
This is an author generated postprint of the article:

Cortés-García, L., Wichstrøm, L., Rodríguez-Cano, R., & von Soest, T. (2023). Within-person prospective associations between disordered eating, appearance dissatisfaction, and depressive symptoms from adolescence to midlife: A 28-year longitudinal population-based study. *Journal of Psychopathology and Clinical Science*, 132(8), 1031-1042. <https://doi.org/10.1037/abn0000860>

Copyright 2023, American Psychological Association. This paper is not the copy of record and may not exactly replicate the final, authoritative version of the article.

The final publication is available at <https://doi.org/10.1037/abn0000860>.

Within-Person Prospective Associations Between Disordered Eating, Appearance Dissatisfaction, and Depressive Symptoms from Adolescence to Midlife: A 28-Year Longitudinal Population-Based Study

Laura Cortés-García^{1*}, Lars Wichstrøm², Ruben Rodríguez-Cano¹, Tilmann von Soest^{1,2,3}

¹PROMENTA Research Center, Department of Psychology, University of Oslo, Oslo, Norway.

² Department of Psychology, NTNU Norwegian University of Science and Technology, Trondheim, Norway.

³Norwegian Social Research, OsloMet – Oslo Metropolitan University, Oslo, Norway

Authors note

This research was supported by two grants from the Research Council of Norway, grant number 288083 and grant number 301010. The authors have no conflicts of interest to declare.

The study was approved by the Regional Committees for Medical and Health Research Ethics (reference no.: 25462; project name: “Young in Norway”). We report all data exclusion criteria and how the final sample size was determined. All measures used in this study are reported. Data, analysis code, and research materials are available upon request to the corresponding author. Data were analyzed using IBM SPSS Statistics (Version 25.0) and Mplus (Version 8.1.) This study was not preregistered.

Correspondence concerning this article should be addressed to Laura Cortés-García (l.c.garcia@psykologi.uio.no), Department of Psychology, University of Oslo, Oslo, Norway. PO Box 1094 Blindern, 0317 Oslo, Norway.

Abstract

Appearance dissatisfaction and depressive symptoms are considered key risk factors of disordered eating. However, their etiological status is equivocal; previous longitudinal studies have not accounted for time-invariant confounding effects and have not considered potential reverse temporal influences. In addition, whether associations differ between developmental periods and genders has remained untested. To address these issues, we employed a nationwide sample of Norwegian adolescents ($N = 2,933$; $M_{age} = 15.4$ years, 54.2% women) assessed at five time points until midlife. Random-intercept cross-lagged panel models were used to examine the prospective associations between appearance dissatisfaction, depressive symptoms, and disordered eating, net of all unmeasured time-invariant confounding effects. Results showed that high levels of appearance dissatisfaction and depressive symptoms significantly predicted increased disordered eating. Conversely, disordered eating was also a predictor of increased appearance dissatisfaction and depressive symptoms. These reciprocal effects were equal in magnitude across developmental periods and gender. These results suggest that successful interventions to reduce appearance dissatisfaction and depressive symptoms may alleviate disordered eating, while reduced disordered eating may have beneficial effects on appearance dissatisfaction and depressive symptoms, regardless of age or gender.

Keywords: disordered eating, appearance dissatisfaction, depressive symptoms, bidirectional longitudinal associations, random-intercept cross-lagged panel model

General Scientific Summary

This study demonstrates that appearance dissatisfaction and depressive symptoms predict increased disordered eating and vice versa. These bidirectional associations could not be explained by the influence of stable characteristics. The magnitude of the predictions was the same in male and female participants and across ages from adolescence to midlife.

**Prospective Associations Between Disordered Eating, Appearance Dissatisfaction, and
Depressive Symptoms from Adolescence to Midlife: A 28-Year Longitudinal
Population-Based Study**

Eating disorders (EDs) are often persistent, recurrent, and have numerous ramifications in a wide range of life domains, including comorbid psychiatric symptoms, physical problems, and impact on education, work, and interpersonal relationships (Swanson et al., 2011; Udo & Grilo, 2019). Even the presence of subclinical forms of EDs (i.e., disordered eating, including frequent dieting, weight and shape concerns, binge eating and/or fasting, and vomiting) entail significant hazards (Stice et al., 2009) and are related to serious psychological dysfunctions (Chamay-Weber et al., 2005). In addition, disordered eating increases the risk of developing diagnosable EDs (Chamay-Weber et al., 2005; Stice et al., 2009). Effective treatment or prevention of disordered eating requires an understanding of the underlying causes so that they can be adequately addressed. Hence, identifying the risk factors of disordered eating is crucial.

Even though scholars have hypothesized a wide range of factors as contributing to the development and maintenance of disordered eating, some theories have postulated that appearance dissatisfaction (i.e., dissatisfaction with at least one aspect of one's physical appearance such as body weight/shape or dissatisfaction with one's overall physical appearance), and depressive symptoms are of particular importance (Fairburn et al., 2003; Stice, 2001), and a series of prospective studies have supported this contention (e.g., Stice et al., 2011; Stice & Ryzin, 2019). However, fundamental questions regarding the nature of the associations between disordered eating and depression and appearance dissatisfaction remain unexplored. In particular, it is unclear whether these relations afford causal interpretations or if they are better explained by confounding, such as the effects of genetics (Trace et al., 2013), the stable impact of personality or temperamental factors (Cassin & von Ranson, 2005), and shared variance due to common methods of assessing the constructs (Podsakoff et

al., 2012), which could produce a spurious association between the variables. Research is also scarce on the potential reversed order of effects; as a result, knowledge about the detrimental impact that disordered eating may have on its alleged risk factors remains limited.

Furthermore, because of the sharp increase in disordered eating during adolescence, it is understandable that most of the currently available research has focused on this age period. However, a considerable share of adults also struggles with disordered eating (Smolak, 2015), yet comparatively less is known about whether alleged risk factors are the same in adulthood and adolescence. In a similar vein, although substantially more women evince disordered eating than men, adolescent boys and young men have also been reported to display eating problems (Murray et al., 2017). Nevertheless, the participants in most previous studies have been women, leaving any gender specificity of risk factors underexplored.

Recognizing these gaps in the literature, we conducted this study, which is the first to investigate (a) whether depressive symptoms and appearance dissatisfaction prospectively predict increased disordered eating when all time-invariant confounding effects are adjusted for, (b) the reverse order of effects (in other words, whether disordered eating predicts increased depressive symptoms and appearance dissatisfaction), (c) whether the prospective relations differ between adolescence and adulthood, and (d) whether associations are different for men and women.

Prospective Associations With Depressive Symptoms and Appearance Dissatisfaction

Several theoretical models propose that appearance dissatisfaction and depressive symptoms may contribute to disordered eating (e.g., Jacobi et al., 2018; Stice & Ryzin, 2019). For example, cognitive-behavioral theories of EDs (Fairburn et al., 2003) and Stice's (2001) dual pathway model of eating pathology hypothesize that dissatisfaction with one's body and depressive symptoms are major drivers of the onset and maintenance of disordered eating. According to these theories, negative self-evaluation, which is part of depressive symptomatology, can give rise to appearance dissatisfaction (Presnell et al., 2004). As a

result, depressed individuals may resort to unhealthy eating practices in an effort to counter their negative self-image by altering their body shape to align with the current beauty ideal (Cafri et al., 2005). Longitudinal evidence supports such models, finding both body dissatisfaction and depressive symptoms to prospectively predict both subclinical disordered eating and clinical EDs (e.g., Ferreiro et al., 2012; Stice et al., 2011). However, albeit the documentation of such prospective relationships, the etiological implications for disordered eating remain unclear due to a range of third variables (e.g., common genetics, personality, or temperamental factors) that the previous research has not taken into account in any systematic way.

Various scholars (Berry & Willoughby, 2017; Hamaker et al., 2015) have pointed out that causal processes take place at the within-person level—that is, what happens to a specific individual. In this regard, the available studies have typically asked whether individuals who scored higher than *others* on risk factors (e.g., depressive symptoms) had more disordered eating than *others* at a later time point using regression-type or cross-lagged approaches. These approaches blended between and within-person information into an amalgam that impedes the ability to draw within-person causal implications since state-like between-person differences may influence the results (Berry & Willoughby, 2017). To some extent, likely confounders can be measured and entered as covariates, but ruling them all out is difficult. This conundrum necessitates approaches that can disentangle within- from between-person effects. To the best of our knowledge, none of the previous research has tested whether within-person variation in appearance dissatisfaction and depressive symptoms prospectively predict changes in disordered eating. In this study, we do so by using random intercept cross-lagged panel models (RI-CLPM) to estimate the longitudinal within-person associations between appearance dissatisfaction, depressive symptoms, and disordered eating while accounting for all time-invariant confounding (Berry & Willoughby, 2017; Hamaker et al., 2015).

Reverse Order of Effects

Most of the previous longitudinal studies have assumed that depressive symptoms and appearance dissatisfaction precede the appearance of disordered eating. However, some scholars have questioned the directionality of such effects while highlighting reasons to expect disordered eating to influence depressive symptomatology as well as dissatisfaction with one's body (Ferreiro, Wichstrøm, et al., 2014; Lee & Vaillancourt, 2018; Sehm & Warschburger, 2018).

Concerning depressive symptoms, classic experiments such as the Minnesota Starvation Experiment (Franklin et al., 1948) revealed that dietary restriction reduces energy levels and may induce depressive mood. Dieting may also result in failure to control weight in the long term (Neumark-Sztainer et al., 2011). Furthermore, recurrent cycles of binge eating and purging may lead to feelings of shame and guilt (Stice, 2001), in turn promoting a depressed affect. Along those lines, prospective studies have demonstrated that different forms of disordered eating (i.e., dietary restraint, bulimic symptoms) could predict the onset of as well as increases in depressive symptoms (e.g., Stice et al., 2000; Stice & Bearman, 2001). However, such studies examined only unidirectional relationships, meaning that they did not allow the authors to rule out the possibility of reverse causation. To date, only a few longitudinal studies have investigated possible bidirectional, reciprocal associations between depressive symptoms and disordered eating. Some of these studies concluded that depressive symptoms could forecast disordered eating (Ferreiro, Wichstrøm, et al., 2014; Measelle et al., 2006; Puccio et al., 2017), while others found the reverse (Marmorstein et al., 2008; Sehm & Warschburger, 2018). For instance, a recent investigation testing cross-lagged associations between disordered eating and depressive symptoms revealed that from early to late adolescence, disordered eating repeatedly preceded symptoms of depression (Lee & Vaillancourt, 2018). Interestingly, some evidence has also indicated bidirectional effects between depressive and bulimic symptoms, whereby depressive symptoms predicted future

bulimic symptoms and vice versa (Presnell et al., 2009; Skinner et al., 2012; Stice et al., 2004). Thus, the evidence concerning whether depressive symptoms are a consequence of disordered eating is mixed.

Also plausible is that eating problems may predict dissatisfaction with one's physical appearance, including body weight and shape. An increasing number of studies based on neuroimaging data have indicated that altered neural networks involved in cognitive control and emotion regulation may be related to body image distortions among patients with EDs (Gaudio et al., 2017; Steward et al., 2018). For example, reductions in white matter in prefrontal and parietal areas—mainly due to underweight and food restriction—in patients with anorexia nervosa symptoms may distort their body perception (Gaudio et al., 2017). In fact, targeting disordered eating behaviors (e.g., normalizing eating and meal habits, restoring weight) rather than body dissatisfaction is usually the first step in the treatment of EDs, partly based on the observation that reducing eating disorder behaviors also tends to diminish appearance dissatisfaction (Fairburn, 2008). Nevertheless, research has largely focused on analyzing unidirectional models stipulating that appearance dissatisfaction promotes disordered eating without explicitly examining the reverse temporal direction. To the best of our knowledge, only one study has simultaneously tested bidirectional effects between appearance dissatisfaction–related variables and disordered eating. Specifically, Espinoza et al. (2019) reported that the internalization of beauty ideals predicted disordered eating in early adolescence but did not find the reverse to be the case. Thus, given the lack of inquiry on this topic in the current literature, further work examining the directionality of this association is warranted.

In summary, although theoretical reasons undergird the expectation that disordered eating precedes both depressive symptoms and appearance dissatisfaction, current evidence concerning the direction of effects is sparse. Furthermore, no investigation has yet explored whether these predictions to and from disordered eating might be evident at the within-person

level (i.e., when all time-invariant confounding effects are adjusted for). Therefore, causal implications from available prospective findings are difficult to derive.

Developmental Periods

Theoretical models of disordered eating have usually taken adolescence as a vantage point, and most of the research has undeniably been performed on adolescents. However, the possibility exists that the etiology of disordered eating may differ between adult and adolescent populations. For instance, young people are particularly exposed to intense sociocultural pressure to be thin, typically from the media, peers, and the family (Wertheim & Paxton, 2012), which may be less, though still present, in adulthood (Smolak, 2015; Tiggemann, 2004). The negative impact of appearance dissatisfaction on disordered eating may therefore be particularly strong in adolescence compared to later life stages. However, scholarly understanding of disordered eating among adults and how the predictors might differ from those in the case of adolescents is limited. Accordingly, we sought to fill this void by testing whether depressive symptoms and appearance dissatisfaction could predict disordered eating (and vice versa) during adolescence, emerging adulthood, young adulthood, and midlife and whether the effects might differ between developmental periods.

Gender Differences

Despite the female preponderance in disordered eating, men constitute a substantial subset among those suffering from disordered eating (Murray et al., 2017). Key findings from animal and human research include evidence of sex-specific biological mechanisms (e.g., sex steroid and genetic effects) that may underlie a differential risk regarding eating pathology (Culbert et al., 2021). In addition, some longitudinal research supports the existence of a female-specific pathway whereby depressive symptoms and appearance dissatisfaction may be particularly detrimental to eating in women (e.g., Ferreiro, Seoane, et al., 2014; Jackson & Chen, 2008). Notably, other studies have failed to detect a gender-moderated effect from depressive symptoms or appearance dissatisfaction on subsequent disordered eating (Ferreiro

et al., 2011, 2012; Ferreiro, Wichstrøm, et al., 2014; Wichstrøm, 2000). However, these mixed results originated from studies of adolescents, and whether gendered effects exist at other ages has largely been unaddressed. Therefore, in the present inquiry, we included men among the study participants and tested for potential gender differences in predictions in the age periods ranging from adolescence to midlife.

The Present Study

Theoretical perspectives suggest that depressive symptoms and appearance dissatisfaction are key risk factors for disordered eating (Jacobi et al., 2018). However, empirical research has not detailed whether associations on the within-person level remain after taking into account all time-invariant confounding effects. Furthermore, most of the previous studies have been restricted to examining only one causal direction and have focused on female adolescents, as well as limiting their scope in terms of age to adolescents or young adults only. This study sought to fill these voids by aiming to investigate the interplay between the three factors of appearance dissatisfaction, depressive symptoms, and disordered eating from adolescence to midlife at the within-person level. Clarifying how these three factors may be associated across time or differ across gender is a fundamental step toward generating relevant knowledge for designing age- and gender-specific prevention and treatment strategies for these problems. Accordingly, we also examined whether such associations might vary according to gender and developmental phases.

Based on the theorizing and findings we have presented to this point, we first hypothesized that increased appearance dissatisfaction and depressive symptoms would predict later increases in disordered eating, even when adjusting for initial levels of the measured variables and applying a within-person design. We also expected the reverse association; that is, increased disordered eating would be prospectively related to more appearance dissatisfaction and depressive symptoms. Lastly, due to the lack of available research exploring these associations throughout such long spans as from adolescence to

middle adulthood—and among women and men—we remained open to whether any difference in predictions might emerge across developmental periods or gender.

Method

Participants and Procedure

The data for the present research came from the [blinded for review], a nationwide population-based longitudinal study conducted in 1992 (T1), with follow-ups in 1994 (T2), 1999 (T3), 2005 (T4), and 2020 (T5). The initial sample at T1 included 12,655 students in Grades 7 through 12 (12 to 20 years of age) from 67 junior and senior schools in Norway, which were stratified according to size, geographical region, and type of school, with a response rate of 97%. The mean age of participants was 15.44 years ($SD = 1.66$) at T1 and 44.14 ($SD = 1.70$) at T5. At T2, a sizable number of students had completed the 3-year track at the junior or senior high school and had left the school they had been attending at T1. The response rate of those still attending the same school at T2 was 92%, and only those students were followed up at T3. Because the study was originally designed as a two-wave study, new informed consent was obtained at T2. Only students who consented ($n = 3,507$; 91%) were followed up at T3 and T4, with response rates of 84% and 82%, respectively. At T4, the respondents were asked to consent to link their records to a variety of official administrative registers. Those who consented to the linkage ($n = 2,606$; 90%) were eligible to participate at T5. At T5, data were collected from 2,214 respondents, with a response rate of 85%. Overall participation rates, based on all eligible students at T1 who still were at their original school at T2, were therefore 68% at T3, 67% at T4, and 51% at T5 (for more information about study participation, see Figure S1 in the Online Supplementary Material). All respondents who participated in at least three data collections and were 19 years or younger at T1 ($N = 2,933$; 1,590 girls and 1,343 boys) were included in this study and formed the basis of the present analyses.

At T1, the educational level of the parent with the highest education was junior high school or less among 20.5%, senior high school among 36.9%, three years or less college education among 22.1%, and more than three years university education among 20.5% of the sample. Moreover, 33.7% of the respondents reported parental occupational level (based on the highest occupational attainment by either parent) to be farmer/fisherman or manual worker, 13.0% professional positions on a lower level, 40.8% professional positions on a higher level, and 12.6% higher administrative position/leaders. Of all respondents, the majority were of Norwegian ethnical origin and only 1.8 % had both parents with immigration background (i.e., both parents were not born in Norway).

The participants received detailed oral and written descriptions of the project. Informed consent from every participating student was obtained, as well as from the parents of students younger than 15 years who took part in the study. At T1 and T2, the participating students completed the questionnaires at school. At T3 and T4, the participants received the questionnaire by mail. Meanwhile, at T5, most of the participants completed the questionnaire electronically, though a minority chose to record their responses via a paper questionnaire. The study was approved by the Regional Committee of Medical Research Ethics.

Multiple logistic regression analyzing the impact of variables at T1 on attrition revealed that being a male participant predicted attrition in late adolescence (T2), OR = 1.63, 95% CI [1.48, 1.81], emerging adulthood (T3), OR = 1.46, 95% CI [1.31, 1.61], young adulthood (T4), OR = 1.45, 95% CI [1.31, 1.61], and midlife (T5), OR = 1.52, 95% CI [1.36, 1.70]. Likewise, older age increased the likelihood for drop-out in late adolescence, OR = 1.17, 95% CI [1.13, 1.20], emerging adulthood, OR = 1.35, 95% CI [1.32, 1.38], young adulthood, OR = 1.33, 95% CI [1.28, 1.37], and midlife, OR = 1.30, 95% CI [1.27, 1.33]. Adolescents with higher depressive symptoms were more likely to drop out in emerging adulthood, OR = 1.11, 95% CI [1.02, 1.22], and young adulthood, OR = 1.11, 95% CI [1.01,

1.20]. In addition, early adolescents with higher levels of appearance dissatisfaction were more likely to drop out when they were young adults, OR = 1.09, 95% CI [1.01, 1.17].

Finally, having higher levels of disordered eating increased the likelihood of dropping out in late adolescence, OR = 1.18 0.85, 95% CI [1.03, 1.37]. In accordance with these findings,

Little's test failed to find that data were missing completely at random (MCAR), $\chi^2 = 1301$, $df = 1067$, $p < .001$, whereas, the normed Little's test was 1.22, clearly suggesting that data were missing at random (MAR; Ullmann, 2001).

Measures

Disordered Eating

A 12-item short version of the Eating Attitude Test-26 (EAT-26; Garner et al., 1982) developed by Lavik et al. (1991) was used to measure disordered eating. A 4-point scale ranging from 1 (*never*) to 4 (*always*) was used. Mean scores were calculated, with high scores reflecting high levels of disordered eating. In the present study, α coefficients for the whole sample were .70, .74, .75, .73, and .72 from T1 to T5. Moreover, α coefficients by gender were .69, .72, .77, .75, and .74 for females, and .64, .70, .63, .68, and .68 for males, across data collection waves. The estimated values of internal consistency are in line with reports from other studies using the EAT-12 (Martín et al., 2015; Wichstrøm, 1995). Validation studies of the EAT-12 have shown that the instrument has favorable psychometric properties and correlates highly with other measures of disordered eating (Lavik et al., 1991; Wichstrøm, 1995a). The item wording of all scales used in this study are presented in Tables S1 to S3 in the Online Supplementary Material.

Depressive Symptoms

Symptoms of depression were measured by six items derived from the Hopkins Symptom Checklist (Derogatis et al., 1974). On a response scale ranging from 1 (*not distressed*) to 4 (*extremely distressed*), participants were asked to restrict their ratings to the preceding week. Mean scores were calculated, with high scores indicating high levels of

depressive symptoms, and the scale revealed a satisfactory internal consistency on all occasions, with values of .78, .81, .84, .85, and .87 at T1 to T5. The α coefficients by gender were .78, .80, .85, .85 and .88 for females, and .76, .80, .81, .85, and .85 for males, across data collection waves. The measure used has been shown to correlate highly with other measures of depressive symptoms (von Soest & Wichstrøm, 2014).

Appearance Dissatisfaction

Appearance dissatisfaction was measured at all points with the Physical Appearance subscale of the revised version of the Self-Perception Profile for Adolescents (Harter, 1988; Wichstrøm, 1995b). The scale consists of five items (e.g., “I am not satisfied with my appearance”; “I wish my body was different”). Response options ranged from 1 (*Describes me very poorly*) to 4 (*Describes me very well*). Mean scores were computed where high mean scores indicated high appearance dissatisfaction. Cronbach’s alpha was .86, .89, .90, .90 and .90, at T1 to T5. The α coefficients by gender were .86, .88, .90, .88 and .90 for females, and .83, .86, .90, .90, and .88 for males, across data collection waves. Several studies have supported the validity of the revised version of the Self-Perception Profile for Adolescence and the Physical Appearance subscale (Wichstrøm, 1995; Wichstrøm & von Soest, 2016).

Statistical Analysis

IBM SPSS Statistics (Version 25.0) was used to calculate descriptive statistics and *t*-tests. All other analyses were performed in Mplus (Version 8.1). We aimed at identifying within-person longitudinal associations between appearance dissatisfaction, depressive symptoms, and disordered eating. For this purpose, RI-CLPM were estimated to disaggregate within-person variation from between-person variation. Such disaggregation is achieved by modelling three latent random intercepts representing the stable, between-person components of appearance dissatisfaction, depressive symptoms, and disordered eating, in addition to cross-lagged associations between variables. By including random intercepts in cross-lagged models, the RI-CLPM provides the possibility to examine how variations in appearance

dissatisfaction and depressive symptoms within the individual are longitudinally related to variations in disordered eating across time. Moreover, the estimated within-person cross-lagged effects are free of the influence of all time-invariant confounding (e.g., common genetics, temperamental factors). To test whether the reciprocal effects were the same across gender, we performed multiple group analyses (Mulder & Hamaker, 2020). The following thresholds for model fit indices were considered acceptable: root mean square error of approximation (RMSEA) ≤ 0.08 , comparative fit index (CFI) ≥ 0.95 , Tucker–Lewis index (TLI) ≥ 0.95 , and standardized root mean residual (SRMR) ≤ 0.10 (Schermelleh-Engel et al., 2003). When interpreting the size of cross-lagged effects, standardized regression coefficients of .03 indicated a small effect, .07 a medium effect, and .12 a large effect (Orth et al., 2022). We used the Satorra–Bentler χ^2 difference test to compare nested models (Satorra, 2000). A robust maximum likelihood estimator was applied, and missing data were handled by full information maximum likelihood estimation under the assumption that data were missing at random, as indicated by the attrition analyses.

Transparency and Openness

We report all data exclusion criteria and how the final sample size was determined. All measures used in this study are reported. Data, analysis code, and research materials are available upon request to the corresponding author. Data were analyzed using IBM SPSS Statistics (Version 25.0) and Mplus (Version 8.1.) This study was not preregistered.

Results

Descriptive Statistics

Table 1 presents estimated means, standard deviations, and correlations between all study variables by gender, along with the results of *t*-tests comparing female and male participants. The table shows that female participants scored higher on depressive symptoms, disordered eating, and appearance dissatisfaction than their male counterparts across all time

points, and gender differences were statistically significant for all variables. In addition, disordered eating, depressive symptoms, and appearance dissatisfaction were positively correlated at all time points for both women and men.

Prospective Associations Between Appearance Dissatisfaction, Depressive Symptoms, and Disordered Eating

For disordered eating, the intra-class correlation—defined as the proportion of variance attributed to differences between participants—was .78, indicating that 78% of the variance in disordered eating was due to variation between persons. In contrast, 22% of the variance was due to variation in disordered eating within persons across the five time points. Moreover, the intra-class correlation for appearance dissatisfaction and depressive symptoms was .84 and .73, respectively.

We then estimated a RI-CLPM for the associations between appearance dissatisfaction, depressive symptoms, and disordered eating. The overall model fit of the RI-CLPM was good, $\chi^2(48) = 107.66$, CFI = 0.995, TLI = 0.989, RMSEA = 0.021, SRMR = .021. In line with our hypotheses, this model shows that high levels of appearance dissatisfaction and depressive symptoms significantly predicted later increases in disordered eating, and *vice versa*, on the within-person level.

Associations Across Developmental Periods

To examine whether prospective associations differed across developmental periods, we constrained paths for each cross-lagged association to be equal across all five time points. The Satorra–Bentler χ^2 difference test comparing the two models indicated that the constraints were tenable, $\Delta\chi^2(18) = 22.17$, $p = .22$. Hence, cross-lagged effects did not differ significantly across developmental periods. The overall fit of this constrained model was $\chi^2(66) = 129.33$, CFI = 0.995, TLI = 0.992, RMSEA = 0.018, SRMR = .023. Figure 1 depicts that at the between-person level the stable components of disordered eating and depressive symptoms, $r = .50$, $p < .001$, disordered eating and appearance dissatisfaction, $r = .58$, $p <$

.001, and depressive symptoms and appearance dissatisfaction, $r = .48$, $p < .001$, showed substantial positive correlations. At the within-person level, similar but weaker concurrent correlations were observed, $r = .16-.36$, $p < .001$. The autoregressive paths for appearance dissatisfaction, depressive symptoms, and disordered eating were significant at each time interval, $\beta = .05-.11$, $p < .001$, peaking between T1 and T2. All within-person cross-lagged paths were significant (small to large effect sizes of $\beta = .05-.11$, $p < .001$), indicating that depressive symptoms and appearance dissatisfaction were prospectively predicting disordered eating and vice versa. More specifically, depressive symptoms showed the smallest sized associations with later outcomes, with standardized regression coefficients for appearance dissatisfaction and disordered eating between .05 and .06. Disordered eating showed somewhat larger prospective associations with standardized regression values between .06 and .08 for the associations with appearance dissatisfaction and depressive symptoms. The largest effect sizes were observed for appearance dissatisfaction, with standardized regression coefficients in the range of .09 to .10 when predicting depressive symptoms and disordered eating (Figure 1).

Gender-Specific Associations

Next, we tested for potential gender differences in the associations by means of multiple group analysis. The overall fit of this gender differentiated model was $\chi^2 (132) = 178.66$, CFI = 0.995, TLI = 0.992, RMSEA = 0.016, SRMR = .029. This model was compared to a model where the cross-lagged paths were constrained to be equal for men and women. The Satorra–Bentler χ^2 difference test yielded at least some gender differences in cross-lagged effects, $\Delta \chi^2 (6) = 13.85$, $p = .031$. Constraining one path at a time revealed that the prospective association between appearance dissatisfaction at the previous time point and depressive symptoms at the next time point differed across gender ($\Delta \chi^2 [5] = 12.19$, $p = .032$), with stronger associations for women (medium effect sizes of $\beta = .08$ and $.09$, $p < .001$) than men (small to medium effect size of $\beta = .05$ and $.06$, $p = .014$). No gender

differences were found for the five other regression coefficients, $p > .05$, including to and from disordered eating. This model is presented in Figures 2 and 3 for male and female participants, respectively.

Discussion

Previous research has typically asserted that appearance dissatisfaction and depressive symptoms predict disordered eating (Jacobi et al., 2018; Stice & Ryzin, 2019); however, these studies did not explore whether those associations would sustain at the within-person level after ruling out time-invariant confounding effects that pose threats to inferring etiological conclusions. In line with our expectations, our results demonstrated that within-person variations in depressive symptoms and appearance dissatisfaction predicted increases in disordered eating. Also, as hypothesized, disordered eating predicted increases in appearance dissatisfaction and depressive symptoms on the within-person level. Notably, these effects were similar across adolescence, emerging adulthood, young adulthood, and midlife. Despite substantial mean differences in appearance dissatisfaction, depressive symptoms, and disordered eating, the cross-lagged effects were also the same for men and women, except for appearance dissatisfaction predicting increased depressive symptoms to a stronger degree among women than men. Overall, effect sizes were medium, with standardized regression coefficients ranging from .05 to .11.

Reciprocal Associations Between Appearance Dissatisfaction, Depressive Symptoms, and Disordered Eating

In line with previous longitudinal evidence (Jacobi et al., 2018; Stice & Ryzin, 2019), we found appearance dissatisfaction and depressive symptoms to predict disordered eating. However, some scholars have questioned how such results should be interpreted since the identified associations may be the result of potential confounders, such as the stable effects of genes (Trace et al., 2013) or personality traits (Cassin & von Ranson, 2005). In the present study, both increased depressive symptoms and appearance dissatisfaction predicted later

increases in disordered eating even when all time-invariant confounding effects were taken into account, thus providing indications that these factors may influence disordered eating. The present study was not positioned to reveal the mechanisms involved, but according to cognitive-behavioral theories of EDs (Fairburn et al., 2003), those with high appearance dissatisfaction use dysfunctional strategies for reducing weight that, in the long run, lead to various forms of disordered eating (e.g., extreme dieting, restriction; Stice, 2001). Such processes are also accompanied by negative affect; in that context, dysfunctional eating behaviors (e.g., binge eating, emotional overeating of energy-dense foods) may offer a momentary reduction in depressive affect (Gibson, 2012). Other types of eating behavior (e.g., restriction, purging) may then be exercised to avoid the perceived negative effects of overconsumption and to improve body image by losing weight (Stice, 2001). Hence, appearance dissatisfaction and depression may increase the risk of the full binge-purge cycle.

Interestingly, disordered eating was also a predictor of both increased appearance dissatisfaction and depressive symptoms; these within-person findings echoed results from two previous studies that did not separate within-person from between-person associations (Gaudio et al., 2017; Lee & Vaillancourt, 2018). Notably, various other studies have not found disordered eating to precede depressive symptoms (Ferreiro, Wichstrøm, et al., 2014) and appearance dissatisfaction (Espinoza et al., 2019). This discrepancy may be due to the fact that the previous studies relied on smaller samples and used other analytical approaches. Importantly, it should be noted that the current study was the first to test these bidirectional associations in the same model while, at the same time, ruling out the effect of time-invariant confounding. Therefore, further research is needed to replicate our results.

In summary, the present study's outcomes have uncovered reciprocal relations between appearance dissatisfaction, depressive symptoms, and disordered eating. Our findings support the notion of a pernicious cycle in which appearance dissatisfaction and

depressive symptoms are risk factors for disordered eating while, conversely, disordered eating aggravates appearance dissatisfaction and depressive symptoms (Stice et al., 2000).

Developmental Period and Gendered Associations

Our analyses revealed that the reciprocal associations between appearance dissatisfaction, depressive symptoms, and disordered eating were stable across different developmental periods. Such findings suggest that adults, as well as adolescents, are vulnerable to the pervasive appearance norms that may lead to a complex interdependence between appearance dissatisfaction, depressive symptoms, and disordered eating. This result seems to run counter to self-report studies where adolescents and young adults considered appearance dissatisfaction detrimental to their well-being to a larger degree than older age groups (Hockey et al., 2021; Tiggemann, 2004). However, such subjective reports do not seem to be in line with empirical findings suggesting that the negative correlations between appearance dissatisfaction and indicators of well-being—such as self-esteem—remain stable across age (Mellor et al., 2010). Hence, the slim body ideal may permeate society similarly across all age groups, and appearance dissatisfaction may consequently remain an important risk factor for disordered eating and depressive symptoms independent of age. However, alternative explanations for stable associations across developmental periods are possible. For example, in contrast to most other studies in the field, we used a broad measure of appearance dissatisfaction, not only capturing dissatisfaction with body weight and size, but also other aspects of dissatisfaction with appearance. As a consequence, satisfaction with own body weight and size may become of less importance, but other of appearance satisfaction related to aging, such as graying hair or facial wrinkles may become of increasing importance with increasing age (Smolak, 2015). Moreover, during the study period of almost 30 years, significant cultural and societal changes, such as growing exposure to idealized standards of beauty and the introduction and rapid expansion of social media (Vandenbosch et al., 2021), may have strengthened the reciprocal associations between appearance dissatisfaction,

depressive symptoms, and disordered eating. As a result, the longitudinal association between appearance dissatisfaction and disordered eating may have persisted in later developmental periods due to an increasing pressure to conform to beauty norms across the study period, even though there may have indeed be differences in the strength of associations across age when period effects are accounted for. Additional research is needed to examine whether associations remain stable across developmental periods or whether results from the present study rather can be explained by societal changes across the study period.

Even though men were considerably less depressed, evinced less disordered eating, and proved to have a better body image than women, their prospective associations to and from disordered eating were the same as for women. Thus, our within-person results parallel some evidence indicating that gender did not moderate any of the paths between depressive symptoms and appearance dissatisfaction with disordered eating (Ferreiro et al., 2011; Wichstrøm, 2000). Our findings are therefore in line with the notion that the negative body attitudes elicited by self-objectification are indeed relevant to the development of both male and female disordered eating (Slater & Tiggemann, 2010). Nevertheless, our findings run contrary to those of previous studies that have chronicled stronger effects in adolescent girls than boys (Ferreiro, Seoane, et al., 2014; Jackson & Chen, 2008). Conceivably, our findings may differ because of the use of within-person variance only. In the current study, we examined whether the predictive effect of women's and men's deviations from their average value of depressive symptoms and body dissatisfaction on changes in disordered eating was similar across gender, hence ruling out the effect of mean level differences between men and women. Moreover, the reverse effects—the potential impact of disordered eating on appearance dissatisfaction and depressive symptoms—were found to be equally strong among males and females—a possibility heretofore not addressed. In principle, gender differences in the level of these constructs may be brought about by either women being exposed to more risk factors or, alternatively, women reacting more strongly to these risk

factors than men. With respect to developing disordered eating, our findings nonetheless provide no support for a higher reactivity in women, at least in terms of depressive symptoms and appearance dissatisfaction.

Although not a prime focal point, we found that appearance dissatisfaction notably predicted depressive symptoms to a larger extent in women than men, which aligns with prior research (Bearman & Stice, 2008; Salafia & Gondoli, 2011). Specifically, the present study replicated this gendered effect at the within-person level. Possibly, this greater female susceptibility may result from the fact that Western sociocultural ideals strongly emphasize physical appearance for women and girls across the life span (Tiggemann, 2004; Wertheim & Paxton, 2012). Consequently, appearance dissatisfaction may influence negative affect to a larger degree among women than men in Western cultures.

Strengths and Limitations

The use of a large population-based sample, the inclusion of both genders, and the long follow-up across 28 years with multiple measurements are major strengths of the study, as is the application of RI-CLPM, rendering—for the first time—estimates of prediction free from influences from a range of potential time-invariant confounding effects, such as stable effects of genes, common methods, and personality traits.

However, we must also recognize some limitations that might have affected the results. First, most of the study participants were ethnic Norwegians. As the link between appearance dissatisfaction, disordered eating, and depression may vary considerably between cultures (Anderson-Fye, 2018), extrapolating the present results to other countries and cultures should be performed with care. Therefore, future studies should test our model in different populations from diverse ethnic backgrounds. Our study included both women and men; however, we did not assess whether respondents identified outside of the gender binary. Because gender diverse individuals report elevated risk for ED (Nagata et al., 2020), future studies should examine observed relationships in samples with greater gender diversity. In

addition, as with most longitudinal research, we observed selective attrition which might have influenced the results. More specifically, key variables in this study (i.e., depressive symptoms, appearance dissatisfaction, disordered eating) were related to dropout, which may have biased the estimated associations. However, although the potential effect of systematic attrition on the results cannot be completely ruled out, simulation studies have shown that associations between variables are only to a small degree affected by systematic attrition (Gustavson et al., 2012). Moreover, we applied a full information maximum likelihood procedure, which produces less biased estimates than listwise deletion (Enders & Bandalos, 2001).

The study relied solely on self-reports from one source and future studies would benefit from the inclusion of different measures, such as clinical interviews. However, to the extent that any common rater bias evinced trait-like characteristics, it would be adjusted for by the inclusion of latent random intercepts in the model. Additionally, because disordered eating and depression were studied in terms of symptoms and not disorders with full diagnostic criteria applied, our results cannot necessarily be generalized to full eating or depressive disorders. Validation studies in population samples have shown that the EAT-12 has favorable psychometric properties (Lavik et al, 1991; Wichstrøm, 1995). However, most measures of disordered eating, including the EAT, have originally been developed and validated by using female samples only. As a result, such measures may mainly assess disordered eating symptom expressions in women, focusing on thinness-oriented disordered eating, whereas they are criticized for not sufficiently assessing male symptom expressions, such as symptoms related to pursuing a muscular body (McCreary, 2012). Indeed, validation studies of the EAT indicate that instrument does not measure disordered eating equally well for males than females (Engelsen & Hagtvet, 1999; Gleaves et al., 2014), suggesting that caution should be practice when interpreting the results of the present study for male participants. There is therefore a need for future studies examining the complex association

between disordered eating and putative risk factors by using instruments that are specifically designed to measure disordered eating in male populations (Darcy & Hsiao-Jung Lin, 2012). Finally, although we accounted for time-invariant factors, time-varying factors, such as body mass index and negative life events, were not included. Nonetheless, such factors could have produced spurious relations between disordered eating, depressive symptoms, and appearance dissatisfaction at the within-person level. Thus, the degree to which associations may be accounted for by negative life events or other time-varying covariates requires further exploration.

Conclusion

The results of this study document that appearance dissatisfaction and depressive symptoms prospectively predict disordered eating from adolescence to midlife, even when all time-invariant confounders are adjusted for, regardless of gender and age. Likewise, disordered eating appears to predict increased appearance dissatisfaction and depressive symptomatology across ages and for both genders. Therefore, the present study provides for the first time in the field a stronger, more refined test of the previous theoretical models of EDs, advocating for appearance dissatisfaction and depressive symptoms as etiological factors in the development of disordered eating (Fairburn et al., 2003; Stice, 2001). Our findings also expand the current knowledge by informing fellow scholars about the reciprocity of the effects. As such, future studies should consider the dynamic interplay between disordered eating and its risk factors. The pervasive reciprocal pattern of associations suggests that interventions to reduce depressive symptoms and appearance dissatisfaction might include a focus on eating problems. Furthermore, preventive and treatment efforts directed at disordered eating should consider addressing physical appearance concerns and depressive symptoms in all genders and at all stages in life.

References

- Anderson-Fye, E. (2018). Cultural influences on body image and eating disorders. In W. S. Agras & A. Robinson (Eds.), *The Oxford handbook of eating disorders* (2nd ed., pp. 187–208). Oxford University Press.
- Bearman, S. K., & Stice, E. (2008). Testing a gender additive model: The role of body image in adolescent depression. *Journal of Abnormal Child Psychology*, *36*(8), 1251–1263. <https://doi.org/10.1007/s10802-008-9248-2>
- Berry, D., & Willoughby, M. T. (2017). On the practical interpretability of cross-lagged panel models: Rethinking a developmental workhorse. *Child Development*, *88*(4), 1186–1206. <https://doi.org/10.1111/cdev.12660>
- Cafri, G., Yamamiya, Y., Brannick, M., & Thompson, J. K. (2005). The Influence of sociocultural factors on body image: A meta-analysis. *Clinical Psychology: Science and Practice*, *12*(4), 421–433. <https://doi.org/10.1093/clipsy.bpi053>
- Cassin, S. E., & von Ranson, K. M. (2005). Personality and eating disorders: A decade in review. *Clinical Psychology Review*, *25*(7), 895–916. <https://doi.org/10.1016/j.cpr.2005.04.012>
- Chamay-Weber, C., Narring, F., & Michaud, P.-A. (2005). Partial eating disorders among adolescents: A review. *Journal of Adolescent Health*, *37*(5), 417–427. <https://doi.org/10.1016/j.jadohealth.2004.09.014>
- Culbert, K. M., Sisk, C. L., & Klump, K. L. (2021). A narrative review of sex differences in eating disorders: Is there a biological basis? *Clinical Therapeutics*, *43*(1), 95–111. <https://doi.org/10.1016/j.clinthera.2020.12.003>
- Darcy, A. M., & Lin, I. H.-J. (2012). Are we asking the right questions? A review of assessment of males with eating disorders. *Eating Disorders*, *20*(5), 416–426. <https://doi.org/10.1080/10640266.2012.715521>

- Derogatis, L. R., Lipman, R. S., Rickels, K., Uhlenhuth, E. H., & Covi, L. (1974). The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. *Behavioral Science, 19*(1), 1–15. <https://doi.org/10.1002/bs.3830190102>
- Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling, 8*(3), 430–457. https://doi.org/10.1207/S15328007SEM0803_5
- Engelsen, B. K., & Hagtvet, K. A. (1999). A generalizability study of the Eating Attitudes Test (EAT-12) in non-clinical adolescents. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity, 4*(4), 179–186. <https://doi.org/10.1007/BF03339734>
- Espinoza, P., Penelo, E., Mora, M., Francisco, R., González, M. L., & Raich, R. M. (2019). Bidirectional relations between disordered eating, internalization of beauty ideals, and self-esteem: A longitudinal study with adolescents. *Journal of Early Adolescence, 39*(9), 1244–1260. <https://doi.org/10.1177/0272431618812734>
- Fairburn, C. G. (2008). *Cognitive behavior therapy and eating disorders*. Guilford Press.
- 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. [https://doi.org/10.1016/s0005-7967\(02\)00088-8](https://doi.org/10.1016/s0005-7967(02)00088-8)
- Ferreiro, F., Seoane, G., & Senra, C. (2011). A prospective study of risk factors for the development of depression and disordered eating in adolescents. *Journal of Clinical Child and Adolescent Psychology, 40*(3), 500–505. <https://doi.org/10.1080/15374416.2011.563465>
- Ferreiro, F., Seoane, G., & Senra, C. (2012). Gender-related risk and protective factors for depressive symptoms and disordered eating in adolescence: A 4-year longitudinal study. *Journal of Youth and Adolescence, 41*(5), 607–622. <https://doi.org/10.1007/s10964-011-9718-7>

- Ferreiro, F., Seoane, G., & Senra, C. (2014). Toward understanding the role of body dissatisfaction in the gender differences in depressive symptoms and disordered eating: A longitudinal study during adolescence. *Journal of Adolescence*, *37*(1), 73–84. <https://doi.org/10.1016/j.adolescence.2013.10.013>
- Ferreiro, F., Wichstrøm, L., Seoane, G., & Senra, C. (2014). Reciprocal associations between depressive symptoms and disordered eating among adolescent girls and boys: A multiwave, prospective study. *Journal of Abnormal Child Psychology*, *42*(5), 803–812. <https://doi.org/10.1007/s10802-013-9833-x>
- Franklin, J. C., Schiele, B. C., Brožek, J., & Keys, A. (1948). Observations of human behavior in experimental semistarvation and rehabilitation. *Journal of Clinical Psychology*, *4*, 28–45. [https://doi.org/10.1002/1097-4679\(194801\)4:1<28::AID-JCLP2270040103>3.0.CO;2-F](https://doi.org/10.1002/1097-4679(194801)4:1<28::AID-JCLP2270040103>3.0.CO;2-F)
- Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychological Medicine*, *12*(4), 871–878. <https://doi.org/10.1017/s0033291700049163>
- Gaudio, S., Quattrocchi, C. C., Piervincenzi, C., Zobel, B. B., Montecchi, F. R., Dakanalis, A., Riva, G., & Carducci, F. (2017). White matter abnormalities in treatment-naive adolescents at the earliest stages of Anorexia Nervosa: A diffusion tensor imaging study. *Psychiatry Research. Neuroimaging*, *266*, 138–145. <https://doi.org/10.1016/j.psychresns.2017.06.011>
- Gibson, E. L. (2012). The psychobiology of comfort eating: Implications for neuropharmacological interventions. *Behavioural Pharmacology*, *23*(5–6), 442–460. <https://doi.org/10.1097/FBP.0b013e328357bd4e>
- Gleaves, D. H., Pearson, C. A., Ambwani, S., & Morey, L. C. (2014). Measuring eating disorder attitudes and behaviors: A reliability generalization study. *Journal of Eating Disorders*, *2*(1), 6. <https://doi.org/10.1186/2050-2974-2-6>

- Gustavson, K., von Soest, T., Karevold, E., & Røysamb, E. (2012). Attrition and generalizability in longitudinal studies: Findings from a 15-year population-based study and a Monte Carlo simulation study. *BMC Public Health, 12*, 918. <https://doi.org/10.1186/1471-2458-12-918>
- Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods, 20*(1), 102–116. <https://doi.org/10.1037/a0038889>
- Harter, S. (1988). *Manual for the Self-Perception Profile for Adolescents*. Denver, CO: University of Denver Press.
- Hockey, A., Milojev, P., Sibley, C. G., Donovan, C. L., & Barlow, F. K. (2021). Body image across the adult lifespan: A longitudinal investigation of developmental and cohort effects. *Body Image, 39*, 114–124. <https://doi.org/10.1016/j.bodyim.2021.06.007>
- Jackson, T., & Chen, H. (2008). Predicting changes in eating disorder symptoms among adolescents in China: An 18-month prospective study. *Journal of Clinical Child & Adolescent Psychology, 37*(4), 874–885. <https://doi.org/10.1080/15374410802359841>
- Jacobi, C., Hütter, K., & Fittig, E. (2018). Psychosocial risk factors for eating disorders. In W. S. Agras & A. Robinson (Eds.), *The Oxford handbook of eating disorders* (2nd ed., pp. 106–125). Oxford University Press.
- Kelly, N. R., Mitchell, K. S., Gow, R. W., Trace, S. E., Lydecker, J. A., Bair, C. E., & Mazzeo, S. (2012). An evaluation of the reliability and construct validity of eating disorder measures in white and black women. *Psychological Assessment, 24*(3), 608–617. <https://doi.org/10.1037/a0026457>
- Lally, M., & Valentine-French, S. (2017). *Lifespan development: A psychological perspective* (2nd ed.). Open Textbook Library. <https://open.umn.edu/opentextbooks/textbooks/540>

- Lavik, N. J., Clausen, S. E., & Pedersen, W. (1991). Eating behaviour, drug use, psychopathology and parental bonding in adolescents in Norway. *Acta Psychiatrica Scandinavica*, *84*(4), 387–390. <https://doi.org/10.1111/j.1600-0447.1991.tb03164.x>
- Lee, K. S., & Vaillancourt, T. (2018). Longitudinal associations among bullying by peers, disordered eating behavior, and symptoms of depression during adolescence. *JAMA Psychiatry*, *75*(6), 605–612. <https://doi.org/10.1001/jamapsychiatry.2018.0284>
- MacLaren, V. V., & Best, L. A. (2009). Female students' disordered eating and the big five personality facets. *Eating Behaviors*, *10*(3), 192–195. <https://doi.org/10.1016/j.eatbeh.2009.04.001>
- Marmorstein, N. R., von Ranson, K. M., Iacono, W. G., & Malone, S. M. (2008). Prospective associations between depressive symptoms and eating disorder symptoms among adolescent girls. *International Journal of Eating Disorders*, *41*(2), 118–123. <https://doi.org/10.1002/eat.20477>
- Martín, J., Padierna, A., Unzurrunzaga, A., González, N., Berjano, B., & Quintana, J. M. (2015). Adaptation and validation of the Spanish version of the Clinical Impairment Assessment Questionnaire. *Appetite*, *91*, 20–27. <https://doi.org/10.1016/j.appet.2015.03.031>
- McCabe, M. P., & Ricciardelli, L. A. (2003). Sociocultural influences on body image and body changes among adolescent boys and girls. *Journal of Social Psychology*, *143*(1), 5–26. <https://doi.org/10.1080/00224540309598428>
- McCreary. (2012). Muscularity and body image. In T. F. Cash (Ed.). *Encyclopedia of body image and human appearance* (pp. 561–567). Amsterdam: Elsevier.
- Measelle, J. R., Stice, E., & Hogansen, J. M. (2006). Developmental trajectories of co-occurring depressive, eating, antisocial, and substance abuse problems in adolescent girls. *Journal of Abnormal Psychology*, *115*(3), 524–538. <https://doi.org/10.1037/0021-843X.115.3.524>

- Mellor, D., Fuller-Tyszkiewicz, M., McCabe, M. P., & Ricciardelli, L. A. (2010). Body image and self-esteem across age and gender: A short-term longitudinal study. *Sex Roles, 63*(9), 672–681. <https://doi.org/10.1007/s11199-010-9813-3>
- Mulder, J. D., & Hamaker, E. L. (2020). Three extensions of the random intercept cross-lagged panel model. *Structural Equation Modeling, 28*(4), 1–11. <https://doi.org/10.1080/10705511.2020.1784738>
- Murray, S. B., Nagata, J. M., Griffiths, S., Calzo, J. P., Brown, T. A., Mitchison, D., Blashill, A. J., & Mond, J. M. (2017). The enigma of male eating disorders: A critical review and synthesis. *Clinical Psychology Review, 57*, 1–11. <https://doi.org/10.1016/j.cpr.2017.08.001>
- Nagata, J. M., Ganson, K. T., & Austin, S. B. (2020). Emerging trends in eating disorders among sexual and gender minorities. *Current Opinion in Psychiatry, 33*(6), 562–567. <https://doi.org/10.1097/YCO.0000000000000645>
- 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. <https://doi.org/10.1016/j.jada.2011.04.012>
- Orth, U., Meier, L. L., Bühler, J. L., Dapp, L. C., Krauss, S., Messerli, D., & Robins, R. W. (2022). Effect size guidelines for cross-lagged effects. *Psychological Methods*. <https://doi.org/10.1037/met0000499>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*(1), 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Presnell, K., Bearman, S. K., & Stice, E. (2004). Risk factors for body dissatisfaction in adolescent boys and girls: A prospective study. *International Journal of Eating Disorders, 36*(4), 389–401. <https://doi.org/10.1002/eat.20045>

- Presnell, K., Stice, E., Seidel, A., & Madeley, M. C. (2009). Depression and eating pathology: Prospective reciprocal relations in adolescents. *Clinical Psychology & Psychotherapy*, *16*(4), 357–365. <https://doi.org/10.1002/cpp.630>
- Puccio, F., Fuller-Tyszkiewicz, M., Youssef, G., Mitchell, S., Byrne, M., Allen, N., & Krug, I. (2017). Longitudinal bi-directional effects of disordered eating, depression and anxiety. *European Eating Disorders Review*, *25*(5), 351–358. <https://doi.org/10.1002/erv.2525>
- Salafia, E. H. B., & Gondoli, D. M. (2011). A 4-year longitudinal investigation of the processes by which parents and peers influence the development of early adolescent girls' bulimic symptoms. *Journal of Early Adolescence*, *31*(3), 390–414. <https://doi.org/10.1177/0272431610366248>
- Satorra, A. (2000). Scaled and adjusted restricted tests in multi-sample analysis of moment structures. In R.D.H. Heijmans, D.S.G. Pollock & A. Satorra (Eds.), *Innovations in multivariate statistical analysis. A Festschrift for Heinz Neudecker* (pp. 233–247). Kluwer Academic.
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research*, *8*(2), 23–74.
- Sehm, M., & Warschburger, P. (2018). Prospective associations between binge eating and psychological risk factors in adolescence. *Journal of Clinical Child & Adolescent Psychology*, *47*(5), 770–784. <https://doi.org/10.1080/15374416.2016.1178124>
- Skinner, H. H., Haines, J., Austin, S. B., & Field, A. E. (2012). A prospective study of overeating, binge eating, and depressive symptoms among adolescent and young adult women. *Journal of Adolescent Health*, *50*(5), 478–483. <https://doi.org/10.1016/j.jadohealth.2011.10.002>

- Slater, A., & Tiggemann, M. (2010). Body image and disordered eating in adolescent girls and boys: A test of objectification theory. *Sex Roles, 63*(1–2), 42–49.
<https://doi.org/10.1007/s11199-010-9794-2>
- Smolak, L. (2015). Eating disorders across the lifespan. In L. Smolak and M. Levine (Eds.) *Wiley handbook of eating disorders* (pp. 479–491). Wiley.
- Steward, T., Menchon, J. M., Jiménez-Murcia, S., Soriano-Mas, C., & Fernandez-Aranda, F. (2018). Neural network alterations across eating disorders: A narrative review of fMRI studies. *Current Neuropharmacology, 16*(8), 1150–1163.
<https://doi.org/10.2174/1570159X15666171017111532>
- 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. <https://doi.org/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. <https://doi.org/10.1037/0012-1649.37.5.597>
- Stice, E., Burton, E. M., & Shaw, H. (2004). Prospective relations between bulimic pathology, depression, and substance abuse: Unpacking comorbidity in adolescent girls. *Journal of Consulting and Clinical Psychology, 72*(1), 62–71.
<https://doi.org/10.1037/0022-006X.72.1.62>
- Stice, E., Hayward, C., Cameron, R. P., Killen, J. D., & Taylor, C. B. (2000). Body-image and eating disturbances predict onset of depression among female adolescents: A longitudinal study. *Journal of Abnormal Psychology, 109*(3), 438–444.
<https://doi.org/10.1037/0021-843X.109.3.438>

- Stice, E., Marti, C. N., & Durant, S. (2011). Risk factors for onset of eating disorders: Evidence of multiple risk pathways from an 8-year prospective study. *Behaviour Research and Therapy, 49*(10), 622–627. <https://doi.org/10.1016/j.brat.2011.06.009>
- Stice, E., Marti, C. N., Shaw, H., & Jaconis, M. (2009). An 8-year longitudinal study of the natural history of threshold, subthreshold, and partial eating disorders from a community sample of adolescents. *Journal of Abnormal Psychology, 118*(3), 587–597. <https://doi.org/10.1037/a0016481>
- Stice, E., & Ryzin, M. V. (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. <https://doi.org/10.1037/abn0000400>
- Swanson, S. A., Crow, S. J., Le Grange, D., Swendsen, J., & Merikangas, K. R. (2011). Prevalence and correlates of eating disorders in adolescents. Results from the national comorbidity survey replication adolescent supplement. *Archives of General Psychiatry, 68*(7), 714–723. <https://doi.org/10.1001/archgenpsychiatry.2011.22>
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Tiggemann, M. (2004). Body image across the adult life span: Stability and change. *Body Image, 1*(1), 29–41. [https://doi.org/10.1016/S1740-1445\(03\)00002-0](https://doi.org/10.1016/S1740-1445(03)00002-0)
- Trace, S. E., Baker, J. H., Peñas-Lledó, E., & Bulik, C. M. (2013). The genetics of eating disorders. *Annual Review of Clinical Psychology, 9*, 589–620. <https://doi.org/10.1146/annurev-clinpsy-050212-185546>
- Udo, T., & Grilo, C. M. (2019). Psychiatric and medical correlates of DSM-5 eating disorders in a nationally representative sample of adults in the United States. *International Journal of Eating Disorders, 52*(1), 42–50. <https://doi.org/10.1002/eat.23004>
- Ullman, J. B. (2001). Structural equation modeling. In B. G. Tabachnick & L. S. Fidell (2001). *Using Multivariate Statistics* (4th ed.) (pp. 653- 771). Allyn & Bacon.

- Vandenbosch, L., Fardouly, J., & Tiggemann, M. (2022). Social media and body image: Recent trends and future directions. *Current Opinion in Psychology*, *45*, 101289. <https://doi.org/10.1016/j.copsyc.2021.12.002>
- von Soest, T., & Wichstrøm, L. (2014). Secular trends in depressive symptoms among Norwegian adolescents from 1992 to 2010. *Journal of Abnormal Child Psychology*, *42*(3), 403–415. <https://doi.org/10.1007/s10802-013-9785-1>
- Wertheim, E. H., & Paxton, S. J. (2012). Body image development – adolescent girls. In T. Cash (Ed.), *Encyclopedia of body image and human appearance* (pp. 187–193). Academic Press. <https://doi.org/10.1016/B978-0-12-384925-0.00029-8>
- Wichstrøm, L. (1995a). Social, psychological and physical correlates of eating problems: A study of the general adolescent population in Norway. *Psychological Medicine*, *25*(3), 567–579. <https://doi.org/10.1017/S0033291700033481>
- Wichstrøm, L. (1995b). Harter's Self-Perception Profile for Adolescents: Reliability, validity, and evaluation of the question format. *Journal of Personality Assessment*, *65*(1), 100–116. https://doi.org/10.1207/s15327752jpa6501_8
- Wichstrøm, L. (2000). Psychological and behavioral factors unipredictive of disordered eating: A prospective study of the general adolescent population in Norway. *International Journal of Eating Disorders*, *28*(1), 33–42.
- Wichstrøm, L., & von Soest, T. (2016). Reciprocal relations between body satisfaction and self-esteem: A large 13-year prospective study of adolescents. *Journal of Adolescence*, *47*, 16–27. <https://doi.org/10.1016/j.adolescence.2015.12.003>

Table 1. Descriptive statistics and bivariate correlations for men and women from adolescence (T1) to adulthood (T5)

Variables	Men	Women															
	(<i>n</i> = 1,278)	(<i>n</i> = 1,527)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Disordered Eating T1	1.48 (0.32)	1.71 (0.38)		0.54	0.32	0.28	0.24	0.25	0.19	0.12	0.10	0.07	0.29	0.26	0.20	0.21	0.14
2. Disordered Eating T2	1.43 (0.31)	1.74 (0.38)	0.59		0.38	0.32	0.33	0.21	0.30	0.18	0.13	0.14	0.28	0.39	0.26	0.26	0.20
3. Disordered Eating T3	1.44 (0.29)	1.71 (0.39)	0.35	0.45		0.54	0.38	0.14	0.21	0.30	0.20	0.17	0.16	0.23	0.38	0.34	0.25
4. Disordered Eating T4	1.47 (0.34)	1.63 (0.39)	0.29	0.33	0.51		0.49	0.15	0.22	0.25	0.26	0.19	0.21	0.23	0.29	0.45	0.31
5. Disordered Eating T5	1.62 (0.32)	1.69 (0.37)	0.28	0.29	0.36	0.52		0.19	0.22	0.18	0.23	0.27	0.19	0.18	0.25	0.33	0.36
6. Depressive symptoms T1	1.59 (0.51)	1.81 (0.58)	0.32	0.20	0.13	0.10	0.16		0.46	0.35	0.28	0.24	0.32	0.25	0.17	0.16	0.17
7. Depressive symptoms T2	1.57 (0.50)	1.91 (0.60)	0.24	0.29	0.16	0.17	0.13	0.54		0.38	0.29	0.29	0.22	0.29	0.20	0.18	0.21
8. Depressive symptoms T3	1.61 (0.55)	1.81 (0.62)	0.11	0.15	0.30	0.23	0.15	0.30	0.38		0.43	0.39	0.19	0.23	0.37	0.25	0.24
9. Depressive symptoms T4	1.56 (0.55)	1.63 (0.58)	0.11	0.15	0.24	0.37	0.25	0.23	0.31	0.41		0.47	0.18	0.20	0.26	0.34	0.30
10. Depressive symptoms T5	1.68 (0.56)	1.83 (0.65)	0.12	0.14	0.17	0.21	0.30	0.25	0.29	0.35	0.48		0.16	0.18	0.23	0.22	0.37
11. Appearance dissatisfaction T1	2.20 (0.62)	2.58 (0.64)	0.29	0.25	0.21	0.17	0.18	0.23	0.24	0.13	0.08	0.13		0.59	0.38	0.41	0.35
12. Appearance dissatisfaction T2	2.08 (0.63)	2.57 (0.66)	0.22	0.35	0.28	0.24	0.19	0.18	0.30	0.19	0.15	0.18	0.64		0.47	0.46	0.39
13. Appearance dissatisfaction T3	2.05 (0.63)	2.42 (0.63)	0.16	0.23	0.47	0.29	0.27	0.14	0.22	0.33	0.18	0.21	0.41	0.53		0.64	0.53
14. Appearance dissatisfaction T4	2.07 (0.63)	2.36 (0.63)	0.19	0.18	0.29	0.48	0.33	0.10	0.18	0.24	0.33	0.30	0.37	0.48	0.58		0.63
15. Appearance dissatisfaction T5	2.17 (0.58)	2.41 (0.62)	0.15	0.16	0.21	0.31	0.45	0.18	0.18	0.23	0.30	0.48	0.35	0.40	0.50	0.62	

Note. Pearson correlations for women under the diagonal. Pearson correlations for men above the diagonal. Intercorrelations of $r = |.11|$ or above are statistically significantly different from zero at $p < .001$. T-test mean differences by gender are statistically significant for depressive symptoms at $p = .004$ and all other variables at $p < .001$.

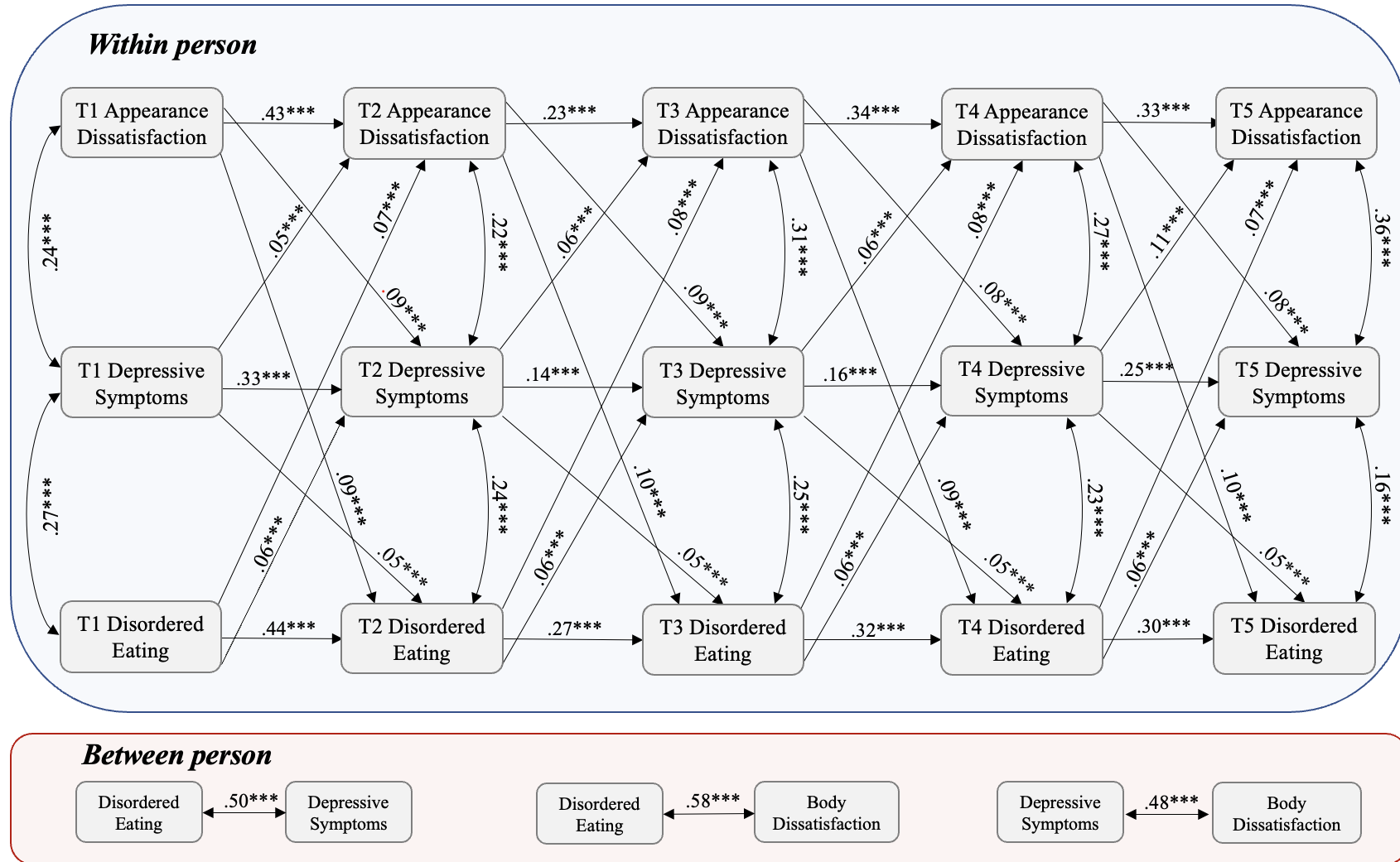


Figure 1. RI-CLPM examining the association between appearance dissatisfaction, depressive symptoms, and disordered eating among boys and girls. T1=1992, age range 12-18; T2=1994, age range 14-21; T3=1999, age range 19-26, T4=2005, age range 26-32; T5=2020, age range 41-47. Standardized coefficients are depicted. RMSEA = .018, CFI = .995, TLI = .992, SRMR =.023. *p < .05, **p < .01, ***p < .001.

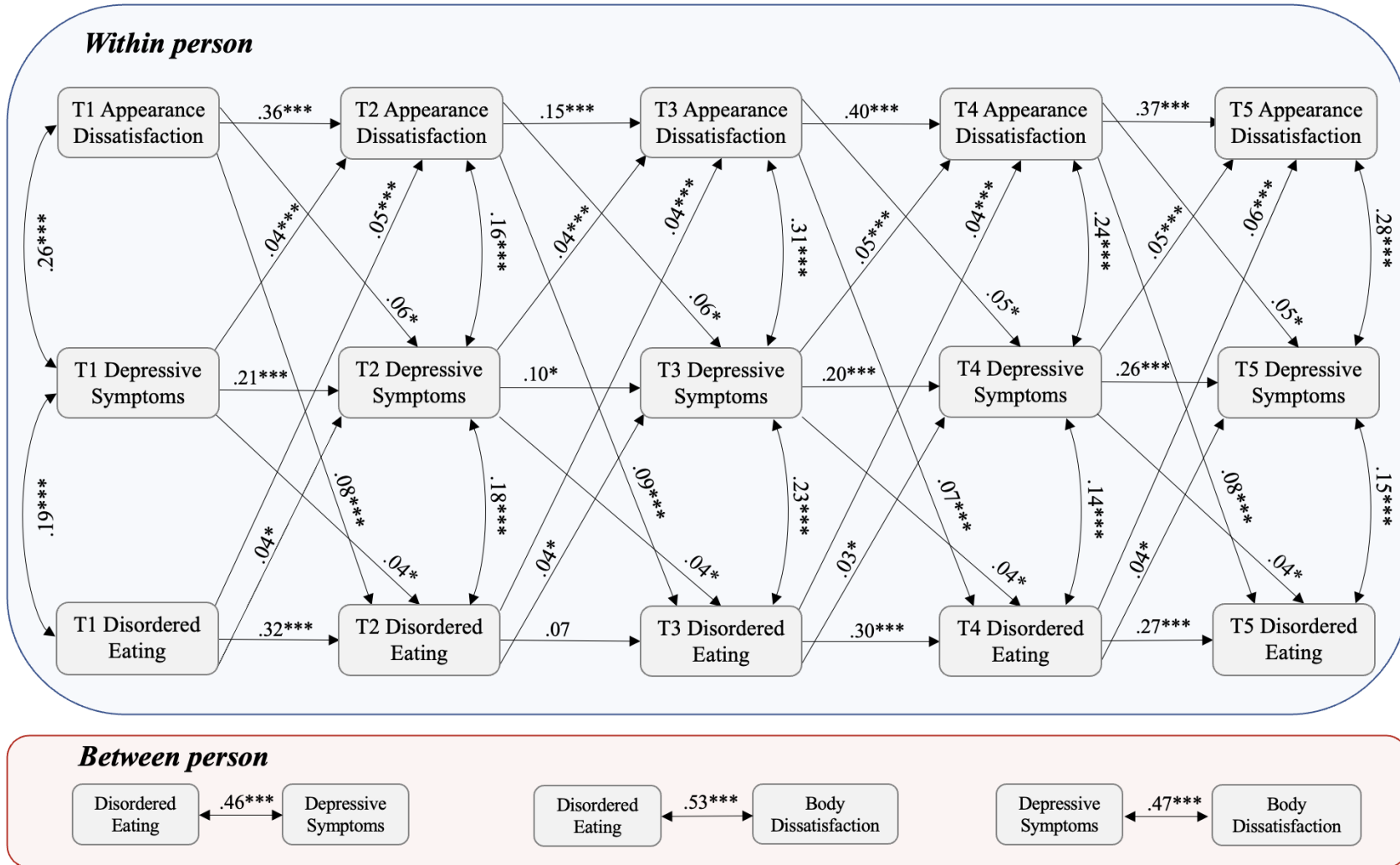


Figure 2. Multigroup RI-CLPM for males (cross-lagged paths constrained across time, except the path from appearance dissatisfaction on depressive symptoms). T1=1992, age range 12-18; T2=1994, age range 14-21; T3=1999, age range 19-26, T4=2005, age range 26-32; T5=2020, age range 41-47. Standardized coefficients are depicted. RMSEA = .016, CFI = .995, TLI = .992, SRMR = .029. *p < .05, **p < .01, ***p < .001.

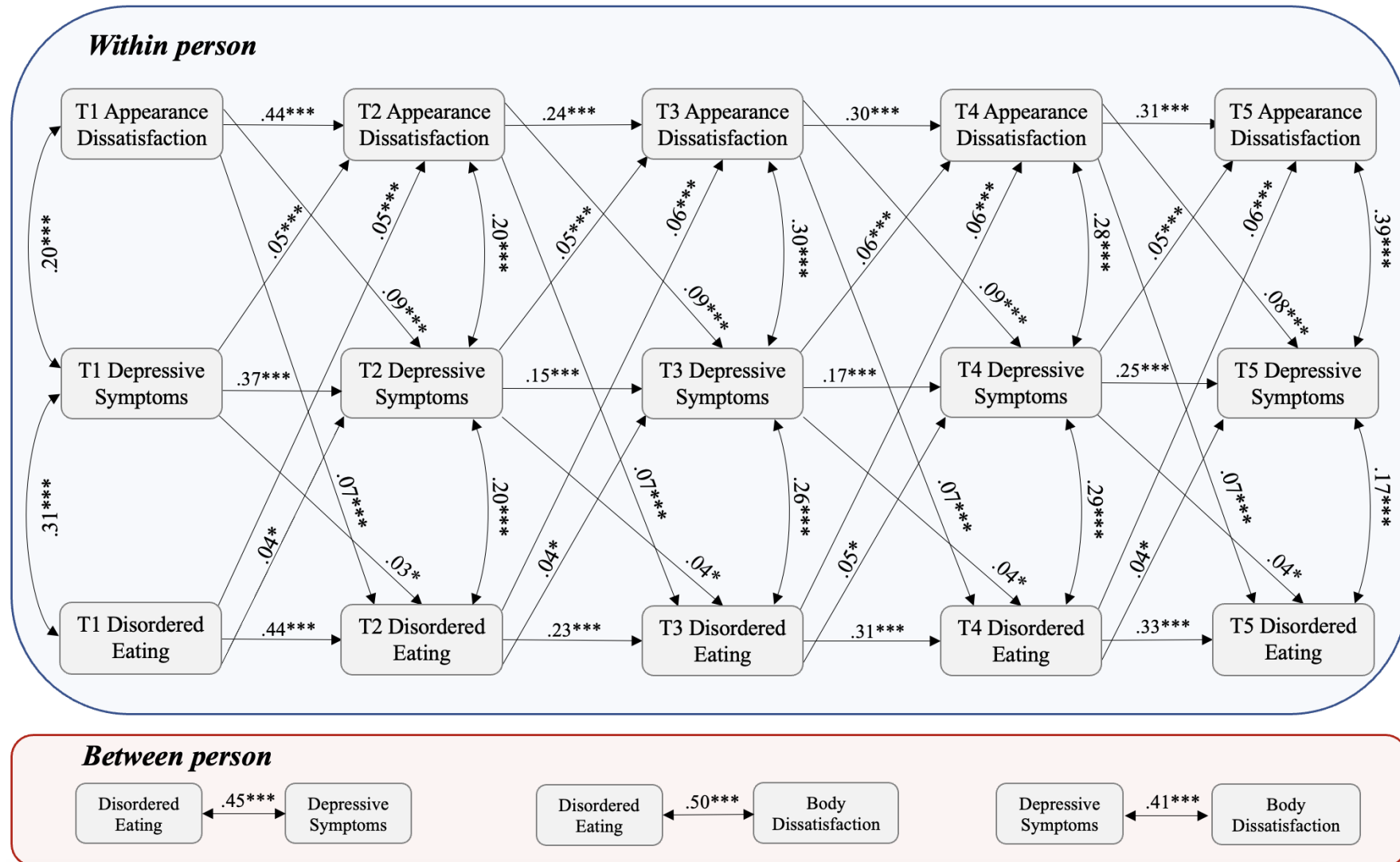


Figure 3. Multigroup RI-CLPM for females (cross-lagged paths constrained across time, except the path from appearance dissatisfaction on depressive symptoms). T1=1992, age range 12-18; T2=1994, age range 14-21; T3=1999, age range 19-26, T4=2005, age range 26-32; T5=2020, age range 41-47. Standardized coefficients are depicted. RMSEA = .016, CFI = .995, TLI = .992, SRMR = .029. *p < .05, **p < .01, ***p < .001.