, S. (1999). *The construction oft he self: A developmental perspective.* New York: The Guilford Press.

Harvey, J.A. & Robinson, J.D. (2003). Eating disorders in men: Current considerations. *Journal of Clinical Psychology in Medical Settings*, 10, 297-306.

Johnson, J.G., Cohen, P., Kolter, L., Kasen, S., & Brook, J. S. (2002). Psychiatric disorders associated with risk for the development of eating disorders during adolescence and early adulthood. *Journal of Consulting and Clinical Psychology, 70*, 1119-1128.

Joiner, T.E., Katz, J., & Heatherton, T. F. (2000). Personality features differentiate late adolescent female and males with chronic bulimic symptoms. *International Journal of Eating Disorders,* 191- 197

Klump, K., Strober, M., Bulik, M.C., Thorton, L., Johnson, C., Devlin, B., Fichter, M.M., Halmi, A.A., Kaplan, A.S., Woodside, B.D., et al. (2004). Personality characteristic of women before and after a recovery from eating disorders. *Psychological Medicine, 34*, 1407 – 1418.

Lech, B., Anderson, G, & Holmqvst, R. (2008). Consciousness about own and others' affects. A study of the validity of a revised of the Affect Consciousness Interview. *Scandinavian Journal of Psychology, 49,* 515 – 521.

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*, 140– 149.

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

Nùnez-Navarro, A., Aguera, Z., Krug, I., Jiménez-Murcia, S., Sànchez, I., Araguz, N., Gorwood, P., Granero, R., Penelo, E., et al. (2012). Do men with eating disorders differ from women in clinics, psychopathology and personality? *European Eating Disorders Review, 20,* 23-31.

O'Dea, J.A. (2004). Evidence for a self-esteem approach in the prevention of body image and eating problems among children and adolescents. *Eating Disorders, 12,* 255-239.

Pearson, C.M., Combs, J. L., Zapolski, T.C.B., & Smith, G.T. (2012). A longitudinal transactional risk model for early eating disorder onset. *Journal of Abnormal Psychology, 121*, 707-718.

Peck, L. D. & Lightsey, O.R. (2008). The eating disorders continuum, self esteem, and perfectionism. *Journal of Counseling & Development, 86,* 184-192.

Polivy, J. & Herman, C.P. (2002). Causes of eating disorders. *Annual Review of Psychology*, 53, 187-213.

Presnell, K., Bearman, S. K., & Stice, E. (2004). Risk factors for body dissatisfaction in adolescent boys and girls: a perspective study. *International Journal of Eating Disorders, 36,* 389-401.

Shisslak, C.M., Crago, M., & Estes, L. (1994). The spectrum of eating disturbances. *International Journal of Eating Disorders, 18,* 209-219.

Soto, C.J., John, O.P., Gosling, S.D., & Potter, J. (2008). The developmental psychometrics of Big Five self-reports: Acquiescence, factor structure, coherence, and differentiation from ages 10

to 20. *Journal of Personality and Social Psychology, 94*, 718-737.

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,* 597–607.

Stice E. & Whitenton, K. (2002). Risk factors for body dissatisfaction in adolescent girls: A longitudinal investigation. *Developmental Psychology, 38,* 669-678.

Vohs, K.D., Bardone, A.M., Joiner, T.E., Abramson, L.Y., & Heatherton, T.F. (1999). Perfectionism, perceived weight status, and self-esteem interact to predict bulimic symptoms development. *Journal of Abnormal Psychology, 108*, 695-700

White, S., Reynolds-Malear, J.B., & Cordero, E. (2011). Disordered eating and the use of unhealthy weight control methods in college students: 1995, 2002, and 2008. *Eating Disorders, 19,* 323-334.

Table 1.

Test-retest part-correlations for EDI-2 scales controlling for T1 BMI as a temporal antecedent of the EDI-2 outcome variables.

T2 EDI-2 scale	Whole sample			Boys			Girls		
	T1 EDI-2 matching scale	T1 BMI	R^2	T1 EDI-2 matching scale	T1 BMI	R^2	T1 EDI-2 matching scale	T1 BMI	R^2
Drive for Thinness	.42***	.20*	.25***	.36**	.24	.17**	.43***	.15	.30***
Bulimia	.35***	-.14	.14***	.20	-.10	.05	.54***	-.15	.30***
Body Dissatisfaction	.62***	.04	.42***	.56***	.08	.34***	.68***	-.01	.49***
Ineffectiveness	.58***	.13	.35***	.50**	.09	.25***	.64***	.20	.47***
Interpersonal Distrust	.52***	.05	.27***	.38**	.08	.15**	.64***	.12	.44***
Interoceptive Awareness (low)	.46***	-.09	.22***	.32	-.12	.10	.56***	.01	.35***
Maturity Fears	.34***	-.04	.11**	.33**	-.03	.11*	.32	.06	.11
Impulse Regulation (low)	.42***	.04	.17***	.34*	.09	.11*	.55**	-.09	.30***
Perfectionism	.38***	-.01	.14***	.39**	-.01	.12**	.35*	-.01	.12
Social Insecurity	.46***	-.04	.22***	.52**	-.02	.28***	.36*	-.05	.13*

Note Whole sample: 96 ≤ N ≤ 112; boys 55 ≤ N ≤ 57; girls 37 ≤ N ≤ 55. For each EDI-2 outcome, participants with z-scores ≤ 1.29 on the

matching EDI-2 predictor were selected only.   * p ≤ .05 ** p ≤ .01 *** p ≤ .001

Table 2.

Hierarchical regression model for predicting changes in the EDI-2 outcome variables: R^2_{change} values.

	T2 EDI-2									
	DT	B	BD	I	ID	IA	MF	IR	P	SI
1. T1 Matching scale	.28***	.13***	.41***	.37***	.27***	.16***	.20***	.13***	.19***	.24***
2. T1 Remaining EDI-2 scales	.14	.13	.08	.09	.14	.13	.16	.22**	.12	.12
3. T1 MMPI-A scales	.03	.03	.04	.12**	.11*	.11*	.05	.05	.03	.07

Note. $71 \leq N \leq 88$. DT = Drive for Thinness, B = Bulimia, BD = Body Dissatisfaction, I = Ineffectiveness, ID = Interpersonal Distrust, IA = low Interoceptive Awareness, MF = Maturity Fears, IR = low Impulse Regulation, P = Perfectionism, SI = Social Insecurity.

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

Table 3.

Temporal antecedents of changes in EDI-2 variables across a 7-months interval.

Step	Predictors at T1	R^2_{change}	sr
		Drive for Thinness at T2	
1	EDI Drive for Thinness	.26***	.43***
2	EDI Body Dissatisfaction	.09***	.30***
	R^2_{Adj} (N)	.34*** (101)	
		Bulimia at T2	
1	EDI Bulimia	.11***	.30***
2	EDI Perfectionism	.03*	.18*
	R^2_{Adj} (N)	.12*** (108)	
		Body Dissatisfaction at T2	
1	EDI Body Dissatisfaction	.41***	.59***
2	MMPI A-Health concerns	.03***	.16*
	R^2_{Adj} (N)	.42*** (111)	
		Ineffectiveness at T2	
1	EDI Ineffectiveness	.35***	.34***
2	MMPI A-Depression	.12***	.35***
	R^2_{Adj} (N)	.46*** (99)	
		Interpersonal Distrust at T2	
1	EDI Interpersonal Distrust	.26***	.37***
2	EDI Ineffectiveness	.13***	-.31***
	EDI low Interoceptive Awareness		-.20**
	EDI Social Insecurity		.34***
3	MMPI A-Obsessiveness	.08***	.28***
	R^2_{Adj} (N)	.44*** (103)	
		low Interoceptive Awareness at T2	
1	EDI low Interoceptive Awareness	.21***	.36***
2	MMPI A-Low Self-esteem	.09***	.31***
	R^2_{Adj} (N)	.29*** (103)	
		Maturity Fears at T2	
1	EDI Maturity Fears	.16***	.32***
2	EDI low Impulse Regulation	.11***	.33***
		.25*** (99)	
		low Impulse regulation at T2	
1	EDI low Impulse Regulation	.19***	.24***
2	EDI low Interoceptive Awareness	.13***	.36***
		.30*** (98)	
		Social Insecurity at T2	
1	Social Insecurity	.19***	.34***
2	MMPI A-Low Self-esteem	.09**	.30**
	R^2_{Adj} (N)	.26*** (105)	

Note. Semi-partial correlations (sr) are reported for the full regression model.

Table 4.

Hierarchical regression model for predicting changes in the MMPI-A outcome variables: R^2_{change} values.

	T2 MMPI-A				
	A-Obs	A-Dep	A-Lse	A-Sod	A-Hea
1. T1 Matching scale	.27***	.41***	.21***	.31***	.28***
2. T1 BMI	.01	.03*	.01	.11**	.00
3. T1 Remaining MMPI-A scales	.04	.04	.02	.04	.04
4. T1EDI-2 scales	.09	.07	.16	.09	.06

Note. 71 ≤ N ≤ 88. MMPI-A scales: A-Dep = Depression; A-Obs = Obsessiveness; A-Lse = Low Self-esteem; A-Sod = Social Discomfort; A-Hea = Health Concerns.

* p ≤ .05 ** p ≤ .01 *** p ≤ .001

Table 5.

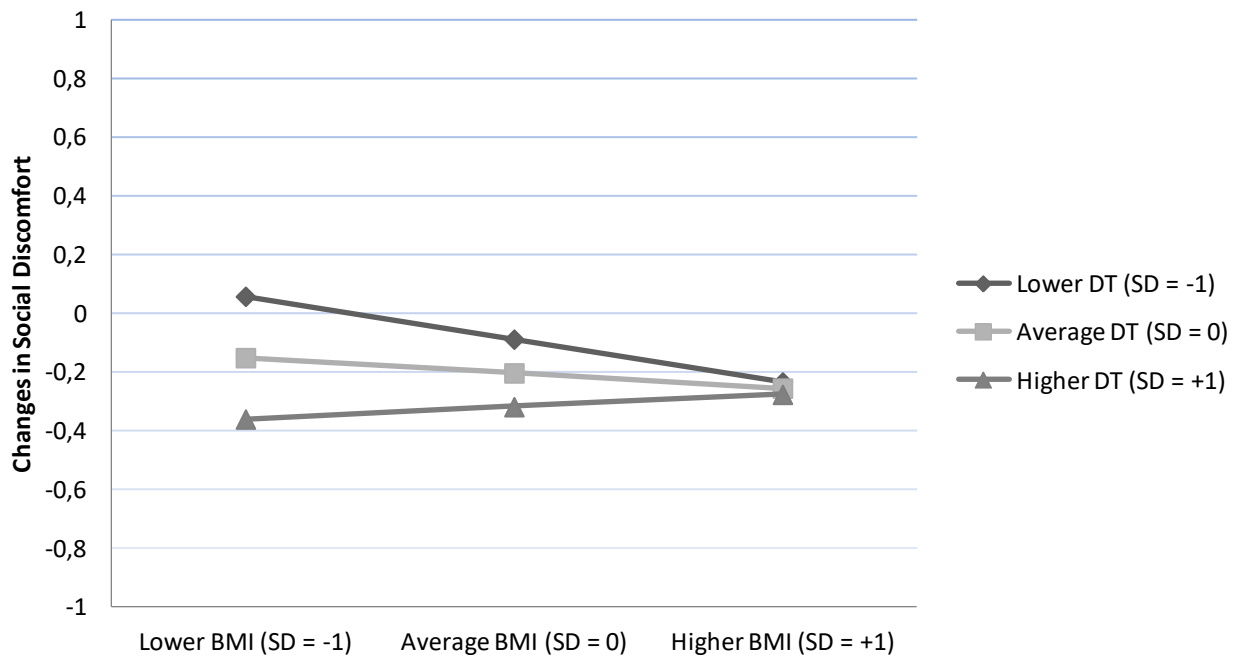*EDI-2 antecedents of changes in MMPI-A variables across a 7-months interval.*

		R^2_{change}	sr
		Obsessiveness at T2	
Step	Predictors at T1		
1	A-Obsessiveness	.25***	.47***
2	EDI-2 Ineffectiveness	.07**	.26**
	R^2_{Adj} (N)	.30*** (96)	
		Depression at T2	
1	A-Depression	.38***	.32***
2	A-low self-esteem	.03*	.16*
3	EDI-2 Interpersonal Distrust	.05***	.22***
	R^2_{Adj} (N)	.44*** (100)	
		Low Self-esteem at T2	
1	Low Self-esteem	.19***	.25**
2	EDI-2 Ineffectiveness	.16***	.22*
	EDI-2 Interpersonal Distrust		.27**
	R^2_{Adj} (N)	.33*** (90)	
		Social Discomfort at T2	
1	Social Discomfort	.42***	.50***
	BMI		- .30***
2	EDI-2 Social Insecurity	.03* (103)	.17*
	R^2_{Adj} (N)	.44*** (92)	

Semi-partial correlations (sr) are reported observed for the full regression model.

Figure 1.

Initial Drive for Thinness scores interacted with BMI in predicting changes in Social Discomfort in adolescent boys, 7 months later.

Note. T1 Social Discomfort and Social Insecurity were partialled out from initial BMI and Drive for Thinness scores.