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2017

Document Version:
Publisher's PDF, also known as Version of record

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LUND
UNIVERSITY

DOCTORAL DISSERTATION
by due permission of the Faculty of Social Sciences, Lund University, Sweden.
To be defended at Eden Auditorium, June 15, 2017, at 1 pm.

Faculty opponent
Professor Øyvind Rø

Organization LUND UNIVERSITY	Document name: DOCTORAL DISSERTATION
	Date of issue: May 24 2017
Author Erika Hansson	Sponsoring organization: KRISTIANSTAD UNIVERSITY

Title and subtitle: Disordered Eating among Swedish Adolescents Associations with Emotion Dysregulation, Depression and Self-Esteem

Abstract

The path to an eating disorder (ED) always leads through a borderland, which, in this thesis, is referred to as disordered eating (DE) (Neumark-Sztainer, Wall, Eisenberg, Story, & Hannan, 2006; Waaddegaard, Thoning, & Petersson, 2003). In this borderland, people tend to make unhealthy eating choices, such as greatly reducing their food intake, self-inducing vomiting, or engaging in binge eating, but not to the extent that they would receive an ED diagnosis. Nevertheless, DE can have a strong negative effect on psychological health. Approximately 15%–52% of all adolescents, depending on the gender and the study's focus, are found within the borderland between a healthy diet accompanied by psychological well-being and full-blown ED (e.g. Hautala et al., 2011; Herpertz-Dahlmann et al., 2008). While most of these individuals return to a more or less healthy diet after engaging in DE for some time, others continue to engage in DE and also tend to have trouble regulating their emotions, depression, and low self-esteem. For these reasons, DE itself, apart from being a springboard to EDs, is well worth exploring.

At the outset of this thesis, an instrument assessing DE among 1265 adolescents (54.5% girls) was validated. This easily administered questionnaire, referred to by the acronym SCOFF (Morgan, Reid, & Lacey, 1999), comprises five questions assessing possible eating disturbances that are all answered using a "yes"/"no" answer format. The results showed that more girls than boys suffered from DE, and that girls also suffered from more severe DE, which is in line with previous research (e.g. Hautala et al., 2008). Additionally, this assessment of the SCOFF gave rise to the question of whether a positive answer on only certain items (instead of the stipulated cut-off of two) is necessary for indicating the possible presence of DE among adolescents, such as the item assessing whether individuals had ever vomited because they felt uncomfortably full.

To further explore DE among adolescents, a person-oriented approach to identify specific patterns of DE based on the subscales of the Eating Disorders Examination Questionnaire (EDE-Q) (restraint, eating, weight, and shape concerns) was used. There were six different DE patterns for both boys and girls. The associations of these patterns with emotion dysregulation, depressive symptoms, and self-esteem, which all are related to DE (e.g. Shea & Pritchard, 2007; Svaldi, Griepenstroh, Tuschen-Caffier, & Ehring, 2012), were also assessed. Four of the six girl clusters and five of the six boy clusters showed scores above the cut-off for a clinical ED on at least one of the four indicators. Furthermore, although the "non-problematic" pattern was substantial, including 50% and 76% of girls and boys, respectively, a large portion of adolescents were part of clusters reporting generally high levels of DE. This might partly have to do with my use of an overly permissive cut-off, but nevertheless indicates that a considerable amount of adolescents suffer from DE. Generally, individuals in the DE patterns showed worse emotion regulation, depressive thoughts, and self-esteem than did those in the "non-problematic" patterns. However, some exceptions were found, which emphasizes the utility of analyzing different patterns of DE, not merely severity. Specifically, both girls and boys belonging to the pattern characterized by scores well above the cut-off on shape and weight concerns reported the lowest levels of self-esteem. Moreover, girls and boys in the pattern with scores above the cut-off on restraint showed good emotion regulation skills, few depressive symptoms, and high self-esteem.

In Study III, the possible links between adolescents' and parents' possible DE and emotion dysregulation were explored, alongside the possible impact of shared family meals on DE. This study further examined whether it is possible to predict DE among adolescents according to their parents' behaviors. Both DE and emotion dysregulation were found to be more frequent among adolescents than among parents. Furthermore, both adolescents and parents showed weak but significant associations between DE and emotion dysregulation, and showed similarities regarding specific aspects of emotion regulation, although the associations were gender specific. For example, parental emotional strategies were associated with girls' emotional strategies, impulse control, and emotional goals, but only with boys' emotional strategies. The only factor that was (weakly) associated with DE and emotion regulation among adolescents was the number of dinners that they shared with the family. Additionally, parental ED was the only predictor of current adolescent DE.

In summary, the results of this thesis showed that many adolescents, especially girls, suffer from DE as well as poor emotional regulation, depressive thoughts, and low self-esteem. This is a problem, especially given that existing instruments for evaluating DE do not seem optimal, especially for boys. For instance, answering "yes" to the question of ever having engaged in self-induced vomiting because you have felt too full is probably best followed by a visit to the school nurse. Furthermore, the results indicated the importance of viewing DE not as a singular problem, but as a collection of different problems, even among individuals of the same gender. These differences call for different strategies aimed at helping adolescents achieve a healthier diet. Finally, while the parental influence of DE was significant, more research is required, preferably in a Swedish or Nordic context, where parental responsibility is not as heavily reliant on the mother as in other countries.

Key words: Disordered eating, emotion dysregulation, depression, self-esteem, SCOFF, parental associations

Classification system and/or index terms (if any)

Supplementary bibliographical information		Language: English
ISSN and key title 1652-8220		ISBN 978-91-7753-327-6 (print) ISBN 978-91-7753-328-3 (pdf)
Recipient's notes	Number of pages 123	Price
	Security classification	

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Cover photo by Jan H. Andersen

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Department of Psychology

ISBN 978-91-7753-327-6 (print)
ISBN 978-91-7753-328-3 (pdf)

Printed in Sweden by Media-Tryck, Lund University
Lund 2017

"Fredrik"[1] "Vi kommer att dö samtidigt du och jag"[2]

1 Norlin, A. (2014) p. 75

2 Ibid p. 123

Content

Acknowledgements

Thank you Daiva and Per!

Thank you Sanna, Eva, and Andreas!

Thank you friends and colleagues at Kristianstad University! And thank you Violetta, for saving Christmas!

Thank you Jason!

Thank you to the adolescents and parents who participated!

Thank you Academica Gastronomia Scaniensis for a very generous contribution to my research!

Thank you Parkdala Preschool in Ronneby!

Thank you Eva!

Thank you Pia Libris! Thank you Caroline and Stina for actually asking to read my studies! For real! Thank you Camilla for your support and great reading tips!

Thanks to all my friends and family (including my extended non-Trump-supporting American family), and to Malin, Njördur, Kerstin, and Lennart for proofreading the Swedish portion of the manuscript. Thank you Cathy for teaching me how to answer reviewers in a nice way.

Thank you Arvid and Teodor for always making me feel good about myself by constantly handing me difficult but *manageable* problems such as figuring out where the little yellow Lego-piece is supposed to go and cutting a big piece of Band Aid for a (very) minor scrape. I will love you both until the day I die (and even when I possibly return as a zombie).

Thank you Fredrik! I love you the *most* (of all boys above 6 years of age).

Abstract

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Furthermore, although the "non-problematic" pattern was substantial, including 50% and 76% of girls and boys, respectively, a large portion of adolescents were part of clusters reporting generally high levels of DE. This might partly have to do with my use of an overly permissive cut-off, but nevertheless indicates that a considerable amount of adolescents suffer from DE. Generally, individuals in the DE patterns showed worse emotion regulation, depressive thoughts, and self-esteem than did those in the "non-problematic" patterns. However, some exceptions were found, which emphasizes the utility of analyzing different patterns of DE, not merely severity. Specifically, both girls and boys belonging to the pattern characterized by scores well above the cut-off on shape and weight concerns reported the lowest levels of self-esteem. Moreover, girls and boys in the pattern with scores above the cut-off on restraint showed good emotion regulation skills, few depressive symptoms, and high self-esteem.

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In summary, the results of this thesis showed that many adolescents, especially girls, suffer from DE as well as poor emotional regulation, depressive thoughts, and low self-esteem. This is a problem, especially given that existing instruments for evaluating DE do not seem optimal, especially for boys. For instance, answering "yes" to the question of ever having engaged in self-induced vomiting because you have felt too full is probably best followed by a visit to the school nurse. Furthermore, the results indicated the importance of viewing DE not as a singular problem, but as a collection of different problems, even among individuals of the same gender. These differences call for different strategies aimed at helping adolescents achieve a healthier diet. Finally, while the parental influence of DE was significant, more research is required, preferably in a Swedish or Nordic context, where parental responsibility is not as heavily reliant on the mother as in other countries.

Svensk sammanfattning

Vägen till en ätstörning, som exempelvis anorexia nervosa eller hetsätningsstörning leder alltid förbi ett gränsland där energiintaget stegvis förändras. Kanske stoppar man i sig aningen mindre mat på måndagen än man gjorde på söndagen och på tisdagen lite mindre än på måndagen. Eller kanske man frivilligt stoppar fingrarna i halsen någon gång när man känner att man har ätit för mycket.

Detta gränsland kan benämnas störda ätbeteenden (disordered eating; DE) (Neumark-Sztainer, Wall, Eisenberg, Story, & Hannan, 2006; Waaddegaard, Thoning, & Petersson, 2003) och här vistas många ungdomar (Hautala et al., 2011; Herpertz-Dahlmann et al., 2008). De flesta tar sig därifrån efter en tid medan andra kanske lever ett helt liv i detta gränsland där inte bara energiintaget regerar, utan där individen ofta även upplever svårigheter med att reglera sina känslor, sina depressiva tankar och sin låga självkänsla. Gränslandet är därför, helt bortsett från att ibland vara språngbrädan till en ätstörningssjukdom, väl värt att undersöka för sin egen del. Av denna anledning genomfördes tre studier av sammanlagt 1265 ungdomar (54,5 % flickor), dels i syfte att undersöka förekomsten av DE, men även för att ytterligare klargöra sambanden mellan DE, emotionsreglering, depression och låg självkänsla.

I studie I utvärderades ett kortfattat instrument, kallat SCOFF (Morgan, Reid, & Lacey, 1999), som ofta används för att bedöma DE. Namnet SCOFF baseras på en akronym bestående av de springande punkterna i fem frågor rörande viktnedgång och tankar kring mat som ska besvaras med ”ja” eller ”nej”. I den första studien kartlades även hur många av ungdomarna som uppvisade någon form av DE. Det visade sig att fler flickor än pojkar hade bekymmer med DE, och dessutom i högre grad, vilket är i linje med tidigare forskning (t.ex. Hautala et al., 2008). Den inledande studien väckte även ett antal frågor rörande SCOFFs användbarhet i ungdomspopulationer som exempelvis huruvida SCOFF verkligen är en bra metod för att mäta DE och ifall endast ett ”ja”-svar (istället för två) ibland borde leda till fortsatt utvärdering om förekomsten av DE, som exempelvis påståendet om man någonsin framkallat kräkningar för att man känt att man ätit för mycket.

Bedömningen av ätstörningsproblematik bör, enligt vissa forskare, ske med hjälp av en *kontinuerlig* skala där man tar hänsyn till sjukdoms*grad,* medan andra argumenterar för att ätstörningsproblematik skall bedömas *kategoriskt*, genom en uppdelning i olika sjukdomsklassificeringar (Williamson, Gleaves, & Stewart, 2005). Oavsett

tillvägagångssätt tycks varken kontinuerliga eller kategoriska modeller fånga hela ätstörningsspektrat (Williamson et al., 2005) och av denna anledning genomfördes en personorienterad analys i studie II. DE bedömdes genom en klusteranalys baserad på subskalorna tillhörande Eating Disorders Examinations Questionnaire (EDE-Q); återhållsamhet, samt bekymmer med ätandet, vikten respektive figuren. De olika grupper som formades baserat på dessa skalor relaterades sedan till förmågan till emotionsreglering, nivå av depressiva tankar och självkänsla. Fyra av sex flickgrupper (50 %) och fem av sex pojkgrupper (24 %) uppvisade poäng som låg över gränsvärdet för en ätstörning. Siffrorna pekar på en generellt hög nivå av DE vilket delvis skulle kunna ha att göra med en alltför tillåtande poäng för att avgränsa en ätstörning från DE. Likväl tyder de på en omfattande allmän problematik. De grupper som uppvisade olika former av DE hade generellt även problem med emotionsreglering, depressiva tankar och låg självkänsla även om vissa undantag fanns. Lägst självkänsla återfanns hos en grupp flickor och en grupp pojkar som båda hade poäng långt över gränsvärdena gällande figur- och viktbekymmer. Detta resultat är i linje med tidigare forskning som visat att en överdriven uppfattning om figur och vikt är starkt relaterat till låg självkänsla (Dunkley & Grilo, 2007). Ett något oväntat fynd var en grupp flickor och en grupp pojkar som båda hade höga poäng på återhållsamhet (restraint) men vars resultat ändå tydde på god emotionsregleringskompetens, fåtalet depressiva symptom och en god självkänsla.

I den tredje studien undersöktes eventuella samband mellan barns och föräldrars DE och emotionsreglering samt gemensamma måltider i familjens inverkan på barns DE. Därtill undersöktes även huruvida någon del av föräldrarnas beteende skulle kunna användas för att förutsäga sannolikheten för DE hos barnen. Resultaten i den tredje studien visade att DE är ett större problem i ungdomsåren än hos vuxna vilket påvisats tidigare (t.ex. Neumark-Sztainer, 2005; Büyükgöze-Kavas, 2007). Vidare visade både ungdomarna och föräldrarna en svag association mellan DE och emotionsreglering.Gällande emotionsreglering så fanns det vissa likheter mellan föräldrarna och barnen, men de såg lite olika ut beroende på barnets kön. Till exempel var föräldrarnas emotionsregleringsstrategier associerade till flickornas emotionsregleringsstrategier, impulskontroll och känslomässiga mål, men endast till pojkarnas emotionsregleringsstrategier. Endast det familjegemensamma middagsmålet var relaterat till barnens DE och emotionsreglering, och slutligen visade studie III att förekomsten av en ätstörning hos föräldern var det enda som ökade sannolikheten för DE hos barnet.

Sammanfattningsvis visade resultaten att många ungdomar, framför allt flickor, men även pojkar, lider av DE och även att DE är associerat med sämre emotionsreglering, fler depressiva tankar och en lägre självkänsla. Det visade sig också att de instrument som idag finns att tillgå sannolikt inte är optimala för att utvärdera förekomsten av DE. Som ett exempel på detta är det tveksamt om det verkligen kan vara okej att svara ”ja” på frågan om man någonsin framkallat kräkningar för att man känt sig obekvämt mätt

utan att detta leder till ett besök hos skolhälsovården. Resultaten visade också på vikten av att inte se DE som *ett* tillstånd utan det finns stora skillnader i problematik även mellan olika grupper av samma kön. Dessa skillnader kan vara betydande vid utformandet av olika strategier för att kunna hjälpa ungdomarna.

Föräldrarnas roll i DE visade sig också vara av betydelse men mer forskning krävs, gärna i en specifikt svensk, eller åtminstone nordisk kontext där föräldraansvaret är jämnare fördelat än i de flesta andra länder.

List of original papers

The thesis is based on the following three studies, which will be referred to in the text by their Roman numerals.

Study I

Hansson, E., Daukantaité, D., & Johnsson, P. (2015). SCOFF in a general Swedish adolescent population. *Journal of Eating Disorders, 3*(48).

Study II

Hansson, E. Daukantaité, D., & Johnsson, P. (2016). Typical patterns of disordered eating among Swedish adolescents: associations with emotion dysregulation, depression, and self-esteem. *Journal of Eating Disorders, 4*(28).

Study III

Hansson, E. Daukantaité, D., & Johnsson, P. (2017). Disordered eating and emotion dysregulation among adolescents and their parents. *BMC Psychology, 5*(12).

Introduction

Nobody goes to bed healthy and wakes up with a diagnosable eating disorder (ED) such as anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), or other specified feeding or eating disorder (OSFED) (as defined by The Diagnostic and Statistical Manual of Mental Disorders, 5th ed. DSM-5; American Psychiatric Association, 2013). Although little is known about the developmental course of EDs, individuals with these disorders seem to enter a period of changed eating behavior prior to fulling the criteria for an ED (American Psychiatric Association, 2013). Such *disordered eating* (DE) represents a kind of borderland between an ED and healthy energy intake, and is considered a problem among adolescents. Although the actual prevalence of DE is uncertain, at least partially because of its unclear definition, researchers have determined it to range from 15% to 17% in boys and from 30% to 52% in girls (Hautala et al., 2011; Herpertz-Dahlmann et al., 2008; Kaluski, Natamba, Goldsmith, Shimony, & Berry, 2008). DE also seems to manifest differently according to gender (Mond et al., 2014).

DE deserves attention for several reasons. First, it may be a predictive factor in the development of an ED (Neumark-Sztainer, Wall, Guo, Story, Haines, & Eisenberg, 2006; Waaddegaard et al., 2003), which can be fatal (Smink, van Hoeken, & Hoek, 2012). DE can also be detrimental to any individual in its own right, even before it progresses to a full-blown ED, as it is often accompanied by several other psychiatric difficulties such as emotion dysregulation, depressive thoughts, and low self-esteem (e.g., Sim & Zeman, 2006; Sonneville et al., 2013; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011).

In light of the uncertainty regarding DE's definition, its high prevalence, its probable differences between boys and girls, and its association with other psychiatric difficulties, the aim of this thesis was to explore the prevalence of DE among Swedish adolescents and the associations with emotion dysregulation, depression, and self-esteem. This was done by first validating a short and easily administrated screening method for DE and then adopting a person-oriented perspective in exploring how DE is associated with emotion dysregulation, depression, and low self-esteem. Finally, the possible links between adolescents' and parents' DE and emotion dysregulation were explored, alongside the possible effects of shared family meals on adolescent DE. The thesis further examines whether it is possible to use parents' behaviors to predict DE among adolescents.

Background

Where does disordered eating begin and end?

As noted above, no one is diagnosed with an ED suddenly – rather, they tend to exhibit DE well before their diagnosis. Furthermore, many of the vulnerabilities and comorbidities associated with EDs are also associated with DE. There is no clear definition of DE at present. Indeed, DE is sometimes defined as whatever does *not* meet the criteria for an ED or healthy eating. However, this implies that healthy eating and EDs are clearly defined, which is not strictly true. Consequently, DE is very difficult to define, and is located somewhere in the borderlands between the two extremes of eating behavior. Indeed, while DE has been defined by several different researchers (e.g. Dennard & Richards, 2013; Klump et al., 2012; Neumark-Sztainer, Eisenberg, Fulkerson, Story, & Larson, 2008; Stice, Marti, Shaw, & Jaconis, 2009), it has rather foggy boundaries. Figure 1 (below) is a purely theoretical and rather simplistic illustration of DE as the borderlands between healthy eating and ED. Drawing on this theoretical model, I describe healthy eating, DE, and ED below.

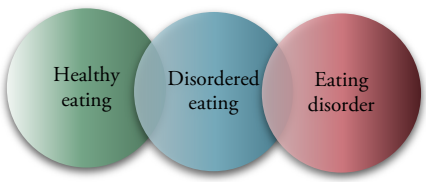

Figure 1: Disordered eating as a borderland between healthy eating and eating disorders.

Healthy eating

Healthy eating refers to eating plenty of vegetables, enjoying a varied diet, and consuming the right amount of food. Eating a wide variety of foods makes it easier to obtain what the body needs to function optimally, while simultaneously reducing the risk of consuming too many harmful substances (National Food Agency, 2015). In Sweden, professionals recommend eating three healthy meals (breakfast, lunch, and

dinner) daily, as well as up to two healthy snacks in between. These recommendations also include the necessary amount of vegetables and fruit that should be eaten on a daily basis (i.e., 500 grams for everyone above ten years of age) and avoidance of energy dense foods (i.e., foods with considerable amounts of fat and sugar; National Food Agency, 2015). Overall, the definition of healthy eating is – on the surface at least – rather clear-cut. Research has also shown that having a dietary pattern similar to that recommended by professionals is effective for increasing longevity among middle-aged and elderly men and women (Drake et al., 2013). However, only a minority of people eat according to the recommendations – it is, in fact, possible that the majority lie within the blue circle in Figure 1, as people sometimes exceed the recommended intake of fat and sugar and are too frugal concerning their intake of fruit and vegetables. For example, only about 40% of fifteen-year-olds included fruit and vegetables in their daily diet in a study by Samuelson (2000). In addition, eating behaviors differ between genders. Generally, girls make better food choices than do boys, whereas boys have a more regular meal pattern (Samuelson, 2000).

While most adults are rather tolerant to deviations from these recommendations, children are less so, given its potential impact on their development. While people often exert considerable effort to optimize the energy intake of newborns to ensure healthy development, the adolescent brain is also undergoing various changes (Klingberg, 2011) and thus requires healthy food intake. For this reason, straying from nutritional recommendations can be non-problematic or problematic depending on the developmental stage of the individual.

Disordered eating

DE is a complex and multifaceted phenomenon (McLaren, Gauvin, & Steiger, 2001) found among individuals who fail to meet the DSM-5 diagnostic criteria for an ED (American Psychiatric Organization, 2013) but who do not engage in healthy eating on a consistent basis. Despite the vagueness of the term, DE is a predictive factor of developing an ED (Neumark-Sztainer, et al., 2006; Waaddegaard et al., 2003), which in turn is associated with high morbidity (Smink et al., 2012). Although most individuals who engage in DE never cross the (rather unclear) boundary into an ED, DE is nevertheless worthy of acknowledgement due to its adverse effects such as increased emotion dysregulation (e.g. Racine & Wildes, 2013), depressive thoughts (e.g. Measelle, Stice, & Hogansen, 2006), and low self-esteem (e.g. Shea & Pritchard, 2007).

Both DE and EDs have been suggested to have a distinct core psychopathology and is governed by the same mechanisms in men and women, which have to do with an over-evaluation of shape and weight (Fairburn & Harrison, 2003). Researchers often use labels such as “subthreshold eating disorders, “subclinical eating disorders,,”

"symptomatic eating," or "partial eating disorders" (e.g. Dennard & Richards, 2013; Klump et al., 2012; Neumark-Sztainer et al., 2008; Stice et al., 2009) when referring to DE. Furthermore, DE can "take many forms" (Combs, Pearson, Zapolski, & Smith, 2013 p 41) such as fasting, the use of diet pills, purging (by vomiting or the use of laxatives), or smoking for weight control (Loth, MacLehose, Bucchianeri, Crow, & Neumark-Sztainer, 2014). Because of the inconsistent definition of DE and its many different labels, I have chosen to use the definition by Waaddegaard et al. (2003), as follows:

> "(…) a behavior and attitude toward body perception, eating habits, weight regulation and self-evaluation that increases the risk of developing clinical eating disorders as well as the risk of developing physical health problems" (Waaddegaard et al., 2003 p 434).

Disordered eating and gender

DE has a strong preponderance among females, although the reasons for this are unknown (Hautala et al., 2008). Gender is often considered an important factor in understanding the etiology and maintenance of psychopathologies such as DE (Lafrance Robinson, Kosmerly, Mansfield-Green, & Lafrance, 2014; Mond et al., 2014; Striegel-Moore & Smolak, 2002). Furthermore, the expression of DE may differ by gender (Mond et al., 2014) – for example, DE among boys is more often used to increase muscularity rather than to slenderize (Kerig, Ludlow, & Wenar, 2012).

When we ignore its imprecise definition, the prevalence of DE varies: for example, it was 15% in boys and 33% in girls in a study of 1,895 eleven- to seventeen-year-old adolescents in a German sample (Herpertz-Dahlmann et al., 2008), but 30% in girls in an Israeli sample (mean age 14.7 years; Kaluski et al., 2008) and 17% in boys and 52% in girls (mean age 14.9 years) in a Finnish sample (Hautala et al., 2011). Furthermore, the prevalence increases from early to late adolescence in girls. Research on the prevalence among boys is rather limited, but overall suggests that DE is comparatively uncommon in adolescent boys (Allen, Crosby, Oddy, & Byrne, 2013; Neumark-Sztainer et al., 2006).

The biology of disordered eating

DE is also of interest from a biological perspective, given that healthy eating – and by contrast, DE and EDs – might affect brain development. However, the ill-defined nature of DE may be one reason that there is no research on possible neural changes associated with DE. Still, a range of neural disturbances have been reported in individuals with anorexia nervosa (AN), such as abnormalities in systems related to reward processing and the development of systems relevant to forming habits (Steinglass & Walsh, 2016). Recent data further suggest that the dorsal frontostriatal circuits play a sizeable role in guiding decisions on what to eat among people suffering from AN, but less so among healthy individuals (Steinglass & Walsh, 2016).

Additionally, neural changes suggesting an altered reward sensitivity and attentional bias have also been found in individuals suffering from binge eating disorder (BED), which are similar to those found in abusers of substances other than food (Kessler, Hutson, Herman, & Potenza, 2016). It is not yet clear whether EDs *cause* neural changes or whether the neural changes are present from birth and make individuals more vulnerable to EDs, or are instigated by a lack of nutrients. Nevertheless, it is evident that neurobiology plays a role in the onset of EDs and possibly DE.

Regarding the genetic components of DE, findings have emphasized adolescence as a critical time with regard to the genetics of DE. Specifically, while genetic factors accounted for 6% of the variance in DE at age 11, they accounted for about 46% of the variance in DE at ages 14–18. Moreover, the effects of shared environmental factors decreased substantially over these same ages. The increase in genetic effects during this developmental stage confirms previous research implicating puberty in the genetic etiology of EDs (Klump, Burt, McGue & Iacono, 2007).

Eating disorders

The research field of EDs is, just like that of DE, quite complex. In particular, the DSM-5's classification system for EDs considers these disorders to be mutually exclusive – in other words, only a single diagnosis can be assigned to any given ED episode. This is because, despite several commonalities, EDs "differ substantially in clinical course, outcome and treatment needs" (American Psychiatric Association, 2013 p. 329); however, it should be noted that this notion is currently under debate (e.g. Fairburn, Cooper, & Shafran, 2003; Williamson et al., 2002). Nevertheless, all EDs are characterized by a persistent disturbance of eating or eating-related behavior that results in the altered consumption or absorption of food, and that significantly impairs physical health or psychosocial functioning (American Psychiatric Association, 2013). The DSM-5 includes diagnostic criteria for all known feeding and eating disorders, but only a few are relevant to this thesis: *anorexia nervosa* (AN), which is characterized by restriction of food (energy) intake and a fear of being fat; *bulimia nervosa* (BN), which involves recurrent episodes of binge eating along with inappropriate compensatory behaviors to prevent weight gain; and *binge eating disorder* (BED), which refers to recurrent episodes of binge eating (American Psychiatric Association, 2013). However, not all clinical cases fall neatly into these pre-defined categories (Thomas,Vartanian, & Brownell, 2009). Thus, the DSM-5 includes a diagnosis of Other Specified Feeding or Eating Disorder (OSFED) when the ED symptoms are present but are not severe or durable enough to warrant a diagnosis of any other ED. Importantly, the symptoms still cause clinically significant distress or impairment in social, occupational, or other important areas of functioning (American Psychiatric Association, 2013). OSFED includes five subdiagnoses: *atypical AN*, *atypical BN* (i.e. of low frequency or limited

duration), *atypical BED* (i.e. low frequency or limited duration), *purging disorder*, and *night eating syndrome* (NES; American Psychiatric Association, 2013).

Unspecified feeding and eating disorder = disordered eating?

The DSM-5 includes a final ED diagnosis called Unspecified Feeding or Eating Disorder (UFED), which is reserved for people who do not fit into any of the five OSFED subdiagnoses or for whom there is insufficient information to make a specific OSFED diagnosis (American Psychiatric Organization, 2013). The UFED diagnosis can be considered the "rag-bag" of EDs. Indeed, Ekeroth, Clinton, Norring, and Birgegard (2013) found that individuals with UFED had milder psychopathology compared to those suffering from other EDs. As such, they suggested that the UFED diagnosis might encompass the boundary between an ED and healthy eating – in other words, UFED may be considered equivalent to DE.

The borderlands of disordered eating

EDs are not stable disorders (Fairburn & Cooper, 2011; Fichter & Quadflieg, 2007), and specific ED diagnoses might be better viewed as mere "snapshots" within the course of an ED (Fairburn & Cooper, 2011). In fact, many patients shift from one diagnosis to another over time (Fichter & Quadflieg, 2007; Helverskov et al., 2010; Stice & Spoor, 2007). Furthermore, the probability of relapsing into an ED is as high as 43%, as shown in a study by Grilo et al. (2012). It seems quite probable that the individuals who relapse into an ED have spent some time within the borderland between EDs and healthy eating, where DE resides.

The controversy concerning whether EDs are supposed to be seen as categorical as opposed to dimensional (i.e. existing on a continuum) has "raged for many years", although neither categorical nor dimensional models seem to adequately represent the full spectrum of ED pathology (Williamson et al., 2005). Focusing specifically on the notion of a "symptom continuum," we must ask: *when* does an ED *begin*? If that question can be answered, then we might also find a way to unravel when DE *ends*. As with most other disorders, it is likely impossible to understand exactly when an ED will manifest, and it is probable that when the first signs of an ED are detected (in hindsight, these signs most likely manifest as DE), the individual has already experienced various biological and neurochemical changes (that they likely do not realize themselves) as well as certain (obvious) behavioral changes. Unfortunately, the diagnoses that are perhaps most important for clarifying what is and what is "not" an ED, UFED and OSFED, have been the subject of little research (Ekeroth et al., 2013). While some studies have noted that OSFED represents a transitional stage of progression into or out of an ED, others suggest that patients with OSFED are a mixed group of individuals who are as seriously ill as those with AN or BN (Fairburn et al., 2007). Other researchers have

pointed out that the categorizations of these disorders matters less than the clinical utility and, in particular, their relative prognostic and therapeutic implications (Fairburn & Cooper, 2011). Furthermore, given the general instability of ED symptoms and diagnoses (Ekeroth et al., 2013), it is doubtful whether further classifications would have greater clinical utility; instead, attention might focus on delineating what is and what is not an ED, since the delineation, at present, relies solely on clinical judgement (Ekeroth et al., 2013; Thomas et al., 2009).

In sum, understanding what does and does not constitute an ED is one of the most challenging aspects of ED research, and when this boundary is muddled, so too is the boundary of where DE ends. In this thesis, I meet this challenge by determining what would constitute healthy eating, and what would constitute DE for girls and boys and exploring what psychological factors might adversely influence healthy eating. Furthermore, it is important to acknowledge that although DE might be a stepping stone towards more serious disease (Neumark-Sztainer et al., 2006; Waaddegaard et al., 2003), it is nevertheless a problematic behavior in its own right, and causes both adolescent girls and boys considerable worry and pain.

Disordered eating: associated psychological factors

Although we lack understanding of the precise causes of EDs, researchers have shown that biological (e.g. genetics, epigenetics, and diseases) and environmental (e.g. media role models, peer pressure, and body dissatisfaction) factors play a role (Rikani et al., 2013). Furthermore, EDs are positively correlated with almost all of the core DSM-IV (the precursor of the DSM-5) mood, anxiety, impulse-control, and substance use disorders (Hudson, Hiripi, Pope, & Kessler, 2007). These associations have raised questions as to whether EDs are merely atypical variants of other conditions, but research on this point is lacking (Wonderlich, Joiner, Keel, Williamson, & Crosby, 2007). The causes for the high levels of comorbidity are unknown, although the co-occurrence of AN with mood disorders might specifically be caused, at least partially, by environmental and genetic factors (Wade, Bulik, Neale, & Kendler, 2000).

As with ED, DE is associated with various other psychopathologies and apparent vulnerabilities (Sim & Zeman, 2006; Sonneville et al., 2013; Swanson et al., 2011) Given the complex and multifaceted nature of DE (McLaren et al., 2001), all of these associations are of interest to understanding DE; however, I focused primarily on its associations with emotion dysregulation, depression, self-esteem, and parental eating behaviors.

Associations of disordered eating with emotion dysregulation

It is difficult to define emotion regulation without context, but, in general, it can be understood as an individual's ability to optimize his or her emotional dynamics to appropriately respond to the demands of the environment (Aldao, 2013). It can also be conceptualized as the difficulties in engaging with the ability to understand, differentiate, and modulate emotions—namely, *emotional dysregulation* (Gratz & Roemer, 2004). Note that the study of emotion dysregulation is still in its infancy (Aldao, 2013; Aldao & Nolen-Hoeksema, 2013), and the processes that underlie regulation of emotion are still under debate (Gross & Barrett, 2011). There is, however, wide agreement regarding the fact that emotions refer to a collection of psychological states that include subjective experiences, expressive behavior (e.g. facial, bodily, verbal), and peripheral physiological responses (e.g. heart rate, respiration), and that emotions are a central feature of any psychological model of the human mind (Gross & Barrett, 2011). Studies have also shown that both over- and under-regulation of emotions can lead to a diminished emotional repertoire and worse emotion regulation. Furthermore, emotion dysregulation can be specifically expressed as difficulties with some or all of the following abilities: (a) emotional awareness, i.e. one's understanding of and attentiveness towards one's own feelings; (b) acceptance of one's own emotions, even when those emotions are not optimal for dealing with a certain situation; (c) the ability to control impulsive behaviors and act in line with one's goals even when experiencing negative emotions; and (d) the ability to use emotion regulatory strategies that are adequate and flexible to modify one's own emotional responses in line with situational demands and one's own goals (Gratz & Roemer, 2004).

Emotion dysregulation has been found to contribute to several psychiatric disorders, as it allegedly intensifies negative emotional states and leads to increased physiological arousal, distress, and avoidance (Cisler, Olatunji, Feldner, & Forsyth, 2010). More relevantly, emotion dysregulation has been shown to associate with DE in women (Svaldi et al., 2012) as well as in young adult men (Griffiths, Angus, Murray, & Touyz, 2014). Furthermore, both emotion dysregulation and DE have been linked with binge eating (Gianini, White, & Masheb, 2013; Leehr et al., 2015; Whiteside et al., 2007), and, in a study of 89 adults (approximately 90% of which were women) with BN, non-acceptance of one's emotions, dysfunctional impulse control, and problems with emotion regulatory strategies were significantly correlated with the *severity* of the ED (Lavender et al., 2014).

Those who seem to lack adaptive ways of regulating their emotions might be more vulnerable to EDs, and thereby DE (Gianini et al., 2013; Heatherton & Baumeister, 1991; Racine & Wildes, 2013). This suggests a possible causal direction, in that emotion dysregulation may contribute to the *development* of an ED. In line with this, researchers suggest that EDs develop as a method of managing strong emotions by "blocking off", or dissociating, from painful cognitions or negative moods—in other

words, as a sort of coping method (Cooper, Wells, & Todd, 2004; Corstorphine, 2006; Ferriter & Ray, 2011). Additionally, emotion dysregulation has been suggested as an important maintaining factor of DE (Cooper, O'Shea, Atkinson, & Wade, 2014).

The development of emotion regulatory skills

The development of emotion regulation is influenced by many factors, such as child temperament, neurophysiology, and cognitive development (Eisenberg & Morris, 2002). It has also been implied that parents' emotion regulation influences that of their children (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Furthermore, there is emerging evidence that emotion regulation continues to develop well into adulthood. An example of this is the suggestion that the neurobiological, hormonal, and psychological changes that occur as a result of becoming a parent have a significant impact on emotion regulation (Rutherford, Wallace, Laurent, & Mayes, 2015). Thus, a common challenge for parents is to maintain their own regulated state when caring for a distressed child, and, at the same time, facilitate their child's emotional regulation (Rutherford et al., 2015). Rutherford et al. (2015) mainly focused on the challenges that parents face with infants' emotional regulation, but their arguments can be applied to the parents of adolescents. In fact, emotion dysregulation has been proposed to play a core role in adolescents' ability to weather developmental challenges (Yap, Allen, & Sheeber, 2007), and both over- and under-regulation of emotions suggest some risk. Conversely, adapted emotion regulation leads to higher social competence, more prosocial behavior, and fewer internalizing problems (Silk, Steinberg, & Morris, 2003; Zeman, Cassano, Perry-Parrish, & Stegall, 2006). In adolescence, emotion dysregulation is regarded as a significant factor related to the development of DE among girls (Mills, Newman, Cossar, & Murray, 2015) and adolescent girls who reported high levels of DE have also reported experiencing increased levels of negative affect, greater difficulties with emotional awareness, and more difficulties in coping constructively with negative emotions than girls who reported low levels of DE (Sim & Zeman, 2006).

The process model of emotion regulation

The process model of emotion regulation (PMER; Gross, 1998) is an information-processing model that expands on the modal model of emotions (MME), specifying the sequence of processes that are involved in the generation of emotions. Each step in this emotion-generation process, listed as follows, is regarded as a potential target for regulation: Situation selection (1) refers to the action that makes it more (or less) likely to end up in a situation that one expects will give rise to (un)desirable emotions. Situation modification (2), by contrast, is the direct modification of a situation to alter its emotional impact, while attention deployment (3) refers to the direction of attention within a given situation and how it influences one's emotions (the most common being distraction). Cognitive change (4) refers to the modification of one's appraisal of the situation in order to alter its emotional significance. Finally, response modulation (5)

refers to limiting the physiological aspects of the negative emotions (Gross, 2013). Consequently, the PMER suggests that there are five different ways of regulating undesirable emotions, which can be broadly categorized as choosing another action altogether or altering the emotional impact of the situation. Furthermore, through attention deployment, individuals' attention to that emotion or the situation deriving it can be directed elsewhere, and through cognitive change, the emotional significance of the situation might be altered.

The biology of emotion dysregulation

Effective emotion regulation involves several different neural mechanisms. Studies of cognitive appraisal (Gross, 1998) have shown that people use a variety of different strategies to regulate their emotions, while neuroimaging research has shown that conscious attempts to change emotional experience influence (i.e. regulate) activity in the frontolimbic structures of the brain (Purves et al., 2013). When individuals engage in cognitive reappraisal of negative emotional stimuli, increased activity is observed in the dorsal frontoparietal network as well as in other prefrontal regions, including the dorsal anterior cingulate cortex and ventrolateral prefrontal cortex. Notably, some of these areas are responsive irrespective of whether the regulatory goal is to increase or decrease affect, suggesting that they are involved in selecting and applying the best cognitive strategy for the situation at hand. Conversely, other regions such as the amygdala and insula are targets of prefrontal modulation, and activity in these regions seems to be sensitive to the regulatory goal (e.g. increasing only when negative affect is enhanced). Overall, attempts to cognitively alter emotional experience appear to involve interactions between dorsal executive control and ventral emotion-processing regions of the brain.

As for the genetic influences of emotion dysregulation, the research field is still rather new. One study showed that variation in the 5-HTT gene has been shown to influence regulation of emotion. More specifically, changes in the gene appear to influence both the structure and function of key pathways regulating the brain's capacity for effectively dealing with stress. Recent evidence suggests that these neural changes contribute to the emergence of individual differences in affect and temperament associated with 5-HTT gene variation. When the system is stressed, the heritable differences could significantly influence the vulnerability to affective illness (Hariri & Holmes, 2006).

Associations of disordered eating with depression

Depression is a complex and multifaceted disorder that has been conceptualized in at least three different ways: as a mood, as a syndrome, and as a disorder (Angold, 1988). A depressed *mood* refers to a general feeling of negative affect that can include sadness and irritability. Depressive *syndrome* involve several co-occurring symptoms, such as

irritability, diminished interest or pleasure in enjoyable activities, weight loss or weight gain, sleeplessness, fatigue, feelings of guilt or worthlessness, concentration problems, and recurrent thoughts of death. Depressive *disorder*, as reflected in the DSM-5 (American Psychiatric Association, 2013), is defined as meeting certain criteria for the number, duration, and severity of these symptoms as well as impaired social functioning. Depressive disorder is associated with high mortality, especially within the first year of its onset, much of which is accounted for by suicide (American Psychiatric Association, 2013). Genetics (Kendler, Gatz, Gardner, & Pedersen, 2006), neurochemical factors (Godlewska, Near, & Cowen, 2015), adverse life events (Kessler, 1997), and binge eating (Sonneville et al., 2013) are all regarded as potential triggers for depression.

Depression has also been found to be associated with DE (Measelle et al., 2006; Santos, Richards, & Bleckley, 2007), regardless of the severity of the DE (Dennard & Richards, 2013; Swanson et al., 2011). Depression may also contribute to the persistence of DE (Hautala et al., 2008).

The development of depression

Most adolescents consider themselves healthy, but they are increasingly likely to face stress and depressive thoughts as they age (Hutton, Nyholm, Nygren, & Svedberg, 2014). Adolescence is characterized by vast changes in several domains of functioning (Eccles, Templeton, Barber, & Stone, 2003), and for a long time, adolescent mood disturbances such as moodiness and self-depreciation were considered normal aspects of child and adolescent development (Kerig, Ludlow, & Wenar, 2012). Indeed, mood disorders were thought to be rare outside of adulthood (Kessler, Avenevoli, & Merikangas, 2001). Depression is no longer considered a "normal" aspect of development, although it is likely to manifest somewhat differently in children and adolescents than in adults, such as a preoccupation with music with depressive themes, missing classes due to lack of motivation and energy, or writing poetry with morbid themes (Santrock, 2016). Adolescents experiencing depression might also show a host of other symptoms, such as social withdrawal, academic problems, crying, avoidance of eye contact, physical complaints, irritability, aggression, and poor appetite (Seroczynski, Jacquez, & Cole, 2006). Adolescent depression has been shown to have a negative impact on academic, social, and health outcomes, as well as with other psychiatric problems such as depression in adulthood (Kessler et al., 2001).

Before the onset of puberty, the rates of depression are the same among boys and girls (Angold, Erkanli, Silberg, Eaves, & Costello, 2002; Nolen-Hoeksema & Girgus, 1994); however, after the onset of puberty, depression is twice as common in girls than in boys (Santrock, 2016). Furthermore, depressive symptoms at age 14 have been shown to increase symptoms of ED in Australian girls at age 20, but not in Australian boys (Allen et al., 2013).

When viewed as a symptom, and not as a diagnosable disease, the prevalence rates of depression among adolescents vary from 20% to 46% among boys and 25% to 59% among girls in the US and Canada (Kerig et al., 2012). However, it is likely that these rates are underestimations, given that many individuals with depression do not seek out or obtain any treatment (Avenevoli, Swendsen, He, Burstein, & Merikangas, 2015). However, in recent years, increasingly more Swedish adolescents are obtaining inpatient treatment for major depressive disorder (Utbildningsdepartementet, 2006). It is unclear whether this represents an increase in the number of adolescents with depression or an increased willingness to seek and receive treatment.

Pubertal timing is regarded as pivotal for onset of depression among girls as well as boys, with early puberty being a predictor of depression for both girls and boys who present emotional problems in childhood or perceive greater parental rejection (Benoit, Lacourse, & Claes, 2013). The precise effect pubertal timing has on depressive symptoms must be extracted from the complex interactions between adolescents' relationships with others and pre-pubertal vulnerabilities (Benoit et al., 2013). The fact that pubertal timing is such a pivotal factor in the onset of depression is especially relevant to the study of ED, given that girls showing early maturation tend to be more likely to develop EDs than do those who begin to physically develop later (Day et al., 2011).

Several different factors have been proposed to account for the gender difference in depression among adolescents. Some researchers suggest that girls tend to ruminate during a depressed mood, which in turn amplifies it. Others have pointed out that their body images tend to be more negative than do boys', and, relatedly, girls experience greater stress regarding weight concerns than do boys. Still others point to how girls face more discrimination than do boys and are more often victims of relational victimization, which in turn may lead to depression. Furthermore, hormonal changes seem to alter vulnerability to depression in adolescence, especially among girls (Santrock, 2016).

The biology of depression

Depression is associated with various functional and structural brain abnormalities (Palazidou, 2012). In particular, depressed patients exhibit dysregulation of the hypothalamo-pituary-adrenal (HPA) axis, which in turn leads to reduced hippocampal volume and prefrontal cortical activity. Such dysregulation likely derives from genetic vulnerabilities and stress, which are also key factors in the development of depression (Palazidou, 2012). Indeed, major depressive disorder (MDD) is moderately heritable and those who exhibit recurrence as well as an early onset age are the ones with the greatest familial risk (Levinson, 2006). However, it remains to be confirmed whether the structural brain abnormalities are reversible or not, whether they predate depression, and whether they increase in the long term.

Associations of disordered eating with self-esteem

The concept of self-esteem most likely has its roots in ancient Greece, where an inscription on the Apollo Temple in Delphi urged people to *gnothi seauton* ("know thyself") (Lindwall, 2011). The concept was later revived in the late eighteen hundreds by the psychologist William James (James, 1957), but research did not begin in earnest until the 1960s, when social psychologist Morris Rosenberg defined self-esteem as a feeling of self-worth and developed the Rosenberg (1965) Self- Esteem Scale. At present, self-esteem is one of the most studied subjects in modern psychology (Zeigler-Hill, 2011) and, consequently, it has numerous different definitions and usages, depending on the researcher (Brown & Marshall, 2006). I utilize the definition by Orth and Robins (2014): "an individual's subjective evaluation of his or her worth as a person" (p. 381). High self-esteem appears to act as buffer against negative experiences, and it has been found to be an important protective factor for ED (Croll, Neumark-Sztainer, Story, & Ireland, 2002). Low self-esteem, on the other hand, seems to make individuals more prone to experience various forms of psychopathology (Zeigler-Hill, 2011). Low self-esteem has also been associated with exaggerated views of one's shape and weight (Dunkley & Grilo, 2007) and has direct effects on restrained eating and compensatory behavior (Brechan & Kvalem, 2015). Overall, a negative assessment of oneself is associated with impaired psychosocial functioning as well as psychopathology (Zeigler-Hill, 2011).

Although numerous studies have demonstrated an association between low self-esteem and psychopathologies such as ED (Shea & Pritchard, 2007) and depression (Orth & Robins, 2013), the directions of the links remain unclear (Sowislo & Orth, 2013; Zeigler-Hill, 2011). There are several interventions aimed at increasing self-esteem in order to reduce the risk of depression—indeed, a recent review showed that the effect of low self-esteem on depression was significantly stronger than was the effect of depression on self-esteem, indicating a possible causal effect of low self-esteem on depression (Orth & Robins, 2013). Low self-esteem has also been found to be a significant contributor to DE (Shea & Pritchard, 2007).

The development of self-esteem

Although self-esteem varies across the different life stages, in general, high self-esteem at one point in time is predictive of high self-esteem at a later point (Robins & Trzesniewski, 2005). Men typically report higher levels of self-esteem than do women (Bleidorn et al., 2015), but gender is overall not a strong influence on the developmental trajectory of self-esteem (Orth & Robins, 2014). Furthermore, self-esteem seems to be a relatively stable, but by no means unalterable, trait, and it tends to become more stable and less contingent across the life course (Meier, Orth, Denissen, & Kuhnel, 2011). Self-esteem is commonly high in childhood but begins to decline during adolescence (Robins & Trzesniewski, 2005). It further increases from

adolescence to middle adulthood, peaking at about age 50, and thereafter decreases into old age (Orth & Robins, 2014). Adolescent girls generally report lower self-esteem than do adolescent boys, and the largest difference between the genders is seen during late adolescence (Räty, Larsson, Söderfeldt, & Larsson, 2005). Adolescents with low self-esteem are at greater risk of ED symptoms and high levels of depressive symptoms than are adolescents with relatively high self-esteem (Courtney, Gamboz, & Johnson, 2008). Notably, low self-esteem is associated with ED and DE independently of depression (Silverstone, 1990).

Although there is still little evidence of the precise causes of high and low self-esteem (Orth & Robins, 2014), pubertal timing may be a factor, just as with the development of depression and DE. Specifically, early pubertal maturation seems to have a detrimental effect on girls' self-esteem, but an beneficial one for boys' (Dusek & McIntyre, 2003). Girls who go through puberty at an early age tend to be partially out of sync in terms of developmental characteristics with their peers; given that puberty is a time when social comparison becomes very important, becoming out of sync might lead to feelings of isolation and confusion (Dusek & McIntyre, 2003). Another possible adverse factor for both boys' and girls' self-esteem is the transition to junior high. This is because, for most adolescents, it involves meeting new people after having spent several years with those they already know well (Wigfield & Eccles, 1994).

The biology of self-esteem

Individuals with low self-esteem tend to report greater social pain relative to individuals with higher self-esteem. One possible reason for this is that individuals with low self-esteem exhibit heightened dorsal anterior cortex activity along with a failure of the prefrontal cortex to suppress the heightened activity (Onoda et al., 2010). Self-esteem has also been found to be a moderately heritable trait (52%), which suggests that research concerning self-esteem should integrate genetics (Roy, Neale & Kendler, 1995).

Associations of disordered eating with parental eating behaviors

Although DE, as previously stated, most likely has a genetic component, numerous researchers have focused on the environmental factors. Traditionally, mothers have been blamed for the occurrence of EDs in children (primarily daughters; Eliot & Baker, 2000), which has led most studies to explore the different aspects of EDs among mothers and daughters, such as mothers' talk with their daughters about their own and their daughters' weight (Bauer, Bucchianeri, & Neumark-Sztainer, 2013), or the similarity of coping styles between mothers and daughters with EDs (Lantzouni, Cox, Salvator, & Crosby, 2015). Despite the focus on mother–daughter relations, associations between parenting practices and eating behaviors have also been found

among adolescent boys (Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2014). Parental comments on a child's weight appear to be the most consistent correlate of child weight and shape concerns and eating behavior, but children's modeling of parental weight concerns through observation of parents' own dieting behavior, comments on weight-related concerns, and weight loss attempts have also been found to give rise to EDs among children in fourth and fifth grade (Smolak, Levine, & Schermer, 1999). One study further suggested that modeling is a risk factor for bulimic pathology, although this study also found no evidence that modeling is a risk factor for body dissatisfaction or dieting (Stice, 2002).

Social learning theory

Children's modeling of their parents behaviors is usually explained with social learning theory (SLT) (Bandura, 1971), which states that a great deal of observational or social learning takes place during childhood within the family setting (Gee & Leith, 2007). More specifically, SLT suggests that individuals are not solely driven by either inner forces (as advocated by psychodynamic theory) or environmental influences (as advocated by behaviorism), but rather by a continuous reciprocal interaction between their behaviors and the controlling conditions of those behaviors (Bandura, 1971). Thus, an individual's capacity to learn by observation enables him or her to acquire various behaviors using others' examples without having to use trial and error. Such learning can also, according to Bandura (1971), occur for emotional responses.

Parents teach their children how to behave appropriately by displaying model behaviors and rewarding children for successful attempts at the same behavior. Children also receive covert messages that communicate parental beliefs and expectations (White, Johnson, & Buyske, 2000); indeed, most social learning (attitudes, emotional responses, and new patterns of behavior) is the result of casual or studied observation of exemplary models, such as parents. As the child grows older, there is reason to believe that such indirect parental influences continue to have an impact, despite adolescents' increased independence from parental control (Riediger et al., 2009; Zimmer-Gembeck & Collins, 2005).

Importantly, the modeling hypothesis suggests that children model more than their parents' eating behaviors and attitudes – they may, in fact, implicitly model how their parents regulate emotions. Therefore, SLT and the modeling hypothesis might partially explain findings of how parental ED predicts ED in 11-year-old girls (Francis & Birch, 2005), college women (Kluck, 2008), and 5-year-old children (Stice, Agras, & Hammer, 1999). In addition, mothers' and fathers' food abstaining behaviors appear to predict food abstaining behaviors in their adolescent daughters (Wertheim, 1999), which may also partially be explained by SLT.

Shared family meals

Shared family meals provide an excellent opportunity for children to observe healthy eating behaviors (provided, of course, that the eating behaviors of the family members are indeed healthy). Shared family meals are associated with higher diet quality among adolescents (Larson, Neumark-Sztainer, Hannan, & Story, 2007), and are inversely associated with DE among adolescents (Larson et al., 2007; Neumark-Sztainer, Wall, Story, & Fulkerson, 2004). Notably, this relationship is most commonly found among women (Skeer & Ballard, 2013). However, the specific problematic behaviors that are improved by regular shared meals remain under debate. Some studies have suggested that shared meals serve a protective function against bulimia or extreme weight control behaviors (Skeer & Ballard, 2013). It has also been suggested that shared meals serve a protective function for both girls and boys, although in different ways. For example, it appears as if shared meals are associated with a decreased risk of engaging in risk behaviors among girls, but not among boys (Skeer & Ballard, 2013).

Aim

The aim of this thesis was to explore the prevalence of DE among Swedish adolescents and the associations with emotion dysregulation, depression, and self-esteem. To meet this aim, my colleagues and I determined the validity of a brief questionnaire of DE among adolescents of both genders, and, in an attempt to broaden the concept of DE, utilized a person-oriented approach to explore patterns of DE patterns among adolescents. In addition, we explored the associations of parents' DE and emotion dysregulation, as well as the frequency of family meals, with adolescents' DE and emotion dysregulation.

Methodological Background

Participants

The thesis is based on the second wave of data collection in a longitudinal study, and was conducted from January to March 2014. Complete questionnaires were obtained from 1,265 students (M_{age} = 16.19, SD = 1.21; age range 13.5–19 years, 54.5% female), or approximately 78% of the 1,621 students attending the participating schools. Of the 356 students who did not participate, 62 refrained from participation either of their own or of their parents' volition. The remaining 294 students were for various reasons absent from school on the day of the data collection.

In total, 83.1% of the adolescents were born in Sweden or another Scandinavian country; the others were born in another European country (4.7 %), the Middle East (7.9 %), or other parts of the world (4.3 %). Approximately two-thirds of the parents were born in Sweden or another Scandinavian country (67.0% of mothers and 67.7% of fathers), with the rest being born in another European country (12.9% and 12.4%, respectively), the Middle East (11.7% and 12.0%), or other parts of the world (8.4% and 8.0%). Furthermore, approximately three-quarters of the adolescents (74.8%) lived in two-parent households with their biological parents, while 10.3% lived in a single-parent household (8.2% with the mother) and 3.7% lived with a parent and a stepparent (3.1% with the biological mother). Roughly one in ten adolescents (9.9%) lived alternatingly with mother and father, 0.9% lived with adults other than their parents, and 0.5% lived alone.

In Study III, 290 mainly Swedish (95.1 %) parents (83.8 % mothers) responded to a written letter with a questionnaire appended. Of those, 236 were matched to their respective child by use of the child's personal code number. The remaining 54 responses were not matched for various reasons. No significant differences were found between the group of adolescents whos parents participated in the study and the adolescents whos parents chose not to answer the questionnaire sent to them.

Procedure

Participants were recruited as a minor part of a project titled "The psychological health and problem behaviors of teenagers in relation to upbringing, circadian rhythms, food practices, and sleep". This project, which commenced in 2012 and had its first data collection in January 2013, comprised a three-year longitudinal study of teenage behaviors among 13- to 19-year-old girls and boys attending schools in a municipality in the south of Sweden. This municipality had a population of approximately 85 500 individuals in 2017. Of the 10 municipal schools in the region, all but two were invited to participate in the study and agreed to participate. The two excluded schools were at the time already engaged in another research project that might have been confounding to them.

The project was presented to schools as an opportunity to aid in the improvement of adolescents' psychological health, and students were invited to complete a printed, self-report questionnaire in their classrooms during school hours and under the supervision of a teacher and one or more members of the research team. There was no time limit, but all students finished within 60 minutes. The students were further told not to talk with each other during the questionnaire session; however, they were given time to ask questions beforehand. The students who declined participation were working on school-related assignments. No remuneration was provided to either students or their teachers.

Study III was based on the same data as Studies I and II, but also invited the parents of the adolescents to participate. In January 2014, parents of the students who attended the schools participating in the study received a letter with a questionnaire, which they were asked to complete and return in a pre-paid envelope.

Measures

Demographic variables

Adolescents

The demographic variables reported by the adolescents included age, gender, country of birth, country of parents' birth, and family composition (e.g., two-parent or single-parent home).

Parents

The demographic variables reported by parents included what grade their child attended, what gender the child was, and in which country the child was born. Furthermore, each parent reported his or her relation to the child (i.e., mother, father, stepmother, stepfather, or other caretaker). In addition, parents, as opposed to the adolescents, reported whether they had ever been diagnosed with an ED (with answer options of "yes", "no", and "do not want to answer").

Disordered Eating

SCOFF[3]*

The SCOFF (Morgan et al., 1999) is a brief instrument that was designed to be used as part of primary care screening for possible ED (Hill, Reid, Morgan, & Lacey, 2010). The SCOFF contains five items concerning eating habits and attitudes toward weight and body shape: "Do you make yourself sick (vomit) because you feel uncomfortably full?" "Do you worry that you have lost control over how much you eat?" "Have you recently lost more than one stone (15 pounds) [around 6.8 kg] in a 3-month period?" "Do you believe yourself to be fat when others say you are thin?" and "Would you say that food dominates your life?" A threshold of two positive answers is used to indicate suspicion of an ED (Luck et al., 2002; Morgan et al., 1999). This cut-off was determined by the developers wanting to optimize the sensitivity of the test for screening purposes (Hill et al., 2010). The Cronbach's alpha for the SCOFF was .44, and the mean (SD) score was 1.24 (1.39) in a study by Mond et al. (2008). As the SCOFF is a dichotomous test, the reliability of the SCOFF was assessed with Kuder and Richardson's formula 20 (KR20), which was .42 for adolescents and .29 for parents in this study. The SCOFF was translated into Swedish by one of the authors using back translation with help from another Swede who was competent in English; however; the translation was not presented to or approved by the original authors of the SCOFF.

EDE-Q

The Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Beglin, 1994), which was derived from the Eating Disorder Examination (EDE), is a frequently used self-report instrument measuring DE and the only outcome tool for the assessment and monitoring of eating disorders recommended by the National Institute for Mental Health in England (White, Haycraft, Goodwin, & Meyer, 2014). The EDE-Q's psychometric properties have been extensively investigated in various study populations, and it has been found to have strong internal consistency and test-retest

[3] Unless otherwise stated, only measures marked by an asterisk (*) in the following sections were responded to by the parents. All other measures were completed by the adolescents only.

reliability (Berg, Peterson, Frazier, & Crow, 2012; Grilo, Masheb, & Wilson, 2001). Strong convergent validity was also demonstrated between the EDE-Q and EDE in both clinical and general population samples (Fairburn & Beglin, 1994; Mond, Hay, Rodgers, Owen, & Beumont, 2004). The EDE-Q yields descriptive data (5 items assessing length, weight, menstruational features, and medication) and frequency data (9 items) on the key behavioral features of EDs such as binge eating or self-induced vomiting. It also yields subscale scores reflecting the severity of the psychopathology of EDs.

The EDE-Q has been revised several times since its original publication, and has also been modified to suit adolescent populations (Carter, Stewart, & Fairburn, 2001). This was done by reducing the memory time frame from 28 to 14 days, and also by replacing certain words and phrases with simpler language. The reduction in recall time frame was intended to improve the accuracy of recall, but also might have caused cases with less frequent symptoms (e.g. vomiting once per month) to go undetected (Carter et al., 2001).

The items used in the present studies were from the following subscales: eating concern (e.g., "How many of the past 14 days have you had a definite fear of losing control over eating?"), restraint (e.g., "How many of the past 14 days have you been deliberately trying to limit the amount of food you eat to influence your shape or weight?"), shape concern (e.g., "How many of the past 14 days have you had a definite desire to have a totally flat stomach?"), and weight concern (e.g., "How many of the past 14 days have you had a strong desire to lose weight?"). Each item is answered on a 7-point Likert scale ranging from 0 ("no days") to 6 ("every day"). The item scores for each subscale are averaged to provide subscale scores, and a global score can be calculated by averaging the subscale scores. Higher scores are indicative of more severe eating disorder psychopathology. The Cronbach's alpha coefficients were .95 for the whole EDE-Q, .77 for eating concern, .90 for restraint, .93 for shape concern, and .85 for weight concern in the present studies.

Traditionally, based on the theoretically derived subscales of the EDE, a mean global score of 4.0 has been used as a threshold for ED psychopathology in community studies of the EDE-Q. However, evidence from clinical settings has shown that nearly half of patients diagnosed with an ED obtain a global score of less than 4.0 (Welch, Birgegard, Parling, & Ghaderi, 2011). It is therefore probable that a cut-off of 4.0 has limited clinical utility, and if utilized for screening purposes, may yield an underestimate of the prevalence of ED (Rø, Reas, & Stedal, 2015). A slightly higher threshold might also be appropriate (Mond et al., 2004); thus, in Study II, the cut-off scores of the EDE-Q were calculated using the method of Ekeroth and Birgegard (2014). As a result, the clinical cut-off points for the EDE-Q global and subscale scores for girls (and boys) were as follows: global scale, 2.17 (1.06), eating concern, 1.50 (.69), restraint, 1.88 (.92), shape concern 2.90 (1.45), and weight concern, 2.39 (1.25).

Shared Meals

Adolescents also completed three questions on the frequency of shared meals: "How often do the majority of your family members share breakfast/lunch/dinner with you"? Each question was rated on a 7-point Likert-type scale ranging from 1 ("one day per week") to 7 ("seven days per week"). The answers were added into a total score of a maximum of 21 meals per week.

Emotion Dysregulation

*DERS**

The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item self-report questionnaire that has been validated for adolescents (Weinberg & Klonsky, 2009). The DERS comprises six dimensions of emotion regulation: (1) lack of emotional awareness (e.g., "I am attentive to my feelings" [reverse scored]); (2) lack of emotional clarity (e.g., "I have no idea how I am feeling"); (3) impulse control difficulties (e.g., "When I'm upset, I feel out of control"); (4) difficulties in engaging in goal-directed behaviors (e.g., "When I'm upset, I have difficulties getting work done"); (5) non-acceptance of emotional responses (e.g., "When I'm upset, I feel guilty for feeling that way"); and (6) limited access to emotion regulation strategies (e.g., "When I'm upset, my emotions feel overwhelming").

The items are rated on a five-point Likert scale corresponding to the frequency that each statement applies to them; this scale ranges from 1 ("almost never") to 5 ("almost always"). The DERS has demonstrated high internal consistency (Gratz & Roemer, 2004), with a Cronbach's alpha of .93. In Study II, the Cronbach's alpha was .94 for the total scale for adolescents (.77 for the parents), .76 (.34) for awareness, .81 (.64) for clarity, .85 (.58) for impulsivity, .86 (.60) for goals, .87 (.51) for non-acceptance, and .86 (.65) for strategies.

Depression

The Center for Epidemiological Studies Depression Scale for Children (CESD-C) (Faulstich, Carey, Ruggiero, Enyart, & Gresham, 1986) is a 20-item measure for assessing depressive symptoms in adolescents. The scale covers six broad symptom areas, including (1) sleep disturbances, (2) guilt/worthlessness, (3) helplessness/hopelessness, (4) psychomotor retardation, (5) loss of appetite, and (6) positive mood (which is reverse scored). For each item, the respondent indicates the extent to which he or she has felt this way in the past week using a four-point Likert scale ranging from 0 ("not at all") to 3 ("all the time"). Higher scores indicate more

severe depressive symptoms. In Study II, the Cronbach's alpha was .91 for the adolescents.

Self-esteem

Lack of self-esteem was measured using the 10-item Rosenberg Self-Esteem Scale (Rosenberg, 1965). This scales measures global self-worth by assessing positive and negative feelings about the self. All items are answered using a four-point Likert scale ranging from strongly agree (1) to strongly disagree (5). An example item for this scale includes "I feel that I am a person of worth, at least on an equal plane with others." In Study II, the Cronbach's alpha was .90 for the adolescents.

Statistical Analysis

For all statistical analyses, IBM SPSS Statistics was used. The correlations between continuous variables (e.g. EDE-Q, DERS) were calculated using Pearson's (r) correlation coefficient, while correlations regarding SCOFF, a dichotomous variable, were calculated using point-biserial correlations (r_{pb}). Independent group comparisons (e.g. between boys and girls) were calculated with independent t-tests. The SCOFF answers were compared using the non-parametric Mann–Whitney U-test. All effect sizes were calculated as suggested by Field (2013), and all p-values were two-tailed.

Study I

Factor analyses were used to evaluate the structure of the SCOFF in Study I. Before the factor analysis was performed, the data were divided into two parts. An exploratory factor analysis (i.e. principal component analysis) was conducted on one of the parts, while a confirmatory factor analysis was conducted on the second part using R. The internal consistency reliability of the SCOFF was assessed with Kuder and Richardson's formula 20 (KR20), which is used for instruments that use dichotomous answer formats.

To compare the total SCOFF scores between girls and boys, the Mann–Whitney U-test was used. Furthermore, to compare the groups with differing numbers of "yes" answers on the SCOFF, the Kruskal-Wallis H-test was used. These tests were employed because of the differences in the variances between the groups and the non-normal distribution of the scores.

Study II

In Study II, a cluster analysis with in the framework of the LICUR procedure (Bergman, 1998) was performed to identify the various DE profiles. The cluster analysis was performed using the SLEIPNER statistical package (Bergman & El-Khouri, 2002). Cluster analyses performed with SLEIPNER have several advantages over traditional forms of cluster analysis. In particular, they have the ability to analyze the explained variance of cluster solutions and the clusters' homogeneity coefficients. Furthermore, SLEIPNER contains an explicit procedure for testing the statistical significance of the cluster solution by using Monte Carlo simulations to create random data for comparison.

The cluster analysis was carried out in three steps. First, multivariate outliers were identified and removed via the RESIDUE module. Second, the remaining subjects were cluster analyzed using the agglomerative hierarchical method (Ward Jr, 1963). Four criteria were used to determine the appropriate number of clusters to extract: (a) the cluster solution must have theoretical meaning; (b) a pronounced drop in the explained error sum of squares (EESS; explained below) should occur when a cluster solution with one less cluster is extracted; (c) the number of clusters should not be more than 15 and should not be less than five; and (d) the size of the EESS for the chosen cluster solution should preferably be no less than 67%, and at the very least should exceed 50% (Bergman, 1998). Finally, a data simulation was carried out to verify whether the EESS was higher than could be expected by chance using a random dataset.

An evaluation of the trustworthiness and explanatory power of the clusters was based on their degree of homogeneity. The average squared Euclidean distances (ASEDs) were computed between all members within a cluster, thus yielding the homogeneity coefficient (hc). For the total cohort, or a one-cluster solution, the hc would be 2.00 for standardized variables. As a rule of thumb, an hc below 1.00 for a cluster is considered highly desirable, and a value below 0.50 indicates a reasonably homogenous cluster. Finally, we assessed the differences in the various validation variables (i.e., SCOFF, emotion dysregulation, depression, and self-esteem) between the clusters. If the classification structure is valid and useful, then clear differences in the expected directions would be found between the clusters in these three variables.

Study III

In Study III, paired-samples t-tests as well as McNemar's test were used to explore the differences in DE and emotion dysregulation between adolescents and their parents. A logistic regression analysis was used to explore which parental variables predicted adolescent DE.

Study aims and main findings

Study I: SCOFF in a General Swedish Adolescent Population

Aim

The aim of the first study was to explore the validity of the five-item SCOFF questionnaire in a Swedish community sample of adolescents of both genders.

Main findings

The results indicated that there might be pitfalls when treating SCOFF as a uni-factorial scale. Furthermore, the SCOFF and EDE-Q were correlated in both the girl and boy samples, suggesting that the SCOFF has some utility. Girls scored significantly higher on the SCOFF and were also over-represented in frequency in the group with more severe DE. The results raised questions as to whether the SCOFF might be interpreted and responded to in different ways by girls and boys, and also whether only one "yes" answer, instead of the stipulated two, could be sufficient when using the SCOFF for screening purposes.

Study II: Typical Patterns of Disordered Eating among Swedish Adolescents: Associations with Emotion Dysregulation, Depression, and Self-Esteem

Aim

The aim of the second study was to identify typical patterns of DE by determining the relationships between the four indicators (restraint and eating, shape, and weight

concerns) of DE, as measured by the EDE-Q, and to relate these patterns to clinical EDE-Q cut-off scores and emotion dysregulation, depression, self-esteem, and two categories of DE behaviors (based on participants' responses to the SCOFF questionnaire).

Main Findings

The cluster analysis yielded a six-cluster solution for each gender. Four of the six clusters for girls and five for boys showed scores above the clinical cut-off on at least one of the four DE indicators. For girls, the two clusters that scored above the clinical cut-offs on all four DE indicators reported severe psychological problems, including high scores on emotion dysregulation and depression and low scores on self-esteem. Conversely, for boys, although two clusters also reported above the clinical cut-offs on all four indicators, only the cluster with exceedingly high scores on shape and weight concerns reported high emotion dysregulation and depression, and extremely low self-esteem.

Study III: Disordered Eating Behaviors and Emotion Dysregulation among Adolescents and their Parents

Aim

The aim of the third study was to explore whether parents' own DE and emotion dysregulation, as well as the frequency of family meals, were associated with their adolescent children's DE and emotion dysregulation.

Main findings

The adolescents showed greater problems with DE than their parents. Significant though weak associations were found between girls' DE and their parents' DE as well as boys' DE and their parents DE. DE was associated with problems with emotion dysregulation among both adolescents and adults. Furthermore, adolescent and parental emotion dysregulation was associated, although there were gender-differences in the specifics of this relationship.

Only the dinner meal was associated to fewer problems with DE and emotion dysregulation among adolescents. Finally, parental ED was the only factor significantly predicting adolescent DE.

Discussion

The aim of this thesis was to explore the prevalence of DE among Swedish adolescents and the associations with emotion dysregulation, depression, and self- esteem. This aim was based on the evident importance of early detection of DE, which may cause significant psychological distress and has the potential to transition into a full-blown ED. To meet this aim, three studies were performed. First, the validity of a brief questionnaire among adolescents of both genders was explored. Second, in an attempt to broaden the concept of DE, a person-oriented approach was applied to explore the different patterns of DE and how these patterns were related to EDE-Q cut-off scores, emotion dysregulation, depression, and self-esteem. Finally, associations between adolescent and parental DE and emotion dysregulation, the frequency of shared family meals, and possible predictors of DE were explored.

Challenges in measuring disordered eating

Defining and measuring DE is indeed a challenge. The instruments used in the present study, the SCOFF and EDE-Q, both have their strengths and limitations.

A questionnaire containing only five short yes/no questions is not burdensome to the respondent and, due to its brevity, is easier to combine with other questionnaires. This has earned the SCOFF the description as a "brief," "easily administrated," and "simple" questionnaire for screening for DE (Botella, Sepulveda, Huang, & Gambara, 2013; Garcia et al., 2010; Hill et al., 2010; Pannocchia, Fiorino, Giannini, & Vanderlinden, 2011). However, can a questionnaire be too brief? The most important characteristic of a psychometric questionnaire is to reliably measure a given construct, and it remains debatable whether five questions are sufficient for measuring DE among both girls and boys. This is especially true when one of the questions asks whether food dominates your life. Several adolescent boys expressed "Hell, yes!" when they were completing the questionnaire, reflecting the rather well-known fact that growing teenage boys tend to eat large amounts of food. Guidelines for public health (Folkhälsoguiden, 2017) similarly suggest that the energy intake for growing boys should be higher than for adult men, assuming, of course, that the boys expend more energy. This is in line with the previously mentioned notion that a developing brain requires considerable energy to

optimize its development (Ingvar & Eldh, 2015; Klingberg, 2015). Still, while brief, the SCOFF has been validated in non-clinical adolescent samples of both genders (Hautala et al., 2009; Garcia et al., 2010); this suggests that these boys' exclamations are not indicative of the questionnaire being unsuitable for them. However, the SCOFF, like so many screening questionnaires for ED, originates from research on women and adolescent girls, whose thoughts and behaviors on food might not mirror those of boys, and who possibly express different types of risk behaviors (Waaddegaard, Davidsen, & Kjoller, 2009). For this reason, the SCOFF might be made more gender sensitive; indeed, at present, it is difficult to decide whether fewer number of boys suffering from DE is actually the result of their better resilience towards DE or merely a lack of adherence to the questionnaires.

An additional question is whether the SCOFF would operate well as a scale, considering that it has been used as such in some studies (e.g. Siervo, Boschi, Papa, Bellini, & Falconi, 2005; Leung, et al., 2009). Because SCOFF is a dichotomous test, its reliability was assessed with the KR20 instead of Cronbach's alpha in this thesis. KR20 for the adolescents was .42 while KR20 for the parents was .29. The low KR20 values might indicate that the SCOFF does not function well as a full scale; therefore, the SCOFF was used as a screener with a cut-off of two positive answers (except for when the one positive answer cut-off was tested). By deciding the SCOFF cut-off as "yes" answers for two out of the five questions, the developers wanted to optimize the sensitivity of the test for screening purposes (Hill et al., 2010). However, the exploration of the SCOFF in Study I revealed that the question of whether the respondent had ever engaged in self-induced vomiting after a meal was perhaps "enough" to indicate the need for further inquiries on possible DE. Thus, when screening for DE in adolescent populations, it should be a priority to ensure that no probable cases are missed, even though this might come at the price of a higher rate of false positives (Mond et al., 2008). Self-induced vomiting – even if one does not do it "often enough" to receive an ED diagnosis – is clearly not a sign of healthy eating, and asking about this may serve as a useful screener in its own right.

The SCOFF was initially meant to be used in primary care screening for possible ED (Hill et al., 2010) and it is important to recognize that questionnaires developed for use in clinical samples might not be suited for use as screening instruments in non-clinical samples (Mond et al., 2008). An additional possible flaw is that the SCOFF does not have a specific time scope (e.g. a week, two weeks, or a month), unlike the adolescent version of the EDE-Q (Carter, et al., 2001) which time scope is two weeks. The lack of a time scope might be considered a shortcoming of the SCOFF because it opens up the participants' answers to different interpretations. For example, some responents might not have reported self-induced vomiting that happened some time ago, even though this would be very much relevant to the possibility of DE. On the other hand, the EDE-Q's use of a two-week time scope restricts respondents in a way that the SCOFF does not, and thus it is possible that the lack of time scope works the other way

so to speak – namely, that it captures important events that happened some time ago but are still relevant for the assessment of DE.

The EDE-Q, which is a more comprehensive instrument for measuring DE than the SCOFF (comprising 22 items if only using the subscale items and not the frequency items), has shown excellent internal consistency and two-week test-retest reliability for the four subscales (Luce & Crowther, 1999). Furthermore, the EDE-Q has shown good agreement with its precursor, the Eating Disorder Examination Interview, in a study of a community sample of women aged 18–45 (Mond et al., 2004). However, because the subscales of the EDE-Q were used for the pattern analyses in Study II, it is important to note that the factor structure of the EDE-Q has yielded inconsistent results (for a thorough review, see Allen, Byrne, Lampard, Watson, & Fursland, 2011). The subscale scores of restraint and shape and weight concerns were highly correlated in the initial assessment comparing the EDE-Q to the EDE (Fairburn & Beglin, 1994), while in a study by Mond et al (2014), the rank order correlations were strong between the weight and shape concern subscales in both male and female participants, such that the subscales were combined into a single weight/shape-concern subscale. Furthermore, the weight and shape concern subscales tend to load together in all groups in a study of male and female college athletes (Darcy, Hardy, Crosby, Lock, & Peebles, 2013). In a study by White, et al. (2014), the original four-factor structure of the EDE-Q was not replicated in a sample of 917 adolescents aged 14–18 years; however, the original subscales, aside from the shape and weight concern subscales, which were combined, were mostly reproduced. Note that the shape and weight subscales often accompanied each other in the pattern analysis of Study II, as well.

The EDE-Q was designed for use in female populations (Luce & Crowther, 1999), and may therefore not be sensitive to the eating and weight/shape control behaviors largely confined to males and adolescent boys, such as behaviors aimed at increasing muscle mass (Mond et al., 2014; Berg et al., 2012). Furthermore, Berg et al. (2012) suggested that while the EDE-Q indeed has demonstrated validity for a specific use and in specific samples, this does not constitute evidence for the validity of the instrument for different uses and samples. In fact, there is an almost complete lack of research on the psychometric properties of the EDE-Q among adolescents. Although Berg et al. (2012) does have a valid point – that there currently are no reliable or validated instruments to be used when measuring boys' DE, despite the fact that, for several years, researchers have suspected that EDE-Q might not measure boys' DE in a comprehensive way – this merely indicates that DE must be measured among boys with a flawed instrument or not at all. While this statement might be considered a bit rough, there remains no alternative measure. Due to this, more boys than previously estimated might be suffering from DE.

Furthermore, when using the EDE-Q in adolescent samples, some respondents do not provide responses for the behavioral questions referring to self-induced vomiting and

excessive exercise, which suggests that researchers might need to consider the clarity, wording, and applicability of these questions when conducting research among community samples of adolescents (White et al., 2014). Additionally, items addressing the more extreme forms of weight control have been questioned, particularly when trying to identify EDs typically encountered in general population surveys (Mond et al., 2004). This issue is of particular concern to the first item of the SCOFF (i.e., whether the respondent has has ever felt so full as to self-induce vomiting). However, no such tendencies were found for the SCOFF – the question on self-induced vomiting did not differ from the other questions in terms of the amount of responses. It is, however, a relatively blunt question, which might lead to biased answers, as most adolescents know that self-induced vomiting is not a sign of good health.

A receiver operating characteristic (ROC) analysis (Mond et al., 2004) of the 22 items of the EDE-Q revealed that an optimal compromise between sensitivity and specificity was achieved for a score of 2.3 on the global EDE-Q scale. This was suggested to be well-suited for use in prospective studies. However, the study by Mond (2004) included only women, and therefore the cut-off scores for the EDE-Q and its subscales for this thesis were adapted from the works of Ekeroth and Birgegard (2014), who also suggested cut-off scores for adolescent boys. Although the cut-off scores suggested by Ekeroth and Birgegard (2014) might be considered somewhat too permissive, again, the importance of missing no probable cases (Mond et al., 2008) governed the analyses of all studies in this thesis.

In March 2016, a short form of the original 28-item EDE-Q was presented (EDE-QS; (Gideon et al., 2016). The 12-item EDE-QS showed high internal consistency and was highly correlated with the original EDE-Q. Furthermore, it was sufficiently sensitive to distinguish between people with and without ED. The researchers concluded that the EDE-QS was a brief, reliable, and valid measure of ED symptom severity. The EDE-QS might prove a more useful measure than the SCOFF in future studies, even if it has more than twice the number of questions. Of course, it is worth noting that the majority (90.2%) of the respondents in the validation of the EDE-QS were female and above eighteen years of age (Gideon et al., 2016).

In summary, caution should be taken when using the SCOFF and EDE-Q as screening instruments among adolescents of both genders. Both measures have their benefits and flaws.

The importance of studying different patterns of disordered eating

Traditionally, most research on DE has been dimensional (i.e. it has focused on the severity of DE) as opposed to categorical (i.e. focused on distinct types of DE). The debate as to whether DE should be viewed as dimensional or categorical has continued for years, but both views seem desirable for representing the full spectrum of DE and to detect DE as early as possible (Williamson, Gleaves, & Stewart, 2005). DE has been typically studied by first examining a number of DE indicators, such as eating or shape concerns, and then determining the relations of either individual DE indicators or the total scores of those indicators to different psychosocial problems such as depression or self-esteem (e.g. Allen, Crosby, Oddy, & Byrne, 2013; Shea & Pritchard, 2007; Sonneville et al., 2013). Such a variable-oriented approach, built on the examination of linear relationships and mean differences, provides important knowledge about the relationships between various DE indicators and psychosocial difficulties.

In contrast, a person-oriented approach, which aims to reveal different patterns of DE, provides important knowledge about the relationships between various DE-indicators, that in a traditional, variable-oriented approach might be more segmented. The approach could, to some degree, be understood as similar to how clinical psychologists examine different symptoms in order to build individual profiles for each patient. By using a person-oriented approach, some key indicators of DE, in this case derived from the subscales of the EDE-Q, were regarded as indivisible and therefore studied and interpreted simultaneously (Magnusson, 1985, 1998). Study II was able to confirm previous research using this method – namely, that boys and girls with non-problematic DE patterns reported the highest levels of psychological health, including low levels of emotion dysregulation and depression and high levels of self-esteem. In contrast, adolescents with DE patterns above the clinical cut-offs tended to report higher levels of emotion dysregulation, more depressive symptoms, and lower self-esteem (Sim & Zeman, 2006; Sonneville et al., 2013; Swanson et al., 2011). However, some non-dimensional results also arose, as the groups did not only differ in severity (i.e., "non-problematic" to "most severe") but also in several characteristics. For instance, both girls and boys exhibiting DE and clinical levels of restraint did not differ from those with the non-problematic DE pattern in terms of emotion dysregulation, depression, or self-esteem, and also reported better mental health than did the other patterns with problematic DE. These results suggest that clinical levels of restraint do not, on their own, have a significant impact on adolescents' psychological health. Of course, there is also a possibility that this group of boys and girls are in denial of their behavior, or actually find the restrained eating as beneficial to their self-image. Furthermore, the fact that two of the girl patterns showed significant differences in the restraint subscale but similar scores for emotion dysregulation, self-esteem, and depression might suggest that

DE has different developmental trajectories. This, in turn, suggests the need for different intervention strategies. Among the boys, there was an evidently problematic DE pattern characterized by clinical levels of DE. This particular group, comprising only eight boys, had the lowest self-esteem of all adolescents in the study. This is noteworthy considering that girls generally tend to have lower self-esteem than do boys (Räty et al., 2005).

As a final remark regarding the difficulties in establishing boundaries of DE and ED, we found that two patterns (one each for boys and girls) showed scores above the clinical cut-offs on two of the four DE indicators. Despite this, these patterns did not differ significantly from the less problematic patterns, and might not have been identified using another approach. However, these groups might experience difficulties in the future, and in fact may represent "pre-clinical" individuals or "turning points." As such, they might require special attention from healthcare professionals and parents.

The exploration of parental associations with adolescent DE and emotion dysregulation

Although the relationship between parent and child changes as the child grows older, parents remain important role models to adolescent children (Bandura, 1971). Despite this, there is little research on the relationships between parental and adolescent DE and emotion regulation (Bariola et al., 2012; John & Gross, 2004; Morris, et al, 2007). Study III indicated that adolescents experienced more DE than did their parents, which is in line with previous research indicating that DE is greater among adolescents than among adults (Neumark-Sztainer, 2005; Büyükgöze-Kavas, 2007). Furthermore, girls showed greater difficulties with emotion regulation than did boys, and adolescents in general showed greater difficulties with emotion regulation than did their parents. A possible explanation for why DE and emotion dysregulation is more common among younger individuals could be that emotion regulatory skills develop well into adulthood, and therefore might not be as advanced in adolescence as in later life (Rutherford et al., 2015). In other words, from a developmental perspective, adolescents have somewhat less mature emotion regulation skills (Eisenberg & Morris, 2002). Consequently, because DE is associated with emotion dysregulation, greater emotion regulation skills may be a contributor to more healthy food choices as a person ages. However, this does not explain why girls experience more emotion dysregulation than do boys. In fact, girls, in general, mature earlier than do boys (Lim, Han, Uhlhaas, & Kaiser, 2015), which gives them an advantage in the development of emotion regulation skills. On the other hand, adolescent girls are also more likely to suffer from low self-esteem, depression, and DE (Santrock, 2016; Dennard & Richards, 2013;

Lampard, Byrne, & McLean, 2011), which might partially inhibit their development of emotion regulatory skills.

Girls' emotion regulation skills (as well as boys') were weakly associated with parents' skills, giving partial support to the modeling hypothesis (Bandura, 1971). This hypothesis was also explored in terms of the possible effect of shared family meals. Surprisingly, we found no association between shared family meals and DE in adolescents, despite previous studies indicating that the former is a protective factor against the latter (e.g. Larson, et al, 2007; Neumark-Sztainer, et al, 2004). However, there was a rather weak association between shared family dinners and adolescent DE and emotion regulation. This might be because a shared dinner is considered more of a "family affair" in Sweden, given that lunch is provided at school (and is, incidentally, skipped by about 50% of adolescents; Höglund, Samuelson, & Mark, 1998) and breakfast, if not completely disregarded (Höglund et al, 1998), is often a stressful period for families with children in school and two parents working full time. Still, the frequency of shared breakfast meals was previously found been found to be associated with DE (Ackard & Neumark-Sztainer, 2001). This is perhaps because "family" time is more important for reducing DE than is mere "food intake," which occurs during breakfast and lunch as well. Of course, it should be noted that not all shared family dinners are considered joyful occasions by either the parent or child.

A somewhat surprising result of the third study was that only parental eating disorder raised the odds of adolescent DE. This result might further, alongside the genetic component (Klump et al., 2007; Rikani et al., 2013), strengthen the importance of modeling among adolescents and their parents (Bandura, 1971).

Disordered eating: vulnerability factors

As previously stated, no one suddenly gets diagnosed with an ED, and many of the vulnerabilities and comorbidities associated with EDs are also associated with DE. Although the exact causes of EDs and DE are unknown, relevant factors have been identified, from which we might derive an understanding of the individual vulnerabilities to these conditions.

Known biological vulnerabilities of DE range from genetics to structural brain changes (e.g. Rikani et al., 2013). The genetic vulnerabilities refer mainly to the fact that DE appears to be congenital, although epi-genetic research befuddles the certainty with which this can be stated at present. Structural brain changes and altered neural circuits have been found in patients with confirmed ED (e.g. Kessler et al., 2016); however, it has not yet been concluded whether these changes are congenital, or whether they have occurred because of an illness and/or a lack of nutrients.

The genetic vulnerabilities for DE seem particularly active in adolescence (Klump et al., 2007), possibly due to puberty; while this association is not clear at present, there is evidence that early maturing girls are more likely to develop EDs than are those whose physical development begins later (Day et al., 2011). Furthermore, early pubertal maturation appears to have a detrimental effect on girls' as well as boys' mood, causing many adolescents to experience depression (Benoit et al., 2013). Going through puberty at an early age can negatively influence girls' self-esteem (Dusek & McIntyre, 2003), although it appears to be beneficial to boys' (Dusek & McIntyre, 2003). Because both depression and self-esteem are associated with DE, it is possible that the vulnerability for DE is related to early puberty, as with the onset of depression and poorer self-esteem. The different biological vulnerabilities might also affect and strengthen each other in different ways, accounting for the observed individual differences in DE. In addition, as previously stated, adolescents with emotion dysregulatory problems appear to be more vulnerable to DE (e.g. Gianini et al., 2013; Heatherton & Baumeister, 1991; Racine & Wildes, 2013), adding yet another potential factor leading to DE in adolescents. Of course, these are the associations that were focused on in this thesis, and there are likely other factors that have not yet been explored in much detail. In addition, environmental factors such as for example peer pressure, or adverse life events, may also help determine whether an individual is able to handle DE or not.

Overall, some individuals exhibit a vulnerability, congenital or not, to developing DE, and early pubertal timing seems to increase this risk. There remains, however, an enormous challenge in identifying and ultimately aiding those who are vulnerable – one girl might develop DE because of a genetic predisposition, difficulties with emotion regulation, and low self-esteem, whereas another might develop it because of a different genetic predisposition, structural brain changes, and unhealthy parental modeling.

The borderlands revisited

One of the main purposes of this study was to examine DE and the factors related to it in order to identify what is and what is not DE. This will enable us to understand when the borders between healthy eating, DE, and ED have been crossed. Ekeroth et al. (2013) suggests that further attention should be given to delineating what is and what is not an ED, but I think that it is as important to delineate what is and what is not DE (Figure 1).

"DE differs from ED in the frequency of behavior and level of severity, and can lead to OSFED and UFED, or clinical ED such as AN and BN" (Pettersen, Hernaes, & Skarderud, 2016 p.1).

The quote above explains this all, and yet, at the same time, states nothing. Similar to the quote from Waaddegaard (2003) included in the introduction, this quote by Pettersen et al. (2016) is valid, but does nothing to clarify the boundaries of where DE begins and ends. Thus, this definition is insufficient for use in practice.

Again, an important question that needs answering is where to draw the line between normal and pathological eating behavior (Ekeroth et al., 2013). Surely an individual's eating to the point of making themselves sick is likely to be considered as a serious issue by, for example, a school nurse. Nevertheless, Morgan et al. (1999) has still suggested that two "yes" answers are the best cut-off for the SCOFF, and some researchers have gone even further, suggesting three "yes" answers (Siervo, Boschi, Papa, Bellini, & Falconi, 2005). For screening adolescents, why not use a cut-off of one "yes" answer, particularly the question of self-induced vomiting? Although Thomas et al. (2009) has pointed out the possible risks of overpathologizing normative behaviors, they did not clearly indicate what such behaviors might be. Although this are risks to overpathologizing – such as the risk of "washing out" a particular diagnosis – what harm would outweigh detecting possible DE at an early stage?

A final question is whether the boundaries of DE should be set differently for boys and girls, much like the cut-off values of the EDE-Q (Ekeroth & Birgergård, 2014), but not the SCOFF. Gender-specific questionnaires may be useful because girls and boys evidently do not experience and express DE similarly, and might therefore have different boundaries. While research suggests that DE is comparatively uncommon in adolescent boys, there is still an overall lack of research in this area (e.g. Allen et al, 2013; Mond et al., 2014; Neumark-Sztainer et al., 2006), and it is possible that the questionnaires, which are primarily developed for girls and women, do not accurately capture boys' DE. Furthermore, several differences between genders in DE as well as emotion dysregulation, depression, and self-esteem were found in this thesis, which implies that the boundary between DE and ED is not a straight line. Restraint, for example, might be of great danger to some adolescents (e.g. those who are continuing towards possible AN), whereas others might go on a diet for a certain period and then return to more healthy eating. The suggestion of this boundary not being straight is, of course, no excuse for making the boundaries between these conditions foggy – even slanted boundaries can be distinct.

Ethical and procedural considerations

The research for this thesis was conducted in accordance with the Declaration of Helsinki (World Medical Association, 2016), which is especially important for studies concerning children and youth. Furthermore, Beauchamp and Childress's (2009) elemental ethical principles of autonomy, justice beneficence, and non-maleficence governed the thesis, and the study design and methods were approved by the regional ethical review board in Lund, Sweden (dnr: 2012/499; 2013/642).

Regarding the principle of autonomy – namely, the right for the individual to make his or her own choice (Beauchamp & Childress, 2009) – adolescents and their parents both received a letter before data collection explaining the study aims. The letter also contained the contact details of the research group and emphasized the autonomy principle. In accordance with the ruling of the ethical board, an "opt-out" procedure was employed for parents, meaning that parental consent was assumed unless parents informed the research group that they did not wish for their child to participate. The "opt-out" procedure was chosen for administrative reasons, as it would have been a greater administrative burden to process "opt-ins." However, the "opt-out" is obviously somewhat problematic from an ethical standpoint, as parents, for various reasons (e.g. having moved without change of an address, lack of ability to read or understand the Swedish language) might not have received or understood the letter. Thus, they might not had the chance to "opt-out," even if they wanted to.

By contrast, with adolescents, an "opt-in" procedure was employed where they consented to participate in the study by writing their personal code number and filling in the questionnaire. The adolescents were informed about the principle of autonomy partly through the letter sent to their parents and partly through a handout given to them a week prior to the data collection. This information was also given both orally and in writing on the day of data collection. The adolescents were told that they could resign from the study at any time, without giving a reason, and were assured of the confidentiality of the storage and processing of the collected data. Of course, it is important to acknowledge that despite all of the information given to them, voluntary participation might be difficult to obtain in a school setting, where students feel that they must do what they are told by their teacher because it is the normal procedure. Another shortcoming relates to whether the teacher is popular with the students or not – children might not want to "disappoint" a well-liked teacher whom they perceive as wanting them to fill out the questionnaires.

With regard to ensuring fairness and equality among individuals, the principle of justice (Beauchamp & Childress, 2009) was partly met by inviting all students of the relevant age-groups in the municipal schools to participate. Non-municipal schools were not invited because some non-public schools are under different legislation than are public schools, which could have influenced the confidentiality of the students in unforeseen ways.

The principles of beneficence (i.e. acting with the best interest of participants in mind) and non-maleficence (i.e. "above all, do no harm", as stated in the Hippocratic Oath; Beauchamp & Childress, 2009) were both considered in this study. My colleagues and I were particularly concerned with the risk that answering the questionnaires might have stirred negative thoughts regarding DE, depression, and self-esteem in participants, which in turn could lead to negative emotional reactions. To reduce this risk, the teacher, whom the students knew, was present in the classroom along with the researcher. The school nurse was also notified of the content of the questionnaire beforehand in order to prepare for a possibly heightened workload. However, with the teacher present, participation might not have been truly voluntary, since teachers are seen by many students as authoritative figures, thus leading to adolescents feeling obliged to fill out the questionnaire.

Although my colleagues and I desired to administer the questionnaires class by class, one school arranged for the data-collection in a different manner, gathering several classes at once in the general assembly hall. Although this was not according to protocol, the school presented it as a fait accompli upon arrival and it was the only opportunity to collect data. This might have been an uncomfortable situation for several students, which could have possibly influenced their answers, as well as their will to answer.

Because of the decision of the ethical review board, the procedure demanded that no questionnaires could be linked to the respondent, with the exception of the longitudinal linkages. This meant that even when respondents with scores indicating DE, depression, or low self-esteem were found, these individuals could not be identified in any way. Additionally, according to ethical protocol, the personal code numbers were re-coded to avoid any possibility of deducing which respondent answered each questionnaire.

Strengths, limitations and future studies

The present thesis has several strengths and limitations. All of the studies had a large, representative, gender-diverse sample of community-dwelling urban and rural adolescents (although none from a metropolitan region). The research was conducted in public schools in a municipality in Southern Sweden and, although potential local bias might exist, the municipality is, in many respects, representative of Sweden as a whole (SCB, 2017). Furthermore, almost 80% of the students agreed to participate, although it should be noted that DE appears to be disproportionately common among girls who choose not to take part in surveys on ED, as revealed by a study by Carter, et al. (2001).

In Study III, the final sample comprised 235 adolescent–parent pairs, which is a rather large sample. Although the response rate of the parents was rather poor and a possible volunteer bias might have occurred, the knowledge of which parent (mother or father) answered the questions as well as the link between the parent and his or her specific child were regarded as strengths of the third study.

An obvious limitation was the self-report format. The main shortcomings of self-report data include conscious distortion, social comparison, and situational and contextual factors, all of which to some degree limit the conclusions. On the other hand, it has been argued that anonymous self-report format might provide more valid data than interviews because it is less personally intrusive (Fairburn & Beglin, 1994; Perry et al., 2002). To verify the results, a multi-method approach that involves diagnostic interviews, parent reports, and hospital records would be advantageous in future studies. On this note, additional limitations included missing information regarding adolescents' possible ED diagnosis and the inability to answer "never" on the question regarding how often one shared breakfast, lunch, or dinner with one's family.

In Study III, the DERS Cronbach's alpha for parents was .77 (compared to .94 for the adolescents), while that for parents' emotional awareness was .34 (compared to the .76 for the adolescents). These results indicate that the DERS probably requires further evaluation for use in an adult population. People differ substantially in their ability to track subtle emotional dynamics (Gross, 2013), and emotional awareness specifically appears to be a crucial limiting factor in successfully regulating emotions (Barrett, Gross, Christensen, & Benvenuto, 2001; Samson, Huber, & Gross, 2012). Furthermore, the absence of information on the context in which emotion regulatory

strategies are used might lead to insufficient information about the individual's ability to regulate her or his emotions effectively (Gratz & Roemer, 2004). As an example, Aldao (2013) points to the problem of whether the respondents think of the same events when answering a questionnaire such as the DERS, or, even if they do, whether the event would have the same emotional impact on the respondents.

Although a valid and reliable scale was used for measuring depressive symptoms in this thesis, the measure has similar issues to those used for measuring DE and emotion dysregulation. Depressive thoughts are volatile, especially during adolescence (Larson et al., 2002), and this can lead to results that do not capture the general mood of the individual. Furthermore, although the CESD-C has been modified to better adhere to adolescents, it does not contain a measure of irritability, which is especially common in adolescent depression (Santrock, 2016).

Lack of self-esteem was measured using the 10-item RSES (Rosenberg, 1965) which remains the most widely used (Byrne, 1996) of the plentiful self-esteem measures. Although the Rosenberg self-esteem scale has been criticized for, among other things, possible underlying subfactors (e.g Tafarodi & Swann, 1996), it has also received much support (e.g. Whiteside-Mansell & Corwyn, 2003, Schmitt & Allik, 2005). Self-esteem is considered a rather stable trait, which, despite showing a decline during adolescence (Robins & Trzesniewski, 2005), is probably less volatile on a day-to-day basis and is perhaps a more stable construct in comparison to emotion dysregulation (without context) and depression.

Yet another limitation was the cross-sectional design. A longitudinal design might be able to expand on the partially surprising findings of the second study, which were obtainable due to the novel, and potentially fruitful for future use, way of approaching DE. Specifically, researchers could investigate the different patterns' developmental trajectories. By increasing current knowledge of the specific patterns and their developmental trajectories, the detection and prevention of DE could be improved, which in turn would reduce the likelihood of DE problems becoming chronic in adulthood (Santos, Richards, & Bleckley, 2007) or from developing into an ED. Furthermore, it would be informative to explore the adolescents who displayed a pattern of psychological health along with high levels of clinical restraint in further detail to determine whether they would continue to be emotionally well-regulated and show good mental health despite their elevated weight and shape concerns and restraint levels. Alternatively, their level of restraint might have been temporary and could thereafter develop into healthy eating habits or worsen over time. Furthermore, if both possibilities arise, what would underlie an individual's shift in one direction, rather than another?

As for the future studies of possible parental influences of DE and emotion regulation, it is important to obtain answers from both parents separately in order to further clarify the specific influences that mothers and fathers have on their adolescents. It is also

necessary to continue to include adolescents of both genders, as already suggested by Berge et al. (2014). On this note, it would be of interest to conduct a study on only boys to further explore boys' DE and emotion dysregulation and how it relates to those of their mothers and fathers. Furthermore, it is of great importance to study fathers' possible influence on their sons' and daughters' eating, as a contrast to past studies suggesting that the mother is responsible for the DE (Eliot & Baker, 2000), a concept that seems quite outdated in a post-modern society.

By replicating the results of these studies in different cultural contexts and exploring younger as well as older adolescents, more information could be gathered and the results validated. The samples used in this research were quite homogeneous in that they were limited to students in middle or high school. On the other hand, many of the results were in line with those from other parts of the world.

The criticism of the definition and boundaries of DE should, in further studies, be considered as a challenge to met, not as a reason for avoiding further exploration of the concept. Most psychological concepts are rather fuzzy (e.g. self-esteem), and therefore, some meta-analytic research would be beneficial to strengthen the definition and boundaries of DE. Indeed, such research would be necessary for developing a sound theory of a concept such as DE, which is in turn a precursor for needed interventions (Pennesi & Wade, 2015).

As a final note, it would be important to evaluate the SCOFF, EDE-Q, and the EDE-QS, along with other measures of DE and ED, in light of the continually evolving diagnostic criteria for these problems.

Conclusions and implications for preventive efforts

In this thesis, I explored DE among Swedish adolescents and its associations with emotion dysregulation, depression, and self-esteem. Taken together, the current thesis revealed several important findings. First, the validation of the SCOFF, a frequently used instrument for measuring DE, revealed several inconsistencies implying that the SCOFF would benefit from more thorough evaluation and revision. Second, the results suggested the possibility of using a cut-off on the SCOFF of only one "yes" answer (the item related to self-induced vomiting), instead of the stipulated two, for screening purposes. The adolescents who answered "yes" to this item should definitely be apprehended by someone from the school health care in order to clarify the severity of DE.

Third, the thesis revealed that the person-oriented approach can be beneficial for understanding DE. My colleagues and I determined several different patterns among boys and girls, thus providing in-depth information about the differences in DE both between and within the groups of girls and boys. These patterns, and their differing relations to emotion dysregulation, depression, and low self-esteem, could aid health care personnel in deciding which route to choose to provide aid to individuals with DE at an early stage.

The fourth finding referred to the different associations found between parents and their adolescent children with regard to DE and emotion regulation. Furthermore, only a shared family dinner (not breakfast or lunch) contributed to lower DE and emotion dysregulation among adolescents. Finally, only parental ED predicted adolescent DE.

Overall, the findings of this thesis may be of use in the future when continuing the struggle to define and assess DE in adolescents. A better understanding of the gender specific development of disordered eating is needed to design effective preventive strategies.

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DOI 10.1186/s40337-015-0087-6

Journal of Eating Disorders

RESEARCH ARTICLE Open Access

SCOFF in a general swedish adolescent population

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Abstract

Background: Although Disordered Eating Behaviors (DEB) is an ill-defined concept, multiple studies have examined prevalence of DEB and its relations to other variables in various populations. DEB have been shown to predict more serious eating disorders which in turn can lead to death. Mostly girls seem to suffer from DEB, but the question has been raised whether this, at least, partially is due to the methods used for screening. The SCOFF-questionnaire has been suggested as a quick and easily administered tool to assess DEB. However, the psychometric results regarding SCOFF suggest some inconsistencies, and more research is needed in various countries and age samples.

Method: To validate SCOFF, a total of 1265 Swedish adolescents (51.6 % girls) completed self-report questionnaires using the Eating Disorder Examination Questionnaire (EDE-Q) as a reference standard.

Results: The factor analyses show inconclusive results as to whether SCOFF should be regarded as a comprehensive scale; furthermore, the results indicate a correlation between SCOFF and the EDE-Q in both girl and boy samples. Girls scored significantly higher on SCOFF and also had a higher total score, indicating more severe problems than boys.

Conclusions: The results raised questions as to whether the SCOFF might be interpreted and responded to in different ways by girls and boys, risking overlooking boys' DEB and also whether one "yes" answer, instead of the stipulated two, could be sufficient when using SCOFF for screening purposes. In sum, the results challenge the use of SCOFF in a general adolescent population.

Keywords: Subclinical, Disordered eating behaviors, SCOFF

Background

Disordered Eating Behaviors (DEB) is not a unified concept and therefore difficult to study. DEB is used to describe various behaviors or symptoms that can "take many forms" ([3], p. 41). Fasting, the use of diet pills, purging (by vomiting or the use of laxatives), and smoking for weight control are all examples of DEB [16]. DEB is furthermore suggested to have a distinct core psychopathology, with the same mechanisms in men and women, and having to do with an over evaluation of one's own shape and weight [5].

The prevalence of DEB, despite its imprecise definition, has been calculated with frequencies varying from 15 % in boys and 33 % in girls in a study of 1895 11–17 year-old adolescents in a German sample [11] to 30 % in Israeli girls with a mean age of 14.7 years [13] to 17 % in boys and 52 % in girls with a mean age of 14.9 years in a Finnish sample [9]. The results indicate that DEB is a prevalent health problem in both girls and boys. Adolescents with DEB run a high risk of developing a clinical eating disorder [25] which renders high morbidity [12, 27] and therefore, it is of great importance to detect DEB as early as possible, providing appropriate help for adolescents at risk. For early identification of DEB, reliable and valid instruments are needed. The SCOFF-questionnaire [23] which we aim to validate in a Swedish adolescent sample in the present study, addresses core features of both anorexia nervosa and bulimia nervosa and has been used as a screening tool to enable the detection of individuals possibly at risk for an eating disorder [2, 12, 26]. During its development, great effort was made to make the SCOFF brief since it was meant to be used as part of primary care screening, often in addition to other cumbersome measures [12]. By deciding the cut-off to be the answer "yes" to two out of five questions, the researchers maximized the sensitivity of the test, which was considered a priority [12]. In the initial

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study by Morgan et al. [23], the test's sensitivity in the sample of adult females already diagnosed with anorexia nervosa or bulimia nervosa was 100 %, whereas in a study by Pannocchia et al. [26], the sensitivity was 97 %. The false positive rates of 12.5 % and 12.7 %, respectively, were claimed to be an acceptable trade-off for the high sensitivity.

A validation of the SCOFF in a non-clinical adolescent sample in Finland demonstrated that 81 % of the students whose eating disorder symptoms were detected by the SCOFF-questionnaire (i.e., answered "yes" to two of five questions) had undetected DEB in a health examination performed by a nurse [10]. Furthermore, the questionnaire has been found to be accurate and reliable with a reported sensitivity of 94.6 % in a sample of students administered the SCOFF and judged to be at high or low risk of an eating disorder by a health professional [8]. Other studies are more moderate in their assessment and consider the SCOFF to have acceptable psychometric properties [15] or to be restricted but feasibly useful for ruling out the presence of eating disorders, according to a study by Lähteenmäki et al. [18] in which none of the participants with current eating disorders scored zero points on the SCOFF-questionnaire.

Thus, although multiple studies have examined the SCOFF, the results suggests some inconsistencies and more research in various samples is needed.

In addition to the SCOFF, the Eating Disorder Examination Questionnaire (EDE-Q) is a widely used instrument to examine DEB. The EDE-Q is a self-reported instrument derived from the Eating Disorder Examination interview [6] and contains questions about shape, weight and eating concerns as well as the practice of food restraint. Although the EDE-Q is a highly reliable and valid instrument in screening for DEB [20, 21], it has lately been criticized for not adequately assessing eating, weight and shape control behaviors in adolescent boys [19]. Furthermore, because of the EDE-Q's length with thirty-six items to be answered both by multiple choice as well as with answers concerning frequencies, shorter and easier administered instruments, such as the SCOFF, which only have five items, have been requested from primary care personnel. Because the EDE-Q assesses a broad range of the specific psychopathologies of DEB, the instrument has been used as a reference in studies examining the validity of the SCOFF. It is expected that those with higher scores on the EDE-Q, indicating DEB, would also answer "yes" to two or more questions of the SCOFF.

In sum, although many of the aforementioned studies advocate the SCOFF as a useful screening tool, the results and conclusions of these studies differ. This contrast could be due to cultural influence, sample age [22], different forms of recruitment [24], or gender diversity. Because earlier adolescent validation studies have been conducted in Finland, Spain and Hong Kong, a validation study in a non-clinical, gender diversified Swedish adolescent setting would add valuable information to research regarding the validity of the SCOFF. Thus, in this study, we aim to examine the validity of the SCOFF by screening for DEB in a Swedish sample using the EDE-Q as a "reference standard". We expect that individuals with high scores on the EDE-Q, which indicates more DEB, will also score higher on the SCOFF. Furthermore, because most validation studies contain few males and mostly adult samples, the present study will focus on adolescent boys and girls since gender differences regarding the SCOFF and its relationships to the EDE-Q also seems to be of great importance. Finally, the limit of two "yes" answers on the SCOFF is questioned, focusing on whether only one "yes" answer could be sufficient for the individual to obtain further examination to rule out DEB.

Method

Measures

Demographic variables

The demographic variables reported by the adolescents included age, gender, country of birth, country of parents' birth, and family composition (e.g., two-parent or single-parent home).

Disordered eating behaviors

SCOFF. The SCOFF questionnaire [23] contains five questions concerning eating habits and attitudes toward weight and body shape: "Do you make yourself sick (vomit) because you feel uncomfortably full?"; "Do you worry that you have lost control over how much you eat?"; "Have you recently lost more than one stone (15 pounds) (ca 6.8 kg) in a 3 month period?"; "Do you believe yourself to be fat when others say you are thin?"; and "Would you say that food dominates your life?". A threshold of two positive answers has been proposed to raise a suspicion of an existing eating disorder [17, 23].

The SCOFF was translated into Swedish by one of the authors by using back translation with help from another Swede competent in English.

EDE-Q. Twenty-two Likert-scale questions of the original 36-item version of the EDE-Q [4] were used in the present study. The questions included in the study are from the following subscales: restraint (e.g., " How many of the past 14 days have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether you have succeeded)"); shape concerns (e.g., "How many of the past 14 days have you had a definite desire to have a totally flat stomach"); weight concerns (e.g., "How many of the past 14 days have you had a strong desire to lose weight") and eating concerns (e.g., "How many of the past 14 days have you had a definite fear of losing control over eating"). The questions are answered on a 7-point Likert scale ranging

from 0 = "not one day" to 6 = "every day". The questions in each subscale provide subscale scores and a global score can be calculated by summing and averaging the subscale scores. Higher scores are indicative of higher eating disorder psychopathology. In the current study, Cronbach's alpha was .95 for the total scale, .77 for eating concern, .93 for shape concern, .85 for weight concern and .90 for restraint.

Procedure

Both the legal guardians of students below age 15 and the students themselves, irrespective of age, received written information about the study aims, procedures and the possibility to decline participation. The students were further informed on the day of data collection and assured confidentiality. Parents provided passive consent which required them to sign and return a form if they refused to allow their child to participate in research. Students consented actively by completing the questionnaire, which took approximately 1 h. The study was approved by the Regional Ethics Committee in Lund, Sweden.

Statistical analysis

The data for girls and boys were divided into two parts. In one of the parts, an exploratory factor analysis using principal component analysis in SPSS was conducted, and in the other part, a confirmatory factor analysis using program R was conducted to evaluate the structure of the SCOFF. The reliability of the scale was assessed with Kuder and Richardson's formula 20 (KR20). To compare the total SCOFF-score between girls and boys, a Mann–Whitney U test was conducted, and to calculate the correlations between the SCOFF and the EDE-Q and its subscales, point biserial correlations were used. To compare the zero "yes" group of SCOFF to the one and two or more "yes" group, the non-parametric Kruskal-Wallis H test was used due to differences of variances in the groups and non-normal distribution of the scores. The pairwise comparisons were conducted by Mann–Whitney tests, and effect sizes were calculated as suggested by Field [7].

Participants

The manuscript is based on the second wave of data collection in an ongoing longitudinal study in a municipality in southern Sweden and was conducted from January to March in 2014. The sample consisted of 1265 students (M_{age} = 16.19, SD = 1.21; 54.5 % female) who were approximately 78 % of the population of 1621 students attending the schools participating in the study. Of the 356 students who did not participate, 62 chose to refrain from participation either on their own or their parents' initiative. The remaining 294 students were absent from school on the day of data collection for unclear reasons.

In total, 83.1 % of the adolescents were born in Sweden or another Scandinavian country, whereas the others were born in another European country (4.7 %), the Middle East (7.9 %), or other parts of the world (4.3 %). The number of foreign-born parents was somewhat higher; specifically, approximately two-thirds of the parents were born in Sweden or another Scandinavian country (mothers: 67.0 %, fathers: 67.7 %), another European country (mothers: 12.9 %, fathers: 12.4 %), the Middle East (mothers: 11.7 %, fathers: 12.0 %), or other parts of the world (mothers: 8.4 %, fathers: 8.0 %).

Approximately three-quarters of the adolescents (74.8 %) lived in two-parent households with both their biological parents, 10.3 % of the children lived in a single-parent household (8.2 % with mother), and 3.7 % lived with a parent and a step-parent (3.1 % with biological mother). One in ten adolescents (9.9 %) lived alternatingly with mother and father, 0.9 % lived with adults other than their parents, and 0.5 % lived alone.

Results

Exploratory factor analysis

To explore the structure of the SCOFF in the Swedish adolescent sample, a principal components factor analysis with direct oblimin rotation was conducted for half of the total sample of girls and boys separately. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis of the total sample (KMO = .65) as well as for girls only (KMO = .61) and for boys only (KMO = .68). In all samples, the tests showed two factors with eigenvalues over Kaiser's criterion of 1 explaining 56.37 % (girls: 54.61 %, boys: 60.83 %) of the variance. Table 1 shows the factor loadings after rotation for the girl and boy samples. The items that load on the same factor for the girl sample suggest that factor 1 represents thoughts about food and eating, whereas factor 2 represents actions regarding food and eating. In the boy sample, four of the items loaded on one factor and only one item; fast weight reduction, added to a second factor.

Confirmatory factor analysis (CFA)

Based on the EFA results and to further examine the structure of the SCOFF, confirmatory factor analyses were performed to test one-factor (i.e., all SCOFF items comprise one factor) vs. two-factor models (Model 1: items 1 and 3; Model 2: items 2, 4 and 5). The results of the CFA for the second part of the participants are presented in Table 2. For girls, goodness-of-fit statistics indicated good fit for both 1-factor and 2-factor models, whereas for boys, a 1-factor model showed excellent fit with non-significant chi-square, zero value of RMSEA and high values for CFI and TLI.

Table 1 Factor Loadings for Exploratory Factor Analysis with Direct Oblimin Rotation of Items of the SCOFF-scale

	Rotated factor loadings			
	Girls ($n = 329$)		Boys ($n = 258$)	
	Factor 1 Thoughts about food	Factor 2 Acts in regard to food	Factor 1	Factor 2
Do you make yourself sick (vomit) because you feel uncomfortably full?	. 23	.65	.62	.05
Do you worry that you have lost control over how much you eat?	.79	−.01	.83	−.10
Have you recently lost more than one stone (15 pounds) (ca 6.8 kg) in a 3 month period?	−.18	.84	−.01	.98
Do you believe yourself to be fat when others say you are thin?	.68	.12	.82	−.14
Would you say that food dominates your life?	.64	−.08	.53	.19

Based on the CFA results, the SCOFF was used as a 1-factor scale in further analyses in the present article. The reliability of the SCOFF-scale, assessed with Kuder and Richardson's formula 20 (KR20), was .48 in the current study and considered acceptable for screening tests [28].

Gender differences of the SCOFF

To compare the total SCOFF-score between girls and boys, a Mann–Whitney U test was conducted. The girls ($Md = .000$, $n = 684$) revealed higher scores, indicating higher DEB than in the boys ($Md = .000$, $n = 559$), $U = 146907.5$, $z = -8.54$, $p = <.001$, $r = .24$.

Table 3 shows the number and percentages of girls and boys answering "yes" and "no" to the single SCOFF-items. Large and significant gender differences indicating more "yes" answers by girls were found for all items except item 3, regarding weight loss.

Relationships between SCOFF and EDE-Q

Table 4 shows the point biserial correlations between the SCOFF and EDE-Q subscales. The results indicate strong relationships between the SCOFF and all EDE-Q subscales, with the highest relationship being eating concern for girls, $r = .63$, $p = < .001$, and weight concern for boys, $r = .58$, $p = < .001$. Although the results show significantly stronger relationships between the SCOFF and eating restraint and eating concern for girls than for boys, the differences are not large.

Table 2 Summary of Confirmatory Factor Analyses for Two SCOFF Models for Girls and Boys Separately

	Girls		Boys
Goodness-of-fit statistics	1-factor model	2- factor model	1-factor model
χ^2	8.13	4.41	4.44
df	5	4	5
p	.15	.35	.49
RMSEA	.028	.018	.00
CFI	.98	.99	1.00
TLI	.97	.98	1.02
r		.61	

Gender differences in frequency of one "yes" answer to the SCOFF

The threshold of two "yes" answers to the SCOFF was established for further investigation of eating disorders [23]. However, one "yes", especially on particular items (e.g., vomiting or losing a substantial amount of weight during a short period of time), may be a significant indicator of DEB risk. In the present sample, 168 of 689 girls and 85 of 575 boys answered "yes" to the SCOFF once. As Table 5 shows, one "yes" answer was rarely found on the first item regarding vomiting, indicating a non-healthy eating behavior. No significant gender differences were found on this item. More boys than girls answered "yes" on items regarding eating behavior (i.e., items three and five), whereas more girls than boys answered "yes" on items regarding losing weight and appearance.

To further investigate differences among those with different numbers of "yes" answers to the SCOFF, girls and boys were divided into three SCOFF groups representing a group with no "yes" answers (Group 0), a group with one "yes" answer (Group 1) and a group with two or more "yes" answers (Group 2). Group differences were examined on the total EDE-Q scale and subscales, and Kruskal-Wallis' tests were conducted to examine group differences. Pairwise comparisons were made with the Mann–Whitney test. The results are presented in Tables 6 and 7 for girls and boys, respectively. In girls, significant differences were found between all groups on all studied variables, and the effect-sizes were large when comparing group 0 to group 2. When comparing group 0 to group 1 and group 1 to group 2, the effect-sizes for the girls were in the medium range, indicating a moderate difference between the groups. The girls with one "yes" answer differed from the girls with zero "yes" answers, with effect sizes ranging from .22 for restraint to .30 for eating and weight concern. In boys, smaller effect sizes were found. However, group 1 differed significantly from both group 0 and group 2 on all EDE-Q subscales.

Table 3 The number (in parenthesis) and percentages of girls and boys answering "yes" and "no" to the SCOFF items, respectively

	Total		Girls		Boys		
	"Yes"	"No"	"Yes"	"No"	"Yes"	"No"	*Z*
Do you make yourself sick (vomit) because you feel uncomfortably full?	(41)	(1238)	(33)	(645)	(8)	(545)	3.33**
	3.3 %	96.7 %	4.9 %	95.1 %	1.4 %	98.6 %	
Do you worry that you have lost control over how much you eat?	(152)	(1090)	(126)	(552)	(25)	(532)	7.52***
	12.2 %	87.8 %	18.6 %	81.4 %	4.5 %	95.5 %	
Have you recently lost more than one stone (15 pounds) (ca 6.8 kg) in a 3 month period?	(75)	(1158)	(41)	(633)	(34)	(518)	−.055
	6.1 %	93.9 %	6.1 %	93.9 %	6.2 %	93.8 %	
Do you believe yourself to be fat when others say you are thin?	(154)	(1078)	(126)	(544)	(27)	(528)	7.35 ***
	12.5 %	87.5 %	18.8 %	81.2 %	4.9 %	95.1 %	
Would you say that food dominates your life?	(180)	(1045)	(120)	(547)	(58)	(493)	3.67 ***
	14.7 %	85.3 %	18.0 %	82.0 %	10.5 %	89.5 %	

** $p = < .001$, *** $p = < .0001$

Discussion

The aim of this study was to explore the validity of the SCOFF questionnaire [23] in a Swedish community sample of adolescents of both genders. The confirmatory factor analysis showed good fit concerning a one-factor model for girls, replicating results by Pannocchia et al. [26] and excellent fit regarding a one-factor model for boys, who were not included in the Pannocchia et al. [26] study. However, the exploratory factor analysis was not as permissive, and the results indicated that the SCOFF scale should be interpreted with some caution. Notably, the result of the exploratory factor analysis in which the scale for girls was divided into two factors ("thoughts about food" and "acts in regard to food") resembled the two-factor model suggested by Muro-Sans et al. [24] in which the girl sample (11–17 years) loaded on the same two factors as the girl sample of the present study. Another two-factor model including girls as well as older adolescents of both genders showed a slightly better fit than a uni-factorial model [10]. The results combined indicate that although the confirmatory analysis showed good as well as excellent fit, there might be pitfalls if treating the SCOFF questionnaire as uni-factorial.

Table 4 Point biserial correlations divided between genders in regard to the SCOFF Total and EDE-Q scales

	SCOFF TOTAL		z
	Girls	Boys	
EDE-Q Total	.66 ($n = 559$)	.60 ($n = 476$)	1.61 ns
EDE-Q Restraint	.55 ($n = 619$)	.39 ($n = 521$)	3.37**
EDE-Q Eating Concern	.63 ($n = 617$)	.52 ($n = 520$)	2.86*
EDE-Q Weight concern	.58 ($n = 607$)	.58 ($n = 518$)	0.00 ns
EDE-Q Shape concern	.59 ($n = 595$)	.55 ($n = 509$)	1.05 ns

Note. All reported correlations are significant at the p = .001 level (two tailed)
* $p = < .01$ ** $p = < .001$

The results of the present study also showed that, consistent with earlier studies [9, 11], girls scored significantly higher on the total SCOFF and that they were over-represented in frequency in the group with 2 or more "yes" answers to the SCOFF, indicating more severe DEB. Furthermore, more girls than boys answered "yes" to the SCOFF questions concerning "lost control" and "feelings of being fat", which implies that these questions are either indicators of more pronounced problems in girls or that the questions are interpreted differently by girls and boys. More boys than girls answered "yes" to the question whether food "dominates your life", which may also be a question of interpretation as in either "eating all the time", like many healthy growing adolescent boys experience that they are doing, or as constantly thinking about food and planning each calorie-intake.

Because DEB are most common among girls and the SCOFF primarily has been validated in female samples, it is possible that boys do not sufficiently adhere to the items the scale uses and that screening questionnaires in general may be missing pertinent questions for boys who might express specific "male risk behaviors" ([29] p. 448). Mond et al. [19] suggested that boys (and girls) might perform excessive exercise to lose weight. This factor could be one example of a question missing in the SCOFF. However, the question about losing a substantial amount of weight during a 3 month period might be related to this behavior. This item was also one of the questions in which girls and boys did not differ in their answers, posing the idea that this item is fairly "gender neutral". Although hard to administer in a screening milieu, the SCOFF might benefit from a girl and boy version like the works of Kopp and Gillberg [14], investigating autism spectrum disorders in gender specific ways.

When comparing SCOFF to the EDE-Q scale, the SCOFF and the global EDE-Q were found to correlate

Table 5 Table showing the answers posed by those answering" yes" to only one of the SCOFF questions

	Total sample		Girls		Boys		z
	"Yes"	"No"	"Yes"	"No"	"Yes"	"No"	
Do you make yourself sick (vomit) because you feel uncomfortably full?	(10)	(244)	(8)	(160)	(2)	(83)	.93
	3.9 %	96.1 %	4.8 %	95.2 %	2.4 %	97.6 %	
Do you worry that you have lost control over how much you eat?	(47)	(206)	(19)	(149)	(24)	(61)	−3.39**
	18.7 %	81.4 %	11.3 %	88.7 %	28.2 %	71.8 %	
Have you recently lost more than one stone (15 pounds) (ca 6.8 kg) in a 3 month period?	(43)	(211)	(39)	(128)	(8)	(77)	2.67*
	16.9 %	83.1 %	23.4 %	76.6 %	9.4 %	90.6 %	
Do you believe yourself to be fat when others say you are thin?	(55)	(196)	(45)	(121)	(10)	(74)	2.74*
	21.9 %	78.1 %	27.1 %	72.9 %	11.9 %	88.1 %	
Would you say that food dominates your life?	(102)	(149)	(39)	(107)	(42)	(42)	−4.22*
	40.6 %	59.4 %	35.5 %	64.5 %	50 %	50 %	

*p = < .01 ** p = < .001*** p = < .0001

strongly in both girls and boys. This evidence is consistent with the results reported by Leung et al. [15] using a sample of Hong Kong high school students. In evaluating the subscales of the EDE-Q, girls showed higher correlations between the SCOFF and the EDE-Q subscale restraint, which taps items concerning areas as making oneself sick. Girls also showed higher correlations than boys in regard to eating concern, which detects issues of losing control over eating and of preoccupation with food, eating and calories. Leung et al. [15] used only the global EDE-Q and therefore no further comparisons can be made; however, the results revealed in this study by the use of the EDE-Q subscales imply that when using the EDE-Q as a

Table 6 Kruskal-Wallis Test with pairwise comparisons for the girl sample divided into three groups (Group 0 = 0 "yes"-answers to the SCOFF scale, Group 1 = 1 "yes" answer to the SCOFF-scale and Group 2 = 2 or more "yes" answers to the SCOFF scale)

Girl Sample							
	Kruskal –Wallis Test	*N*	*Mdn*	*M(SD)*	Pairwise comparisons	*z***	ES
EDE-Q Total	H(2) = 174.74 ***	0 = 330	.41	.65(.68)	0–1	−6.15	.28
		1 = 137	1.09	1.32(1.10)	0–2+	−12.88	.63
		2 = 92	2.89	2.78(1.28)	1–2 +	−6.63	.44
		559					
EDE-Q Restraint	H(2) = 130.19***	0 = 361	.20	.48(.74)	0–1	−4.94	.22
		1 = 155	.40	.96(1.20)	0–2+	−11.21	.52
		2 + = 103	1.90	2.25(1.68)	1–2 +	−6.12	.38
		619					
EDE-Q Eating concern	H(2) = 188.72***	0 = 364	.00	.25(.49)	0–1	−6.73	.30
		1 = 154	.40	.76(.91)	0–2+	−13.29	.62
		2 + = 99	2.0	1.96(1.39)	1–2 +	−6.67	.42
		617					
EDE-Q Weight concern	H(2) = 170.85***	0 = 355	.40	.81(.96)	0–1	−6.66	.30
		1 = 154	1.40	1.72(1.44)	0–2+	−12.58	.59
		2 + = 98	3.20	3.11(1.45)	1–2 +	−6.14	.39
		607					
EDE-Q Shape concern	H(2) = 167.74***	0 = 352	.75	1.09(1.05)	0–1	−6.06	.27
		1 = 145	1.63	2.03(1.55)	0–2+	−12.61	.59
		2 + = 98	4.13	3.72(1.54)	1–2 +	−6.44	.41
		595					

*** p = < .0001

Table 7 Kruskal-Wallis Test with pairwise comparisons for the boy sample divided into three groups (Group 0 = 0 "yes"-answers to the SCOFF scale, Group 1 = 1 "yes" answer to the SCOFF scale and Group 2 = 2 or more "yes" answers to the SCOFF scale)

Boy Sample							
	Kruskal –Wallis Test	*N*	*Mdn*	*M (SD)*	Pairwise comparisons	*z*	ES
EDE-Q Total	H(2) = 71.87***	0 = 383	.13	.28(.44)	0–1	−5.03***	.24
		1 = 70	.45	.72(.79)	0–2+	−7.26***	.36
		2 + = 23	1.71	2.06(1.35)	1–2+	−3.77***	.39
		476					
EDE-Q Restraint	H(2) = 65.99***	0 = 419	.00	.27(.70)	0–1	−4.83***	.22
		1 = 76	.20	.76(1.25)	0–2+	−6.96***	.33
		2 + = 26	1.4	1.76(1.60)	1–2 +	−3.55**	.35
		521					
EDE-Q Eating concern	H(2) = 84.01***	0 = 420	.00	.11(.35)	0–1	−6.18***	.28
		1 = 77	.20	.37(.53)	0–2+	−7.30***	.35
		2 + = 23	1.2	1.31(1.23)	1–2 +	−3.35*	.34
		520					
EDE-Q Weight concern	H(2) = 68.03***	0 = 415	.20	.39(.65)	0–1	−3.88***	.18
		1 = 77	.60	.84(.97)	0–2+	−7.61***	.36
		2 + = 26	2.8	2.75(1.65)	1–2 +	−4.67***	.46
		518					
EDE-Q Shape concern	H(2) = 62.51***	0 = 408	.13	.43(.70)	0–1	−4.29***	.20
		1 = 74	.5	.92(.98)	0–2+	−7.03***	.34
		2 + = 27	2.25	2.59(1.85)	1–2 +	−3.80***	.38
		509					

*p = < .01 ** p = < .001*** p = < .0001

validation instrument, the use of the subscales would be recommended.

Although the "cut-off" for the SCOFF in an attempt to maximize both sensitivity and specificity [23] has been set at two "yes" answers, the question of whether only one "yes" might indicate DEB and warrant further investigation was assessed. As results of the present study showed, eight girls and two boys answered "yes" to the question about whether they had made themselves sick after eating too much. Although the number of adolescents who replied "yes" to the question was low, a healthy eating behavior does not involve any vomiting. Furthermore, thirty-nine girls and eight boys answered "yes" to the SCOFF question about losing 6.8 kg during a 3 month period. The answers of these two questions could be due to measuring errors but still ought to be highlighted due to the severity of the behaviors and their proximity to the DSM-V criteria of anorexia nervosa and bulimia nervosa [1], as opposed to the maybe less severe "thoughts" about food measured by the other questions. The sensitivity is undoubtedly heightened by using only one "yes" answer as cut off [8, 18, 24] but naturally, it lowers specificity. The question is whether the cost of lowered specificity is acceptable in the matter of adolescent screening.

In dividing the adolescents into three groups (zero, one and two or more "yes" answers to the SCOFF), all groups differed from each other concerning all subscales of the EDE-Q. Notably, the individuals who reported one "yes"-answer differed significantly from those reporting zero and two "yes"-answers, again indicating the importance of monitoring the "one yes" group for DEB. If the one "yes"-answer group would be investigated further this would certainly heighten the rate of false positives and perhaps lead to an attenuated questionnaire. On the other hand, since the point of SCOFF is to raise the suspicion of DEB, to hopefully get ahold of adolescent boys and girls before they develop full-blown eating disorders, this goal stands a greater chance of being fulfilled if adolescents are identified and questioned as early as possible.

Strengths and limitations

The strengths of the present study are the large sample size and the gender diversity which provide valuable information on boys' adherence to the SCOFF and risk of DEB as well as the differences between girls and boys in this specific area.

A limitation is that the cross-sectional design of the study only shows the scores of the SCOFF during one

point in time. However, a longitudinal study using the SCOFF scale as a screening instrument might not be optimal considering the possible fluctuation of these behaviors during adolescence [10]. Still, the individuals with zero "yes" answers and those with one "yes" answer could change into two "yes" answer individuals with more severe DEB [25].

Additional limitations are the self-report format and the back translation, which was not reviewed by the original authors for face validity.

Conclusions

Despite the above mentioned limitations, the results of the present study, in which SCOFF was highly correlated to the EDE-Q, indicate that the SCOFF is a fairly good measure of DEB. However, the exploratory and confirmatory factor analyses differed in regard to factors to be extracted and also showed different response-patterns for boys and girls.

Girls scored significantly higher on the SCOFF and also had a higher total score, indicating more severe problems than those of boys, which is consistent with the findings of earlier research. Furthermore the results raised the questions whether the SCOFF items might be interpreted differently by girls and boys and whether one "yes"-answer might be "enough" when using the SCOFF for screening purposes. Future studies should consider whether a one "yes" answer should lead to follow up questions for a more thorough screening.

Although several researchers [2, 8, 12, 26] have noted the benefits of this "simple" five-item screening-questionnaire, our results suggest that the SCOFF needs further evaluation and probably requires revision to be valid screening instrument, especially among boys. Significant gender differences on item level further indicate that more profound research is needed to reveal whether any of the questions are too blunt, vague or difficult to relate to and in which way the questions could either be reworded to fit a more gender-diversified group or entirely exchanged to fit a group of adolescent boys [19]. This information should be of interest to obtain a broader view of boys' DEB, which might be less common but also might be undetected. Further studies are also needed to investigate whether some of the SCOFF items are critical, in which even one "yes" on the item might signal DEB risk.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

EH designed the study, carried out the data collection, performed the statistical analysis and wrote the paper. DD designed the study and performed the statistical analysis. PJ designed the study and gave conceptual advice. All authors discussed the results and implications and DD and PJ commented on the manuscript at all stages. All authors read and approved the final manuscript.

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Received: 10 September 2015 Accepted: 11 December 2015
Published online: 15 December 2015

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Hansson et al. Journal of Eating Disorders (2016) 4:28
DOI 10.1186/s40337-016-0122-2

Journal of Eating Disorders

RESEARCH ARTICLE Open Access

Typical patterns of disordered eating among Swedish adolescents: associations with emotion dysregulation, depression, and self-esteem

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Abstract

Background: Using the person-oriented approach, we determined the relationships between four indicators (restraint and eating, shape, and weight concerns) of disordered eating (DE), as measured by the self-reported Eating Disorders Examination Questionnaire (EDE-Q), to identify typical DE patterns. We then related these patterns to clinical EDE-Q cut-off scores and emotion dysregulation, depression, self-esteem, and two categories of DE behaviors (≥2 or ≤1 "yes" responses on the SCOFF questionnaire).

Method: Typical patterns of DE were identified in a community sample of 1,265 Swedish adolescents ($M_{age} = 16.19$, $SD = 1.21$; age range 13.5–19 years) using a cluster analysis. Separate analyses were performed for girls ($n = 689$) and boys ($n = 576$).

Results: The cluster analysis yielded a six-cluster solution for each gender. Four of the six clusters for girls and five for boys showed scores above the clinical cut-off on at least one of the four DE indicators. For girls, the two clusters that scored above the clinical cut-offs on all four DE indicators reported severe psychological problems, including high scores on emotion dysregulation and depression and low scores on self-esteem. In contrast, for boys, although two clusters reported above the clinical cut-off on all four indicators, only the cluster with exceedingly high scores on shape and weight concerns reported high emotion dysregulation and depression, and extremely low self-esteem. Furthermore, significantly more girls and boys in the most problematic DE clusters reported ≥2 "yes" responses on the SCOFF questionnaire (as opposed to ≤1 response), indicating clear signs of DE and severe psychological difficulties.

Conclusion: We suspect that the various problematic DE patterns will require different paths back to a healthy diet. However, more research is needed to determine the developmental trajectories of these DE patterns and ensure more precise clinical cut-off scores, especially for boys. Comprehensive understanding of DE patterns might be of use to healthcare professionals for detecting DE before it develops into an eating disorder.

Trial registration: Lund, EPN (dnr: 2012/499).

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Plain English summary

We sought to identify groups of adolescents with distinct disordered eating patterns by looking at similarities in their restraint and eating, shape, and weight concerns. Then, we compared these subgroups in their levels of emotion dysregulation, depression, and self-esteem to clarify which subgroups had notable psychological problems. Identification of the different problematic disordered eating patterns for girls and boys can help healthcare personnel, such as school nurses, detect disordered eating among adolescents early on.

Background

Disordered eating (DE) is a complex and multifaceted phenomenon [31] that can take many forms [7]. Waaddegaard et al. [46] defined DE rather broadly as the behaviors and attitudes with regard to body perception, eating habits, weight regulation, and self-evaluation and we have used this definition in the present study. DE is a predictive factor of eating disorders [35, 46], which can be fatal if left unchecked [42]. Therefore, it is of great importance to identify DE as early as possible.

Most research on DE has been dimensional-that is, it focused on the severity of the DE-as opposed to categorical (i.e., focused on distinct types of DE behavior). The debate over whether DE should be viewed as dimensional or categorical has raged for years, but both views seem desirable for representing the full spectrum of DE and detecting DE as early as possible [50]. Usually, DE has been studied by first examining a number of DE indicators, such as eating and/or shape concerns, and then relating either individual DE indicators or the total scores of those indicators to different psychosocial problems such as depression or self-esteem (e.g., [2, 40, 43]). A variable-oriented approach, built on the examination of linear relationships and mean differences, provides important knowledge about the relationships between various DE indicators and psychosocial difficulties. However, the knowledge provided can be rather segmented. In contrast, a person-oriented approach, which focuses on obtaining and studying information about the chosen subsystem (in this case, DE) as a whole, could be more informative. According to this approach, the key indicators of particular systems (e.g., DE) are regarded as indivisible and therefore must be studied and interpreted simultaneously [29, 30]. In the article, we draw on a person-oriented approach to identify subgroups of individuals with specific DE patterns because essential relationships in these data might not be reflected through ordinary correlational analyses due to their non-linearity. This can, to some degree, be compared to how clinical psychologists examine various different symptoms to build a specific profile for each patient to diagnose eating or other disorders.

Simultaneous examination of the different aspects of DE-including restraint and eating, shape, and weight concerns, as measured by the self-reported Eating Disorder Examination Questionnaire (EDE-Q; [12]), revised for adolescents [6]-is expected to yield a variety of different DE patterns. By examining those specific patterns, and comparing them in terms of their associations with emotion dysregulation, depression, and self-esteem, as well as two categories of DE behaviors (≥ 2 or ≤ 1 "yes" responses as measured by the SCOFF questionnaire), we expect to obtain a broader picture of the psychological problems found in specific problematic DE subgroups.

Furthermore, we also compare the DE indicators within each subgroup to clinical cut-off values of the four EDE-Q subscales suggested by Ekeroth and Birgegard [11] to better understand whether only those adolescents who score above the suggested clinical cut-off for all indicators are at risk of developing psychological problems or whether scoring above the cut-offs on only specific indicators presents this risk. Traditionally, a mean global score of 4.0 on the Eating Disorder Examination Interview has been used as a threshold for eating disorder psychopathology in community studies, but clinical evidence has shown that nearly half of the patients diagnosed with an eating disorder obtain a global score of less than 4.0 (e.g., [49]). It therefore has been suggested that a cut-off of 4.0 has limited clinical utility, and if utilized for screening purposes, might yield underestimates of the prevalence of ED [37]. Thus, using more sensitive cut-off scores of the four DE indicators, such as those suggested by Ekeroth and Birgegard [11], in addition to studying other psychological difficulties, could be important for the early prevention of DE because it would allow for identifying the early warning signs of DE. Ultimately, this may be useful for preventing eating problems that otherwise might become chronic into adulthood [39].

Gender is generally considered an important factor for understanding the etiology and maintenance of psychopathologies such as DE [24, 33, 36, 44]. In particular, DE is much more prevalent among females, although the reasons for this are unknown [19]. Interestingly, while the core psychopathology of DE has been suggested to be similar for men and women and related to an distorted evaluation of one's shape and weight [13], its expression has appears to show gender differences [17, 33, 36]. Despite the appearance, these standpoints are not contradictory; nevertheless, more research is needed to understand them, especially among men and boys, who are underrepresented in most studies. In the present study, we were interested in examining whether boys have similar DE patterns to girls.

Emotion dysregulation, defined as an individual's inability to optimize his or her emotional dynamics in response to the demands of the environment [1], is regarded as a significant contributor to the development of DE among girls aged 14–18 years [32]. In a study of 89 adults (approximately 90 % of which were women) with bulimia nervosa, a lack of acceptance of emotions,

impulse control, and emotion regulation strategies were significantly correlated with the severity of the eating disorder [27]. Girls with high levels of DE also reported experiencing greater negative affect, difficulties with emotional awareness, and difficulty coping constructively with negative emotions than did girls with low levels of DE [41]. DE has also been linked with emotion dysregulation in young adult Australian men [16].

DE, regardless of the severity, is also correlated with depressive thoughts [9], while depressive symptoms at age 14 appear to increase eating disorder symptoms in Australian girls at age 20 [2]. Furthermore, depressive symptoms, other psychiatric disorders, and suicidality were all found to be associated with DE among American adolescents of both genders [43, 45], while negative affect is a good predictor of DE in young men [25].

Besides emotion dysregulation and depression, low self-esteem is a significant contributor to DE ([40] p. 1527): Adolescents (M_{age} = 16.31, SD = 1.07; 21.3 % male) with low self-esteem were found to be at greater risk of eating disorder symptoms as well as depression [8]. Relatedly, exaggerated views of shape and weight are partly mediated by low self-esteem [10], while a study of 320 Norwegian students (35 % men) showed that self-esteem had direct effects on restrained eating and compensatory behavior [5].

To summarize, while there is a plethora of studies on the various DE concerns and behaviors and their relations to psychological difficulties, our understanding of these relationships, and DE concerns in general, remains rather segmented. In this study, we examined the four main DE indicators-restraint and eating, shape, and weight concerns-together to identify typical patterns of DE in a community sample of Swedish adolescents. We then compared these patterns to the clinical cut-offs suggested by Ekeroth and Birgegard [11] and determined their relations with emotion dysregulation, depression, self-esteem, and two categories of DE behaviors (≥2 or ≤ 1 "yes" responses on the SCOFF) to identify which DE patterns are particularly problematic. We hypothesized that adolescents with non-problematic DE patterns (i.e., below the clinical cut-offs) would report more effective emotion regulatory capabilities, fewer depressive symptoms, and higher self-esteem, whereas adolescents with problematic DE patterns would report higher levels of emotion dysregulation, more severe depressive symptoms, and lower self-esteem. Identifying these problematic patterns is expected to benefit healthcare professionals, as it would broaden the evaluation of adolescent DE and thereby contribute to efforts to prevent DE from worsening at an earlier stage.

Method

Participants

This study was conducted in a municipality in southern Sweden between January and March 2014. The sample comprised 1,265 students (M_{age} = 16.19, SD = 1.21; age range 13.5–19 years, 54.5 % female), or approximately 78 % of the 1,621 students attending the schools participating in this study. Of the 356 students who did not participate, 62 refrained from participation either of their own or of their parents' volition. The remaining 294 students were for various reasons absent from school on the day of the data collection.

In total, 83.1 % of the adolescents were born in Sweden or another Scandinavian country; the others were born in another European country (4.7 %), the Middle East (7.9 %), or other parts of the world (4.3 %). Approximately two-thirds of the parents were born in Sweden or another Scandinavian country (67.0 % of mothers and 67.7 % of fathers), with the rest being born in another European country (12.9 and 12.4 %, respectively), the Middle East (11.7 and 12.0 %), or other parts of the world (8.4 and 8.0 %).

Approximately three-quarters of the adolescents (74.8 %) lived in two-parent households with biological parents, while 10.3 % lived in a single-parent household (8.2 % with the mother) and 3.7 % lived with a parent and a stepparent (3.1 % with the biological mother). Roughly one in ten adolescents (9.9 %) lived alternatingly with mother and father, 0.9 % lived with adults other than their parents, and 0.5 % lived alone.

Procedure

The legal guardians of students below age 15 and the students themselves, irrespective of age, received written information about the study aims and procedures, as well as their right to decline participation. The students were again informed on the day of the data collection and assured of their confidentiality. Parents provided their *passive consent*, which meant that they had to sign and return a form if they did not wish for their child to participate in the study. Students consented actively by completing the questionnaire, which took approximately one hour. The study was approved by the Regional Ethics Committee in Lund, Sweden.

Measures

Disordered eating behaviors

EDE-Q An updated version of the original 36-item EDE-Q [12] was used in the present study; this version comprises only 22 items and restricts the time range to 14 days to better suit adolescent populations [6]. The items that we used were from the following subscales: eating concern (e.g., "How many of the past 14 days have you had a definite fear of losing control over eating?"); restraint (e.g., "How many of the past 14 days have you been deliberately trying to limit the amount of food you eat to influence your shape or weight?"); shape concern (e.g., "How many of the past 14 days have you had a

definite desire to have a totally flat stomach?"); and weight concern (e.g., "How many of the past 14 days have you had a strong desire to lose weight?"). Each item is answered on a 7-point Likert scale ranging from 0 ("no days") to 6 ("every day"). The item scores in each subscale can be averaged to provide subscale scores, and then a global score can be calculated by averaging the subscale scores. Higher scores are indicative of more severe eating disorder psychopathology.

Ekeroth and Birgegard [11] have suggested various clinical cut-off points for the EDE-Q's global and subscales scores. They used Jacobson and Truax's [21] method of determining clinically meaningful changes by evaluating the clinical significance (i.e., an individual's transition between a clinical/dysfunctional population and a normal/functional population based on an empirically derived cut-off point) and the reliable change index (i.e., the reliability of an instrument's change score). The clinical cut-off points for the EDE-Q global and subscale scores for girls were as follows (boys' cut-off scores are presented in parentheses): global, 2.17 (1.06), eating concern, 1.50 (.69), restraint, 1.88 (.92), shape concern 2.90 (1.45), and weight concern, 2.39 (1.25). The Cronbach's alpha was .95 for the whole EDE-Q, .77 for eating concern, .90 for restraint, .93 for shape concern, and .85 for weight concern in the present study.

SCOFF The SCOFF questionnaire [34] contains five items concerning eating habits and attitudes toward weight and body shape: "Do you make yourself sick (vomit) because you feel uncomfortably full?" "Do you worry that you have lost control over how much you eat?" "Have you recently lost more than one stone (15 pounds) [around 6.8 kg] in a 3-month period?" "Do you believe yourself to be fat when others say you are thin?" and "Would you say that food dominates your life?" A threshold of two positive answers is often used to indicate a suspected eating disorder [28, 34]. The SCOFF has been validated among Swedish adolescents [17].

Emotion dysregulation

Emotion dysregulation The Difficulties in Emotion Regulation Scale (DERS; [15]) is a 36-item self-report questionnaire that has been validated for adolescents [48]. The DERS comprises six dimensions of emotion regulation; (1) lack of emotional *awareness* (e.g., "I am attentive to my feelings" [reverse scored]); (2) lack of emotional *clarity* (e.g., "I have no idea how I am feeling"); (3) *impulse control* difficulties (e.g., "When I'm upset, I feel out of control"); (4) difficulties in engaging in *goal* directed behaviors (e.g., "When I'm upset, I have difficulties getting work done"); (5) *non-acceptance* of emotional responses (e.g., "When I'm upset, I feel guilty for feeling that way"); and (6) limited access to emotion regulation *strategies* (e.g., "When I'm upset, my emotions feel overwhelming"). The items are rated on a five-point Likert scale ranging from (1) "almost never" to (5) "almost always" and the participants are asked to rate how frequently each statement applies to them. The DERS has demonstrated high internal consistency in the past (α = .93; [15]). In the current study, the Cronbach's alphas were .94 for the DERS total scale, .76 for awareness, .81 for clarity, .85 for impulsivity, .86 for goals, .87 for non-acceptance, and .86 for strategies.

Psychological health

Depression The Center for Epidemiological Studies Depression Scale for Children (CESD-C) [14] is a 20-item measure for assessing depressive symptoms in adolescents. The scale covers six broad symptom areas including (1) sleep disturbances, (2) guilt/worthlessness. (3) helplessness/hopelessness, (4) psychomotor retardation, (5) loss of appetite, and (6) positive mood (which is reverse scored). For each item, the respondent indicates the extent to which he or she has felt this way in the past week using a four-point Likert scale that ranges from 0 ("not at all") to 3 ("all the time"). Higher scores indicate more severe depressive symptoms. In the current study, the Cronbach's alpha was .91.

Self-esteem Lack of self-esteem was measured using the 10-item Rosenberg Self-Esteem Scale [38] that measures global self-worth by measuring both positive and negative feelings about the self. All items are answered using a four-point Likert scale format ranging from strongly agree to strongly disagree. Example items for this scale include "I feel that I am a person of worth, at least on an equal plane with others." The Cronbach's alpha in this study was .90.

Statistical analyses

A cluster analysis within the framework of the LICUR procedure [3] was used to identify the various DE profiles. We used the SLEIPNER statistical package [4] to perform the cluster analysis. The cluster analysis performed with SLEIPNER has several advantages over traditional forms of cluster analysis, including the ability to analyze the explained variance of cluster solutions and homogeneity coefficients of the clusters, and the fact that it contains an explicit procedure for testing the statistical significance of the cluster solution (using Monte Carlo simulations to create random data for comparison).

The cluster analysis was carried out in three steps. First, multivariate outliers were identified and removed via the RESIDUE module. Second, the remaining subjects were cluster analyzed using the agglomerative hierarchical method [47]. Four criteria were used to establish an appropriate number of clusters to extract: (a) the cluster solution must have theoretical meaning; (b) a pronounced drop in the explained error sum of

squares (EESS; explained below) should occur when a cluster solution with one less cluster is extracted; (c) the number of clusters should not be more than 15 and should not be less than five; and (d) the size of the EESS for the chosen cluster solution should preferably be no less than 67 %, and at the very least should exceed 50 % [3]. Finally, a data simulation was carried out to verify that the EESS was higher than could be expected by chance using a random data set.

An evaluation of the trustworthiness and explanatory power of the clusters was based on their degree of homogeneity. The average squared Euclidean distances (ASEDs) were computed between all members within a cluster (the homogeneity coefficient, *hc*). For the total cohort, or a one-cluster solution, the *hc* is 2.00 for standardized variables. As a rule of thumb, a value below 1.00 for a cluster is considered highly desirable and a value below 0.50 indicates a reasonably homogenous cluster. Finally, we assessed the differences in the various validation variables (i.e., SCOFF, emotion dysregulation, depression, and self-esteem) between the clusters. If the classification structure is valid and useful, then clear differences in the expected directions should be found between the clusters in these three variables.

Results

Correlational analyses

To evaluate the relationships between the DE indicators-restraint and eating, shape, and weight concerns-used for the cluster analyses, we conducted bivariate correlation analyses separately for boys and girls. As Table 1 shows, highly significant positive correlations were obtained between all indicators for both genders. Particularly high inter-correlations were obtained between the weight and shape concern subscales scores for both girls ($r = .91$) and boys ($r = .90$).

Cluster analyses

Following the rationale outlined above, we performed two cluster analyses (on the samples of 666 girls and 538 boys) using the four DE indicators. Both cluster analyses yielded a six-cluster solution with explained variances of 80.05 % for girls and 76.16 % for boys. Table 2 shows the mean profiles for the cluster solutions and their suggested labels.

Cluster solutions for girls

Cluster G1 ($n = 331$; 50 %) was interpreted as the *non-problematic* cluster, which included girls who reported low scores on all EDE-Q subscales (and thus indicating low levels of DE). Cluster G2 ($n = 143$; 21 %) was characterized by elevated scores for shape and weight concerns, and thus was labeled the *elevated shape and weight concern* cluster. Cluster G3 ($n = 37$; 6 %) also had elevated shape and weight concern scores, along with restraint scores that exceeded the clinical cut-off point suggested by Ekeroth and Birgegard [11]; as such, this cluster was labeled the *clinical restraint* cluster. Cluster G4 ($n = 55$; 8 %) was interpreted as the *clinical shape and weight concern* cluster because it exhibited shape and weight concern scores above the clinical cut-off point. Cluster G5 ($n = 61$; 9 %) was termed the *clinical DE with high shape and weight concern* cluster because all of the EDE-Q subscales were above the clinical cut-off points, with the shape and weight concern scores being particularly high. Finally, Cluster G6 ($n = 39$; 6 %) also showed scores above the clinical cut-off on all subscales, but instead showed especially high scores for restraint; therefore, it was defined as the *clinical DE with high restraint* cluster. All of the clusters for girls except for the *clinical DE with high restraint* cluster ($hc = 1.32$) indicated high cluster homogeneity.

Cluster solutions for boys

Cluster B1 ($n = 407$; 76 %) was defined as the *non-problematic* cluster because it showed low scores on all subscales. Cluster B2 ($n = 56$; 10 %) was characterized by shape concern scores above the clinical cut-off point as well as heightened weight concern scores; it was thus termed the *clinical shape and elevated weight concern* cluster. Cluster B3 ($n = 20$; 4 %) displayed restraint subscale scores above the clinical cut-off point and was therefore named the *clinical restraint* cluster. Cluster B4 ($n = 27$; 5 %) had scores above the clinical cut-off point on all subscales; as such, the cluster was named the *clinical DE* cluster. Cluster B5 ($n = 8$; 1 %), which comprised

Table 1 Mean (SD) and Bivariate inter-correlations between the EDE-Q subscales for Girls and Boys

The EDE-Q subscales	M (SD)		Eating Concern		Restraint		Shape Concern	
	girls	boys	girls	boys	girls	boys	girls	boys
Eating Concern	0.69 (1.01)	0.23 (0.57)	-	-	-	-	-	-
Restraint	0.91 (1.24)	0.43 (0.94)	.67	.52	-	-	-	-
Shape Concern	1.83 (1.62)	0.63 (0.97)	.78	.73	.67	.60	-	-
Weight Concern	1.48 (1.47)	0.60 (0.95)	.77	.70	.66	.60	.91	.90

Note: All reported correlations are significant at $p < .001$. All mean differences were significant at $p < .001$. N varies between 414–650 for girls and 325–521 for boys

Table 2 M (SD) of the EDE-Q Subscales for Girls' and Boys' Clusters

			EDE-Q Subscales								EDE-Q Global	
	n		Eating		Restraint		Shape		Weight			
Clusters	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
1. Non-problematic	331	407	.12 (.23)	.06 (.18)	.19 (.33)	.07 (.20)	.58 (.50)	.19 (.23)	.33 (.33)	.20 (.30)	.30 (.23)	.13 (.15)
2. Elevated shape & weight (girls) Clinical shape & elevated weight (boys)	143	56	.47 (.44)	.15 (.18)	.55 (.51)	.29 (.37)	2.06 (.83)	**1.45** (.56)	1.78 (.80)	1.24 (.77)	1.20 (.39)	.77 (.29)
3. Clinical restraint	37	20	.39 (.27)	.10 (.14)	**2.23** (.58)	**1.77** (.51)	2.15 (.88)	.56 (.40)	1.78 (.78)	.62 (.42)	1.61 (.37)	.76 (.23)
4. Clinical shape and weight (girls) Clinical DE* (boys)	55	27	1.23 (54)	**1.23** (.56)	1.26 (.65)	**1.10** (.77)	**3.90** (.84)	**2.03** (.63)	**3.08** (.91)	**1.90** (.69)	**2.36** (.38)	**1.53** (.34)
5. Clinical DE*, high shape & weight	61	8	**2.87** (.77)	**2.69** (.38)	**2.23** (.84)	**1.69** (1.26)	**4.54** (.86)	**4.03** (.89)	**4.03** (.94)	**4.15** (.60)	**3.44** (.52)	**2.97** (.59)
6. Clinical DE*, high restraint	39	20	**2.19** (.97)	.44 (.51)	**4.27** (1.01)	**2.82** (.85)	**3.98** (1.17)	**1.98** (.69)	**3.46** (.99)	**1.62** (.85)	**3.54** (.78)	**1.76** (.51)
Total	666	538										

Note: *Clinical DE used as a description when *M* values on all subscales as well as on the EDE-Q Global scale are above clinical cut-off norm values suggested by Ekeroth & Birgegard [11]. *Values above clinical cut-off points in bold*

only 8 individuals, had scores above the clinical cut-off points on all subscales, but with especially high scores on the shape and weight concern subscales. It was subsequently named the *clinical DE and high shape and weight concern* cluster. Finally, Cluster B6 ($n = 20$; 4 %) was defined as the *clinical DE and high restraint* cluster because it showed scores above the clinical cut-off on all subscales but with particularly high scores on restraint.

The *non-problematic*, *clinical shape and elevated weight concern*, and *clinical restraint* clusters for boys all had homogeneity coefficients below the desired value of 1.00. In contrast, the *clinical DE* cluster had a value above 1.00 and the clusters *clinical DE with high shape and weight concern* and *clinical DE with high restraint* both had coefficients exceeding 2.00.

Gender comparison of cluster solutions

In Fig. 1, the mean profiles are presented graphically for the cluster solutions. Based on the ASED, examined by the CENTROID procedure, girls' and boys' clusters with the shortest ASED were paired. As shown in the figure, the girls' scores tended to be higher than the boys', but the patterns of DE indicators were rather similar between the genders.

Table 3 shows a comparison of the cluster sizes between the genders. As expected, significantly more girls than boys-with the exceptions of the *clinical restraint* and the *clinical DE with high restraint* clusters-were found in the problematic clusters, while significantly more boys than girls were found in the non-problematic cluster.

Cluster associations to the SCOFF categories

The trustworthiness of the cluster solutions was initially studied by examining whether cluster membership was associated with the categories of DE behaviors as measured by the SCOFF (≥2 or ≤ 1 "yes"). To examine this, we used the EXACON procedure in SLEIPNER, which enabled us to examine whether an observed pattern occurs significantly more often than would be expected by chance. These patterns are called *types*. In this procedure, we cross-tabulated the DE profiles and the two SCOFF categories (≥2 or and ≤1 "yes" responses on the SCOFF) and then performed exact tests on single cells in two-way contingency tables using hypergeometric probabilities.

Girls

The results revealed that girls in Clusters G4, G5 and G6 reported ≥2 "yes" responses on the SCOFF about two to four times as often as would be expected by chance (Cluster G4: observed = 15, expected = 8.2; $\chi^2 = 5.6$, $p < .02$; Cluster G5: observed = 32, expected = 8.5; $\chi^2 = 64.5$, $p < .001$; Cluster 6: observed = 23, expected = 5.5; $\chi^2 = 56.1$, $p < .001$). About 29 % (n = 15/51), 60 % (n = 32/53) and 67 % (n = 23/34) of girls in Clusters G4, G5, and G6, respectively, had reported ≥2 "yes" responses on the SCOFF questionnaire.

Boys

Boys in Clusters B4 and B5 reported ≥2 "yes" responses about five times as often as would be expected by chance (Cluster B4: observed = 5, expected = 0.9; $\chi^2 = 5.6$, $p < .05$; Cluster 5: observed = 5, expected = 0.3; $\chi^2 = 64.5$, $p < .001$). About 20 % (n = 5/25 boys) and 71 % (n = 5/7) of the boys in Clusters B4 and B5, respectively, were found to belong report ≥2 "yes" responses on the SCOFF questionnaire.

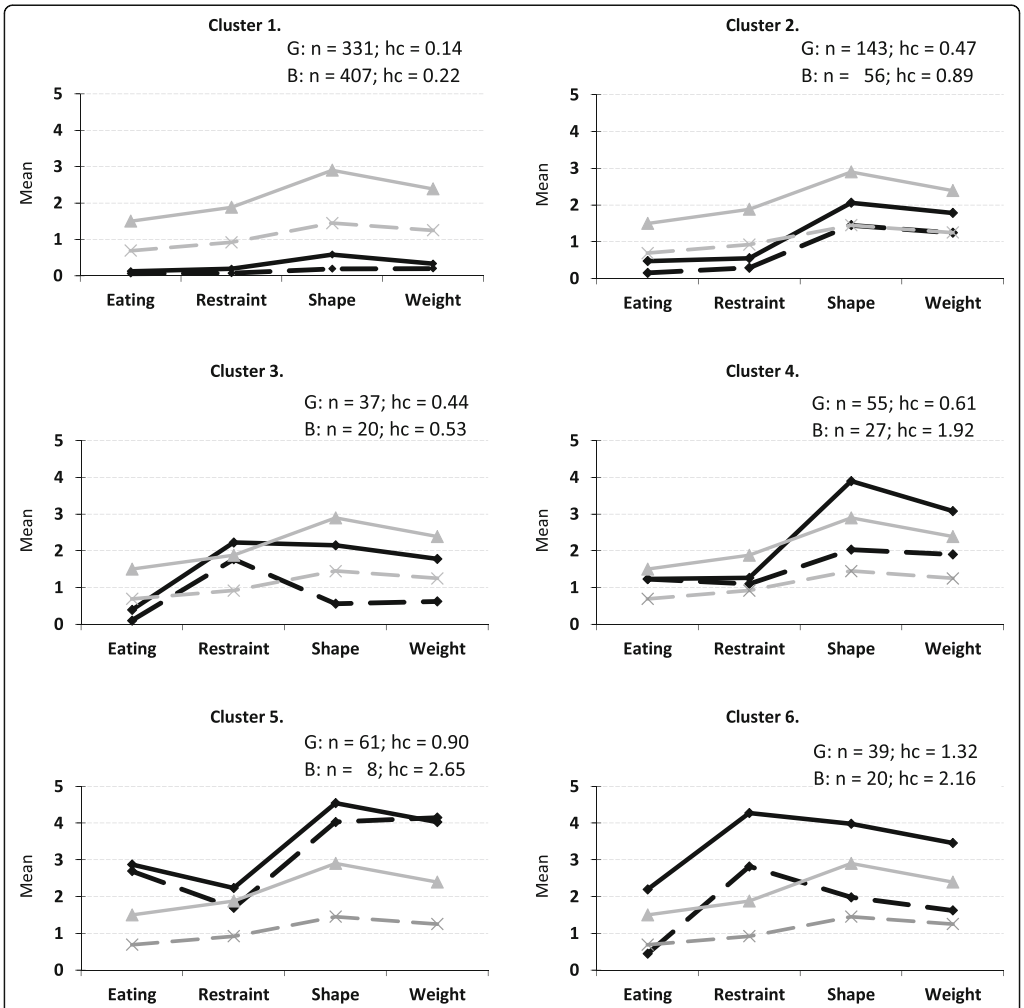

Fig. 1 Graphical illustration (solid black lines for girls and dotted black lines for boys) of the typical DE-profiles (cluster means) in a 6-cluster solution. Solid grey lines and dotted grey lines indicate clinical cut-off scores for girls and boys, respectively. *Note.* hc = homogeneity coefficient

Cluster associations with emotion dysregulation and psychological health

We further confirmed the trustworthiness of the cluster solutions by examining whether cluster membership was associated with emotion dysregulation, depression, and self-esteem. Tables 4 (for girls) and 5 (for boys) present the results of one-way analyses of variance conducted to evaluate the differences among the clusters.

Girls

Tukey's post-hoc tests revealed that, as expected, girls in the *non-problematic* cluster (Cluster G1) had significantly lower scores than did girls in the other clusters (with the exception of the *clinical restraint* cluster) on the DERS total score. This indicated that these girls had greater emotion regulation competency. They also showed significantly lower scores for depression and higher self-esteem. The *elevated shape and weight*

Table 3 Comparison of Cluster Sizes between the Genders

Clusters	Girls *n* (%)	Boys *n* (%)	Total *n* (%)
G1/B1	331 (50 %)	407 (76 %)	738 (61 %)
G2/B2	143 (21 %)	56 (10 %)	199 (16 %)
G3/B3	37 (6 %)	20 (4 %)	57 (5 %)
G4/B4	55 (8 %)	27 (5 %)	82 (7 %)
G5/B5	61 (9 %)	8 (1 %)	69 (6 %)
G6/B6	39 (6 %)	20 (4 %)	59 (5 %)
Total	666 (100 %)	538 (100 %)	1204 (100 %)

Note: Ns and (%) are significantly different at the $p \leq .05$ level between girls and boys except for clusters G3/B3 and G6/B6, which did not differ significantly

concern cluster (Cluster G2) consistently scored higher than did the *non-problematic* cluster (Cluster G1) on all variables, except for emotional impulse control, where there was no significant difference between the two clusters.

Interestingly, the *clinical restraint* cluster (Cluster G3) did not score significantly differently from the *non-problematic* cluster on any variable (with the exception of the mean SCOFF scores).

The *clinical shape and weight concern* cluster (Cluster G4) significantly differed from the *non-problematic* cluster on all variables, except for emotional awareness. Notably, the *elevated-* and *clinical shape and weight concern* clusters (i.e., Clusters G2 and G4, respectively) only differed in terms of their mean scores on the SCOFF, which corresponds with the differing degree of severity expected between these two clusters.

With respect to emotional impulse control, the two *clinical DE* clusters (Cluster G5 and G6), which had the most severe DE, had significantly higher scores than did all of the other clusters; this indicated that they had more problems with emotion dysregulation. Further, both *clinical DE* clusters had significantly higher mean scores on the SCOFF questionnaire than did the remaining clusters. The *clinical DE with high restraint* cluster (Cluster G6) also showed significantly higher depression scores and significantly lower self-esteem scores than did the others, except the *clinical shape and weight concern* and *clinical DE with high shape and weight concern* clusters, indicating high levels of depressive thoughts and low self-esteem among the clusters with most problematic DE.

Boys

Tukey's post-hoc tests showed that, as expected, the boys in the *non-problematic* cluster (Cluster B1) had significantly lower global DERS scores and most DERS subscale scores than did all of the other clusters (with the exception of the *clinical restraint* [Cluster B3] and *clinical DE with high restraint* clusters [Cluster B6]). Furthermore, with respect to the mean scores on the SCOFF, the *non-problematic* cluster showed significantly lower scores than did all of the other clusters except for the *clinical restraint* cluster, thus indicating fewer problems with DE. The boys' *clinical restraint* cluster did not differ in any way from the *non-problematic* cluster. Furthermore, the *non-problematic* and *clinical restraint* clusters reported significantly lower scores for depression and significantly higher scores for self-esteem than did the other clusters, except for the *clinical DE with high restraint* cluster.

The *clinical shape with elevated weight concern* cluster (Cluster B2) showed significantly higher scores on all variables than did the *non-problematic* cluster, with the exception of emotional awareness. The *clinical DE* cluster (Cluster B4) differed from the *non-problematic* cluster on all variables, but when compared to the *clinical DE with high shape and weight concern* cluster (Cluster B5), it exhibited a lower SCOFF score and higher scores on self-esteem. The *clinical DE with high restraint* cluster (Cluster B6) did not differ significantly from the *non-problematic* cluster on any variable, with one exception: namely, it had a higher score on the SCOFF, indicating more severe DE. Cluster B6's scores also significantly differed from those on the *clinical DE with high shape and weight concern* cluster, showing fewer problems with emotion dysregulation and depressive thoughts, better emotional strategies, and higher self-esteem.

Discussion

Our results revealed six typical DE patterns that differed between girls and boys. The clusters contained reasonably homogeneous groups (especially among girls) and the differences between the clusters in the various validation variables were (in many cases) large and generally followed the expected directions. Although some of the DE patterns, such as the *non-problematic* (Cluster 1), the *elevated shape and weight/clinical shape and weight concern* (Cluster 2) and *clinical DE with high shape and weight concern* (Cluster 5) were similar between girls and boys, the remaining three patterns clearly differed. As expected, both boys and girls with the *non-problematic* DE patterns reported the highest levels of psychological health, including low levels of emotion dysregulation and depression and high self-esteem, when compared to their counterparts with more problematic DE patterns. In contrast, the adolescents with DE patterns above the clinical cut-offs tended to report higher levels of emotion dysregulation, more depressive symptoms, and lower self-esteem than did those with DE patterns below the clinical cut-offs; this aligned with our expectations.

Most of the girls (50 %) and boys (76 %) included in our sample had non-problematic DE patterns. Only around 3 % of girls and 1 % of boys with the non-

Table 4 N of 2& > yes and less than 2 yes to the SCOFF and M (SD) for emotion dysregulation (DERS), depression and self-esteem for girls' cluster profiles

	G1 Non-problematic	G2 Elevated shape & weight concern	G3 Clinical restraint	G4 Clinical shape & weight concern	G5 Clinical DE, high shape & weight concern	G6 Clinical DE, high restraint	Total	*F* *	η^2	Post-hoc**
SCOFF N of 2& > "yes"/less than 2"yes"	9/309	14/117	7/27	15/36	32/21	23/11	100/521	–	–	–
DERS Global	70.75 (18.41)	84.39 (21.02)	72.46 (13.39)	92.91 (23.30)	101.57 (23.74)	103.71 (23.13)	80.50 (23.17)	(5, 92.48) =31.02	.26	G1<G2, G4, G5,G6 G2<G5,G6 G3<G4,G5,G6
Awareness	15.12 (4.70)	17.18 (4.22)	15.47 (4.40)	16.42 (4.64)	17.23 (4.58)	18.00 (3.67)	16.08 (4.61)	(5, 567) =6.10	.26	G1< G2, G5,G6
Clarity	9.81 (3.71)	12.44 (4.21)	10.83 (4.00)	13.02 (4.43)	14.45 (3.73)	14.19 (4.22)	11.38 (4.30)	(5, 598) =23.70	.17	G1< G2, G4, G5,G6 G2<G5; G3<G4,G6
Goals	11.57 (4.75)	13.05 (4.73)	11.18 (3.66)	15.06 (4.83)	16.43 (4.56)	15.80 (4.94)	12.87 (5.0)	(5, 371.54) =24.48	.13	G1<G2, G4, G5,G6 G2<G5,G6 G3<G4,G5,G6
Impulse	10.24 (4.11)	11.44 (4.87)	9.50 (3.21)	13.42 (5.10)	15.15 (5.73)	15.59 (5.97)	11.51 (4.97)	(5, 123.86) =19.13	.14	G1<G4, G5,G6 G2<G5,G6 G3<G4,G5,G6
Non-accept	10.35 (4.09)	13.08 (5.25)	10.97 (4.15)	15.13 (6.15)	16.37 (5.91)	15.18 (5.23)	12.22 (5.27)	(5, 116.24) =24.48	.18	G1<G2,G4, G5,G6 G2<G5; G3< G4,G5,G6
Strategies	13.64 (5.13)	17.08 (6.59)	13.27 (3.98)	18.94 (6.30)	21.16 (6.35)	21.38 (8.07)	15.93 (6.46)	(5, 111.60) =26.21	.20	G1<G2, G4, G5, G6 G2<G5, G6; G2>G3 G3<G4,G5,G6
CEDS-C Depression	13.79 (9.18)	21.71 (11.26)	14.03 (7.22)	24.35 (9.82)	30.17 (10.99)	29.41 (12.45)	18.80 (11.63)	(5, 118.17) =39.29	.27	G1<G2,G4, G5,G6 G2>G3; G2<G4, G5, G6 G3<G4,G5,G6
Rosenberg Self-Esteem	4.05 (.67)	3.57 (.76)	3.88 (.69)	3.11 (.80)	2.91 (.71)	3.09 (.81)	3.70 (.83)	(5, 645) =44.37	.26	G1>G2, G4,G5,G6 G2>G5, G4, G6 G3>G4,G5,G6

Note: *All *F*-values are significance at $p < .001$; **All post-hoc tests are significant at $p < .05$

Table 5 N of 2& > yes and less than 2 yes to the SCOFF and M (SD) for emotion dysregulation (DERS), depression and self-esteem for boys" cluster profiles

	B1 Non-problematic	B2 Clinical shape & elevated weight concern	B3 Clinical restraint	B4 Clinical DE	B5 Clinical DE, high shape & weight concern	B6 Clinical DE, high restraint	Total	*F**	η^2	Post-hoc**
SCOFF N of 2& > "yes"/less than 2"yes"	4/389	3/50	2/16	5/20	5/2	1/19	20/496	–	–	–
DERS Global	63.46 (18.33)	79.0 (25.24)	57.33 (11.59)	88.88 (19.97)	111.33 (19.86)	73.17 (17.67)	66.73 (20.60)	(5, 344) =13.47	.16	B1<B2, B4, B5 B2>B3;B3<B4, B5 B5>B6
Awareness	15.25 (24.97)	16.46 (4.75)	12.76 (4.29)	16.71 (4.01)	21.17 (5.95)	16.47 (5.32)	15.48 (4.98)	(5, 433) =3.57	.04	B1<B5; B3<B5
Clarity	8.61 (3.61)	10.88 (4.23)	7.65 (2.57)	12.04 (3.14)	13.67 (3.56)	10.76 (3.93)	9.13 (3.81)	(5, 469) =10.0	.10	B1<B2, B4, B5 B2>B3; B3<B4, B5
Goals	9.87 (4.17)	12.36 (4.78)	9.47 (4.05)	14.55 (4.54)	16.50 (4.36)	11.27 (3.83)	10.45 (4.43)	(5, 436) =9.13	.09	B1<B2, B4, B5 B3<B4, B5
Impulse	9.36 (4.08)	12.43 (5.64)	7.76 (1.75)	13.36 (4.94)	15.50 (4.32)	10.31 (3.20)	9.93 (4.44)	(5, 32.17) =10.25[a]	.12	B1<B2, B4, B5 B2>B3; B3<B4, B5
Non-accept	9.26 (3.92)	12.13 (4.83)	9.38 (3.18)	13.05 (4.89)	15.00 (4.98)	10.94 (4.20)	9.89 (4.26)	(5, 431) =9.11	.10	B1<B2, B4, B5 B3<B5
Strategies	12.69 (4.97)	16.14 (7.01)	11.18 (3.11)	19.33 (5.71)	21.71 (4.72)	13.88 (3.69)	13.49 (5.51)	(5, 34.48) =12.21[a]	.14	B1<B2, B4, B5 B2>B3; B3< B4, B5 B4>B6; B5>B6
CEDS-C Depression	9.22 (8.09)	17.19 (12.31)	7.07 (6.04)	18.57 (9.55)	27.67 (11.04)	12.73 (7.21)	10.77 (9.33)	(5, 29.69) =15.53	.16	B1<B2, B4, B5; B2>B3 B3< B4, B5; B5>B6
Rosenberg Self-Esteem	4.35 (.65)	3.72 (.84)	4.52 (.45)	3.69 (.76)	2.80 (.86)	4.01 (.69)	4.22 (.74)	(5, 503) =19.69	.16	B1>B2, B4, B5 B2< B3; B2>B5 B3>B4, B5; B4>B5 B5<B6

Note: [a] Emotional impulse control and emotional strategies are reported with Welch's test. *All *F*-values are significant at $p < .001$, except Awareness ($p < .01$). **All post-hoc tests are significant at $p < .05$

problematic DE pattern reported ≥2 "yes" responses on the SCOFF. Although significantly more boys than girls had the non-problematic pattern, this was expected and in line with previous research (e.g., [19]).

While it is gratifying that a majority of studied adolescents did not report DE, rather large proportions of girls (29 %) and boys (24 %) still fell into clusters with DE patterns with at least one indicator above the clinical cut-off suggested by Ekeroth and Birgegard [11]. These prevalence rates are within the range found in previous research. Specifically, reported prevalence rates for girls vary from 30 % among Israeli girls (M_{age} = 14.7; [23]) to 52 % among Finnish girls (M_{age} = 14.9; [18]) as well as 56 % of girls in a large sample (over 40,000) of 9th and 12th grade American female adolescents (Croll et al., 2002). The prevalence rates of DE for boys have been found to vary as well, at 15 % as reported by Herpertz-Dahlmann et al. [20] in a German sample of 1,895 11- to 17-year-old adolescents; 17 % as reported by Hautala et al. [18] in a Finnish sample of adolescent boys aged 15; 25 % as reported by Lavender et al. [26] in a study of male undergraduates; and 29 % as reported by Croll et al. (2002) among American adolescents. The main reason for the varying DE prevalence rates across these studies is probably that DE can be defined and measured in numerous different ways. In some studies, DE is defined via specific DE behaviors as measured by the SCOFF questionnaire (e.g., [19, 20]) or using items specifically designed for that study (Croll et al., 2002), while in the present study, we used both the SCOFF questionnaire and the EDE-Q to provide a broader picture of DE.

Surprisingly, adolescents with the *clinical restraint* DE pattern generally did not differ from the *non-problematic* pattern in terms of emotion dysregulation, depression, or self-esteem and reported better mental health compared to the other problematic clusters. These clusters tended to be small (37 girls, or 6 % of all girls, and 20 boys, or 4 % of all boys) and homogeneous, indicating that the individuals included in the clusters scored alike on all four DE indicators. These results seem to point to the fact that clinical-level restraint does not, on its own, have a significant impact on adolescents' psychological health. One possible explanation for these results is that the boys and girls in this cluster are comparable to "non-disordered obese" or overweight "jolly fat" individuals ([22], p. 635), who, despite their severe overweight, do not have the accompanying depressive thoughts common among obese and overweight individuals. It is possible as well that the high self-esteem reported by both genders with *the clinical restraint* DE pattern plays an important role, since high self-esteem has been found to be an important protective factor for the negative effects of DE for both girls and boys in a number of studies (e.g., Croll, Neumark-Sztainer, Story & Ireland, 2002; Micali et al., 2015). Another possible explanation is that adolescents with this pattern are more aware of what they eat than adolescents in general [33]. It would be informative to follow-up on adolescents with the *clinical restraint* DE pattern to determine whether they would continue to be emotionally well-regulated and show good mental health despite their continually elevated weight and shape concerns and restraint levels, or whether the restraint is merely temporary and either develops into healthy eating habits or worsens over time.

The most problematic DE patterns for girls were the *clinical DE with high shape and weight concern* pattern (Cluster G5) and the *clinical DE with high restraint* pattern (Cluster G6); specifically, they showed the worst emotion dysregulation, depression, and self-esteem. Furthermore, the two clusters had the highest proportions of girls with ≥2 "yes" responses on the SCOFF (60 % and 67 % in Cluster G5 and G6, respectively).

The *clinical DE with high restraint* cluster showed worse emotion dysregulation than did the *elevated shape and weight concern* cluster (G2) on all variables except for emotional awareness, emotional clarity, and non-acceptance of emotions. Although being aware of one's (negative) emotions might cause elevated suffering, girls with clearly problematic DE might be unable to optimize their emotions to ensure appropriate responses [1]; however, but this does not suggest that they are not able to optimize their (negative) emotions at all. Why the non-acceptance of one's emotions did not differ between the *clinical DEB with high restraint* cluster and the *elevated shape and weight concern* cluster is unclear, and should be studied further. Although the girls in Clusters G5 and G6 scored rather similar on emotion dysregulation, self-esteem, and depression, their significant differences with regard to restraint might indicate different developmental trajectories of DE that may need different intervention strategies. It should be noted that the lowest self-esteem of all clusters was found among girls with the *clinical DE with high shape and weight concern* pattern (Cluster G5), which is in line with findings that exaggerated views of shape and weight are strongly related with low self-esteem [10].

Among boys, one clearly problematic DE pattern emerged-the *clinical DE with high shape and weight concern* pattern (Cluster B5). Although this DE pattern was almost identical to the girls' pattern (Cluster G5), significantly fewer boys had this pattern (n = 8 [1 %] compared to 61 [9 %] of girls). Furthermore, this DE pattern was the only one (compared to the two highly problematic DE patterns for girls) that clearly showed clinical signs of DE among boys, as five of the boys in the cluster (71 %) reported ≥2 "yes" responses on the SCOFF questionnaire. The DE patterns significantly differed from all other clusters among the boys, having higher scores on

emotion dysregulation and depression and the lowest self-esteem scores of all clusters (i.e., both girls and boys). This last point is noteworthy considering that girls otherwise tended to have a lower self-esteem score than did boys in this study. Previous research has suggested that men who experience emotion dysregulation may use DE to modulate or escape unwanted emotions [25], which, in combination with low self-esteem, may be devastating to their mental health.

Surprisingly, boys with the *clinical DE with high restraint* pattern (Cluster B6), despite having scores above the cut-offs on three of the four DE indicators, reported rather efficient emotional regulation strategies, low depression, and relatively good self-esteem. Furthermore, only one in 20 boys with this problematic DE pattern reported ≥2 "yes" responses on the SCOFF questionnaire, further indicating that these boys seemed to have a lower risk for DE. However, it would be important to follow up on the boys with this DE pattern in order to confirm whether high self-esteem in combination with good emotion regulation plays a decisive role in how the pattern develops. In other words, it may be that the high scores on these three DE indicators are temporary in this cluster, and do not develop into clinical levels of DE.

Although Clusters G4 and B4 (*clinical shape and weight concern* among girls and *clinical DE* among boys, respectively) had scores above the clinical cut-offs on two of the four DE indicators, these clusters did not differ cardinally from the less problematic clusters. Nevertheless, these patterns showed some important signs (e.g., significantly more boys [20 % within the cluster] and girls [29 % within the cluster] reporting ≥2 "yes" responses on the SCOFF than could be expected by chance, elevated scores on emotion dysregulation and depression, rather lower self-esteem) that suggest that this pattern may become more problematic in the future. In other words, this pattern may be considered a "preclinical" or "turning point" pattern requiring special attention from both healthcare personnel and parents. However, more results are needed to confirm this.

In general, the boy clusters appeared to be less distinct than the girl clusters. This could, certainly, be because of the difficulties in measuring overall DE (e.g., [7]) or to the specific difficulties in measuring DE and emotion dysregulation in boys [33]. Additionally, it might be simply that boys' clusters were smaller, thus diminishing the statistical power. Another alternative is that the clinical cut-offs suggested by Ekeroth and Birgegard [11] are too low for boys, since, as discussed above, the DE pattern that had indicators above the clinical cut-offs (Cluster B6) was not confirmed as problematic according to the validation variables. Although boys tend to have less severe DE symptoms, and therefore have correspondingly lower clinical cut-offs, more research may be needed to fine-tune the current cut-offs for them. On the other hand, when using the EDE-Q as a screening tool, it would be valuable to use cut-offs with high sensitivities to avoid passing over adolescents who might be at risk of developing DE or are already experiencing it.

Strengths and limitations

This study has several strengths. First, the sample included in the present study was a large, representative, gender-diverse sample of community-dwelling adolescents. Second, this is, to our knowledge, the first study to examine typical patterns of DE among adolescents of both genders. Third, we used an advanced form of cluster analysis that allowed us to validate our cluster solutions in a more sophisticated way, including calculation of the variance explained and homogeneity coefficients.

Nevertheless, this study also has some limitations. First, the data analyzed in the study were only from self-reports. The main shortcomings of such data concern shared-method variance, conscious distortion, social comparison, and situational and contextual factors that to some degree limit our drawing stronger conclusions. To verify the results, a multi-method approach that involves diagnostic interviews, parent reports, and hospital records would be advantageous in future studies. Second, although we used a large sample, all of the participants were drawn from one municipality in Sweden, meaning that potential local bias may exist; however, it should be noted that this municipality was, in many respects, representative of Sweden as a whole.

Conclusions

Despite the limitations, this study had a number of important findings. First, we found six typical DE patterns among both girls and boys. These patterns suggest an alternative way of representing the relationship structure among the various DE indicators. Four of the six girls' clusters and five of the boys' clusters had scores on at least one DE indicator above recommended clinical cut-offs. However, the most problematic clusters comprised adolescents who reported scores above the clinical cut-offs on all DE indicators in combination with severe psychological problems, including emotion dysregulation, high levels of depression, low self-esteem, and higher proportions of adolescents with ≥ 2 "yes" responses on the SCOFF questionnaire. Unexpectedly, both girls and boys who reported restraint subscale scores above the cut-offs had psychological health comparable to the non-problematic DE pattern. Because several different problematic DE patterns emerged, it is likely that they would require different paths back to a healthy diet. Longitudinal studies that follow-up on the emerged DE patterns in order to study their developmental trajectories in combination with important psychological variables

(e.g., self-esteem) would be of great importance in the future. By expanding our knowledge of the patterns, the detection and prevention of DE can be improved, which in turn would reduce the likelihood of DE problems becoming chronic into adulthood [39].

Abbreviations

ASED: Average squared Euclidean Distances; DE: Disordered Eating; DERS: Difficulties in Emotions Regulations Questionnaire; EDE-Q: Eating Disorders Examination Questionnaire; EESS: Explained Error Sum of Squares

Acknowledgements

We would like to express our gratitude to Jason Maurer for his great job editing the manuscript.

Funding

Not applicable.

Availability of data and material

The data is, in accordance to the ruling of the ethics committee, not to be shared.

Authors' contributions

EH designed the study, carried out the data collection, performed the statistical analysis, and wrote the paper. DD designed the study, performed the statistical analysis, wrote the paper, and gave conceptual advice. PJ designed the study and gave conceptual advice. All authors discussed the results and implications and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

The study was approved by the Regional Ethics Committee in Lund, Sweden (dnr 2012:499).

Received: 26 May 2016 Accepted: 23 October 2016
Published online: 04 November 2016

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DOI 10.1186/s40359-017-0180-5

BMC Psychology

RESEARCH ARTICLE Open Access

Disordered eating and emotion dysregulation among adolescents and their parents

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Abstract

Background: Research on the relationships between adolescent and parental disordered eating (DE) and emotion dysregulation is scarce. Thus, the aim of this study was to explore whether mothers' and fathers' own DE, as measured by SCOFF questionnaire, and emotion dysregulation, as measured by the difficulties in emotion regulation scale (DERS), were associated with their daughters' or sons' DE and emotion dysregulation. Furthermore, the importance of shared family meals and possible parent-related predictors of adolescent DE were explored.

Method: The total sample comprised 1,265 adolescents (M_{age} = 16.19, SD = 1.21; age range 13.5–19 years, 54.5% female) whose parents had received a self-report questionnaire via mail. Of these, 235 adolescents (18.6% of the total sample) whose parents completed the questionnaire were used in the analyses. Parents' responses were matched and compared with those of their child.

Results: Adolescent girls showed greater levels of DE overall than did their parents. Furthermore, DE was associated with emotion dysregulation among both adolescents and parents. Adolescent and parental emotion dysregulation was associated, although there were gender differences in the specifics of this relationship. The frequency of shared dinner meals was the only variable that was associated to DE and emotion dysregulation among adolescents, while parental eating disorder was the only variable that enhanced the probability of adolescent DE.

Conclusion: The present study contributes to the literature by demonstrating that there are significant associations between parents and their adolescent children in terms of DE, emotion dysregulation, and shared family meals. Future studies should break down these relationships among mothers, fathers, girls, and boys to further clarify the specific associational, and possibly predictive, directions.

Keywords: Disordered eating, Emotion dysregulation, Adolescents, Parents, Shared meals

Background

Evidence for the parental influence on adolescents' eating disorders and disordered eating (DE)-namely, the behaviors and attitudes toward body perception, eating habits, weight regulation, and self-evaluation [46]-is inconclusive at present. Research exploring the specific pathways through which parental behaviors operate in this capacity is needed to clarify why some adolescents develop DE while others do not [22, 47]. Traditionally, responsibility has been attributed to mothers for the occurrence of eating disorders in children (primarily daughters) [11], which has led most studies to explore different aspects of DE among mothers and daughters, such as mothers' talk about their own and their daughters' weight with their daughters [4], or the similarity of coping styles between mothers and daughters with eating disorders [25]. Despite this focus on mother-daughter relations, associations between parenting practices and eating behaviors have also been found among adolescent boys [28], making it clear that further efforts to understand the parental influences on boys' and girls' DE are needed. This is especially important since the prevalence of DE, which may lead to a clinical eating disorder [35] that renders high morbidity [19, 42] is rather

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high, varying from 15 to 24% in boys and to 25 to 52% in girls [16–18]. According to Wertheim [47], mothers' and fathers' food abstaining behaviors have predicted the food abstaining behaviors of their adolescent daughters but there is insufficient research on adolescents of both genders [28], and thus, the present study sought to fill this gap by exploring in what ways mothers' and fathers' DE is associated with that of their adolescent children.

Parental comments on a child's weight do appear to be the most consistent correlate of child weight and shape concerns and behaviors; however, one study found that children's modeling of parental weight concerns through observation of parents' own dieting behavior, weight-related concerns, and weight loss attempts gave rise to DE among children in fourth and fifth grade [43]. Such indirect parental influences suggests that children are influenced by their parents through modelling certain behaviors and the receiving of covert messages that communicate parental beliefs and expectations, as explained by social learning theory [2, 48]. Furthermore, such indirect parental influences, might have a stronger effect in adolescence due to their unobtrusive nature, which is especially relevant when considering adolescents' increased independence from parental control with age [37, 49].

DE has also been found to relate to emotion dysregulation among adults [50] and adolescents of both genders [30]. Children of both genders have been shown to express their emotions in different ways-girls are more likely to exhibit more positive and internalizing emotions, whereas boys are more likely to exhibit externalizing emotions [8]. However, as with DE, most research on emotion dysregulation has focused on mothers and daughters, finding evidence that children of depressed mothers are more likely to engage in maladaptive emotion regulation strategies than are children of non-depressed mothers [14, 40]. Furthermore, emotion regulation during middle childhood and adolescence appears to be more closely related to the emotion regulation ability of the mother than of the father [3]. There is also evidence that mothers and fathers give unique contributions to their child's development of emotion regulatory skills by responding differently to their children's sadness behavior [7].

Overall, research on the relationships between parent and adolescent emotion regulation and DE is scarce [3, 21, 32]. As such, the central question examined in this paper was whether parents' own DE and emotion dysregulation are implicitly associated with their adolescents'. One opportunity for children to observe and model healthy eating behaviors (provided that the eating behaviors of the parents are indeed healthy) is during shared family meals. The number of shared meals has been found to be inversely associated with DE among adolescents [26, 36]; notably, this relationship is most commonly noted among females [41]. It is debated what specific problematic behaviors are reduced by regular shared meals, as some studies have suggested that shared meals serve a protective function against bulimia or extreme weight control behaviors [41]. Evidence does suggest that shared meals serve a protective function for both girls and boys, although in different ways. For example, it appears as if shared meals are associated with a decreased risk of engaging in risk behaviours among girls but not among boys [41].

In summary, to extend the knowledge of factors associated with adolescent DE, we explored the relations between parental and adolescent DE, emotion dysregulation, and shared family meals. We hypothesized that there would be associations as well as differences between parents and adolescents in regards to DE and emotion dysregulation, and that high levels of emotion dysregulation among parents would be associated with high levels of DE among the adolescents. Furthermore, we hypothesized that associations would be found between shared meals, emotion dysregulation, and DE among both adolescents and their parents, and that parental DE, parental eating disorders, parental emotion dysregulation, and shared family meals would affect the probability of DE among the adolescents. The analyses were stratified by gender in order to examine possible gender differences in these relationships.

Method

Participants

Adolescents

The study was conducted in a municipality in southern Sweden between January and March 2014. The initial sample comprised 1,265 adolescents (M_{age} = 16.19, SD = 1.21; age range 13.5 – 19 years, 54.5% female); in this study, however, we only analyzed a subsample of 235 adolescents (18.6% of the total sample) whose parents had completed the necessary questionnaires.

Parents

The parents of the students who attended the participating schools received a letter with a questionnaire that they were asked to complete and return in a pre-paid envelope. Two hundred ninety mainly Swedish (95.1%) parents (83.8% mothers) responded. Of those, 235 could be matched to their children using the personal identity number of the child. The remaining 55 responses could not be matched because of various reasons. An analysis of differences between children whose parents participated and those whose parents did not is presented in the Result section.

Measures

Disordered eating

SCOFF The SCOFF questionnaire [31] comprises five questions concerning eating habits and attitudes toward weight and body shape, as follows (with the SOCFF acronym letters printed in bold): "Do you make yourself sick (vomit) because you feel uncomfortably full?"; "Do you worry that you have lost control over how much you eat?"; "Have you recently lost more than one stone (15 pounds or about 6.8 kg) in a 3-month period?"; "Do you believe yourself to be fat when others say you are thin?"; and "Would you say that food dominates your life?" A threshold of two positive answers was proposed to indicate the probability of an existing eating disorder [29, 31], and this threshold was used in the present study, although it has been challenged with the idea that only one positive answer would be necessary to raise suspicion of DE, at least among adolescents [16]. The SCOFF was translated into Swedish [16] by one of the authors by using the back translation procedure with the help of another Swede competent in English. The reliability of the SCOFF-scale, assessed with Kuder and Richardson's formula 20 (KR20), was .42 for the adolescents, and .29 for the parents.

Eating disorder Parents were asked to answer the following question: "Do you suffer from, or have you earlier in life suffered from, a clinical eating disorder?" The response options were "yes," "no," or "I don't want to answer."

Emotion regulatory behaviors

Emotion regulation The Difficulties in Emotion Regulation Scale (DERS) [15] is a 36-item self-report questionnaire that assesses the six dimensions of emotion regulation: (a) lack of emotional *awareness* (e.g., "I am attentive to my feelings" (reversed)); (b) lack of emotional *clarity* (e.g., "I have no idea how I am feeling"); (c) impulse *control* difficulties (e.g., "When I'm upset I feel out of control"); (d) difficulties in engaging in *goal* directed behaviors (e.g., "When I'm upset I have difficulties getting work done"); (e) *non-acceptance* of emotional responses (e.g., "When I'm upset, I feel guilty for feeling that way"); and (f) limited access to emotion regulation *strategies* (e.g., "When I am upset, my emotions feel overwhelming"). The items are rated in terms of how frequently each statement applies to them on a five-point Likert scale ranging from 1 ("almost never") to 5 ("almost always"). The total score for the DERS is calculated by adding all answers and the subscale scores are also added to a total number. The DERS has demonstrated high internal consistency [15], with a Cronbach's α of .93. In the current study, the Cronbach's alpha was .94 for the total scale for adolescents (.77 for the parents), .76 (.34) for awareness, .81(.64) for clarity, .85 (.58) for impulsivity, .86 (.60) for goals, .87 (.51) for non-acceptance, and .86 (.65) for strategies.

Shared Meals

The adolescents answered three questions on the frequency of shared meals: "How often do the majority of your family members share breakfast/lunch/dinner with you"? Each question was rated on a 7-point Likert-type scale ranging from 1 ("1 day per week") to 7 ("7 days per week"). The answers were added into a total score of a maximum of 21 meals per week.

Procedure

Adolescents

Both the legal guardians of the students below age 15 and the adolescents themselves, irrespective of age, received written information on the study aims, procedures, and the right to decline participation, and the same information was given orally to the adolescents on the day of data collection as well. The adolescents were also assured of confidentiality. Parents provided their passive consent-that is, they had to sign and return a form if they refused to allow their child to participate in the study. The adolescents consented to participation by completing the questionnaire, which took approximately one hour.

Parents

A questionnaire, together with a letter explaining the survey and the right to decline participation, was sent out to all parents. By filling in the questionnaire and sending it back, the respondents gave their informed consent to participate. The parent questionnaire took approximately 20 min to complete.

Statistical analysis

All analyses were calculated by use of the IBM SPSS Statistics program, and Pearson's (r), as well as Point-Biserial (r_{pb}) correlation coefficients were used for all correlations. The analyses involving independent group comparisons were calculated with independent t-tests and the Mann-Whitney U-test, while paired-samples t-tests, as well as the McNemar's test were used to explore the differences between adolescents and their parents. A logistic regression analysis was used to explore which variables among the parents possibly affect adolescent DE. All p-values were two-tailed.

Results

Preliminary analysis

Overall, 235 parents (86.4% mothers) with matched adolescents (M_{age} = 16.18, SD = 1.20; 56.6% female) participated in this study. Preliminary analyses were conducted

to examine whether there were any significant differences in the study variables between the 235 adolescents whose parents had completed the questionnaire and those whose parents had not, and as can be seen in Table 1, no significant differences were found among the two samples.

No significant differences were found between mothers and fathers regarding DE, as measured by the SCOFF, or in emotion dysregulation, as measured by the DERS. Therefore, mothers and fathers were not separated in the following analyses.

Parental and adolescent DE

Parental and adolescent DE was associated among the girls ($r_{pb} = .19$, $p \leq .05$), but not among the boys. As Table 2 shows, about 90% of adolescents and 95% of parents reported fewer than two "yes" answers on the SCOFF and none of the participants answered "yes" to more than three SCOFF questions in total.

To further illustrate the presence of DE among adolescents and their parents, a McNemar's chi-square test (Table 3) was conducted, and the results indicated significantly less DE among the parents than among the adolescents ($p \leq .05$).

Five mothers and one father answered "yes" to the question of whether they suffered from, or had earlier in life suffered from, a clinical eating disorder.

Parental and adolescent emotion dysregulation

An independent *t*-test showed that girls ($M = 79.49$, $SD = 20.76$) tended to have higher total scores on the DERS than did boys ($M = 65.16$, $SD = 19.60$, t (171) = 4.63 $p \leq .001$, Cohen's $d = 0.72$), which indicates that boys tend to have less emotion dysregulatory problems than girls. Furthermore, there was a significant positive correlation between adolescents' total DERS scores and their parents' ($r = .18$, $p \leq .01$). Table 4 shows the means and standard deviations of the girls, boys, and parents for the total and subscale scores of the DERS.

Girls

Paired samples t-tests showed that girls ($M = 79.49$, $SD = 20.76$) significantly differed in DERS total score from their parents ($M = 58.53$, $SD = 13.52$, t (89) = 7.19, p ≤ .001, Cohen's d = 0.99), indicating that girls experienced greater emotion dysregulation problems than did parents. Parents' *strategies* subscale score correlated with girls' scores on the *strategies* ($r = .25$, $p \leq .01$), *impulse-control* ($r = .19$, $p \leq .05$), and *emotional goals* ($r = .20$, $p \leq .05$) subscales of the DERS. The parents' *impulse control* subscale score also correlated with that of girls ($r = .22$, $p \leq .05$).

Boys

Boys ($M = 65.16$, $SD = 19.60$) also showed significantly higher DERS total scores than did their parents ($M = 58.53$, $SD = 13.52$, t (67) = 3.15 $p \leq .002$, Cohen's $d = 0.50$). Regarding the correlations, parents' scores on the *clarity* subscale correlated with boys' scores on the *clarity* ($r = .27$, $p \leq .01$), *strategies* ($r = .22$ $p \leq .05$), and *impulse control* ($r = .30$, $p \leq .01$) subscales. Furthermore, vparents' scores on the *strategies* subscale significantly correlated with boys' scores on the *strategies* ($r = .35$, $p \leq .01$) subscale, while parental *impulse control* scores correlated with boys' *non-acceptance* ($r = .24$, $p \leq .05$) and *strategies* ($r = .27$, $p \leq .05$) scores. Finally, parents' *non-acceptance* scores correlated with boys' *non-acceptance* ($r = .32$, $p \leq .01$) and *strategies* ($r = .28$, $p \leq .01$) scores.

The relation between DE and emotion dysregulation among adolescents and parents

DE and emotion dysregulation were significantly correlated in adolescent girls ($r_{pb} = .30$, $p \leq .01$) and in parents ($r_{pb} = .27$, $p \leq .01$), but not in adolescent boys. No significant correlation was found between adolescent DE and parental emotion regulation.

The relation between family meals, DE, and emotion dysregulation

In regards to shared family meals, no significant correlation was found regarding the total number of meals shared and DE among the adolescents, and neither between the total number of meals shared and emotion dysregulation. However, when only family *dinner* meals were included in the analysis, and the breakfast and lunch meals omitted, weak but significant negative

Table 1 The children whose parents participated and children whose parents did not were compared to determine structural differences among the groups

	Parent participated	Parent did not participate	
	M (SD) (*Mdn* for SCOFF)	*M (SD)* (*Mdn* for SCOFF)	t (u for SCOFF)
SCOFF	0.00	0.00	u = 99716.5, $p = .07$
DERS	73.11 (21.42)	75.19 (23.70)	t (295.59) = 1.11, $p = .30$
M_{age}	16.18 (1.20)	16.19 (1.22)	t (1262) = .084, $p = .93$

Note: For each analysis, we excluded the data of adolescents with missing values in a pairwise fashion. Samples whose parents did not participate and whose parents did participate ranged from 642 to 1029 adolescents and 173 to 235 adolescents, respectively
As can be seen from the *p*-values no such significant differences were found

Table 2 Number of "yes" answers on the SCOFF among adolescents and parents

"Yes" answers	Adolescents (*n*)	Adolescent Girls (*n*)	Adolescent Boys (*n*)	Parents (*n*)	Mothers (*n*)	Fathers (*n*)
0	(164) 73.9%	(78) 63.4%	(86) 86.9%	(190) 81.9%	(163) 81.5%	(27) 84.5%
1	(35) 15.8%	(23) 18.7%	(12) 12.1%	(32) 13.8%	(29) 14.5%	(3) 9.5%
2	(19) 8.6%	(18) 14.7%	(1) 1.0%	(9) 3.9%	(8) 4%	(1) 3%
3	(4) 1.7%	(4) 3.2%	(0)	(1) 0.4%	(0) 0%	(1) 3%

More than two "yes" answers are indicative of an eating disorder

correlations with DE ($r_{pb} = -.16$, $p \leq .01$) as well as with emotion dysregulation ($r = -.16$, $p \leq .05$) were found. When exploring girls and boys separately, no significant correlations were observed.

The effect of parental eating disorders

A logistic regression analysis was performed to assess the impact of a number of factors, including parents' DE and earlier diagnosed eating disorder, emotion dysregulation, and frequency of shared meals, on the odds that adolescents would report having DE. However, only the results of the girls are presented, as only one boy gave two "yes" answers on SCOFF. The model contained 12 independent variables: eating breakfast, lunch, or dinner together with parent; parental awareness; clarity; impulse control; goals; non-acceptance of emotions; parental emotional strategies; parental SCOFF score; and parental self-reported eating disorder. The full model containing all predictors was significant (for girls) χ^2 (1, $N = 133$) = 6.31, $p = .012$, indicating that the model could distinguish the girls who reported DE and girls who did not. The model as a whole explained between 5.7% (Cox and Snell R-square) and 9.3% (Nagelkerke's R-squared) of the variance in DE and correctly classified 83.2% of the cases. Surprisingly, only one of the independent variables made a significant contribution to the model: whether the parent reported suffering from an eating disorder. The odds ratio was .07, indicating that there is slightly higher odds that girls of parents suffering, or having suffered from an eating disorder would report DE.

Discussion

In this study the relationships between DE, emotion dysregulation, frequency of shared family meals among adolescents and their parents, as well as possible parental predictors of adolescent DE were explored. Associations between girls' DE and their parents' DE were found, and DE was also associated with difficulties with emotion dysregulation among adolescents as well as parents. Furthermore, associations were found among adolescent and parental emotion dysregulation, although the specifics of this relationship showed gender differences such as the parents' emotion dysregulatory strategies were associated with impulse control and emotional goals for girls but not for boys. Regarding the boys, the parents' scores on the emotional clarity subscale were associated with emotional clarity, strategies and impulse control. These associations were not found among girls. Parents' non-acceptance scores were also positively associated with the non-acceptance scores of the boys', but not the girls'. Only the shared family dinner meal was associated with less problems with DE and emotion dysregulation among adolescents, and finally, only parental eating disorder enhanced the probability of adolescent DE.

One boy and 22 girls reported 2 or more "yes" answers on the SCOFF, which is indicative of an eating disorder. However, only one answer on SCOFF might, in some cases, be indicative of DE [16] and about 13.1% of the boys and 35.2% of the girls reported 1 or more "yes" answers on SCOFF. These numbers are roughly comparable to studies where the prevalence of DE varied from 15 to 17% among boys and to 33 to 52% among girls in German and Finnish adolescent samples [17, 18].

Adolescents were more likely to experience DE than were their parents, which is in line with research saying that more than 50% of teenage girls and 33% of teenage boys are using restrictive measures to lose weight at any given time [33] while "only" 13 and 11% of women and men, respectively, scored in the DE range [6]. A possible explanation as to why DE is more common among

Table 3 Observed frequencies of DE among adolescents and parents (based on two "yes" answers on SCOFF)

	Adolescents				
	Girls		Boys		
	DE	No DE	DE	No DE	Total
Parents with DE	4 (18%)	5 (5%)	0 (0%)	1 (1%)	10 (4.5%)
Parents without DE	18 (82%)	93 (95%)	1 (100%)	97 (99%)	209 (95.5%)
Total	22 (100%)	98 (100%)	1 (100%)	98 (100%)	219 (100%)

Note: The boys' association was not significant according to McNemar's test

Table 4 Girls', boys' and parents' means and standard deviations on the total and subscale scores of the DERS

	Girls		Boys		Parents	
DERS	*M*	*SD*	*M*	*SD*	*M*	*SD*
Total	79.49	20.76	65.16	19.60	58.53	13.52
Awareness	16.27	5.05	15.68	5.37	12.40	4.11
Clarity	11.82	3.98	8.68	3.62	6.86	2.06
Impulse control	11.23	5.25	9.17	4.28	8.24	2.48
Goals	13.13	4.95	10.91	4.51	9.63	3.42
Non-acceptance	12.72	5.40	9.22	3.50	10.04	3.98
Strategies	16.39	6.76	12.72	5.10	11.32	3.28

younger people is that emotion regulation skills develop well into adulthood, and therefore might not be as advanced in adolescence as in later life [38]. Thus, if emotion dysregulation is indeed associated with DE, greater emotion regulation skills might be one contributor to healthier eating behaviors as a person gets older.

Girls' DE was associated with their parents DE, which is in line with earlier research [47], and on a speculative note, considering the majority of the parents were mothers, a gender link between daughters' and mothers' DE could be possible, as well as a parallel relationship between boys' and fathers' DE. Furthermore, the girls showed greater problems with DE than did their parents, but boys did not. The number of boys who reported DE was small, and it is possible that the SCOFF is interpreted in different ways by girls and boys [16].

Girls in the study showed higher emotion dysregulation than boys, and adolescents in general had higher emotion dysregulation scores than did their parents. As mentioned earlier, the difference between adolescents and parents could be explained by prior findings saying that emotion regulation develops well into adulthood [38] but this does not explain why girls in this study experience more emotion dysregulation than boys. On the contrary, girls, in general, tend to mature earlier than boys do [27], which ought to give them an advantage in terms of emotion regulation skills. On the other hand, adolescent girls, compared to adolescent boys, are more likely to suffer from low self-esteem and depression [39], which are correlated with DE [10, 24]; these might in some way inhibit the development of emotion regulation skills among girls.

Both girls' and boys' emotion regulation skills were related to their parents', which is in line with the modeling hypothesis proposed earlier [2]. According to this hypothesis, children imitate their parents' manner of regulating their emotions implicitly. Although such modeling may explain the relations of overall DE and emotion dysregulation among adolescents and parents, it might not explain why the specific parental emotion dysregulation *strategies* were associated with adolescents' emotion dysregulation. More specifically, this association suggests that parents have an explicit *strategy* to teach the child his or her emotion regulation skills [32].

In line with previous studies [9, 23, 30], an association between DE and emotion dysregulation was found in adolescents as well as their parents, however, parental emotion dysregulation was not associated with their children's DE. Furthermore, there was no association between frequency of shared family meals and DE among adolescents [26]. We did observe, however, that frequency of shared family *dinners* was negatively associated with adolescent DE and emotion dysregulation, although this association was very weak. This could be because dinners are more relevant than are other meals, and might be considered more of a "family affair" in Sweden, where lunch is provided at school (and, incidentally, skipped by about 50% of adolescents) [20] and breakfast, if not completely disregarded [20], often is a stressful affair for most families with children in school and two parents working full time, although frequency of breakfast meals was earlier found to be associated with DE [1]. Perhaps "family" time is more important for reducing DE as opposed to mere "food intake," which occurs during breakfast and lunch as well, and this might also be true for the development of emotion regulation. Furthermore, it should be noted that we only measured adolescents' reports of how many times per week the family came together for different meals. It is possible that they have different views on what should constitute a "shared family meal" than their parents would have. It is also important to notice that not all shared meals would be considered joyful occasions, and we did not consider the wider family constellation, including siblings. A somewhat surprising result was that parental eating disorder was the only variable that raised the odds of adolescent DE. However, this result might further strengthen the importance of modeling among adolescents and their parents [2].

Strengths and limitations

Although parents' response rate was poor and there was a possible volunteer bias, the knowledge of which parent (mother or father) answered the questions and our matching of the parent to his or her child can be considered strengths of this study. The data were collected in common public schools in a municipality in southern Sweden and the students came from both urban and rural settings, making our sample similar to the composition in other Swedish municipalities. The final sample comprised 235 adolescent-parent pairs, which is a rather large sample overall. All data were obtained via self-report and no diagnostic interviews were used to confirm answers to the questionnaires which can be

considered a limitation of the study. On the other hand, it has been argued that the anonymous self-report format might yield more valid data than interviews because they are less personally intrusive [12]. Another limitation is that, although the reliability of the DERS scale seemed appropriate for adolescents (based on the Cronbach's alpha), it was much lower for parents. If the "awareness" subscale was removed, the Cronbach's alpha for parents would become equivalent to that of adolescents which should be considered in further studies. The initial psychometric testing of the DERS scale, which yielded high internal consistency, was made on undergraduate students [15], and when using adult samples, the awareness subscale has been found to fail to correlate with the four of the five other subscales, while the remaining five all correlate significantly with one another [44, 45]. The fact that the DERS did not work sufficiently for the adults was a limitation, but there was an obvious advantage of using the exact same scale for the adolescents and parents. As a final limitation, we did not measure adolescents' possible eating disorder and our question on shared meals did not contain a "never" answer.

Conclusions and further directions

Although evidence for parental influence on DE and emotion dysregulation is inconsistent [22, 47], likely due to methodological differences [34], the present study contributes to the research by showing significant associations between parents and their adolescent children with regard to DE and emotion dysregulation as well as shared meals. Future studies should specifically ask for answers from both parents separately to further clarify the specific influences mothers and fathers have on their children. Studies should also continually include adolescents of both genders, as already suggested by Berge et al. [5]. On this note, it would also be of interest to focus on boys with DE to further explore how boys' DE relates to their parents' DE and emotion dysregulation. Another avenue to explore is fathers' possible influence on their sons' and daughters' eating, which would offer a contrast to studies focusing solely on mothers and their responsibility for DE [11, 13], which seems to be quite outdated in contemporary society.

Abbreviation

DE: Disordered eating; DERS: Difficulties in emotion regulation scale

Funding

The collection of data from the parents was made possible by funding from Academia Gastronomica Scaniencis.

Availability of data and materials

The data are, in accordance to the ruling of the ethics committee, not to be shared.

Authors' contributions

EH designed the study, carried out the data collection, performed the statistical analysis, and wrote the paper. DD designed the study, performed the statistical analysis, and gave conceptual advice. PJ designed the study and gave conceptual advice. All authors discussed the results and implications and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

The study was approved by the Central Ethical Review Board in Lund, Sweden. Parents and adolescents consented to participation by filling in the questionnaires and returning them to the researchers. Parents consented to the childrens' participation by an "opt-out" procedure.
Trial registration number provided by the Central Ethical Review Board, Lund Sweden: 2012/499 (October 17, 2012) for the adolescents, and 2013/642 (October 15, 2013) for the parents.

Publisher's Note

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Received: 29 November 2016 Accepted: 24 March 2017
Published online: 04 April 2017

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Disordered eating is a complex phenomenon found among individuals who fail to meet the diagnostic criteria for an eating disorder but who do not engage in healthy eating on a consistent basis. The present thesis shows that many Swedish adolescents, especially girls, suffer from disordered eating as well as poor emotional regulation, depressive thoughts, and low self-esteem. Furthermore, the results indicate the importance of viewing DE not as a singular problem, but as a collection of different problems, even among individuals of the same gender. These differences call for different strategies aimed at helping adolescents achieve a healthier diet. Finally, while the parental influence of DE was significant, more research is required, preferably in a Swedish or Nordic context, where parental responsibility is not as heavily reliant on the mother as in other countries.

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Printed by Media-Tryck, Lund 2017 NORDIC ECOLABEL. 3041 0903

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Lund University
Faculty of Social Sciences
Department of Psychology

ISBN 978-91-7753-327-6
ISSN 1652-8220