Relations of dietary restraint and depressive symptomatolgy to loss of control over

eating in overweight youngsters

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Footnote 1: Since our inpatient sample has to complete a rather large standard battery of several assessment instruments at the start of their treatment, we were limited with regard to adding extra instruments to the assessment battery. Although we are aware that the concept of mood intolerance encompasses a broad range of adverse mood states, we opted to focus exclusively on examining the role of depressive symptoms (further described as the 'depression pathway').

Footnote 2: It needs to be remarked that it was not the purpose of the present study to test the entire CBT-E [19]. The CBT-E entails some other additional mechanisms as well (such as the role of perfectionism and core low self-esteem). However, in the present study, our main focus was reserved on those variables that, according to the theory, appear to be directly associated with binge eating. Also, we are aware that all variables that were investigated in the present study are intrapersonal and that interpersonal variables (such as adverse life events) may also contribute to eating pathology.

Abstract

Objective. This study investigated the dietary restraint and depression pathway to loss of control over eating among a sample of overweight youngsters based on the assumptions of the extended cognitive behavioural theory for bulimia nervosa. *Methods*. The Children's version of the Eating Disorder Examination interview and the Children's Depression Inventory were administered to 350 overweight youngsters (with a mean age of 13.30 years old). *Results*. Structural equation modelling indicated that the over-evaluation of eating, weight and shape was significantly associated with dietary restraint, which in turn was significantly associated with loss of control over eating. Evidence was also found for a direct pathway between depressive symptoms and loss of control over eating. *Conclusion*. It can be concluded that in general, the main components to maintain the bulimic cycle in eating disordered patients operate in a similar way to maintain loss of control over eating in overweight youngsters.

Keywords: eating disorders; overweight; restraint; depressive symptomatology

Introduction

Prevalence rates of paediatric overweight are reaching epidemic proportions.
[39, 42] . Paediatric overweight is associated with severe medical [1, 27] and
psychosocial consequences [51] as well as with an increased risk for adult obesity [24,
60] and the development of eating disorders (EDs) [20, 22, 45].

Recent studies have shown that a substantial part of overweight youth report loss
of control over eating (LC), which is considered the most important feature of binge
eating [30, 41, 53], with prevalence rates of LC ranging up to 36% among treatment
seekers [16, 28, 32]. However to date, little is known about which youngsters are most
vulnerable to develop LC. Studying underlying mechanisms of LC is of clinical
importance because research has shown that LC predicts the future onset of obesity [49]
and weight gain [23, 52]. Also, subclinical ED symptoms (like LC) may be a precursor
of full-blown EDs later on [45]. Especially in overweight youngsters, early
identification of those who are most vulnerable to LC seems warranted because in these
youngsters, the burden of suffering from (symptoms of) an ED may add to the burden of
suffering from overweight [29].

The extended cognitive behavioural theory of eating disorders (CBT-E)

Theories designed to understand the development and maintenance of binge
eating among ED samples may serve as an adequate background for understanding LC
in (overweight) youth. According to the extended cognitive behavioural theory (CBT-E)
[17, 19], the over-evaluation of eating, weight and shape constitutes a central role in the
development and maintenance of bulimic symptoms. More specifically, this core
psychopathology promotes efforts to restrict eating. As part of this dietary restriction,

rigid dieting rules are followed. In a moment of weakness, it becomes unbearable to hold on to those rigid rules and eventually, this may lead to binge eating which in turn may again promote dietary restraint afterwards. In that way, a highly distinctive pattern of eating develops in which sustained dietary restraint is repeatedly punctuated by episodes of binge eating.

Another possible pathway to binge eating which is also incorporated in the CBT-E highlights the importance of the concept mood intolerance [19]. According to this pathway, binge eating can also directly result because of a person's difficulty to cope appropriately with intense (mainly adverse) mood states such as anger, anxiety and depression. Although evidence coming from adult samples supports both pathways to binge eating [21, 45, 59], little is known about the value of this model in paediatric overweight samples.

Overweight youth

Some aspects of the CBT-E have already been tested separately in overweight children and adolescents but findings are mixed, possibly due to the heterogeneity within the overweight population. In overweight youngsters who are exclusively treatment seeking, evidence supporting the affect regulation pathway is found, especially with regard to the role of symptoms of depression [16, 32] and anxiety [28], whereas in exclusively non-treatment seeking samples, less evidence is found for this affect regulation pathway [54] and more evidence is obtained supporting the dietary restraint pathway [53]. Thus it may be assumed that depending on the compilation of the overweight sample, different pathways may explain LC. To our knowledge, no study investigated the competitiveness of dietary restraint versus depressive

symptomatology in a more representative sample of both non treatment seeking and treatment seeking overweight youngsters.

With regard to the influence of the core psychopathology studies consistently found that overweight youngsters experiencing LC reported more concerns about eating, weight and shape compared to those who do not experience LC [16, 28, 32, 54]. These results provide preliminary support for the importance of this over-evaluating system among overweight youth and indicate that, in line with adult research [34, 35], being over-concerned about ones eating, weight and shape may not simply reflect concerns commensurate with being overweight but seems to be an important clinical variable associated with both eating pathology and depression. Nevertheless among overweight youngsters, the questions still remains whether this over-evaluating system is related to LC through the restriction of one's food intake, as it was proposed by the CBT-E [19], or also via the experience of depressed emotions?

The present study

The current study aimed at gaining a clear insight into the development of LC among overweight youngsters by evaluating two important pathways specified by the CBT-E [19]. More specifically, we tested a model proposing (1) a relationship between the core psychopathology (that is: over evaluation of eating, weight and shape), dietary restraint and LC and (2) a relationship between depressive symptoms and LC. (insert footnote 1)

To our knowledge, this is the first study using structural equation modelling to evaluate the value of these two proposed mechanisms in one and the same model in overweight youth. Based on the assumptions of the theory, it is hypothesized that after

taking into account possible differences between treatment seekers and non-treatment

seekers, direct associations exist between the core psychopathology and restraint,

between restraint and LC and also between depressive symptoms and LC.

(insert footnote 2)

Methods

<u>Sample of the present study</u>

The sample of this study were 350 overweight children and adolescents (277

were treatment seekers, and 73 were non-treatment seekers); 141 boys (40.3 %) and 209

girls (59.7 %); ages ranged between 8 and 18 years ($M = 13.30$, $SD = 2.17$). Exclusion

criteria in this study were mental retardation and the presence of developmental

syndromes. All participants were diagnosed as being primary overweight (Body Mass

Index (BMI) > the 85th percentile for age and sex).

<u>Measures</u>

Dietary restraint, LC and the over-evaluation of eating, weight and shape - ChEDE

The Children's version of the Eating Disorder Examination (ChEDE) [8] is a

standard investigator-based interview measuring the severity of the core

psychopathology of EDs and generating ED diagnoses. The ChEDE is based on the

adult EDE [18] and is modified by experts in the field of EDs in children in

collaboration with the authors of the original EDE. A translation of the ChEDE was

designed for use in populations of Dutch children [15]. The ChEDE can be administered

from children as young as eight years old and contains four subscales designed to

provide a profile of individuals in terms of four major areas of ED psychopathology:

restraint, eating concern, shape concern and weight concern. In addition, the ChEDE

measures three forms of overeating: objective bulimic episodes (OBE; the ingestion of a large amount of food accompanied by LC), subjective bulimic episodes (SBE; the ingestion of an amount of food that is considered large by the subject but not by others, accompanied by LC) and objective overeating (OO; the ingestion of a large amount of food without LC) episodes. The ChEDE also measures four methods of weight control: self-induced vomiting, laxative misuse, diuretic misuse and intense exercising. Studies confirmed the validity and reliability of this instrument [14, 58]. In the current study, alpha coefficients for the subscales were adequate (.57 for restraint, .57 for eating concern, .63 for weight concern and .83 for shape concern). Based on the recommendations by Marcus and Kalarchian [41], children and adolescents in this study were categorized as having experienced LC when they mentioned at least one episode of OBE or SBE over the last three months.

Depressive symptoms - CDI

The Children's Depression Inventory [38], translated in Dutch by Timbremont and Braet [55], assesses cognitive, affective and behavioural symptoms of depression in youth (between the age of 8 and 17 years). The questionnaire contains of 27 items. Although Kovacs [38] describes five factors or subscales within the English CDI, second order factor analyses reveal only one coordinating factor (referring to one general underlying construct of depression). Moreover, up until now, little research has been conducted on the reliability and validity of the different subscales. Because of this limited empirical evidence, the Dutch version of the CDI [55] and its recently revised manual [57] does not distinguish between subscales, and only uses one general score for depressive symptomatology. This CDI total score has relatively high levels of internal

consistency, test-retest reliability and predictive, convergent, discriminant and construct validity [11, 55, 56]. Research provides support for the usefulness of the CDI as a screening tool for detecting depressive disorders in children and adolescents [56]. In the present study, the coefficient alpha for the CDI total score was .86.

Weight status – Adjusted BMI

Weight and height were measured using calibrated instruments. The BMI (weight/height²) was determined for each child. In order to make BMI comparisons between overweight children of different ages, this study uses the adjusted BMI [(actual BMI/ Percentile 50 of BMI for age and sex) x 100]. The 50th percentiles of the BMI for age and sex are based on normative data [26]. Furthermore, to standardize BMI across (international) samples, BMI standard deviation (BMI-z) scores were calculated according to the Centres for Disease Control (CDC) and Prevention 2000 standards [42] and the percentage of participants classified as overweight and obese on the basis of the IOTF BMI cut-off points [10] was determined.

Procedure

Overweight treatment seekers were recruited through two waves. In the first wave of data gathering, all youngsters who were enlisted on an inpatient treatment waiting list in 1999 and who met inclusion criteria ($n = 162$) were asked to participate and they were visited at their homes where all measures were administered. In a second wave, participants who entered the clinic between January 2005 and July 2006 were invited. Those who met inclusion criteria ($n = 115$) were questioned during the first week of their treatment (for a full description of the program: see Braet [4]).

In addition to the treatment seeking subsample, we also created a subsample of overweight non-treatment seekers. These youngsters were recruited through advertisements in healthcare magazines and via school mailings. The research was described as a study into the psychological well-being of youngsters with 'a bigger size'. These youngsters ($n = 73$), all meeting the general inclusion criteria, were eligible when at the time the study took place, they did not seek or follow any kind of inpatient our outpatient treatment for their overweight (defined as a treatment in order to lose weight with at least the help of a dietician). All participants in the non-treatment seeking sample were aware that they would not receive any kind of treatment as part of the study protocol and they were seen at the university where they completed all assessments. The present study was approved by the university research ethics committee. Informed consent was obtained from both the youngsters and their parents.

Statistical analyses

Results were expressed as a mean (*SD*) or percentage of the sample. To determine group differences between the treatment seekers and non-treatment seekers on any of the subject characteristics, chi-square statistics were used for the categorical data (sex) and univariate analyses of variance (ANOVA) were used for the continuous data (age, Adjusted BMI, the ChEDE subscales and CDI depression score). Furthermore, Pearson correlations were computed among the study variables.

Next, structural Equation Modelling (SEM) was used to investigate the relations between the study variables. To evaluate model goodness of fit of the measurement model, two fit indices were inspected: the Comparative Fit Index (CFI) and the Root Mean Squared Error of Approximation (RMSEA). In general, a CFI > .90 indicates

acceptable fit and > .95 indicates good fit. An RMSEA value up to .08 indicates an

acceptable fit and a value of .05 or lower indicates a good fit [3, 7, 36, 44]. We will first

investigate the measurement model with confirmatory factor analysis. Structural

Equation Modelling (SEM) with latent variables was performed, using LISREL 8.72

[37] and solutions were generated on the basis of maximum likelihood estimation.

Results

Sample characteristics

The participants ($N = 350$) had a mean BMI of 31.27 ($SD = 5.60$) with a range of

20.04 – 50.70 and a mean Adjusted BMI of 169.78% ($SD = 27.21$) with a range of

120% – 256% (CDC BMI z-scores range from 0.98 to 2.78). On the basis of the IOTF

BMI cut-off points, 22% of the participants was classified as overweight and 78% as

obese. Table 1 presents the characteristics of the whole sample and of the treatment

seekers and non-treatment seekers separately. No significant sex differences were found

between the treatment seekers and non-treatment seekers, $\chi^2 (1) = .14$, $p = .79$. Both

samples did however differ in age, $F(1,347) = 3.83$, $p \leq .05$ and Adjusted BMI,

$F(1,343) = 90.16$, $p < .001$. Treatment seekers were younger and were characterised by

a significantly higher Adjusted BMI compared to the non-treatment seekers (insert

Table 1).

Overall, the mean number of LC episodes reported over the last three months by

the entire sample ($N = 350$) was 2.61 ($SD = 9.78$) with a range of 0 - 90 episodes. In the

treatment seeking sample ($N = 277$), the mean number of LC episodes was 2.87 ($SD =$

10.08) with a range of 0 – 90 episodes. Also, 18.1% of the treatment seekers who

reported LC was characterised by a clinical (≥ 19) CDI Depression score ($M = 13.58$,

$SD = 5.26$). In the non-treatment seeking sample ($N = 73$), the mean number of LC episodes was 1.62 ($SD = 8.55$) with a range of $0 - 72$ episodes. In the non-treatment seekers, 13.3% of those reporting LC had a clinical (≥ 19) CDI depression score ($M = 13.01$, $SD = 7.73$). No significant difference was found between the percentage of treatment seekers (27.1%) and the percentage of non-treatment seekers (20.5%) who reported LC, $\chi^2(1) = 1.40$, $p = .24$. Among all the participants (of the entire sample) who reported LC (25.7%) a mean number of 8.94 episodes ($SD = 13.73$; range 1 - 90) was reported over the last three months.

Correlations between the study variables

Table 2 represents the Pearson's correlations between the main study variables. First of all, this table indicates that both Restraint and Depression were significantly and positively related to LC severity (number of LC-episodes). The correlation coefficients also indicate that the association between Restraint and LC severity ($r = .13$) turned out to be from a similar order than the association between Depression and LC severity ($r = .13$). Second, results show that Eating, Weight and Shape Concerns were not only significantly and positively correlated with Restraint but also with Depression and LC severity. Finally, this table also indicates that no significant association existed between Restraint and Depression (insert Table 2).

The Measurement Model

The latent over-evaluation of eating, weight and shape variable (*Over Evaluation*) was measured with the items from the three ChEDE subscales eating concern (5 items), weight concern (5 items) and shape concern (8 items). The latent

dietary restraint variable (*Restraint*) was measured with the items from the ChEDE

subscale restraint (5 items). The latent depressive symptoms variable (*Depression*) was

measured with the items from the CDI divided into three partials. The CDI consists of

27 items and each item was randomly assigned to one of the partials. The latent loss of

control variable (*LC*) was measured with the dichotomous Loss variable (0 = no

episodes of LC, 1 = at least one episode of LC) and with the LC severity variable

(number of LC episodes). Because of the age and adjusted BMI differences between

treatment seekers and non-treatment seekers that were found in the present sample, and

also because of the differences in psychopathology between both groups that were

already detected in past literature [6], participants' group status (0 = non-treatment

seeking, 1 = treatment seeking) was accounted for in the subsequent analyses.

Data screening of the subscale scores (the observed variables) indicated data

non-normality, both at the univariate and multivariate level. Therefore, in the

subsequent model we used the asymptotic covariance matrix between all indicators as

input and inspected the Satorra-Bentler Scaled chi-square (SBS-χ^2) [43]. A confirmatory

factor analysis testing the relationships between the abovementioned observed and

latent variables revealed an acceptable model fit, SBS-χ^2 (68) = 170.26, $p < .001$;

RMSEA = .066, CFI = .95. Table 3 provides an overview of the parameter estimates

(unstandardized solution) and standard errors of each partial loading on the latent

constructs (insert Table 3).

The structural Model

In the structural model the relationship between the independent and dependent

variables was tested. More specifically, it was hypothesized that after taking in account

treatment status (Group), the over-evaluation of eating, weight and shape (Over

Evaluation) would be significantly associated with dietary restraint (Restraint) which in

turn would exert a direct effect on LC. Also, it was hypothesized that depressive

symptoms (Depression) would exert a direct effect on LC. Although the fit of this

model was acceptable, it might be considered rather poor, SBS-χ^2 (71) = 232.79, p <

.001, RMSEA =.08, CFI = .91.

   Because table 2 showed that in our sample, depressive symptoms were not only

significantly correlated with LC but also with the over-evaluation of eating, weight and

shape, we added the association between the latent Over Evaluation and the latent

Depression. The inclusion of this correlation is consistent with recent findings that the

over-evaluation of eating, weight and shape is strongly associated with poor

psychological functioning, such as elevated symptoms of depression (Grilo et al., 2008,

Hrabosky et al., 2007). Results showed that this model had a more acceptable fit, SBS-

χ^2 (70) = 204.02, p < .001, RMSEA = .07, CFI = .93. Also, a comparison between the

model Akaike's Information Criterion (AIC)[13] of the initial model (AIC = 397.91)

and the supplemented model (AIC = 358.86), whereby the model with the smallest AIC

is considered more acceptable, indicated that the model including the correlation

between Over Evaluation and Depression was more acceptable. Also in this latter

model, it was found that Group was significantly related to both Restraint (standardized

β = -.11; t = -2.66) and Depression (standardized β = .13; t = 2.38), indicating that

treatment seekers were characterised by lower degrees of dietary restraint and higher

levels of depressive symptoms, whereas non-treatment seekers were characterised by

higher degrees of dietary restraint and less depressive symptoms.

With regard to the proposed hypotheses, results showed that Over Evaluation was positively associated with Restraint (standardized $\beta = .48$, $t = 6.13$). Restraint was in turn significantly and positively associated with LC (standardized $\beta = .25$; $t = 2.73$). Also, a significant and positive relation was found between Depression and LC (standardized $\beta = .20$; $t = 2.14$). Finally, a significant indirect effect was found between Over Evaluation and LC (standardized $\beta = .12$; $t = 2.51$). The significant relationships are illustrated in Figure 1 (insert Figure 1).

Discussion

The present study evaluated possible mechanisms for understanding loss of control over eating (LC) among a large sample of overweight children and adolescents. First of all, results indicated that 26% of the youngsters in the present sample reported having experienced LC over the last three months whereby no significant differences in the occurrence of LC were found between treatment seekers (27%) and non-treatment seekers (21%). These percentages were comparable to the rates found in other samples of overweight children and adolescents that also used a clinical interview to assess the presence of LC [16, 54] and show that LC is an ED symptom which is prevalent among a substantial part of both treatment seeking and non-treatment seeking overweight children and adolescents.

Based on the central assumptions of the CBT-E [19], a model was tested combining the dietary restraint pathway and depression pathway to LC. Results initially showed that the data did not fit the theoretical model well. Therefore, based on recent empirical findings [35] and based on the results of the present study's correlation matrix, it was decided to supplement the model with an association between the over-

evaluation of eating, weight and shape and symptoms of depression. This resulted in a more acceptable model fit, confirming the main predictions of the model.

More specifically, after taking in account differences between treatment seekers and non-treatment seekers, and after controlling for the association between the core psychopathology and symptoms of depression, the present study found evidence for the dietary restraint pathway to LC. First of all, in line with previous cross-sectional [53] and prospective [2] studies in children results of the present study indicated that higher levels of concerns about eating, weight and shape were associated with elevated levels of dietary restraint. Next, results of the present study showed that dietary restraint was in turn significantly associated with the experience of LC. This latter finding is in line with cross-sectional studies in a sample of both normal weight and non-treatment seeking overweight youngsters [53] and with prospective studies in child [2] and adolescent community samples [48, 49].

Remarkably, results showed that overweight youngsters from our non-treatment seeking sample reported higher levels of restraint compared to those from the treatment seeking sample. This finding is in contrast with the general observation among overweight adults [25] and youngsters [5, 6], that those who seek treatment were characterised by higher levels of psychopathology and consequently may be considered as a more pathological group. In the present study however, we need to differentiate higher scores on dietary restraint from the general measures of psychopathology that were used in the Braet et al.[5] study. Also, when comparing the mean ChEDE Restraint score of our non-treatment seeking sample to those of the Tanofsky-Kraff et al. [54] study, we may conclude that the non-treatment seekers in the present study were characterised by exceedingly high levels of dietary restraint. In other words, although

these youngsters declared that they were not seeking or following any kind of treatment for their overweight at the time of the study, they did have intentions (or even made attempts) to restrict their food intake. All together, we may conclude that even when taking into account differences between treatment seekers and non-treatment seekers, the conclusion holds on that as assumed, the experience of LC appears to be directly associated with dietary restraint among overweight youth.

Furthermore, results showed a significant indirect relation between the 'core psychopathology of EDs' (the over-evaluation of eating, weight and shape) and LC. In line with recent studies among adult samples of patients with binge eating disorder [34, 35], this finding indicates that being over-concerned is not simply a characteristic of overweight individuals, but is also indicative of more severe ED pathology thereby emphasizing the importance of assessing the occurrence of this 'core pathology' among overweight youth.

Next to the dietary restraint pathway, the present model investigated the relevance of the depression pathway to LC [19]. After taking into account differences between treatment seekers and non-treatment seekers, results of the present study showed that the experience of LC was also significantly related to elevated levels of depressive symptoms. This finding is in line with some research [16, 32] but in contrast with other studies, where no such relation could be detected between LC and depressive symptoms [54]. Moreover, results showed that in contrast with the assumptions of the CBT-E [19], but in line with recent research in adults [34, 35], depressive symptoms were also significantly correlated with the over-evaluation of eating, weight and shape. This finding indicates that among overweight youth, the system of over-evaluating

eating, weight and shape does not only play a central role in the dietary restraint

pathway but may also be an essential component in the depression pathway to LC.

The findings of the present study have some clinical implications. More

specifically, when overweight youngsters present for treatment, it seems important to

screen them for the presence of ED pathology, such as the level of concerns about

eating, weight and shape and the presence of LC. Also, it will be important to screen

these youngsters for the presence of depressive symptoms. If present, overweight

treatment may be supplemented by providing these youngsters adequate techniques for

coping with negative emotions, for increasing their self-worth and for acquiring

adequate self-control strategies. Both in treatment seeking and non-treatment seeking

overweight youngsters, early detection and treatment of eating pathology and its

correlates might prevent them of developing more severe ED pathology and adult

obesity [45, 49] later on. Furthermore, results showed that non-treatment seekers were

characterised by higher levels of dietary restraint and lower degrees of overweight

compared to treatment seekers. Because of their lower degree of overweight, these

overweight youngsters may not call in assistance as quickly as the more obese treatment

seekers, and as a consequence of that they may not learn how to target their overweight

(e.g. by acquiring a more healthy lifestyle). Moreover, the fact these non-treatment

seekers are also characterised by elevated levels of dietary restraint, which was found to

be associated with LC, even adds to their vulnerability for adverse outcomes later on.

Strengths of the current study include the use of the interview methodology.

Especially for assessing key ED behaviours such as LC in younger samples, the use of

the ChEDE [8, 15] is highly recommended [14]. Also, the utilization of this interview

made it possible to compare our results with the results obtained by other recent studies

who also used the (Ch)EDE [21, 54]. Another strength of the present study was that to our knowledge, this was the first study investigating the main assumptions of the CBT-E with a central focus on the competitiveness of dietary restraint versus depression among a large sample of both treatment seeking and non-treatment seeking overweight youngsters.

This study has also some limitations. First of all, this study is to be considered explorative and the results of this study will definitely need to be cross-validated in other samples and with the use of other measures. Moreover, it needs to be acknowledged that not all constructs of the CBT-E [19] were operationalized like they were in the original model. For example, the construct of mood intolerance may comprehend a broad range of adverse mood states. In line with this, recent empirical evidence shows that LC may be associated with different affect regulation strategies in community samples [12] as well as in overweight youngsters [33], depending on which adverse mood state has to be regulated. Because of practical reasons however, we exclusively focused on the role of depressive symptoms in the present study. Future research should investigate the differential role of other adverse mood states (like anger and anxiety) for the regulation of LC as well. Also, since no measure of anxiety was assessed, no conclusions could be drawn regarding the role of negative affect, which is considered the common component of anxiety and depression [9]. Another limitation was that our model was tested with the use of a cross-sectional design so consequently, we were only able to make conclusions about associations between variables. This design does not make it possible to draw causal relationships between the study variables. Therefore, replication of our results with the use of a prospective study design will be needed. A next limitation has to do with the sample size. Although our analyses

were conducted on 350 overweight youngsters, which can be considered a large sample, 'only' 26% of them reported LC. In order to replicate the present findings and to further examine possible pathways to LC, it will be interesting for future research to recruit a large sample that entirely and exclusively consists of youngsters who report LC.
A final limitation regards the composition of the overweight sample, which was rather heterogeneous (different treatment statuses and different severities of overweight). Since results showed a significant effect of treatment status, future research should further investigate underlying mechanisms leading to LC among more 'pure' samples of exclusively treatment seekers or exclusively non-treatment seeking overweight youngsters. Also, it will be worthy to examine whether those differences may be attributed to the treatment status itself, or rather to the degree of overweight.

Next, future research may also investigate the importance of sub-typing overweight youth along the dimensions of depression and dietary restraint. Although the present study demonstrates that LC may be explained by both failing attempts to restrict food intake as well as by an inability to cope with depressive symptoms, little is known about the concurrence and prognosis of both pathways. Research in adults with binge eating has already shown that those characterised by high levels of both dietary restraint and negative affect show the poorest prognoses [46, 47]. Accordingly, preliminary findings in a paediatric sample suggest that the presence of negative affect is indicative of a more severe variant of LC [31] but up until now little is known about how these different subtypes further evolve. Also, as suggested by Macht [40], emotion-induced changes of eating may vary across individuals (e.g. high versus low restrained) and across emotions (e.g. high versus low intensity). In order to improve our understanding of the specific effects emotions have on eating, this two-fold variability needs to be

taken in account. Finally, future research should also investigate more thoroughly the role of the 'core psychopathology' in (overweight) youngsters. Although many studies have already investigated the role of body dissatisfaction (see Stice & Shaw [50] for an overview), far less research in young populations focused on the over evaluating system of eating, weight and shape [2].

   To conclude, results of the current study show that the CBT-E may serve as an adequate theoretical background for evaluating the development and maintenance of loss of control over eating among overweight youth.

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Figure legend

Figure 1: The dietary restraint and negative affect pathway to loss of control over eating

(LC) tested in overweight youngsters after controlling for treatment status

Note. Over Evaluation = over evaluation of eating, weight and shape; Restraint = dietary

restraint; Depression = depressive symptoms; Group = Treatment seeking versus non-

treatment seeking; Each pathway listed was significant at $p < .05$ level; Standardized

path coefficients are listed; *t*-values are between parentheses

Figures

Figure 1.

Over Evaluation

Group

-.11 (-2.66)

.48 (6.13)

.13 (2.38)

Restraint

.25 (2.73)

Depression

LC

.20 (2.14)
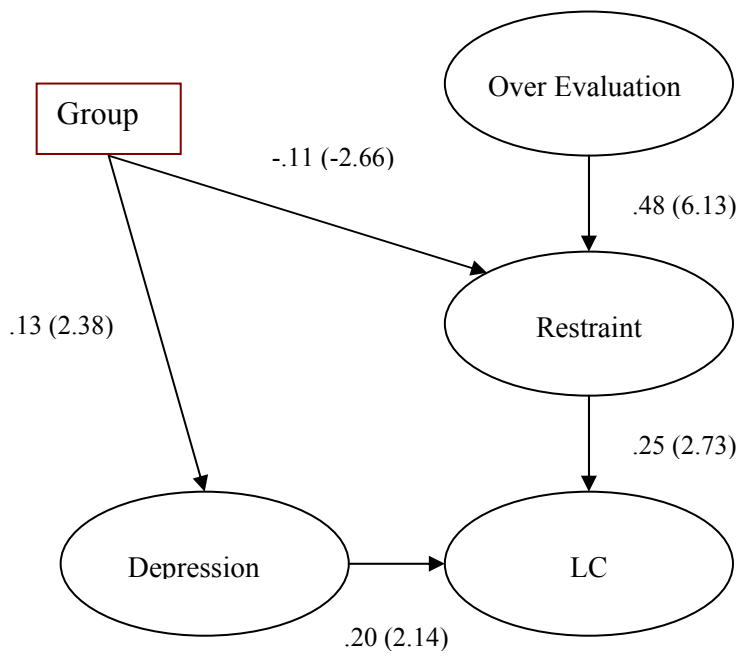
Tables

Table 1. *Characteristics of the whole sample and of the treatment seekers and non-treatment seekers separately*

	Whole sample (N = 350)		Treatment seekers (N = 277)		Non-treatment seekers (N= 73)		F/χ^2 statistic
Sex (M/F)	141/209		113/164		28/45		.79
Age	13.30	(2.17)	13.18	(2.05)	13.74	(2.54)	3.83*
Adj BMI	169.78	(27.21)	176.20	(25.90)	145.85	(16.66)	90.16***
LC/NoLC	90/260		75/202		15/58		1.40
ChEDE Eating Concern	.59	(.73)	.62	(.73)	.46	(.71)	2.93
ChEDE Weight Concern	1.92	(1.07)	1.94	(1.07)	1.86	(1.07)	.32
ChEDE Shape Concern	1.89	(1.24)	1.92	(1.22)	1.76	(1.32)	1.01
ChEDE Restraint	1.08	(1.03)	1.04	(1.02)	1.26	(1.07)	2.74
CDI Depression	11.94	(6.37)	12.26	(6.34)	10.86	(6.41)	2.76

Note. Sex and LC is expressed as a number (*n*) of the sample; age and adjusted BMI are expressed as a mean (*SD*) of the sample; M = male; F = female; BMI = body mass index; LC = loss of control over eating; NoLC = no loss of control over eating; ChEDE = Children's Eating Disorder Examination; CDI = Children's Depression Inventory

* $p \le .05$; *** $p < .001$

Table 2. *Pearson correlations between the main study variables*

	(1)	(2)	(3)	(4)	(5)	(6)
(1) LC severity		.43***	.21***	.34***	.13*	.13*
(2) ChEDE Eating Concern			.42***	.55***	.33***	.32***
(3) ChEDE Weight Concern				.75***	.40***	.26***
(4) ChEDE Shape Concern					.35***	.30***
(5) ChEDE Restraint						.04
(6) CDI Depression						

Note. LC = loss of control over eating; ChEDE = Children's Eating Disorder

Examination; CDI = Children's Depression Inventory; * *p* < .05; *** *p* < .001

Table 3. *Parameter estimates (unstandardized solution) and standard errors of each partial loading on the latent constructs*

Latent construct	Partials	Parameter estimate		*t*-value
		US	SE	
Over Evaluation	Eating Concern	0.33	0.04	8.41
	Weight Concern	0.40	0.05	8.49
	Shape Concern	0.29	0.07	4.15
Restraint	R1	1.58	0.33	4.83
	R2	0.21	0.05	3.99
	R3	1.96	0.29	6.63
	R4	1.82	0.22	8.15
	R5	4.07	0.38	10.83
Depression	CDI1	2.20	0.29	7.61
	CDI2	2.64	0.31	8.61
	CDI3	2.23	0.23	9.55
LC	LCseverity	47.75	24.30	1.96
	Loss	0.12	0.02	6.25

Note. LC = loss of control; R = Restraint subscale of the ChEDE; CDI = Children's Depression Inventory; LC severity = number of LC episodes; Loss = presence versus absence of LC; US = Unstandardized solution; SE = Standard Error; *t*-value $\geq$ 1.96 is significant