Predicting Anorexia Nervosa Symptom Change Using Body Image Disturbance

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Abstract

According to the DSM- V, *body image disturbance* (BID) is a core feature of *anorexia nervosa* (AN). Despite this, the ability to predict *eating disorder symptom changes* using *body image disturbance* measures is an underdeveloped aspect of psychological literature. In the present study, changes in *body attitudes* were used to predict symptom change in *anorexia nervosa*. This prediction was compared to that of similar measures of *cognitive BID*. *METHOD:* Participants ($n = 73$) were adolescent clinical patients just starting treatment, two measures were taken 1 year apart. T-tests and linear regression were used to identify differences and evaluate predictive strength. It was hypothesized that measures of *body attitudes* and *cognitive BID* changed over time, and these changes would successfully predict changes in symptom scores. Changes in *body attitude* were hypothesized to be the strongest predictor, in accordance with previous research. *RESULTS: Body attitude* changes significantly explained 33.6% of *symptom change* variance, and were the strongest predictor of *eating disorder symptom change*. These findings mirror previous study results. Our results suggest that body image disturbance may have maintaining influence in AN, and have implications for AN treatment.

Keywords: *body image disturbance; anorexia nervosa; eating disorder symptom change: body attitude; cognitive body image disturbance, body dissatisfaction, body shape concern.*

Predicting Anorexia Nervosa Symptom Change Using Body Image Disturbance

The concept of body image has been gaining increased attention over the last few decades. The general population is learning that body image is more complex and far-reaching than hypocritical social media posts, and can lead to clinical complications that endanger people's lives. As a result of this there have been several body-positive movements across social media encouraging confidence and appreciation of our own bodies. So, as the public begins to learn of the importance of body image and is becoming more aware of its negative consequences, how does body image affect eating disorder patients? More specifically, how does body image affect the maintenance of Anorexia Nervosa?

Anorexia Nervosa (AN) is an eating disorder with a relatively high mortality rate, around 5 – 10% (Hoek & van Hoeken, 2003). The negative impacts on your physiology, social interactions, behaviour and thinking can lead to serious harm down the road for AN patients. Current estimations of AN prevalence land around 0.3 – 1% of women; with men showing a lower prevalence rate accompanied by an increase over the last few years (Hoek & van Hoeken, 2003). Since the 1950's AN prevalence has been increasing, particularly in women aged 15- 24 years old. It is estimated that only one third of AN patients are receiving mental health care (Hoek & van Hoeken, 2003). AN patients receiving treatment show the following outcomes; 50% recover, 20 – 30% enter partial remission, 10 - 20% remain seriously ill and 5 - 10% die due to related causes (Steinhausen, 2002; Wilson et al., 2008). The longer someone experiences AN, the higher their mortality rate is, increasing 0.56% every year, or 5.6% every decade. (Sullivan, 1995)

AN clearly poses a serious risk to those it affects, so logically the first question is about the treatment and its efficacy. Cognitive Behavioural Therapy is used as the default AN treatment for around 60% of clinicians. Despite this, clinicians have reported dissatisfaction with CBT and manual based therapies to treat AN, citing its lack of client personalization as a

major disadvantage (Block, 2014). There also seems to be a gap between researchers and clinicians' values, affecting the extent to which new scientific theory can be utilized to benefit patients (Block, 2014). Diagnosing AN also has its own pitfalls, with BMI having a disputed reputation yet being used as a major criterion for multiple eating disorders, and with eating disorders having a high comorbidity of symptoms (Castellini et al., 2011).

The ability to understand and prevent the maintenance of AN is becoming increasingly important, as it could help clinicians to intervene, prevent and reduce serious symptom development. One of the main interests in this field is the effect of body image. The ways in which we think about, perceive and behave regarding our bodies seem to have logical links to eating disorder symptomology. This paper is concerned with changes of body image disturbance in relation to the maintenance of anorexia nervosa.

Previous Findings Regarding Body Image Disturbance

The Diagnostic and Statistical Manual of Mental Disorders (DSM 5) classifies anorexia nervosa as an eating disorder with; a restriction of eating causing a significantly low weight, a consistent fear of weight gain and a disturbance in the perception of the patient's own body weight or shape/ an undue influence of weight or shape on self- judgement (5th ed.; DSM–5; American Psychiatric Association, 2013). The last criterion pertaining to body image disturbance (BID) is of particular import as it accompanied by challenges of conceptualization and measurement. More specifically, the way in which clinicians and researchers conceptualize and measure BID varies along with conflated terminology, presenting difficulties in collecting converging and diverging evidence alike (Thompson, 2004). Because of this, the possible ways in which BID influences the maintenance of AN are not directly clear and there are alternating theories (Brytek-Matera & Czepczor, 2017). Furthermore there is evidence of eating disorder patients having similar symptoms and

fluctuating between differing diagnoses, making it difficult to narrow down body image findings to specific eating disorders (Castellini et al., 2011; Fairburn et al., 2003). The goal of this section is to summarize research pertaining to the interactions and pathways whereby BID influences the maintenance of AN.

In the DSM 5 body image disturbance in anorexia nervosa is described as a disturbance in the individual's way of perceiving his or her body weight/shape, an undue influence of body weight or body shape on self-judgment, or lack of acknowledgement about the severity of the current low body weight, (American Psychiatric Association, 2013). Within eating disorder research "Body Image Disturbance" has been separated into several smaller factors: cognitive, behavioural and perceptive body image disturbance (see Glashouwer et al., 2019, for a detailed review). Cognitive BID concerns disturbances in what we think about our own bodies (body image attitudes) as well as the extent to which we value our weight and or shape (weight/shape over-valuation).

According to the transdiagnostic cognitive behavioural theory for eating disorders, cognitive BID plays a central role in the maintenance of eating disorder pathology (Fairburn et al., 2003). Both weight/shape over-valuation and body attitudes are theorized to affect concentration on eating, excessive satiety and reinforce maladaptive mechanisms within eating disorders (Brytek-Matera & Czepczor, 2017; Fairburn et al., 2003). Similarly, the cognitive behavioural model of anorexia nervosa describes a process where over-valuation of body and shape during high arousal magnifies imperfections and encourages further scrutiny of the body, and this cycle reinforces restrictive behaviour (Fairburn et al., 1999).

Regarding empirical support there has been mixed evidence for the effect of body dissatisfaction in regards to AN maintenance, with some finding associations (Amianto, 2017) and some not (Howard et al., 1999). That is not to say that there is *not any* evidence of

a relationship; AN patients show higher frequencies of assumptions and beliefs related to eating disorders than control populations, and these variables were effective in distinguishing between AN and non-eating disorder participants (Cooper & Turner, 2000) Furthermore, women with eating disorders are shown to have higher body dissatisfaction than non-clinical populations, with moderate to large effect sizes (Cash & Deagle, 1997). AN patients with greater body dissatisfaction are also more often re-hospitalized after recovery (Castro et al., 2004).

Danielsen and Rø (2012) demonstrated that changes in body attitudes significantly predicted changes in AN symptomology, with 39% of symptom change variance accounted for. However, there is little other research that utilises body attitudes to predict changes in eating disorder symptoms (Danielsen and Rø, 2012). Replication studies in this area could help to solidify and test previous findings. Furthermore, a comparison of the predictive strengths of measures of body attitudes, body dissatisfaction and over-valuation of body shape in relation to AN symptomology could help to elucidate the extent to which they are delineated, or if they have differing relationships to AN maintenance. Such are the aims of the present study, which will include measures of body dissatisfaction, body attitudes and body shape concern.

The Present Study

The present study is concerned with changes in body image disturbance in relation to AN maintenance. Previous studies have measured BID change over time in general populations, see the review from Karazsia et al. (2017), but the same cannot be said for clinical AN samples (Danielsen and Rø, 2012). The hope is that the specificity of this study (adolescent female AN patients receiving/finished treatment over one year) as well as its longitudinal design could help produce more specific and clinically applicable findings.

Question 1

Thus, the main research question of this study is: Did eating disorder and body image measures change, and if so in what way did they change? The first question is a simple test to detect a difference between Time 1 (T1) and Time 2 (T2) measurements. Because participants were either being treated or had completed treatment during this interval, the expectation is that scores will have decreased.

Did scores of body image disturbance and eating disorder symptoms change over one year?

Hypothesis 1. The scores decreased between T1 and T2.

Question 2

The second question concerns the direction of change of the BID variables (see question 2 below). Differing rates of changes are expected, as the aim is to see if these aspects of cognitive BID are separate, delineated constructs; and the logical assumption is that if they are separate they will likely not change at the same rates.

Did the scores of cognitive BID (body attitude, body dissatisfaction and shape concern) show differing growth/ decline when compared?

Hypothesis 2. The BID variables' scores changed at differing rates between T1 and T2.

Question 3

Question 3 attempts to explore the relative predictive power of the cognitive BID variables (body dissatisfaction and shape concern). Hypothesis 3 is expected to receive support as previous studies have detailed the predictive power of similar variables (for body

dissatisfaction see Schlegl, et al. (2014); for shape concern see Ricca et al. (2010)). The relative predictive strengths of the components of BID when compared to each other are also of interest, and it is expected that body dissatisfaction has the most predictive strength. This is hypothesized as there is evidence that attitudinal based disturbances in BID are more influential than other forms (Mölbert et al., 2017; Cash & Deagle, 1997).

Did change in body dissatisfaction and shape concern predict eating disorder symptom change, and how do their predictive strengths differ?

Hypothesis 3. Changes in both variables explain significant variance of eating disorder symptom change, and body dissatisfaction will have the strongest predictive power.

Question 4

Based on the work of Danielsen and Rø (2012), question 4 seeks to provide further evidence of body attitudes predictive strength on AN symptom change. Cash & Deagle (1997) noted that body attitudes seemed to be the strongest predictor when compared to other forms of BID, and so a comparison between body attitudes, body dissatisfaction and shape concern could prove to be very informative. It is expected that changes in body attitude significantly predict eating disorder symptomology, and body attitudes are suspected to have relatively strong predictive strength when compared to that of body dissatisfaction and shape concern, based off of the findings of Cash & Deagle (1997), Danielsen and Rø (2012) and Mölbert et al. (2017).

Did changes in body attitude significantly explain variance in eating disorder symptoms along with other cognitive BID components?

Hypothesis 4. Changes in body attitude significantly explain variance in eating disorder symptoms separately as well as with cognitive BID components.

Method

Participants and Procedure

In total 73 participants were measured. Data collection took place from 2012 to 2014, at the Center for Eating Disorders of Accare Child and Adolescent Psychiatry (Smilde, the Netherlands). Participants were diagnosed with Anorexia Nervosa and were starting treatment. At T1 participants started treatment and by T2 (one year later) participants were at differing points of treatment, consisting of both in and out-patients. Because the participants were collected from a youth oriented institution the average age was 15.10 ($\bar{x}$ = 15.10; SD = 1.90); and ranged from 12 to 23 years of age. The average BMI at T1 was 16.12 (SD = 1.86; Min = 12; Max = 20). All participants were female. Participants were briefed with the information that the study was concerning factors involved with AN maintenance. Questionnaires were completed by paper. Participants and their guardians were required to consent for the study.

The Eating Disorder Examination was used as an inclusion criterion (EDE Children; BryantWaugh et al., 1996; Dutch version: Decaluwe & Braet, 1999). The sample consisted of varying levels of criteria met for AN patients: DSM IV anorexic restrictive eating type, patients who met most but not all of the criteria including patients with menses, those considered only light underweights (1-15%; n = 16), patients who were nonfat phobic AN, and other partial AN patients (meeting 2/4 criteria).

Due to unknown circumstances there was a significant drop out rate between T1 and T2 (48%). It is unclear why the dropout rate was so large but it could be due to nonresponse,

patients finishing treatment, death between T1 and T2, or other unknown reasons. To deal with this issue multiple imputation was used. Multiple imputation is a data imputation method that creates new sets of data of a dependent variable using available information from independent variables and predicting new data using those existing relationships and distributions. It then adds a random factor that is not dissimilar to random error. Maximum and minimum values of the variables are entered, and this coupled with the use of relationships/distributions of other variables means the new data is within the bounds of the existing data, and maintains its previous relationships with other variables.

There are common concerns that using multiple imputation on datasets with high amounts of missing data such as the present dataset is error prone and risks undermining validity. However, van Ginkel et al. (2020) goes into great detail in investigating such misconceptions, including the misconception that using multiple imputations leads to biased datasets that misrepresent the imputed variables. In the present study, pooled information from 5 imputed datasets was used to account for missing data.

Measures

Body Attitude Test

Body attitudes were measured using the Dutch version (LAV: Lichaamsattitudevragenlijst) of the Body Attitudes Test (BAT: Probst et al., 1992). The goal of the assessment is to quantify body attitudes of eating disorder patients. The LAV is a self-report measure focusing on *negative assessment of body size*, *lack of familiarity with one's own body* and *general dissatisfaction with the body*, which act as its respective subscales.

In total the LAV contains 20 questions which participants answer on a 6 point scale ranging from 0 (never) to 5 (always). An example item is "I feel my body as a burden I have

to carry". The items are added to create subscales, and the subscales are added to get the total score. The LAV has a minimum score of 0 and a maximum of 100; with a higher score marking increased body attitude distortion. The LAV subscales have the following maximum scores: *negative body size estimation* has 35, *lack of body familiarity* has 35 and *general dissatisfaction* has 20.

Eating Disorder Examination (Questionnaire Children)

The Eating Disorder Examination Questionnaire (EDE-Q) is a self-report questionnaire which assesses patient eating disorder symptomology over the past 28 days (Fairburn & Bèglin, 1994). The children version was used as the sample consisted of youths. The EDE-Q consists of 30 questions. 22 questions are answered by how many times in the past 28 days the event in question occurred, which corresponds to a 6 point scale, for example; 0 represents none at all and 3 represents 13-15 days. An example is "in the past 28 days have you had a definite fear that you might gain weight?" The final 8 are answered by multiple choice questions on a scale ranging from 0 (not at all) to 6 (very much). "Has your weight influenced how you think about (judge) yourself as a person?" is one such example item. Each question regardless of format has a minimum score of 0 and a maximum of 6.

The questionnaire has four subscales: *Restraint*, *Eating Concern*, *Shape Concern* and *Weight Concern*, with each measuring its own section of eating disorder symptomology. Restraint covers the participants' experience restricting food intake; eating/shape/weight concern subscales measure the participants' experience in ruminating and spending time thinking about the respective themes.

The EDE-Q Children achieved a sufficient interrater reliability of $r = .91$ (Watkins et al., 2005). It also achieved good cronbach alphas demonstrating high internal consistency, ranging from $\alpha = .80$, .91, .90, and .88 respectively. The EDE-Q distinguishes between

anorexic and control participants quite well; achieving significant results at the $p < .01$ level for all of its subscales.

The Eating Disorder Examination (EDE: BryantWaugh et al., 1996) was used as an inclusion criterion for participation. It has the same subscales and items as the EDE-Q, the only differences being the EDE is completed by an interviewer whilst the EDE-Q is the self-report version, and the values/ scoring differ slightly.

Eating Disorder Inventory II

The EDI II (EDI: Garner, 1991) is a multidimensional self-report measure used to measure the presence of eating disorder symptoms. It has 91 items with 11 subscales. The subscales include: *drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fears, asceticism, impulse regulation and social insecurity*. Each item is answered by responding to a 6 point scale which ranges from never (0) to always (6). An example of an item includes "I feel extremely guilty when I have eaten too much". The scores can be interpreted using the subscales for specific indices, or the total score can be used to represent general eating disorder symptomology. In the present study the body dissatisfaction subscale as well as the total scores was used.

Analyses

In line with Danielsen and Rø (2012), changes in LAV scores were used to predict changes in EDI total scores. Danielsen and Rø also included BMI as a predictor in their regression and this is where some deviation occurs. Instead of BMI, the present study will compare changes in body attitude (LAV total scores) with changes in measures of body dissatisfaction (body dissatisfaction subscale of the EDI) and shape concern (shape concern

subscale of the EDE-Q). The comparison of the predictive strengths of these variables (body attitude, body dissatisfaction and shape concern) was made to replicate previous research (Danielsen and Rø, 2012), establish the strongest predictor, as well as to find an optimal predictive model of eating disorder symptom change. Changes in EDI total scores were predicted using these variables, and represent changes in eating disorder symptomology.

As was done in Danielsen and Rø (2012), the body dissatisfaction subscale was not included when calculating EDI total scores, in an attempt to limit collinearity, and these modified EDI total scores were used across all analyses. Data analyses were completed using IBM SPSS Statistics for Windows, Version 24.0.

Hypothesis 1

Did scores of body image and eating disorder symptoms change over one year? To establish a difference of means, paired T tests were used. These analyses were used on EDI total scores, EDE-Q total scores, LAV total scores, the body dissatisfaction subscale of the EDI and the shape concern subscale of the EDE-Q.

Hypothesis 2

Did the scores of cognitive BID (body attitude, body dissatisfaction and shape concern) show differing growth/ decline when compared? New variables using percentage of difference between T1 and T2 were calculated for body dissatisfaction, shape concern and body image attitude measures. Paired t-tests using a Bonferroni correction were calculated to evaluate significant differences.

Hypothesis 3

Did change in body dissatisfaction and shape concern predict eating disorder symptom change, and how do their predictive strengths differ? Changes in body

dissatisfaction and shape concern from T1 to T2 were used as predictor variables in a linear

multiple regression analysis. Change in EDI total scores was the dependant variable.

Stepwise linear regression was used.

Hypothesis 4

*Did changes in body attitude significantly explain variance in eating disorder

symptoms along with other cognitive BID components?* Change between T1 and T2 was

calculated for the LAV total scores, and then used in linear regression to predict change in

EDI total scores. Another model was created to include both components of BID and the

LAV for comparison of predictive strength. For the LAV model Enter selection was used,

and for the combined model Stepwise selection was used.

Results

Correlations

Preliminary Pearson correlations between change variables including LAV total, body

dissatisfaction, body shape concern and EDI total were calculated, seen below in Table 1. In

general, most relationships showed moderate correlations (from $r = .47$ to $r = .58$), with the

exception of LAV Total Change and Body Shape Change which had a strong correlation ($r = .79$).

Table 1.

Correlation of Regression Variables

	LAV Total Change	Body Shape Change [a]	Body Diss. Change [b]
Body Shape Change [a]	.791		
Body Diss. Change [b]	.481	.474	
EDI Total Change	.581	.566	.569

a. Body Shape Concern subscale of EDE-Q, change between T1 & T2
b. Body Dissatisfaction subscale of EDI, change between T1 & T2

Longitudinal Variable Change

The first analyses carried out were to determine if the total scores of eating disorder symptomology and body attitudes changed between T1 and T2. To accomplish this paired t-tests were used. As observed in Table 2, there were significant differences between T1 and T2 for the eating disorder symptom measures: *EDI t*(359) = 13.95, *p* < .001; *EDE-Q* t(386) = 15.78, *p* < .001. All measures of body image disturbance also showed significant differences between T1 and T2: *LAV t*(356) = 5.36, *p* < .001*; Body Shape Concern t*(391) = 12.76, *p* < .001*; Body Dissatisfaction t*(403) = 33.86, *p* < .001. These analyses showed both eating disorder symptom measures and BID measures significantly changed over the course of one year.

Table 2.

Paired t-tests of the EDI, EDE-Q, EDE and LAV total scores over time.

Pairs	Mean Difference	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
EDI Total T1 & T2*	40.83	55.54	2.93	13.95	359	< .001
EDEQ Total T1 & T2*	7.58	9.45	.48	15.78	386	< .001
LAV Total T1 & T2*	5.91	20.82	1.10	5.36	356	< .001
Body Shape T1 & T2[a]*	1.19	1.85	.09	12.76	391	< .001
Body Dissatisfaction T1 & T2[b]*	13.91	8.26	.41	33.86	403	< .001

a: Body Shape Concern subscale of EDE-Q
b: Body Dissatisfaction subscale of EDI
*: Significant difference at the $p < .001$ level

Differences in Change amongst Component BID Variables

To compare differences rates of change among cognitive BID variables, new percentage change variables were calculated. All 3 variables had negative means (see Table 3), with decreases on average as follows: LAV = -5.91%, Body Shape = -19.85% and Body Dissatisfaction = -25.77%. In terms of participants; 60.8% of participants showed decreased LAV scores, 66.2% for body shape and 84.7% of participants had decreased scores for body dissatisfaction. This is demonstrated in Figures A, B and C below, and confirms that body dissatisfaction decreased the most and had the highest proportion of decreases, followed by body shape concern and then the LAV.

Table 3.

Descriptive Statistics of Percentage Change Variables

	Mean	Std. Deviation	Minimum	Maximum
Body Dissatisfaction [a]	-25.77%	15.30	-68.52%	23.00%
Body Shape [b]	-19.85%	30.80	-93.75%	59.20%
LAV[c]	-5.91%	20.82	-55.00%	49.70%

a. Body Dissatisfaction subscale of EDI, percentage change between T1 & T2
b. Body Shape Concern subscale of EDE-Q, percentage change between T1 & T2
c. LAV Total, percentage change between T1 & T2
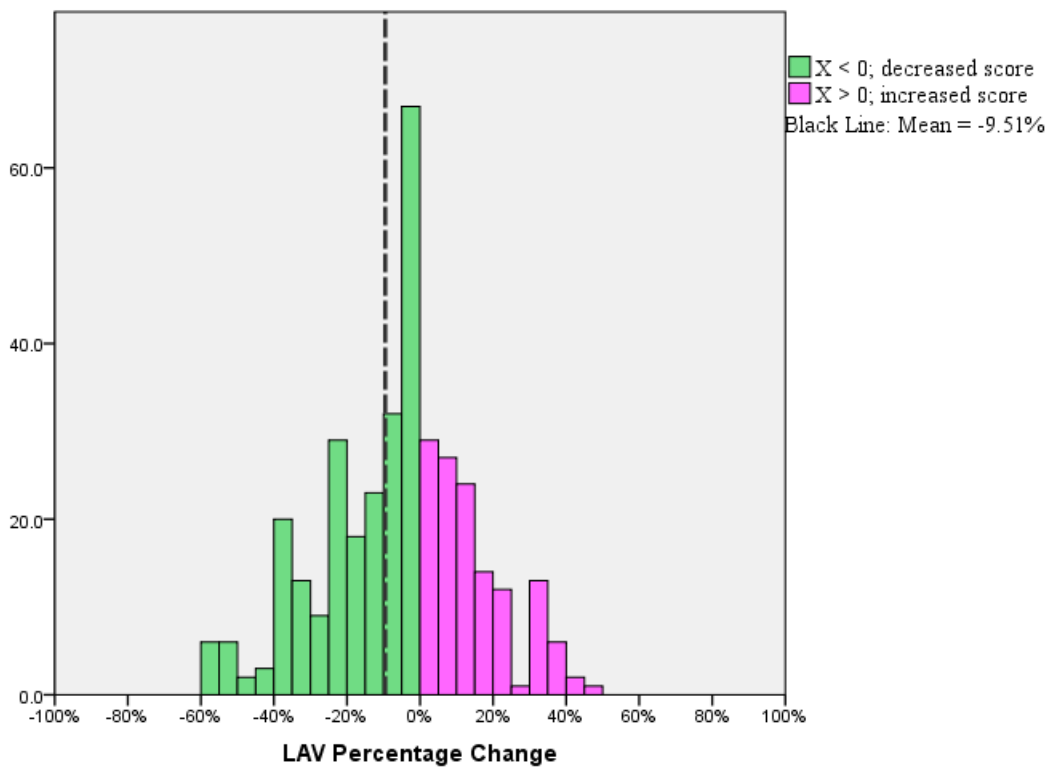
Figure A.

LAV Percentage Change - Distribution.

Figure B.

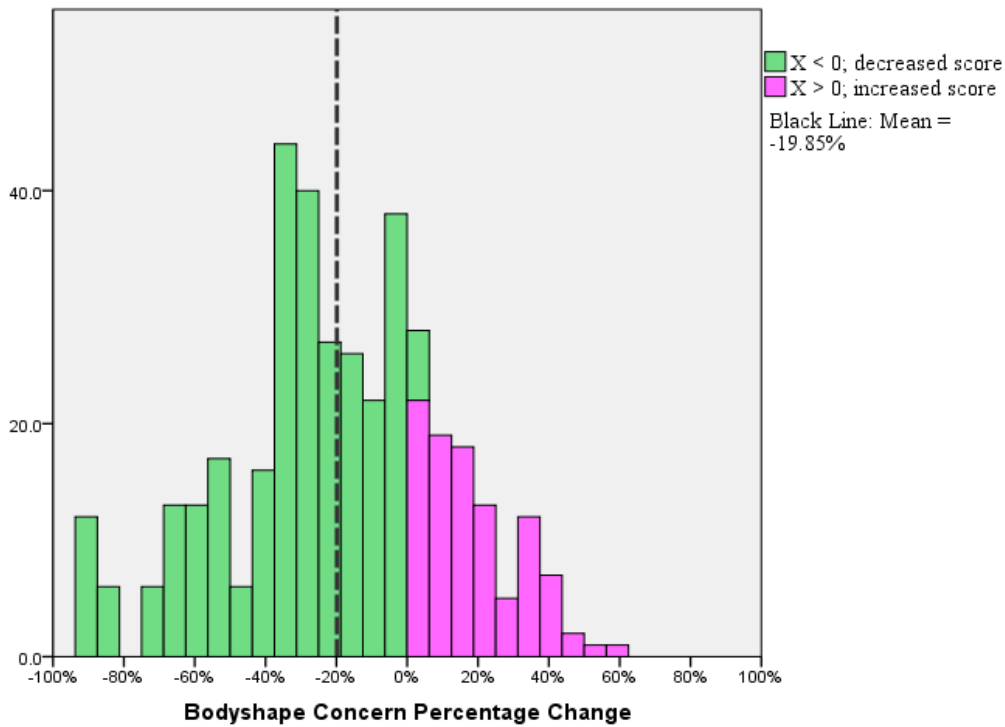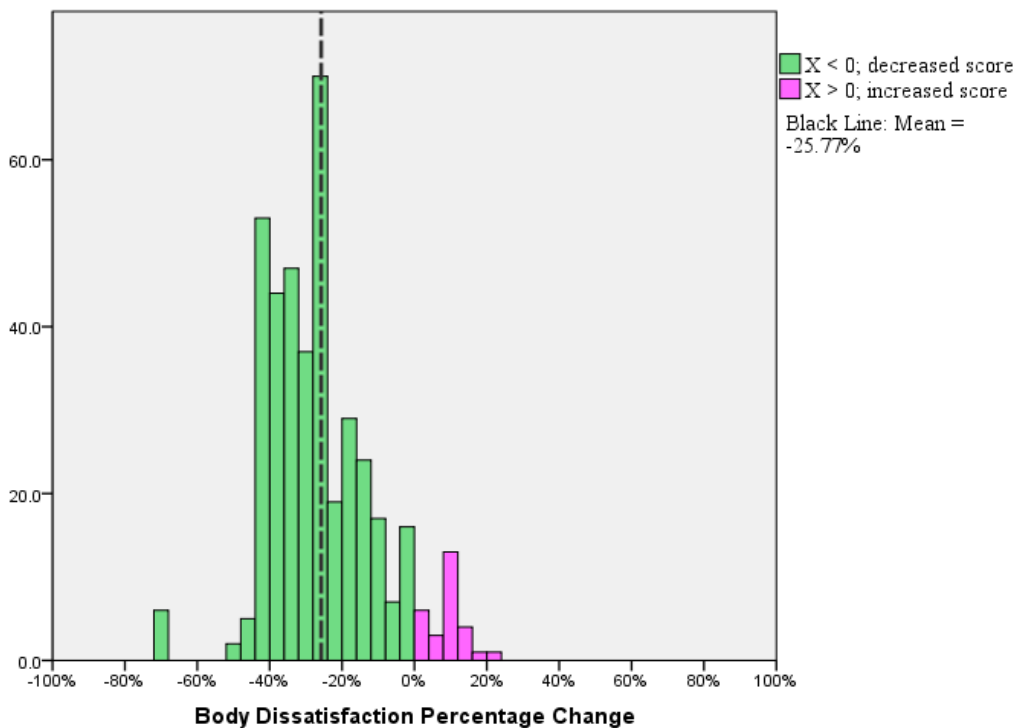*Body Shape Concern Percentage Change - Distribution*

Figure C.

Body Dissatisfaction Percentage Change - Distribution.

A Bonferroni correction was used to compute three paired t-tests at the pooled alpha of α = .05 (α = .167 individually), in order to evaluate significant differences in rates of change. All three pairs showed significant differences: (body dissatisfaction & body shape concern: $t(391) = -4.19$, $p < .001$; body dissatisfaction & LAV: $t(356) = 19.26$, $p < .001$; LAV & body shape concern: $t(344) = 12.99$, $p < .001$)), indicating these variables decreased at different rates.

Table 4.

Bonferroni T-Tests; Differing Rates of Change

Pairs	Mean Difference	Std. Deviation	Std. Error Mean	t	Df	Sig. (2-tailed)
Body Dissatisfaction [b] & Body Shape [a]*	-5.74	27.13	1.37	-4.19	391	< .001
Body Dissatisfaction [b] & LAV[c]*	-19.51	19.14	1.01	-19.26	356	< .001
LAV[c] & Body Shape [a]*	13.13	18.78	1.01	12.99	344	< .001

a. Body Shape Concern subscale of EDE-Q, percentage change between T1 & T2
b. Body Dissatisfaction subscale of EDI, percentage change between T1 & T2
c. LAV Total, percentage change between T1 & T2
d. *: Significant difference at the *p* < .001 level

Change in Body Dissatisfaction and Body Shape Concern on Eating Disorder Symptomology

A linear stepwise regression was used to determine the predictive strengths of body dissatisfaction and body shape. A summary of the regression can be seen below in Table 5. In the first step body dissatisfaction was included as the strongest predictor, and the final step also included body shape concern. The final model yielded an adjusted 43.8% of variance

explained ($F(1,347) = 169.45$, $p < .001$, $R_{adj}^2 = .438$). Both body dissatisfaction change and body shape concern change significantly predicted EDI total change ($\beta = 2.67$, $p < .001$ and $\beta = 11.57$, $p < .001$ respectively). Comparing adjusted R^2 between the two models showed that adding body shape concern change in the final model explained an additional 11.2% variance.

Table 5.

Coefficients of BD & BS Regression Model[a]

Model		Unstandardized Coefficients		Standardized Coefficients			
		B	Std. Error	Beta		t	Sig.
1	(Constant)	14.10	4.90			2.88	.004
	Body Dissatisfaction[b]	3.88	.30	.57		13.02	< .001
2	(Constant)	11.14	4.49			2.48	.014
	Body Dissatisfaction[b]	2.67	.31	.39		8.67	< .001
	Body Shape[c]	11.53	1.38	.38		8.38	< .001

a. Dependent Variable: EDI Total, change between T1 & T2
b. Body Dissatisfaction subscale of EDI, change between T1 & T2
c. Body Shape Concern subscale of EDE-Q, change between T1 & T2

Body Attitude Change Predicting Eating Disorder Symptomology

Next was the predictive strength of change in body attitude on EDI total change. First a single model using LAV change scores alone to predict EDI change scores at T2 was constructed using enter variable selection, and the resulting figures can be found in Table 6. Changes in LAV alone significantly predicted eating disorder symptomology ($\beta = 1.52$, $p < .001$) and accounted for an adjusted 33.6% of variance ($F(1,313) = 159.83$, $p < .001$, $R_{adj}^2 = 0.336$).

Table 6.

Coefficients of LAV Regression Model[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-32.06	2.65		-12.09	< .001
	LAV Total Change	1.52	.12	.58	12.64	< .001

a. Dependent Variable: EDI Total, change between T1 & T2

Finally, one last stepwise regression was computed which included all of the previous predictors (LAV change, body dissatisfaction change and body shape concern change), seen below in Table 7. The first model included only LAV change scores, whilst the final model included LAV change as well as body dissatisfaction change. As a result of the stepwise selection procedure body shape concern was excluded and was not entered into either of the model stages, and was not significant ($\beta = 0.108$, $p = .125$; stepwise removal criterion: $p > .10$). This was likely in part due to the high correlation with LAV change scores ($r = .79$).

The final model accounted for an adjusted 44.9% of variance in EDI total change ($F(2, 301) = 124.65$, $p < .001$, $R_{adj}^2 = 0.449$). Moreover, both LAV change and change in body dissatisfaction significantly predicted in the regression model ($\beta = 1.11$, $p < .001$ and $\beta = 2.39$, $p < .001$ respectively). After comparing R_{adj}^2s the addition of body dissatisfaction change led to an increase of 10.3% in explained variance.

What is of interest is the reduction in standardized regression coefficients when adding secondary predictors to each of the models. LAV's coefficient saw a reduction by 29% (from $\beta = .59$ to $\beta = .42$; after adding body dissatisfaction) whilst body dissatisfaction's saw a 31% decrease (from $\beta = .57$ to $\beta = .39$; after adding body shape concern). Both LAV change and body dissatisfaction change lost considerable predictive power when other variables were added. Moreover, considering changes in explained variance were calculated

using adjusted R squared values, these decreases are likely influenced by more than the effect

of simply adding more variables into regression.

Table 7.

Coefficients of Combined Regression Model[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-31.48	2.73		-11.51	< .001
	LAV Total Change	1.56	.12	.59	12.69	< .001
2	(Constant)	-.81	4.75		-.17	.864
	LAV Total Change	1.11	.13	.42	8.73	< .001
	Body Dissatisfaction[b]	2.39	.31	.37	7.61	< .001

a. Dependent Variable: EDI Total, change between T1 & T2
b. Body Dissatisfaction subscale of EDI, change between T1 & T2

Regression Assumption Checks

Post-hoc analyses were carried out to check for the regression assumptions of

linearity, independent residuals, homoscedasticity, normality and multicollinearity.

Scatterplots showed linear relationships between changes in independent variables and EDI

score change (dependant variable), and so the assumption of linearity was met. Durbin-

Watson scores ranged from 1.003 to 1.127; typically scores below 1 and above 3 are critical,

so the assumption of independent residuals was met. Regarding homoscedasticity,

scatterplots of standardized residuals and predicted values did not show any major deviations

in variance, satisfying that assumption. Normality was checked using Histograms of

standardized residuals, which fitted normal distribution curves and appeared approximately

normal. To test for the effect of multicollinearity, Variance Inflation Factor (VIF) and

Tolerance values were calculated. VIF values closest to 1 are best, with values above 10 warranting concern; VIF in our models ranged from 1.274 to 1.282 and so it was satisfactory. Tolerance values above .20 are considered acceptable, and our values ranged from .78 to .79. Both VIF and Tolerance values were well within acceptable ranges, and did not show signs of multicollinearity.

Discussion

The lens of this study is to investigate the changes of body image disturbance in female Anorexia Nervosa patients, and to see if there are relationships that could implicate them in the maintenance of the disorder. The fact that Anorexia Nervosa has the highest death rate of any psychiatric illness underpins the importance of investigating the mechanisms and relationships surrounding its maintenance (Hoek & van Hoeken, 2003). Body image and its pathological disturbances have been implicated as core features of maintenance by the cognitive behavioural theory of anorexia nervosa (Fairburn et al., 1999), yet there is little scientific literature examining how changes in body image measures might predict change in eating disorder symptomology (Danielsen and Rø, 2012). It is the main aim of this study to provide further evidence for these analyses, as laid out by Danielsen and Rø (2012), with the hope of contributing to the currently lacking literature.

The first research question to be addressed is whether or not measures of body image disturbance or general eating disorder symptoms actually changed. It was hypothesized that all variables of interest would change as participants had started clinical treatment at Time 1, based on the logic that the treatment would reduce scores of both symptoms and body image disturbance. This hypothesis received full support and all variables tested showed significant changes. The next logical question is at what rate did these scores change? It was expected that scores decreased over one year, and that those decreases would not be uniform. On

average our measures of body image disturbance; body image attitudes (measured by LAV; Probst et al., 1992), body shape concern and body dissatisfaction, decreased by 5.91%, 19.88% and 25.77% respectively. Mean comparison found these decreases to be statistically distinct from one another. These distinct decreases met our expectations and aligned with the findings of Danielsen and Rø (2012), which also had a clinical sample undergoing treatment. The significant differences between changes in body dissatisfaction and body shape concern compared to body attitude might be explained by general CBT's lack of focus on body attitudes (Rosen, 1996; Vocks et al., 2008). Regardless, the changes in body image disturbance were significant and the next step was using these differences to help explain changes in eating disorder symptoms.

One of the focal points of the present study was the predictive power of changes in body attitudes when predicting changes in eating disorder symptoms. It was expected that body attitude scores would significantly predict symptom change, and it was expected to outperform other predictor variables, as was found in Danielsen and Rø (2012). As hypothesized, changes in body attitude predicted eating disorder symptom change, accounting for 33.6% of symptom variance. In line with our results, Danielsen and Rø (2012) found that body attitude changes accounted for 39% of symptom variance. These results are quite similar and provide converging evidence for body attitude's ability to predict symptom changes. This provides converging evidence that body attitude may affect the maintenance of anorexia nervosa. Small differences between the two studies could come from differences in sample characteristics, whereas the present study had a larger sample size ($n = 30$ vs. $n = 66$) and a younger sample in general ($\bar{x} = 19.8$; $SD = 3.3$ vs. $\bar{x} = 15.1$; $SD = 1.9$). In relation to age, the present study provides evidence that the relationship between body attitude change and symptom change illustrated by Danielsen and Rø extends to adolescent samples.

Change in body attitudes was not the only significant predictor of the present study; body dissatisfaction and body shape concern change were expected to predict change in symptom scores. Both body dissatisfaction and body shape concern change significantly predicted symptom change, supporting this hypothesis. Body dissatisfaction was the stronger of the two (32.6% variance), with an added 11.2% from body shape concern. However what is of greater interest is the efficacy of the combined model, with all three predictors.

The final hypothesis detailed a combined prediction of body attitudes, body dissatisfaction and body shape concern change and it was expected that all predictors would be significant, with body attitudes change being the most influential. This hypothesis received mixed support, where body attitudes and body dissatisfaction were included as significant in the model, but stepwise selection excluded body shape concern. It was found to be insignificant, likely in part due to its high correlation with body attitudes ($r = .79$). The exclusion of body shape concern provides evidence against the argument that all three variables are delineated, singular constructs. This combined model had the highest amount of adjusted variance explained of all models (44.9%), compared to body attitudes alone (33.6%) and body dissatisfaction and body shape concern together (43.8%). The final combined model appears to be the strongest prediction, implicating both body attitude measures and body dissatisfaction as having strong associations with anorexic symptom change. The last aspect of the fourth hypothesis did receive support, seen through body attitudes being the strongest predictor in the combined model, as well as when body attitude and body dissatisfaction models were compared. This converges with previous findings that attitudinal based distortions specifically are more influential than other distortions (Cash & Deagle, 1997).

Changes in eating disorder symptoms were used so that inference concerning anorexia nervosa maintenance can be made; with the concept being that if changes in body attitude

measures can successfully predict symptom change in the current study, this would lend further support for the cognitive behavioural theory of anorexia nervosa (Fairburn et al., 1999). On average, all measures of body image disturbance showed significant decreases, and these decreases significantly predicted change in anorexia symptoms. Fairburn et al. (1999) theorises that body image disturbance is a core principle in the maintenance of anorexia nervosa; whereby constant evaluation of one's own body during high arousal magnifies insecurities and encourages further scrutiny of the body, and this cycle reinforces restrictive behaviour. Findings of the present study could align with this where body attitudes and body dissatisfaction might play a role in the process of excessive self-scrutiny. This could in turn contribute to the cyclical maintaining process by encouraging more frequent evaluations, thereby reinforcing maladaptive weight control.

These findings may have implications for the treatment of anorexia nervosa. Previous research has shown treatments focusing on body image to have significant efficacy and lasting effects; Cognitive Behavioural Therapy (CBT) that is specifically targeted at body image has been shown to be more effective than general CBT (Rosen, 1996); body-oriented therapy led to significant improvements in BMI and eating disorder symptom scores, which remained 12 months after the end of treatment (Probst et al., 1999). In the present study body attitude decreased the least out of all body image disturbance variables yet was the strongest predictor. This further builds on the idea that body attitudes are significantly related to symptom change, yet to this day do not see large reductions after treatment when compared to other body image disturbance measures. Based on previous research and the findings of the present study, it is proposed that CBT with a focus on body attitudes may be a good strategy when attempting to diminish the maintenance of anorexia nervosa.

Limitations

The first limitation of the present study is its correlational design. Because of this causal interpretations cannot be made. The limitation of multicollinearity was also of concern because all variables had moderate correlations, with the exception of one strong correlation ($r = .79$) between body attitude change and body shape change. Evidence of multicollinearity would also make comparison of the regression models and coefficients difficult and so it was vital to check. VIF and Tolerance values showed there was little evidence of multicollinearity effecting result interpretation. Future studies could consider separating the *general dissatisfaction with the body* subscale of the LAV, in order to limit collinearity with the body dissatisfaction variable. Using a measure of body dissatisfaction other than the EDI subscale could also further limit multicollinearity. The exclusion of body shape concern was likely in part due to multicollinearity, based on its strong correlation with LAV change, but it was not included and so did not affect the final model.

As noted previously, there was significant drop out between T1 and T2 (48%). In an attempt to bolster statistical power without large increases in error, multiple imputation was used. Because of this, the present hypotheses were testable using this dataset. Although there is evidence against the misconceptions of bias surrounding multiple imputation (van Ginkel et al., 2020), non-imputed data is still preferred because of its more natural origin. Future studies with a larger sample size could allow for sufficient power without imputation, and help negate the effect of drop out.

Conclusion

The present study examined body image disturbance in relation to anorexia nervosa maintenance. Decreases in body image disturbance successfully predicted eating disorder symptom change. This could align with the cognitive behavioural theory of anorexia nervosa

(Fairburn et al., 1999) which posits body image disturbance as a key maintaining factor of the disorder. The findings of the present study support the findings of Danielson & Rø (2012), where body attitudes were the best predictor of symptom changes, and extend their findings to adolescent samples. All of this information culminates to highlight the impact of body image disturbance in anorexia nervosa maintenance, and implicates therapies focused on body attitudes as possible defences against the proposed maintenance mechanisms. Future studies with larger sample sizes and a comparison of body attitude focused treatment vs. general treatment could help garner more insight regarding these relationships, and test the implications of the present study.

References

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental

disorders (5th ed.). Washington, DC: Author.

Amianto, F., Spalatro, A., Ottone, L., Abbate Daga, G., & Fassino, S. (2017). Naturalistic

follow-up of subjects affected with anorexia nervosa 8 years after multimodal

treatment: Personality and psychopathology changes and predictors of outcome.

European Psychiatry, 45, 198–206. https://doi.org/10.1016/j.eurpsy.2017.07.012.

Block, M. M. (2014). Research practitioner gap: Treatments for Anorexia Nervosa [ProQuest

Information & Learning]. In Dissertation Abstracts International: Section B: *The

Sciences and Engineering* (Vol. 75, Issue 3–B(E)).

Bryant-Waugh, R. J., Cooper, P. J., Taylor, C. L., & Lask, B. D. (1996). The use of the eating

disorder examination with children: A pilot study. *International Journal of Eating

Disorders*, *19*(4), 391–397. https://doi-org.proxy-ub.rug.nl/10.1002/(SICI)1098-

108X(199605)19:4<391::AID-EAT6>3.0.CO;2-G

Brytek-Matera, A., & Czepczor, K. (2017). Models of eating disorders: A theoretical

investigation of abnormal eating patterns and body image disturbance. *Archives of

Psychiatry and Psychotherapy, 19(1)*, 16–26.

Cash, T. F., & Deagle, E. A., III. (1997). The nature and extent of body-image disturbances in

anorexia nervosa and bulimia nervosa: A meta-analysis. *International Journal of

Eating Disorders, 22*(2), 107–125.

Castellini, G., Sauro, C. L., Mannucci, E., Ravaldi, C., Rotella, C. M., Faravelli, C., & Ricca,

V. (2011). Diagnostic crossover and outcome predictors in eating disorders according

to DSM-IV and DSM-V proposed criteria: A 6-year follow-up study. *Psychosomatic Medicine, 73*(3), 270–279

Castro, J., Gila, A., Puig, J., Rodriguez, S., & Toro, J. (2004). Predictors of Rehospitalization after Total Weight Recovery in Adolescents with Anorexia Nervosa. *International Journal of Eating Disorders*, *36*(1), 22–30. https://doi-org.proxy-ub.rug.nl/10.1002/eat.20009

Cooper, M., & Turner, H. (2000). Underlying assumptions and core beliefs in anorexia nervosa and dieting. *British Journal of Clinical Psychology, 39*(2), 215–218.

Danielsen, M., & Rø, Ø. (2012). Changes in body image during inpatient treatment for eating disorders predict outcome. *Eating Disorders: The Journal of Treatment & Prevention, 20*(4), 261–275.

Decaluwé, V., & Braet, C. (1999). Dutch translation of the Child Eating Disorder Examination, authored by C. G. Fairburn, Z. Cooper, and R. Bryant-Waugh. Ghent University: Unpublished manuscript.

Fairburn, C. G., Shafran, R., & Cooper, Z. (1999). A cognitive behavioural theory of anorexia nervosa. *Behaviour Research and Therapy, 37*(1), 1–13.

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: A "transdiagnostic" theory and treatment. *Behaviour Research and Therapy, 41*, 509–528.

Fairburn, C. G., & Bèglin, S. J. (1994). Assessment of eating disorders: Interview or self-report questionnaire? *International Journal of Eating Disorders*, *16*(4), 363–370.

Garner, D. M. (1991). Eating disorder Inventory-2: Professional manual. Odessa, FL:

Psychological Assessment Resources.

Glashouwer, K. A., van der Veer, R. M. L., Adipatria, F., de Jong, P. J., & Vocks, S. (2019).

The role of body image disturbance in the onset, maintenance, and relapse of

anorexia nervosa: A systematic review. *Clinical Psychology Review, 74*.

Hoek, H. W., & van Hoeken, D. (2003). Review of the prevalence and incidence of eating

disorders. *International Journal of Eating Disorders, 34*(4), 383–396.

Howard, W. T., Evans, K. K., Quintero-Howard, C. V., Bowers, W. A., & Andersen, A. E.

(1999). Predictors of success or failure of transition to day hospital treatment for

inpatients with anorexia nervosa. *American Journal of Psychiatry, 156*(11), 1697–

1702.

Karazsia, B. T., Murnen, S. K., & Tylka, T. L. (2017). Is body dissatisfaction changing across

time? A cross-temporal meta-analysis. *Psychological Bulletin, 143*(3), 293–320.

https://doi-org.proxy-ub.rug.nl/10.

Mölbert, S. C., Thaler, A., Mohler, B. J., Streuber, S., Romero, J., Black, M. J., Zipfel, S.,

Karnath, H.-O., & Giel, K. E. (2018). Assessing body image in anorexia nervosa

using biometric self-avatars in virtual reality: Attitudinal components rather than

visual body size estimation are distorted. *Psychological Medicine, 48*(4), 642–653.

https://doi-org.proxy-ub.rug.nl/10.1017/S0033291717002008

Probst, Coppenolle & Vandereycken (1992). The Body Attitude Test for patients with eating

disorders: Research data. *Bewegen & Hulpverlening. 4*. 286-299.

Probst, M., Vandereycken, W., Van, C. H., & Pieters, G. (1999). Body experience in eating

disorders before and after treatment: A follow-up study. *European Psychiatry, 14*,

333–340.

Rosen, J. C. (1996). Body image assessment and treatment in controlled studies of eating

disorders. *International Journal of Eating Disorders, 20*, 331–343.

Ricca, V., Castellini, G., Lo Sauro, C., Mannucci, E., Ravaldi, C., Rotella, F., & Faravelli, C.

(2010). Cognitive-behavioral therapy for threshold and subthreshold anorexia

nervosa: A three-year follow-up study. *Psychotherapy and Psychosomatics, 79(*4),

238–248 (https://dx.doi.org/10.1159/000315129)

Schlegl, S., Quadflieg, N., Löwe, B., Cuntz, U., & Voderholzer, U. (2014). Specialized

inpatient treatment of adult anorexia nervosa: Effectiveness and clinical significance

of changes. *BMC Psychiatry, 14*(258)https://doi.org/10.1186/s12888-014-0258-z.

Steinhausen, H.-C. (2002). The outcome of anorexia nervosa in the 20th century. The

American Journal of Psychiatry, 159(8), 1284–1293.

Sullivan, P. F. (1995). Mortality in anorexia nervosa. *The American Journal of Psychiatry,

152(7)*, 1073–1074. https://doi-org.proxy-ub.rug.nl/10.1176/ajp.152.7.1073

Thompson, J. K. (2004). The (mis)measurement of body image: Ten strategies to improve

assessment for applied and research purposes. *Body Image, 1*(1), 7–14

van Ginkel, J. R., Linting, M., Rippe, R. C. A., & van der Voort, A. (2020). Rebutting

existing misconceptions about multiple imputation as a method for handling missing

data. *Journal of Personality Assessment*, *102*(3), 297–308. https://doi-org.proxy-

ub.rug.nl/10.1080/00223891.2018.1530680

Vocks, S., Wachter, A., Wucherer, M., & Kosfelder, J. (2008). Look at yourself: Can body

image therapy affect the cognitive and emotional response to seeing oneself in the

mirror in eating disorders? *European Eating Disorders Review, 16*, 147–154.

Watkins, B., Frampton, I., Lask, B., & Bryant-Waugh, R. (2005). Reliability and Validity of

the Child Version of the Eating Disorder Examination: A Preliminary Investigation.

International Journal of Eating Disorders, 38(2), 183–187. https://doi-org.proxy-

ub.rug.nl/10.1002/eat.20165

Wilson, G. T., Grilo, M. C., & Vitousek, K. M. (2008). Psychological treatment of eating

disorders. *American Psychologist 62*(3), 199-216