

**A Multidimensional Approach to the Relationship between  
Emotion Regulation Difficulties and Eating Disorder  
Psychopathology**

An investigation of how emotion regulation difficulties relate to disordered eating symptomatology in a cross-sectional and longitudinal study in young women with or without an eating disorder

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Vorgelegt von Nadine Humbel, Heimatort Zürich

Genehmigt von der Philosophischen Fakultät auf Antrag der  
Professoren Simone Munsch (1. Gutachterin) und  
Silvia Schneider (2. Gutachterin).

Freiburg, den 14.10.2019

Prof. Dr. Bernadette Charlier Pasquier,  
Dekanin der Philosophischen Fakultät.

### **Erklärung der Selbstständigkeit**

Ich erkläre ehrenwörtlich, dass ich meine Dissertation selbstständig und ohne unzulässige fremde Hilfe verfasst habe und sie noch keiner andern Fakultät vorgelegt habe.

Teufenthal, 23.05.2019

Nadine Humbel

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## **Curriculum Vitae**

Nadine Theresia Humbel

Geburtsdatum : 20.11.1984; Heimatort: Zürich

Zivilstand: Ledig

Adresse: Wynentalstrasse 7, 5723 Teufenthal

## **Aktuelle Tätigkeit**

Seit 11/2014

Doktorandin am Lehrstuhl für klinische Psychologie und Psychotherapie der Universität Fribourg unter der Leitung von Prof. Dr. Simone Munsch

Ab 09/2019

MAS in Personenzentrierter Psychotherapie, Universität Basel

## **Ausbildung**

09/2011 - 02/2014

Master in Klinischer Psychologie und Gesundheitspsychologie, Zweisprachig, Universität Fribourg, Titel der Masterarbeit: *„Einfluss von Arbeitsbelastung und Tagesmüdigkeit auf die Diagnosestellung von psychischen Beschwerden in Schweizer Hausarztpraxen“* unter der Leitung von Dr. Jana Bryjova und Prof. Dr. Simone Munsch

09/ 2006 - 06/2011

Bachelor in Psychologie am Institut d'Enseignement à Distance Université Paris 8 (F)

1990 - 2002

Schulzeit und Abschluss Baccalauréat série économique et sociale in Belfort (F)

## **Berufliche Erfahrung**

11/2014 - 06/2017

Doktorandin, Lehrstuhl für klinische Psychologie und Psychotherapie, Universität Fribourg. SNF-Projekt: „Psychological and physiological consequences of exposure to mass media in young women – the role of moderators“ unter der Leitung von Prof. Dr. Simone Munsch

10/2013 - 01/2014

Praktikum am Zentrum für Psychotherapie der Universität Fribourg unter der Leitung von Dr. Annette Cina

02/2011 - 04/2011

Praktikum am Kantonsspital Aarau, Psychoonkologie

01/2010 - 12/2011

Sekretariat des Berufsverbandes der Schweizer Lobbyisten SPAG/SSPA (Schweizerische Public Affairs-Gesellschaft)

2004 - 2010

Sekretariat/Mitarbeit bei Humbel Kommunikation, Teufenthal AG

01/2003 - 03/2003

Pferde- und Sozialpraktikum mit heilpädagogischem Reiten und Hipponotherapie, Lieli LU

## Publikationen

Wyssen, A., Junpeng, L., Rodger, H., **Humbel, N.**, Lennertz, J., Schuck, K., ... & Assion, H. J. (2019). Facial Emotion Recognition Abilities in Women Suffering from Eating Disorders. *Psychosomatic Medicine*.

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**Humbel, N.** (2011). Lobbying: Zwischen Dreistigkeit und falscher Bescheidenheit. *Persönlich, das Schweizer Wirtschaftsmagazin für Kommunikation*, 03, 96-97.

## Vortrag

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## **List of abbreviations**

ED(s) : Eating Disorder(s)

AN : Anorexia Nervosa

BN : Bulimia Nervosa

DSM : Diagnostic and Statistical Manual of Mental Disorders

APA : American Psychiatric Association

ER(D): Emotion Regulation (Difficulties)

DERS: Difficulties in Emotion Regulation Scale

BPD: Borderline Personality Disorder

HC: Healthy Controls

BMI: Body Mass Index

EDE-Q: Eating Disorder Examination Questionnaire

MMD: Mixed Mental Disorders

NICE : National Institute of Clinical Excellence

CBT : Cognitive-Behavioral Therapy

SD : Standard Deviation

EC: Experimental Condition

CC: Control Condition

DIPS: Diagnostisches Interview bei Psychischen Störungen

SATAQ: Sociocultural Attitudes Towards Appearance Questionnaire

BIS: Body Image Satisfaction Scale

BDI: Beck Depression Inventory

BAI: Beck Anxiety Inventory

M: Mean

5-HT: 5-Hydroxytryptamine

SSRIs: Selective Serotonin Reuptake Inhibitors

## **Abstract**

Emotion regulation difficulties (ERD), or the inability to flexibly adjust emotional responses to environmental or personal demands, have persistently been associated in research with puzzling eating disorder (ED) psychopathology. However, consistent findings on the specificity of association between specific dimensions of ERD and specific symptoms of EDs are lacking. This thesis proposes an exhaustive exploration of the complex relationship between ERD and ED symptoms by means of complementing study designs. This thesis adopts a transdiagnostic approach to both ERD and ED symptoms by examining a large heterogeneous female sample consisting of ED patients, patients with mixed mental disorders (MMD) and healthy controls (HC) aged 18 to 35. Analyses based on the multidimensional Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer, 2004) revealed a rather consistent picture of the implication of attending to and acknowledging one's emotions in ED symptomatology across the spectrum of mental health, in contrast to more action-oriented regulatory processes.

This thesis corroborates the implication of some but not all dimensions of ERD in ED pathology in a heterogeneous sample and contributes to identify in which circumstances these associations are observable. The combined exploration of the underlying psychological and biological processes involved in emotion regulation (ER) and EDs is recommended, in order to determine most adequate interventions.

## 1 Introduction

Eating Disorders <sup>1</sup> (EDs) are defined as complex and serious mental disorders, which lead to impairments in physical, social, emotional, and cognitive functioning. On the basis of a Swiss population-based study, Mohler-Kuo, Schnyder, Dermota, Wei, and Milos (2016) reported lifetime prevalence estimates of 1.9% for Anorexia Nervosa (AN) and 2.4% for Bulimia Nervosa (BN) in women, using diagnostic criteria of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013). Prevalence rates are similar in international reports in the case of AN, but are generally slightly lower for BN (Mohler-Kuo et al., 2016). Subthreshold EDs are estimated at around 2-3% in Europe (Keski-Rahkonen & Mustelin, 2016). The perfidy lies in that some of the core features of EDs, such as discontent with body shape or weight, are considered normative in our society (Rodin, Silberstein, & Striegel-Moore, 1984). ED symptoms are especially widespread among young students (Eisenberg, Nicklett, Roeder, & Kirz, 2011). Hence, the physical and mental integrity of a significant population is threatened, even though relatively few individuals develop a full-blown ED.

The multifactorial origins of EDs, which comprise genetic, sociocultural, and psychological factors, although acknowledged, have not been satisfactorily explained yet (Claudat & Lavender, 2018; Kaye, 2008; Riva, 2016; Sjögren, 2017). Similarly, consistent evidence about predictors of outcome in EDs is lacking (Cooper et al., 2016). It is, however, indispensable to clearly

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<sup>1</sup> Our research focuses on Anorexia Nervosa and Bulimia Nervosa in young women. Binge Eating Disorder and Eating disorder not otherwise specified /Other Specified Feeding and Eating Disorders will not be covered in this thesis.

determine the mechanisms of action involved in EDs to ensure the better comprehension of psychopathological phenomena and the implementation of adequate treatment. Puzzling EDs have instead been branded as an awkward burden for healthcare systems (Ágh et al., 2016). Paradoxically, a majority of patients with EDs do not even have access to suitable treatment or to any treatment at all (Kazdin, Fitzsimmons-Craft, & Wilfley, 2017).

Nonetheless, the tremendous efforts invested in the better understanding of EDs over the past decades ought to be valued. One fruitful field of research that has emerged focuses on Emotion Regulation (ER), and more specifically on Emotion Regulation Difficulties (ERD). EDs are associated with deficient abilities to identify, understand, and confront emotions, that result in perceiving emotions as unmanageable, and thus prevent the usage of functional strategies to face challenging emotional states (Berking & Wupperman, 2012; Haynos & Fruzzetti, 2011). The role attributed to ERD in the emergence and maintenance of EDs has become increasingly prominent, and has ultimately been brought to the fore in novel ED treatment modeling (Claudat & Lavender, 2018). Certainly, deficits in ER have consistently been associated with core features of EDs, namely disordered eating and to a lesser extent body-related concerns. There is a lack of in-depth knowledge about the circumstances in which such associations are observable and which particular deficits in ER are more strongly related to specific markers of ED psychopathology. More specifically, it has not yet been examined in a comprehensive manner, which dimensions of ERD relate to the pressure to be thin, the internalization of the thin ideal, body image dissatisfaction, ED cognitions and behaviours, and other features of EDs in young women.

In order to contribute to fill in these gaps, this thesis aims at exploring ERD in the light of a sociocultural framework of EDs in young female adults. Therefore, the main objectives of this thesis are: 1) investigate the moderating role of ERD in the relationship between acute thin ideal exposure and self-ideal discrepancy, body image satisfaction, and the urge to indulge in ED behaviours, 2) explore the association between subdimensions of ERD and ED features such as thin ideal internalization, body image dissatisfaction, and disordered eating based on correlational data, and 3) examine the impact of ERD on a selection of markers of remission after ED treatment.

Results from a multicenter cross-sectional and longitudinal treatment study examining the psychological and physiological consequences of exposure to mass media in young women will be used in analyses (Munsch, 2014). In order to address the first two objectives, analyses will be performed on a sample of young women aged 18-35 with or without a diagnosis of at least one mental disorder. All further analyses will be performed on in- and outpatients with AN or BN only.

This thesis will first introduce ERD as core characteristic of psychopathology. Second, the relationship between ERD and ED symptomatology will be determined. In addition, this thesis will attempt to untangle the relationship between ER and thin ideal internalization, self-ideal discrepancy, and body image dissatisfaction. The last part will be dedicated to the role of ERD in EDs treatment outcome. The underlying study will then be detailed, results will be presented, and outcomes will be discussed in the light of new upcoming challenges for both ED research and practice.

## **2 Defining Emotion Regulation Difficulties**

### **2.1 Introductory definition of Emotion, Emotion Regulation, and Emotion Regulation Difficulties**

Emotions can be described as instinctive or learnt multifaceted responses to endogenous or exogenous stimuli, leading to physiological, behavioural, and cognitive changes (Oldershaw, Lavender, Sallis, Stahl, & Schmidt, 2015). Emotions are reactive to attributable triggers, unlike elusive states such as mood (Oldershaw et al., 2015). From an evolutionary perspective, the rapid identification of emotionally salient information and appropriate processing is vital to humankind. In other words, emotions play an essential role in important domains of functioning, such as social interactions and relationships, environmental adaptation, memory, attention, or decision-making. Most importantly, emotional experience is unique to every human being, therefore one specific situation can trigger varying emotional reactions across individuals (Werner & Gross, 2010). The perception of the threatening character of any given emotional experience may be unbearable for some individuals, which highlights the individuality of the ability to flexibly adapt to various states.

The regulation of emotions is the deliberate or automatic attempt to attain a desired emotional state by determining the offset of emotional responding, motivated by hedonic needs, namely experiencing a certain emotional state, or instrumental motives in order to facilitate specific goals and/or optimize functioning (Kooze, 2009; Tamir, 2016; Thompson, 1994). ER is guided by biological and attentional processes, information processing, coping abilities, and external resources, as well as socially defined emotional demands. ER

evolves throughout life, primarily forged through caregivers and peers in childhood and social interactions in later life (Brenner & Salovey, 1997). ER is generally referred to in terms of *process*. Accordingly, one of the most frequently quoted definition of ER in the literature is the one provided by Gross (1998), which states that “*ER refers to the processes by which individuals influence which emotions they have, when they have them, and how they experience and express them*”. More in depth, Thompson (1994) had previously proposed following definition: “*ER consists of the extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying emotional reactions, especially their intensive and temporal features, to accomplish one’s goals.*” This conceptualization of ER encompasses positive as well as negative emotional arousal, and emphasizes the functionality of processes targeting the maintenance, enhancement, and inhibition of emotions, in accordance to individual objectives. In addition, Gratz and Roemer (2004) identified specific dimensions of ER that have relevance to the adaptive processing in response to emotional distress and proposed a multidimensional conceptualization of ER. The 6 subdimensions of ER according to Gratz and Roemer (2004) are: the awareness of emotions, the understanding of emotional states, the acceptance of emotions, the ability to inhibit impulsive behaviour, the flexible use of appropriate strategies to modulate (intensity and duration of) emotional responses, and the ability to maintain goal-directed behaviour despite experiencing negative emotion. Thus, adaptive emotional processing refers to the tolerance of unwanted emotions and/or to the flexible and context-dependent modification of emotions, largely determined by the above-mentioned abilities.

Conversely, the rather simplistic, yet functional and commonly accepted definition of emotion regulation difficulties (ERD)<sup>2</sup> refers to certain impairments in one or more of the abilities outlined by Gratz and Roemer (2004). ERD are characterized by the inability to effectively influence the experience or expression of emotions, which limits or hinders people's attempts to attain emotion-related goals (Haynos & Fruzzetti, 2011; Jazaieri, Urry, & Gross, 2013). Certain attempts to regulate emotions may be effective in dampening emotional experience in the short run, but highly dysfunctional and harmful over a longer period of time, especially when executed repeatedly (Werner & Gross, 2010). Different facets of ER can be dysfunctional, and they altogether entail negative consequences. In fact, impairments in one or more of the 6 dimensions listed above impede everyday functioning, not least in social situations. Moreover, chronic ERD are associated with impairments in psychological functioning and have been related to a wide range of mental disorders (Berking & Wupperman, 2012; Gross, 1998).

## **2.2 More than an assessment tool: The Difficulties in Emotion Regulation Scale (DERS)**

The conceptualization of ERD by Gratz and Roemer (2004) is best illustrated by the multidimensional tool they developed in order to assess ERD. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) assesses clinically relevant ERD based on the 6 dimensions of adaptive ER presented in the previous section. The DERS is the instrument of predilection in the field of research that examines the association between ERD and

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<sup>2</sup> "Emotion regulation difficulties", "emotion dysregulation", "emotion regulation deficits" or "anomalies in emotion regulation" are interchangeably used in the literature.

psychopathology (Sloan et al., 2017), and is also the questionnaire used in the current study. The scale is known for its good psychometric properties. The DERS has originally been validated on healthy adults by Gratz and Roemer (2004). More recently, its psychometric properties have been validated in adults with severe mental disorders (Fowler et al., 2014) and in adult ED patients (Wolz et al., 2015). The DERS consists of a total score and 6 subscales, which will be introduced briefly.

The subscale “lack of emotional awareness”,  $DERS_{\text{AWARENESS}}$ , consists of items reflecting difficulties associated with attending to and acknowledging one’s emotions. The awareness of emotions is an essential factor underlying adaptive ER, especially in terms of flexible and adequate reactivity to emotional triggers (Gross & Jazaieri, 2014). This subscale emphasizes the fact that ER is not only synonymous of taking action-driven influence on emotions, but also comprises the subjective evaluation of emotional experience.  $DERS_{\text{AWARENESS}}$  is the most controversial subscale of the DERS, and its utility has been questioned because of low correlations with the other subscales. Hence, some authors have advocated the exclusion of  $DERS_{\text{AWARENESS}}$  from the total score in ERD assessment (Hallion, Steinman, Tolin, & Diefenbach, 2018). The particularity of this subscales is, however, partly attributable to reverse-coded items that impact on psychometric properties (Bardeen, Fergus, Hannan, & Orcutt, 2016). Despite the critics, most authors insist on the original 6 factor scale, instead of alternative 5 factor models (Fowler et al., 2014; Wolz et al., 2015).

The subscale “lack of emotion clarity”,  $DERS_{\text{CLARITY}}$ , taps how much individuals know and understand the emotions they are experiencing. Similar

to emotional awareness, it has been suggested that understanding one's emotions is a necessary condition for the adaptive regulation of emotions (Vine & Aldao, 2014).

The subscale "non-acceptance of emotional response",  $DER_{NONACCEPTANCE}$ , assesses the tendency to have negative secondary emotional responses to negative emotions. The tendency to experience negative emotions in response to one's own emotional reactions is maladaptive and is linked to low distress tolerance, which is associated with psychopathology.

The items on the subscale "difficulties in engaging in goal-directed behaviour",  $DER_{GOALS}$ , reflect difficulties concentrating and accomplishing tasks when experiencing negative emotions. This subscale underlines the overwhelming character that emotions can potentially have. The resulting functional impairments are associated with psychopathology.

The subscale "impulse control difficulties",  $DER_{IMPULSE}$ , refers to difficulties with remaining in control of behaviour when experiencing negative emotions. This domain alludes to the lack of inhibition of inappropriate and uncontrolled behaviours, which ultimately hinders individuals from behaving in accordance with desired goals. Engaging in impulsive behaviour generally aims at canceling aversive emotions, rather than modulating emotional arousal.

The subscale "limited access to effective ER strategies",  $DER_{STRATEGIES}$ , focuses on the belief that, once upset, little can be done to regulate one's emotions. Rather than assessing the actual application of ER strategies, this subscale targets the access to and perception of the effectiveness of one's own strategies. Gratz and Roemer (2004) deliberately focused on the

subjective appraisal of effectiveness, so that the use of ER strategies does not depend on the context.

In sum, beyond its qualities as a multidimensional assessment tool, the DERS is a valid attempt to provide a holistic and broadly applicable definition of ERD.

### **2.3 A transdiagnostic approach to Emotion Regulation Difficulties**

Across mental disorders, patients face difficulties with the experience of negative emotions, which they ultimately try to avoid (Werner & Gross, 2010). As previously mentioned, it is widely acknowledged that ERD are associated with psychopathology. Foremost, ERD are associated with psychopathology in terms of being a risk factor for the onset, maintenance, and treatment of mental disorders, such as EDs, depressive disorders, anxiety disorders, Borderline Personality Disorder (BPD), and substance-use related disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010). The perspective on ERD adopted in this thesis implies that ERD are a transdiagnostic factor of psychopathology. Various studies have validated the hypothesis that ERD are not specific to a particular mental disorder, but rather occur across mental disorders (e.g. Lukas, Ebert, Fuentes, Caspar, & Berking, 2018; Svaldi, Griepenstroh, Tuschen-Caffier, & Ehring, 2012). Evidence of ERD being a common underlying factor to various mental disorders seems convincing. Results also hint at a certain heterogeneity regarding the intensity of ERD and the affected subdimensions of ERD across disorders (Lukas et al., 2018). Aldao et al. (2010) showed in their meta-analytic review of 114 studies that the association with maladaptive ER strategies was stronger for depression and anxiety than for disordered eating and substance-use disorders. Similarly,

in Brockmeyer, Bents, et al. (2012), patients with depressive disorders had stronger ERD regarding the attenuation and modulation of emotions than AN patients, suggesting broader and greater ERD in depressed patients. However, these results have to be interpreted with caution for at least two reasons. First, most studies have focused on ER skills in terms of strategy use. Results therefore cannot be generalized to other subdimensions of ERD. Given that studies use different conceptualizations of ERD, the comparability of studies is limited, and consent is difficult to reach. Second, studies usually include clinical samples with only one diagnosis, which does not satisfactorily reflect clinical reality and does not allow drawing conclusions for cases with several comorbid disorders. In fact, ERD appear to be exacerbated by the potentiated accumulation of diagnoses (Muehlenkamp, Peat, Claes, & Smits, 2012). According to Muehlenkamp et al. (2012), females who reported to recur to nonsuicidal self-injury and those who reported to engage in disordered eating had similar levels of ERD. Those who experienced both had even higher levels of ERD. Hence, it is suggested that the general manifestation of psychopathology is conditioned by ERD, rather than specific disorders displaying particular patterns of ERD.

A more in-depth consideration of the transdiagnostic hypothesis suggests that ERD manifest themselves by the means of symptomatology (Heber, Lehr, Riper, & Berking, 2014). For instance, self-harm behaviours associated with BPD have been conceptualized as (dysfunctional) coping strategies in response to challenging situations (Heber et al., 2014). ERD are generally perceived as core feature of BPD. BPD symptoms seem to be specifically associated with impulse control difficulties and limited belief in the own ER

capacities (Glenn & Klonsky, 2009). Similarly, in personality disorders, the core feature of loss of control has been associated with the incapacity to functionally regulate emotionally overwhelming situations (Dimaggio et al., 2017). Other dysfunctional behaviours, such as substance abuse, can be seen as maladaptive ways to cancel out the consequences of emotionally aversive stimuli (Heatherton & Baumeister, 1991). From this perspective, dysfunctional behaviours are not simply correlates of the incapacity to regulate emotions. Rather, symptoms of psychopathology represent dysfunctional attempts to regulate or avoid emotions in themselves. Following this rationale, ERD may translate into various symptoms, with some but not all eventually leading to the diagnosis of a specific syndrome, depending on how pronounced and widespread the difficulties are. Thus, mental disorders can be understood as conglomerates of symptoms, which manifest individually as a result of common underlying processes (Krueger & Markon, 2006), namely ERD. This approach suggests 1) that symptoms of psychopathology can occur beyond the boundaries of specific diagnoses in any individual, and 2) that the decrease of ERD brings about the decrease of symptomatology. These assumptions will be examined in the framework of ED psychopathology in the upcoming sections.

### **3 How Emotion Regulation Difficulties relate to specific features of Eating Disorders**

#### **3.1 Theoretical framework of the association between Emotion Regulation Difficulties and Eating Disorders**

The hypothesis that symptoms of mental disorders serve ER purposes in the absence of functional ER has been introduced in the previous section. It has therefore been suggested that core features of EDs are dysfunctional tools to regulate emotions, by attempting to suppress aversive emotional experience (Berking & Wupperman, 2012). This is particularly applicable to disordered eating behaviours, encompassing binge eating, self-induced vomiting, laxative misuse, diuretic misuse, or fasting. Werner and Gross (2010) suggested that ER involves strategies relating to the avoidance or modification of the situations that triggered emotions in the first place, but also strategies relating to the subsequent emotional experience and emotional reactivity. Importantly, disordered eating is presumed to be related to the incapacity to handle emotional experience rather than being a direct response triggered by a stimulus (Mallorquí-Bagué et al., 2018).

ERD are characteristic of EDs such as AN and BN (Lavender et al., 2015). In particular, EDs are associated with a low tolerance towards distress, and thus the incapacity to handle (negative) emotions in an adaptive way, which leads to the avoidance of aversive emotional experience (Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007). According to Selby, Anestis, and Joiner (2008), emotional cascades occur when individuals ruminate on the negative emotional state they experience, enhancing negative experience by doing so. In consequence, engaging in dysfunctional behaviour such as binge eating is

then used as a strategy to distract from rumination. These strategies operate on an attentional level, aiming at distracting from negative self-awareness by focusing on the physical experience of the dysfunctional behaviour (Selby et al., 2008). Dysfunctional behaviours rapidly lose salience and become habitual, engaging the individual in a harmful distraction-seeking vicious circle. Attentional distraction is very likely to be maladaptive, since avoidance disables the opportunity to face emotion-triggering stimuli and to learn how to handle them (Werner & Gross, 2010). Instead, irrational beliefs and disinhibition towards dysfunctional behaviours are enabled (Heatherton & Baumeister, 1991). Subsequently, engaging in disordered eating behaviours is subjectively perceived as a successful strategy to alleviate distress (Haynos & Fruzzetti, 2011; Monell, Clinton, & Birgegård, 2018). There is evidence that disordered eating behaviours are preceded by decreased positive affect and increased negative affect, whereas the opposite pattern is measured after engagement in dysfunctional behaviour, in both AN (Engel et al., 2013) and BN (Smyth et al., 2007). The gratification character of disordered eating behaviours may temporarily neutralize distress, but, in the long run, the repeated engagement in dysfunctional behaviours in response to emotional distress contributes to the exacerbation of psychopathology (Fairburn, Cooper, & Shafran, 2003). In fact, long-term effects of wrongly perceived benefits of such behaviours are inherently harmful (Oldershaw et al., 2015). The more the individual takes refuge in disordered eating behaviours, the greater the habituation and the lesser the alleged benefits. Due to the exacerbation of psychopathology, the threshold of arousal decreases, and the overwhelming character of emotional stimuli increases, leading to the even

more frequent and aberrant need to resort to disordered eating behaviours (Haynos & Fruzzetti, 2011). The results of an ecologically valid assessment study in AN patients showed that negative affect momentarily increased after some, but not all, disordered eating behaviours (Engel et al., 2013). These results confirm that dysfunctional behaviours do not necessarily induce a reduction of negative affect (anymore).

Thus far, ERD have been introduced in terms of overall impairments of ER capacities, which can be held responsible for the development and maintenance of symptoms of disordered eating. However, ERD is an umbrella concept that encompasses a broad spectrum of ER-related difficulties. EDs therefore present specific deficits in ER, such as difficulties with identifying and labeling one's emotions (for a review on alexithymia see Westwood, Kerr-Gaffney, Stahl, & Tchanturia, 2017), impaired capacities to describe one's own feelings and another person's emotional experience (Gilboa-Schechtman, Avnon, Zubery, & Jeczmiem, 2006), difficulties with emotion recognition and attentional bias with faces, especially towards angry faces (Harrison, Sullivan, Tchanturia, & Treasure, 2010), and the use of more maladaptive ER strategies compared to healthy controls (HC) (Corstorphine et al., 2007). These particular types of impairment, which are to some extent inherent to EDs, hint at specific associations between ERD and disordered eating. The fact that the association with ERD differs across symptoms (Lukas et al., 2018) had already been mentioned in this thesis. In the next section, evidence of specific associations between different domains of ERD and specific symptoms of disordered eating will be reviewed. Solely evidence of the relationship between ERD and disordered eating based on the DERS (see

introduction of the scale in section 2.2) will be presented. In line with a transdiagnostic perspective on the association between ERD and disordered eating, results will be reported for EDs, but also non-EDs, including young women suffering from other mental disorders and HC.

## **3.2 Evidence of specific associations between Emotion Regulation Difficulties and Disordered Eating**

### **3.2.1 Emotion Regulation Difficulties and symptoms of Disordered Eating in Eating Disorder patients**

Beforehand, although ERD are characteristic of EDs (Lavender et al., 2015), research has failed so far to identify consistent patterns of relationship between ERD and cognitive and behavioural symptoms of disordered eating. The lack of consensus will be illustrated on the basis of four studies.

In the first study by Racine and Wildes (2013), regression models revealed that cognitive symptoms of disordered eating were positively associated with ERD, first and foremost with  $DERS_{AWARENESS}$ , whereas objective binge eating and purging was solely associated with  $DERS_{IMPULSE}$ , in 192 mostly female patients with AN. Subjective binge eating was not associated with ERD in this study. These results demonstrate that the association between ERD and disordered eating is selective, and that some but not all symptoms relate to ERD. Findings underpin the assumption that the capacity to attend to one's emotion is crucial for adequately handling emotions. In addition, the interpretation given by the authors supports the assumption that disordered eating symptoms represent dysfunctional ways to handle aversive emotions. According to Racine and Wildes (2013) the shift of attention away from emotional experience onto body and eating-related concerns, is a kind of

emotional avoidance that occurs due to a lack of emotional awareness in the attempt to handle aversive emotion. Similarly, engaging in disordered eating is a way to distract from aversive emotional states by the means of uncontrolled dysfunctional behaviours.

However, findings regarding emotional awareness could not be replicated for BN in the second study. In fact, Lavender et al. (2014) showed that cognitive symptoms of disordered eating positively correlated with DERS total score and the subscales  $DERS_{NONACCEPTANCE}$ ,  $DERS_{STRATEGIES}$ , and above all  $DERS_{IMPULSE}$ , but not with  $DERS_{GOALS}$ ,  $DERS_{CLARITY}$  nor  $DERS_{AWARENESS}$ , in a study conducted with 80 full and subthreshold mostly female BN. No unique association was revealed in subsequent regression analyses. Interestingly, in terms of disordered eating behaviours, there was a unique negative association between frequency of purging and  $DERS_{GOALS}$ , and a positive association between driven exercise and  $DERS_{GOALS}$ . Objective binge eating frequency was associated with neither of the DERS subscales. Once more, results confirm the selective association of certain ERD and particular symptoms of disordered eating. Impulsivity was significantly associated with disordered eating, which is in line with core characteristics of BN. Since emotional awareness was not significantly related to disordered eating in their sample, Lavender et al. (2014) suggested that attending to one's emotions is more of a characteristic in AN, referring to the previous findings by Racine and Wildes (2013). According to Lavender et al. (2014), the fact that purging frequency was associated with fewer ERD signifies that engaging in disordered eating behaviours is subjectively perceived as effective strategy to cope with aversive emotions. Similar negative associations with ERD had

been revealed previously in acute AN, where lower Body Mass Index (BMI) was linked to lower ERD (Brockmeyer, Holtforth, et al., 2012). Findings emphasize the subjectively perceived functionality of maladaptive behaviours such as starvation, underpinning the assumption that wrongly perceived benefits maintain and reinforce dysfunctional behaviour and EDs.

The next study was conducted on a heterogeneous sample of 110 (mostly female) participants suffering from an ED (Pisetsky, Haynos, Lavender, Crow, & Peterson, 2017). Results revealed positive correlations between cognitive symptoms of disordered eating and  $DERS_{CLARITY}$ ,  $DERS_{IMPULSE}$ ,  $DERS_{AWARENESS}$ , and  $DERS_{STRATEGIES}$ . Only  $DERS_{STRATEGIES}$  was uniquely associated in subsequent regression analyses. Frequency of purging was uniquely associated with  $DERS_{IMPULSE}$ , whereas neither frequency of binge eating nor driven exercise were significantly related to ERD. The authors suggested that ERD are more closely associated with cognitive symptoms of disordered eating, rather than disordered eating behaviours. But Pisetsky et al. (2017) also highlighted that the modest association with disordered eating behaviours might be attributable to the fact that they serve as tools to regulate emotions, and thus actual ER abilities could be overestimated.

In the last and most recent study, Monell et al. (2018) showed in a heterogeneous sample of 999 female with an ED that cognitive symptoms of disordered eating were positively associated with  $DERS_{STRATEGIES}$ ,  $DERS_{AWARENESS}$ , and  $DERS_{NONACCEPTANCE}$ .  $DERS_{STRATEGIES}$  was the strongest unique predictor of cognitive symptoms of disordered eating amongst all subscales. Objective binge eating and subjective binge eating were associated with  $DERS_{IMPULSE}$  and  $DERS_{NONACCEPTANCE}$ , respectively. There

was, however, no significant association between purging and ERD. Further, there was a negative association between excessive exercise and DERS<sub>GOALS</sub>. In agreement with the previous studies, the distinctiveness of association between symptoms of disordered eating and ERD subscales is particularly notable, as well as the stronger association between cognitive symptoms and ERD compared to disordered eating behaviours. According to Monell et al. (2018), the weaker associations found between ERD and disordered eating behaviours is due to methodological limitations regarding the assessment of the latter in the light of trait ERD, which are supposedly stable over time and not sensitive to change within a laboratory setting. Importantly, the authors reported no major difference between EDs and subtypes of EDs, which is in line with a transdiagnostic approach of ERD across disorders.

In sum, the aforementioned studies illustrate the heterogeneity of associations between disordered eating psychopathology and ERD across studies, but also within studies when considering different types of features of disordered eating. Overall, the incapacity to acknowledge emotions and even more so the belief that once upset little can be done to regulate one's emotions, appear to be consistently related with cognitive symptoms of disordered eating, whereas impulsivity was recurrently linked to both disordered eating cognitions and behaviours. Previous research had already highlighted the differential associations between ERD and cognitive versus behavioural ED symptoms (Wildes, Marcus, Bright, & Dapelo, 2012). It is particularly notable, that the authors of the aforementioned studies consistently informed that symptoms of disordered eating are used as dysfunctional ER strategies. It is

also important to mention, that a transdiagnostic approach of ERD in EDs is plausible, since no specific patterns within diagnoses of EDs could be identified. Monell et al. (2018) stressed the heterogeneity of study designs and sample composition across research. Thus, appearing differences between AN and BN in the first two studies might have been exacerbated due to methodological reasons.

### **3.2.2 Emotion Regulation Difficulties and symptoms of Disordered Eating in non-Eating Disorders**

As anticipated, the previous section revealed a recurrent association between ERD and symptoms of disordered eating in EDs. The examination of the association between ERD and symptoms of disordered eating in mixed clinical samples without diagnosis of an ED has not received much interest so far. It is insofar surprising as it is presumed that ERD occur across mental disorders (Svaldi et al., 2012) and that, in parallel, symptoms of disordered eating are observed in other mental disorders such as in anxiety disorders, especially in social phobia and post-traumatic stress disorder (Becker, DeViva, & Zayfert, 2004). In fact, more interest has been attributed to non-clinicals. It has been unanimously reported across studies that EDs display higher ERD than HC (Brockmeyer et al., 2014; Harrison, Sullivan, et al., 2010; Mallorquí-Bagué et al., 2018; Svaldi et al., 2012). However, Monell et al. (2018) revealed that EDs indeed present higher impairments regarding  $DERS_{NONACCEPTANCE}$ ,  $DERS_{AWARENESS}$ ,  $DERS_{CLARITY}$ , and  $DERS_{STRATEGIES}$ , but not regarding  $DERS_{GOALS}$  and  $DERS_{IMPULSE}$  compared to HC. Interestingly, the subscales in which EDs show higher impairments compared to HC are associated with cognitive symptoms of disordered eating, whereas those

which revealed no difference between EDs and HC were more closely related to disordered eating behaviours. Likewise, ED symptoms are much less pronounced in HC than in EDs, but still occurs. In young Australian women aged 18-42, high percentages of extreme scores on the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994) subscales shape concern (19.4%) and weight concern (11.3%) were reported (Mond, Hay, Rodgers, & Owen, 2006). In the aforementioned study, vomiting was reported by 1.4%, laxative misuse by 1.0%, use of diuretics by 0.3%, diet pills by 2.2%, and excessive exercise by 4.9%. Higher percentages were found in American female college students aged 18-25, regarding regular dietary restraint (8.4%) and excessive exercise (5.9%) than regarding self-induced vomiting (4.0%), laxative (3.1%), and diuretic (3.6%) misuse in another study (Luce, Crowther, & Pole, 2008). According to Luce et al. (2008), 6.4 to 16.7% reported regular occurrence of objective binge eating episodes and subjective bulimic episodes, respectively.

Most importantly, ERD have also been associated with binge eating, compensatory behaviours, and general symptoms of disordered eating in non-clinicals (Corstorphine et al., 2007; Haynos, Wang, & Fruzzetti, 2018). More specifically, binge eating was positively associated with  $DERS_{STRATEGIES}$  and  $DERS_{CLARITY}$  in a large sample of undergraduates (Whiteside et al., 2007). Similar findings for HC were reported in Monell et al. (2018), where the same subscales were uniquely associated with objective binge eating and cognitive symptoms of disordered eating. Further, disordered eating attitudes and dieting behaviours were associated with  $DERS_{IMPULSE}$ ,  $DERS_{NONACCEPTANCE}$ , and  $DERS_{STRATEGIES}$  in undergraduate male and female students (Lafrance

Robinson, Kosmerly, Mansfield-Green, & Lafrance, 2014). Recently, Racine and Horvath (2018) showed that women with objective binge eating presented higher levels of  $DERS_{CLARITY}$ ,  $DERS_{IMPULSE}$ ,  $DERS_{NONACCEPTANCE}$ , and  $DERS_{STRATEGIES}$ , but not  $DERS_{AWARENESS}$  and  $DERS_{GOALS}$ , compared to female students without pathological eating. Conversely,  $DERS_{AWARENESS}$  and  $DERS_{GOALS}$  predicted cognitive symptoms of disordered eating in a young non-clinical female sample, whereas  $DERS_{IMPULSE}$  significantly predicted disordered eating behaviours (Cooper, O'shea, Atkinson, & Wade, 2014). Finally, Haynos et al. (2018) established a link between restrictive eating and  $DERS_{GOALS}$ ,  $DERS_{IMPULSE}$ , and  $DERS_{STRATEGIES}$  in 98 non-clinicals.

In brief, cognitive as well as behavioural symptoms of disordered eating appear to be related to specific ERD in non-clinicals, just as it is the case in EDs. Results within non-clinicals are inconsistent, and contradictory findings may be inherent to methodological variations. However, findings show that impairments in emotional awareness are more specifically related to the severity of disordered eating symptoms. In contrast, difficulties with remaining in control of behaviour when experiencing negative emotions and beliefs that, once upset, little can be done to regulate one's emotions, manifest in disordered eating in both EDs and non-clinicals. Thus, it seems that engaging in eating behaviours is a strategy to handle aversive emotion, independently of the presence of an ED diagnosis.

So far, the association between ERD and disordered eating behaviours and cognitions has been emphasized. In the next section, the relationship between ERD and body-related concerns will be singled out, since body-related concerns are another core characteristic of ED pathology.

### **3.3 The multilayered relationship between Emotion Regulation Difficulties and Body-related Concerns**

#### **3.3.1 A sociocultural approach to Eating Disorders**

Besides biological, genetic, and psychological factors, environmental factors are involved in the development of EDs (Culbert, Racine, & Klump, 2015; Keel & Forney, 2013)<sup>3</sup>. According to the sociocultural Dual Pathway Model, applicable to AN and BN (Stice, 1994; Urvelyte & Perminas, 2015), pressure to be thin, thin ideal internalization, and deviation from the ideal in terms of body size lead to body image dissatisfaction. In turn, body image dissatisfaction is a risk factor for disordered eating pathology, since body dissatisfaction can lead to disordered eating through either dieting as a weight control technique or negative affect (Stice & Shaw, 2002). Empirical findings support this model (Striegel-Moore & Bulik, 2007). Within this framework, it is assumed that powerful social influences, such as mass media, exacerbate the normative discontent about the own body in women, by excessively promoting the western female thin beauty ideal (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Tiggemann, Polivy, & Hargreaves, 2009). The value of the thin ideal is further inflated by peers through shared media consumption (Becker, Burwell, Herzog, Hamburg, & Gilman, 2002) and the thrive for thinness has become stereotypical of our society (Rodin et al., 1984). Being thin is perceived by many women as ultimate goal to achieve, not solely for esthetic reasons, but also because thinness is synonymous of higher self-confidence and a more successful lifestyle in our society. As a consequence, women may engage in regulatory eating behaviours. However, seemingly anodyne

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<sup>3</sup> It must be kept in mind that biological and cultural factors inevitably interact.

regulatory behaviours such as dieting are potentially harmful. In fact, lifetime dieting frequency has been positively associated with body image dissatisfaction, disordered eating, and affect regulation problems in 345 female college students (Ackard, Croll, & Kearney-Cooke, 2002). Furthermore, dieting, among other factors, predicted the onset of bulimic behaviours in a community based female sample (Stice & Agras, 1998). Notably, adolescents are particularly vulnerable to regulatory weight activities (Keel & Forney, 2013), since inherent bodily changes in adolescence drive girls farther away from the aspired ideal of thinness (Grogan, 2007).

The harmful potential of mass media on body image appears to be undeniable. The connection between the pressure to be thin, body image dissatisfaction, and disordered eating, however, is less evident to define. Thus, it has been suggested that third-factors influence each of these components (Stice & Shaw, 2002). In the upcoming sections, relevant sociocultural concepts will be introduced in the light of one potential third-factor, namely ERD.

### **3.3.2 How Exposure to the Thin Ideal affects young women**

The detrimental effect of the western thin ideal has long been revealed by ethnic studies. The repeated exposure to the thin ideal has been held responsible for the onset of EDs in a famous study by Becker et al. (2002), which brought to light the negative impact of television exposure to the western thin ideal on indigenous Fijian adolescent girls. Hoek et al. (2005) and van Hoeken, Veling, Smink, and Hoek (2010) showed that on the Caribbean Island of Curaçao, AN occurred solely among white minorities, whereas the prevalence of AN in Antilleans who migrated to the Netherlands

was similar to the local Dutch population. Nevertheless, the effects of thinness-promoting mass media on body image or eating behaviours is twofold. In fact, the attitude towards the thin ideal can influence the impact of thin ideal exposure (Dittmar, 2009; Young, Gabriel, & Sechrist, 2012). On one hand, the influence of media has been explained by the tendency of women to define their worth through their shape (Groesz, Levine, & Murnen, 2002). Derived from Festinger's theory of social comparison processes (1954), it is assumed that female compare themselves to social standards in so called upward comparisons, where the other is judged to score higher in the target attribute than oneself (Grogan, 2007; Want, 2009). In quest of objective evaluation of attractiveness, mass media is a powerful, omnipresent, and easily accessible social agent. Since the comparison with the thin ideal generally fails to generate a positive outcome, subsequent distress potentially leads to body dissatisfaction (Tiggemann et al., 2009). On the other hand, according to Myers and Biocca's theory of "thinness fantasy" (as cited in Tiggemann et al., 2009), pictures of the thin ideal are perceived by some women as inspirational and motivational support in the thrive for thinness. Thomsen, McCoy, and Williams (2001) confirmed in a qualitative study that adult AN attribute media inter alia an important comparative role in self-evaluation processes, and that they perceive media as source of information and as strategy to pursue their goal of thinness. Thomsen et al. (2001) rightly emphasized that the apparent soothing offered by media to the unfulfilled needs of vulnerable young women is highly dysfunctional.

A plethora of research has examined the impact of mass media on young women<sup>4</sup> over the past decades. Findings confirm both the negative and positive effects following thin ideal exposure across studies, using various types of supports and sampling methods (Ata, Thompson, & Small, 2013; Tiggemann, Brown, Zaccardo, & Thomas, 2017; Tiggemann et al., 2009). As a résumé, López-Guimerà, Levine, Sanchez-Carracedo, and Fauquet (2010) reviewed cross-sectional, experimental, and longitudinal studies about the impact of the thin ideal. The authors concluded that survey-based empirical findings show modest correlations between mass media consumption and body image dissatisfaction or symptoms of disordered eating in adolescent and controls. Experimental studies, however, confirm a subsequent lower rating in body image satisfaction. Finally, longitudinal prospective studies show that mass media is in fact a risk factor for the development of weight concerns and disordered eating. In sum, negative effects of thin ideal exposure have been revealed across designs, although of varying magnitude. In an earlier review, Grabe, Ward, and Hyde (2008) had highlighted the similar effect sizes for the effect of media on body dissatisfaction and disordered eating. Thus, thin ideal exposure may impact indirectly on disordered eating via body image dissatisfaction, but also directly. Grabe et al. (2008) further suggested that disordered eating cognitions are more affected by brief exposure than disordered eating behaviours. Most importantly, findings demonstrate that the effect of thin ideal exposure is harmful to some, but certainly not all women. Since social comparison processes are not sufficient to explain women's reaction to the thin ideal (Dittmar, 2009), other

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<sup>4</sup> In the following, the focus will be on print media in terms of fashion magazines only.

factors of influence are likely to intervene. It has been suggested that the negative impact of the thin ideal depends on risk factors such as a higher internalization of the thin ideal or preexisting body image dissatisfaction (Ferguson, 2013; Hausenblas et al., 2013; López-Guimerà et al., 2010). So far, ERD have not been overtly considered as potential risk factor in research. However, it is conceivable that individuals with ERD experience distress when exposed to the thin ideal, and that they tend to immediately engage in symptoms of disordered eating in order to reduce the aversive emotional experience, in contrast to those with better regulatory skills. Apart from disordered eating behaviours, body-related concerns are also considered to be dysfunctional avoidance strategies to handle aversive emotion (Espeset, Gulliksen, Nordbø, Skårderud, & Holte, 2012). However, the relationship between ERD and body-related concerns has earned less attention than disordered eating, therefore theoretical background is lacking.

### **3.3.3 The Internalization of the Thin Ideal**

Thin ideal internalization refers to *“the extent to which an individual cognitively “buys into” socially defined ideal of attractiveness and engages in behaviours designed to produce an approximation of these ideals”* (Thompson & Stice, 2001). Thus, apart from being aware of the existence of thin ideals, the belief in their social importance is decisive. As a consequence, thriving for thinness becomes a guiding principle (Thompson, Van Den Berg, Roehrig, Guarda, & Heinberg, 2004). Repeated exposure leads to the incorporation of the thin ideal and to a normative perception of contemporary thin beauty standards. A more important role is attributed to thin ideal internalization in the

development of body image dissatisfaction and disordered eating following exposure than to the magnitude of media consumption itself. Thin ideal internalization has been identified as risk factor for body image dissatisfaction and disordered eating, and thus for the onset and maintenance of EDs (Striegel-Moore & Bulik, 2007; Thompson, Schaefer, & Dedrick, 2018; Thompson & Stice, 2001). Associations with body image dissatisfaction, drive for thinness, and restraint eating have even been identified in non-clinicals (Ahern, Bennett, & Hetherington, 2008; Thompson, Schaefer, & Dedrick, 2018). As the focus is generally on the mediating role of thin ideal internalization in the relationship between thin ideal exposure and negative outcomes (López-Guimerà et al., 2010), little attention has been given to factors such as ERD, which may explain the varying degrees of adherence to the thin ideal in the first place.

#### **3.3.4 The perceived Discrepancy between the Self and the Ideal**

Self-discrepancy is described in the literature as the extent to which a person believes there is a gap between their actual self and so called self-guides, such as the ideal self or the societal ideal (Higgins, 1987). The actual self corresponds to the representation of the attributes that a person believes someone feels he/she actually possesses, whereas the ideal self and the ought self refer to the representation of the attributes that someone would ideally like him/her to possess or that someone feels he/she should or has the duty to possess, respectively. People are genuinely motivated to reach a match between their actual self and the self-guides (Higgins, 1987; Strauman & Higgins, 1987). Consequently, if there is a perceived gap between the self

and the ideal, the person will experience negative emotional states, which are proportional to the deviation (Higgins, 1987; Strauman, Vookles, Berenstein, Chaiken, & Higgins, 1991). Ultimately, discrepancies between the own body size and the ideal potentially lead to body dissatisfaction and disordered eating (Grogan, 2007). Self-ideal discrepancy has been associated with ED symptoms, viz. disordered eating, drive for thinness, weight concerns, and body image dissatisfaction in female HC (Anton, Perri, & Riley, 2000; Posavac & Posavac, 2002), and has been identified as risk and maintenance factor of EDs (Mason et al., 2016). Hence the interest to study self-discrepancies within the sociocultural framework.

Self-ideal discrepancy is usually assessed with figural rating scales, presenting silhouettes varying from very thin to corpulent, from which the silhouette corresponding to the own body and the ideal body have to be chosen (Grogan, 2007). Women tend to rate themselves higher on the scale and the ideal lower, especially after thin ideal exposure (Dittmar, Halliwell, & Stirling, 2009). Women with EDs are even more likely to over-estimate the size of their body, as pointed out by Hawkins, Richards, Granley, and Stein (2004). Self-ideal discrepancy has been used as an index of body image dissatisfaction (Mohr et al., 2011). However, the validity of such analogy has been criticized since discrepancies relate to the perceptual component of body image, whereas body image dissatisfaction further implicates cognitive components such as self-standards (Anton et al., 2000).

Similarly to thin ideal internalization, there is no consistent association between ERD and self-ideal discrepancy. The vulnerability towards negative affect is at least highlighted in Higgins' theory (1987) and shifting the attention

away from emotional states towards body-related concerns is a potentially dysfunctional ER strategy.

### **3.3.5 Body Image Dissatisfaction**

Body image dissatisfaction is defined as the negative subjective evaluation of one's physical bodily appearance (such as figure, weight, stomach, and hips) or in other words as "*a person's negative thoughts and feelings about his/her body*" (Grogan, 2007). The concept of body image dissatisfaction differs from body image distortion or the over-emphasis of weight and shape (Fairburn et al., 2003). Body image dissatisfaction has been linked to disordered eating, obesity, body dysmorphic disorder, depression, and low self-esteem (Dittmar, 2009), and has been named high risk factor for EDs in adolescence (Treasure, Stein, & Maguire, 2015). ED patients show higher body image dissatisfaction (Mölbart et al., 2018), and so do patients with various mental disorders in comparison to HC (Scheffers et al., 2017). Nonetheless, body image dissatisfaction is widespread amongst young women in general (Stice & Whitenton, 2002), with a majority being at some level discontent with their weight or shape, and more than one third experiencing moderate dissatisfaction with their body (Mond et al., 2013).

It is presumed that the pressure to be thin leads to body image dissatisfaction (Stice & Shaw, 2002; Stice & Whitenton, 2002), by the direct means of mass media (Ferguson, 2013). There is now sufficient evidence that exposure to the thin ideal through the media increases body image concerns in the short run (Groesz et al., 2002). A meta-analysis of 33 experimental studies examining the effect of exposure to media images of thin women on female participants

confirmed that body image dissatisfaction significantly increased after exposure, although with small effect sizes and not consistently in all studies (Hausenblas et al., 2013). The negative effect of thin ideal exposure on body image satisfaction has since been confirmed in at least two studies by Wyssen, Coelho, Wilhelm, Zimmermann, and Munsch (2016) and Loeber et al. (2016), and effects seem to be observed independently of disordered eating pathology. Wyssen, Coelho, et al. (2016) showed that in 91 HC, symptoms of disordered eating moderated the relationship between thin ideal exposure and mood (mood only declining in controls displaying higher levels of disordered eating pathology), but no such moderating effect was found between thin ideal exposure and body image satisfaction. Loeber et al. (2016) also showed that in a sample consisting of 36 AN, 32 BN, 31 mixed mental disorders (MMD), and 51 HC, groups did not differ regarding the negative effect of thin ideal exposure on body image satisfaction.

In contrast to thin ideal internalization or self-ideal discrepancy, there is evidence of a relationship between ERD and body image dissatisfaction. For instance, a study of 588 undergraduate women showed that alexithymia was associated with body image dissatisfaction and a higher potential risk for disordered eating (De Berardis et al., 2009). Further, Naumann, Tuschen-Caffier, Voderholzer, Schäfer, and Svaldi (2016) showed in 39 AN and 39 BN that the maladaptive ER strategy rumination led to an increase of body image dissatisfaction after thin ideal exposure. The question addressed in various studies is whether the association between ERD and body image dissatisfaction is stronger than between ERD and disordered eating, or in other words, whether ERD are directly linked to EDs or rather indirectly via

body image dissatisfaction. Sim and Zeman (2006) showed that difficulties with emotional awareness predicted disordered eating but not body image dissatisfaction in adolescent girls. In contrast, Asberg and Wagaman (2010) revealed that the inability to reduce negative affect significantly predicted body image dissatisfaction but not disordered eating in undergraduate students. More generally, Wolz et al. (2015) showed that ERD, with the exception of the DERS subscale  $DERS_{AWARENESS}$ , were related to disordered eating psychopathology, including drive for thinness and body dissatisfaction, in undergraduates and ED patients. Finally, it has to be noted that an Iranian study by Borjali, Sohrabi, and Farrokhi (2015) showed that overall ERD measured by the DERS correlated with both body image disturbance and disordered eating in a sample of 264 university students. Thus, results are inconsistent regarding the differentiation of association between ERD and either body image dissatisfaction or disordered eating. Most studies use instruments to assess cognitive symptoms of disordered eating, but do not include specific measures of body image dissatisfaction.

Body image dissatisfaction has earned less interest in relation to adulthood than adolescence. Even fewer studies have examined body image dissatisfaction in relation to the DERS. Interestingly, more attention has apparently been given to the link between the DERS and body dissatisfaction in men. To sum up corresponding results,  $DERS_{NONACCEPTANCE}$  appears to be most commonly related to body image dissatisfaction, in terms of muscularity dissatisfaction, in non-clinical young men (Griffiths, Angus, Murray, & Touyz, 2014; Lavender & Anderson, 2010; Wyssen, Bryjova, Meyer, & Munsch, 2016).

Overall, studies investigating the relationship between ERD and explicit body-related concerns are scarce (Naumann et al., 2016). Especially, the examination of thin ideal internalization or self-ideal discrepancy in the light of ERD is lacking. More effort has been put into establishing a relationship between ERD and disordered eating, where findings remain somehow inconsistent regarding which dimensions of ERD are related to either cognitive or behavioural symptoms. The few available studies on body image dissatisfaction focus on very specific domains of ERD, such as ER strategies (Hughes & Gullone, 2011), but do not include the DERS as multidimensional assessment tool of ERD.

## **4 Emotion Regulation Difficulties and Treatment Outcome in Eating Disorders**

### **4.1 General considerations regarding Treatment and Outcome in Eating Disorders**

Overall, outcome prognosis in EDs is poor. Steinhausen (2002) reported in over 5500 AN patients, that from those surviving, less than half recovered, one third improved, and 20% remained chronically ill. Similarly, in more than 5600 BN patients, 45% on average showed full remission, 27% improved, and 23% had a chronic course (Steinhausen & Weber, 2009). Although being over a decade old, the information provided by these two studies remains salient. Elevated mortality rates, which are generally higher than for other mental disorders (Arcelus, Mitchell, Wales, & Nielsen, 2011), underscore the severity of the pathology. In a meta-analysis of 36 empirical studies, Arcelus et al. (2011) reported standardized mortality rates of 5.86 in female AN compared to 1.93 in BN, and suicide rates of 1 in 5 patients in AN. Mortality is generally reported to occur more often and earlier in AN than BN (Brown, Klein, & Keel, 2015; Fichter & Quadflieg, 2016). The risk of suicide is considered a concern for all EDs (Crow et al., 2009).

The challenge of providing adequate treatment for EDs seems to be proportional to the inherent severity of this particular pathology. Moreover, specific characteristics attributed to ED patients lead to poor adherence to treatment. Especially in AN, unsatisfactory outcome has been linked to an ambivalence towards remission, which is generally explained in terms of egosyntonic attachment to the disease. In fact, AN patients perceive their situation, and thus the illness, as congruent with their self-concept (Hay,

Touyz, & Sud, 2012; Winkler et al., 2017). In both AN and BN, patients resort to disordered eating as (maladaptive) ER strategy. From this perspective, EDs are operational, yet highly dysfunctional. With regard to treatment, patients may not want to give up on their maladaptive strategy, since it is the most efficacious one, or probably the only one they master, to handle aversive emotional states. The prospect of being defenseless towards overwhelming emotional experiences may partly explain the resistance to treatment (Brockmeyer, Holtforth, et al., 2012), as well as frequent relapse after treatment discharge (Haynos & Fruzzetti, 2011).

Following this rationale, one crucial component of ED treatment is the amelioration of ER skills in order to decrease ED symptomatology. Hence, ER interventions should target the relationship between ERD and symptoms of disordered eating, and, in parallel, consider the repercussions on symptoms of general psychopathology. Corresponding interventions have already been developed. Currently available ER interventions range from skill training modules targeting ER up to treatments fully and specifically developed on the basis of ER, such as Emotion-focused therapy (Greenberg, 2002). Interventions that directly target ER, such as Dialectical Behavioral Therapy (Linehan, 1993), have shown promising results in EDs (Preyde, Watson, Remers, & Stuart, 2016). Nonetheless, supporting empirical evidence is lacking (Gratz, Weiss, & Tull 2015; Haynos & Fruzzetti, 2011). However, Gratz et al. (2015) emphasized that even treatments that do not directly target ER are accompanied by improvement in ER.

The implementation of novel evidence-based interventions in clinical practice requires time (Kazdin et al., 2017; Wilson & Shafran, 2005). For instance, the

National Institute for Health and Care Excellence (NICE) guidelines published in 2004 (cited in Wilson & Shafran, 2005) attributed few efficiency to treatment in AN other than Family-Based Treatment (Lock, le Grange, Agras, & Dare, 2001) in adolescents (Watson & Bulik, 2013; Zipfel, Giel, Bulik, Hay, & Schmidt, 2015). The NICE guidelines published in 2017 (National Institute for Health and Care Excellence, 2017), now recommend Cognitive Behavioural Therapy for Eating Disorders (Fairburn et al., 2003), Maudsley Anorexia Nervosa Treatment for Adults (Schmidt, Wade, & Treasure, 2014), and specialist supportive clinical management (McIntosh et al., 2006) as treatments of choice. Enhanced Cognitive Behavioral Therapy for Eating Disorders (Fairburn et al., 2003), which addresses the intolerance towards mood and thus the inability to functionally handle aversive emotional states (Hay et al., 2012), has for instance proven to be efficient in short and long term improvement in both AN and BN (Calugi, El Ghoch, & Dalle Grave, 2017; Fairburn et al., 2015). Other treatment models that incorporate ER intervention are far from being established in practice on an international level. The example of AN specifically shows how difficult it is to shift primary treatment focus away from sole weight stabilization, which is at most justified in acute cases (Hay et al., 2012; Treasure et al., 2015). Nonetheless, the transdiagnostic approach to psychopathology has led to the consideration of common underlying core features of psychopathology in treatment (Meidlinger & Hope, 2017).

## **4.2 Is Emotion Regulation a predictor of Treatment Outcome in Eating Disorders?**

Determining consistent predictors of outcome in EDs is challenging. Difficulties are partly attributable to methodological heterogeneity across studies that have examined those factors so far (Wild et al., 2016). Nonetheless, in their review, Vall and Wade (2015) identified higher BMI, fewer binge/purge behaviours, greater motivation to recover, lower depression, lower shape/weight concerns, fewer comorbidities, better interpersonal functioning, and fewer familial problems as baseline predictors of better end of treatment outcome. Nevertheless, the strongest predictor was early symptom change (Vall & Wade, 2015). The improvement of symptomatology in the early stages of therapy has been confirmed as important mediator of positive treatment outcome since (Bell, Waller, Shafran, & Delgado, 2017; Linardon, de la Piedad Garcia, & Brennan, 2017; Nazar et al., 2017).

Because ERD are involved in the maintenance of EDs (Haynos & Fruzzetti, 2011), they also represent a valid candidate for the prediction of treatment outcome. It is assumed that the decrease in ERD is associated with positive treatment outcome in terms of improvement of symptomatology. This assumption implies that treatment has an impact on ERD before discharge. According to a review by Sloan et al. (2017), overall ERD and the use of maladaptive ER strategy declined with treatment across mental disorders in almost all examined studies, regardless of the primarily targeted disorder and intervention. These findings suggest that ERD can easily be targeted by treatment. Nonetheless, the reversibility of ERD in AN has been questioned.

In some studies, recovered AN equaled HC or showed significantly less ERD than active AN (Harrison, Tchanturia, & Treasure, 2010; Oldershaw et al., 2012). In other studies, recovered AN and active AN displayed similar ERD (Brockmeyer, Holtforth, et al., 2012; Mallorquí-Bagué et al., 2018). Haynos, Roberto, Martinez, Attia, and Fruzzetti (2014) compared ERD measured by the DERS in 51 AN before and after standard inpatient treatment. There was no improvement in ERD, whereas ED symptomatology and overall psychopathology did improve. It has been hypothesized that residual difficulties with ER remain present after remission, but in muted form (Zipfel et al., 2015), which could explain the high risk of relapse.

It has been proposed that change in ERD is conditioned by weight restoration (Rowell, MacDonald, & Carter, 2016). However, there was no such association between BMI and ERD, neither at baseline nor after treatment, in Haynos et al. (2014). The potential impact of weight gain on ERD seems to be the manifestation of a reciprocal influence, which cannot exclude that ERD lead to disordered eating rather than ERD being caused by starvation. Weight restoration could be a sign of ERD improvement, since restrictive eating behaviours are dismantled in their function as dysfunctional strategies. In addition, weight restoration is primarily of relevance in AN, there does not seem to be any relationship between BMI and ERD in BN.

There is evidence of an association between ERD and treatment outcome (Mallorquí-Bagué et al., 2018). According to Sloan et al. (2017), improvement in ERD was consistently accompanied by better treatment outcome across disorders. In 191 primarily female patients with AN, higher baseline DERS scores predicted the severity and the maintenance of ED symptoms at

discharge and at a one year follow-up (Racine & Wildes, 2015). ERD change, rather than baseline levels of ERD, predicted less risk of cognitive and behavioural symptoms of disordered eating at discharge in 76 mostly female EDs (Preyde et al., 2016). Peterson et al. (2017) revealed in 80 mostly female BN patients that early change in DERS predicted end of treatment improvement in disordered eating symptomatology, with the exception of frequency of disordered eating behaviours.

Furthermore, there is evidence that specific dimensions of ER relate to outcome. Rowsell et al. (2016) showed in 108 mostly female adult AN patients that improvement in DERS<sub>CLARITY</sub> and DERS<sub>GOALS</sub> during treatment was associated with a decrease in overall disordered eating cognitions. MacDonald, Trottier, and Olmsted (2017) revealed in 104 mostly female BN or purging disorder patients that solely DERS<sub>STRATEGIES</sub> was associated with positive outcome in cognitive and behavioural symptoms of disordered eating. Most recently, Hallion et al. (2018) revealed a negative association between DERS<sub>GOALS</sub> (using a short version of the DERS) and response to Cognitive-Behavioral Therapy (CBT). The sample in the study of Hallion et al. (2018) consisted in various “emotional disorders”, for the most part anxiety disorders, and comorbidity was no exclusion criteria.

In sum, the potential role of ERD in ED treatment outcome is both theoretically and experimentally underpinned. Most notably, the association between improvement in ER and ED symptomatology seems to occur regardless of ER being directly targeted by the treatment or not (MacDonald et al., 2017), and regardless of the severity of ER at baseline (Hallion et al., 2018). The improvement in the understanding of one’s emotions, in the belief

in one's own capacities to regulate emotions when upset, as well as improvement in the ability to stay focused even when experiencing aversive emotions were related to positive treatment outcome. Thus, results hint at very specific associations between certain dimensions of ERD and particular features of disordered eating, also in the light of treatment outcome. There have been no further reports since, and additional studies are necessary to determine consistent patterns of association between ERD and particular features of EDs.

### **4.3 Defining Treatment Outcome in Eating Disorders**

The term "treatment outcome" has deliberately not been defined yet in this thesis. There is an ongoing debate when it comes to defining remission in EDs. Hence, standardized definition is lacking (Lock et al., 2013). Consequently, the lack of proper definition disables the comparability of studies (Bardone-Cone et al., 2010; Berkman, Lohr, & Bulik, 2007; Linardon, de la Piedad Garcia, & Brennan, 2017; Vall & Wade, 2015; Wild et al., 2016), and the reliability of remission rates and the determination of valid predictors of outcome. Strikingly, remission rates vary between 3 and 96% in adolescent AN, depending on the definition that is used (Couturier & Lock, 2006). Kordy et al. (2002) urged that providing a standardized definition of remission in EDs is imperative when interpreting results of treatment studies.

The ultimate target of treatment is the cessation of symptoms. It has been debated which or how many symptoms are necessary and sufficient to define remission. Definitions solely based on biological aspects, namely the regulation of menstruation or the normalization of body weight in AN, are

outdated (Winkler et al., 2017). Such markers are subject to disorder-independent fluctuations, and weight restoration does not adequately reflect general cognitive and behavioural improvement of ED symptomatology. The reliability of definitions based on self-report assessment of disordered eating has also been questioned. Hence, it has been suggested that stringent definitions should combine objective and subjective markers, relating to multiple ED symptoms. In accordance, Bardone-Cone et al. (2010) took the definition of remission one step further by including physical, behavioural, and psychological aspects. Criteria include the attainment of a BMI of at least  $18.5\text{kg/m}^2$ , the absence of disordered eating behaviours such as bingeing or purging over the past 3 months, and having scores within 1 Standard Deviation (SD) of age-matched community norms on all the subscales of the EDE-Q (Fairburn & Beglin, 1994). In contrast to full remission, partial remission would encompass meeting solely the physical and behavioural criteria of an ED, which underlines the importance of the cognitive component to remission (Bardone-Cone et al., 2010).

Nonetheless, commonly accepted criteria of remission are subject to caution. The physical and behavioural aspects of remission relate to traditional markers of illness severity, such as BMI in AN (APA, 2013). The utility of BMI as a marker of severity has been questioned (Gianini et al., 2017; Machado, Grilo, & Crosby, 2017; Reas & Rø, 2017), not least because of the contra-intuitive negative association with symptoms of disordered eating in some studies (Smith et al., 2017; Nakai et al., 2017). Thus, the importance of BMI in determining remission might as well be limited. Similar inconsistent findings have been reported across studies regarding the association between the

frequency of inappropriate compensatory behaviours, the marker of severity in BN (APA, 2013), and the severity of symptoms of disordered eating (Dakanalis, Clerici, Riva, & Carra, 2017; Gianini et al., 2017; Jenkins, Luck, Cardy, & Staniford, 2016; Nakai et al., 2017). Hence, the traditional markers included in the determination of remission may not be sufficient to draw a satisfactory clinical picture at discharge.

One other aspect of the rigorousness of remission criteria is the required duration without manifest symptoms. The defined duration is often of arbitrary length, varying between 4 weeks and 1 year depending on the study design (Lock et al., 2013). Kordy et al. (2002) highlighted the importance of setting time criteria when defining remission, not least for the sake of comparability between remission studies. Short-term absence of symptoms may lead to “premature” conclusion on remission (Zerwas et al., 2013), since research only captures a momentum without taking into account the preceding and upcoming development of illness. It has to be kept in mind that partial remission is often only achieved in the years following discharge from treatment, full remission being even more unlikely to be attained (Kordy et al., 2002). The course of EDs is dynamic in that phases of decline and stabilization alternate (Fichter, Quadflieg, & Hedlund, 2006), making the timespan of total absence of symptoms difficult to quantify. Finally, interventions such as Interpersonal Psychotherapy, develop their effects in the long run (Cooper et al., 2016; Fairburn et al., 2015), thus their effect may not be measurable at discharge. Many studies rely on end of treatment measures to assess remission due to feasibility reasons, which implies a narrowed time frame for the assessment of improvement in symptomatology.

Nonetheless, improvements in various symptoms of disordered eating at end of treatment were significant predictors for long-term remission in AN and BN (Lock et al., 2013). Even a short time frame for remission can provide valuable information.

In sum, remission in EDs is a term that is still in search of definition. It is important to emphasize the potential of additional factors that are usually not explicitly included in the assessment of remission. Two such factors will be introduced in the upcoming sections.

#### **4.4 Body-related Concerns as a marker of Treatment Outcome in Eating Disorders**

Cognitive symptoms of disordered eating in general, alongside physical and behavioural aspects, have earned much attention in treatment outcome studies. In contrast, specific findings on body-related concerns are scarce, despite the role they play in the maintenance of EDs (Stice & Shaw, 2002; Striegel-Moore & Bulik, 2007). That is, body related-concerns are indirectly taken into account in the definition of remission, since they are included in the assessment of disordered eating cognitions (Bachner-Melman, Zohar, & Ebstein, 2006; Bardone-Cone et al., 2010; Hartmann, Zeeck, & Van Der Kooij, 2009). Isolating body-related concerns as outcome variable in treatment studies is however justified, since body image satisfaction is a marker of physical and mental health (Dittmar, 2009; Grabe et al., 2008), whereas body image dissatisfaction impacts on the psychological, emotional, and physical health of young women (Ahern, Bennett, Kelly, & Hetherington, 2011).

Body image dissatisfaction is presumed to decline with treatment. In fact, Scheffers et al. (2017) reported positive changes in body image over the course of treatment across mental disorders. Most importantly, body-related concerns have been attributed a specific role in the maintenance of ED symptomatology. In contrast to fully remitted patients, the partially remitted still displayed increased scores on for instance body dissatisfaction, drive for thinness, and endorsement of the thin ideal (Bachner-Melman et al., 2006). As mentioned in the previous section, the definition of partial remission in fact includes the remission of physical and behavioural symptoms of EDs, but not of cognitive symptoms (Bardone-Cone et al., 2010). According to Bardone-Cone et al. (2010), levels of body-related concerns in partially remitted EDs were even similar to the active ED group, whereas the fully remitted could not be dissociated from HC. It has further been suggested that body image dissatisfaction and thin ideal internalization remain highly impaired even in remitted AN compared to HC at 12 year follow-up (Fichter et al., 2006). Hence, body-related concerns may be more difficult to access during treatment than for instance disordered eating behaviours.

Overall, findings hint at body-related concerns being a key aspect of remission and highlight the importance of distinguishing the different dimensions of remission in EDs. Regarding ERD, Swami, Begum, and Petrides (2010) summarized that ER-promoting interventions had a positive impact on symptoms of disordered eating including also body image dissatisfaction. Nevertheless, both evidence of body image dissatisfaction being a valid marker of remission and evidence of its explicit association with ERD in treatment is lacking.

#### **4.5 Psychiatric Comorbidity as a marker of Treatment Outcome in Eating Disorders**

Psychiatric comorbidity is a frequent phenomenon in EDs. EDs occur alongside depression, anxiety disorders, substance use disorders or personality disorders (Dalle Grave, 2011; Keski-Rahkonen & Mustelin, 2016; Martinussen et al., 2017; Root et al., 2010). Spindler and Milos (2007) showed that in 202 EDs, 73% presented another lifetime Axis I disorder. Most common were anxiety disorders (53%), affective disorders (51%), and substance-related disorders (25%). Axis II personality disorders were present in 68% of cases. Markedly, only 16% of patients had a single ED without any comorbid diagnosis. Among comorbid anxiety diagnoses, social phobia appears to be the most frequent (Kaye et al., 2004; Swinbourne et al., 2012). So far, most studies have examined psychiatric comorbidity as predictive factor. Comorbidity has in fact been closely linked to the prediction of outcome in EDs (Franko et al., 2018). General anxiety and social anxiety were identified as predictors of disordered eating psychopathology at end of treatment in Smith et al. (2018). Premorbid depression was the strongest negative predictor of AN outcome in Keski-Rahkonen et al. (2014), and so was lifetime depression diagnosis in Wild et al. (2016). In general, higher frequency of comorbid disorders was associated with lower level of recovery (Bachner-Melman et al., 2006). That fewer comorbidities were amongst simple baseline predictors of better outcome in EDs in Vall and Wade (2015) also supports this. Furthermore, psychiatric comorbidity at discharge was a negative long-term predictor of 6 year outcome in AN (Fichter & Quadflieg, 1999).

Evidence of the occurrence of comorbidity in recovered EDs is somewhat inconsistent. Some studies showed that recovered patients still had comparable depression or anxiety levels to ED patients, whereas other studies revealed similar scores between recovered EDs and HC (Bardone-Cone et al., 2010). Some authors suggested that depressive symptoms are rather induced by starvation than being linked to the disordered eating pathology itself (Dalle Grave, 2011; Keski-Rahkonen et al., 2014; Zipfel et al., 2015). Anyways, symptoms of general psychopathology appear to fluctuate throughout the course of the illness (Fichter et al., 2006), therefore the frequency of comorbid disorders may vary accordingly.

It is not in the scope of this thesis to determine whether psychiatric comorbidity is a consequence of the ED or rather a co-occurring manifestation of psychopathology. In both cases, psychiatric comorbidity has been associated with the severity of disordered eating symptoms (Spindler & Milos, 2007). It can further be assumed that the decrease of ED symptoms goes hand in hand with the improvement of general psychopathology, and thus with the improvement in symptomatology of psychiatric comorbidity (or vice versa). In fact, depressive symptoms declined after psychotherapeutic and antidepressant BN treatment in numerous studies (Linardon, Wade, de la Piedad Garcia, & Brennan, 2017), which is in line with the repeated observation of improvement in both primary and comorbid disorder after treatment across disorders (Sloan et al., 2017).

To sum up, psychiatric comorbidity has been associated with the persistence and severity of ED symptomatology. In addition, both primary and comorbid disorders seem to be modulated by the same intervention. In this thesis,

comorbidity will therefore be considered as a core feature of EDs, because improvement in comorbid symptomatology goes hand in hand with the improvement in ED symptomatology.

What is of particular interest from the perspective of this thesis is how outcome measures relate to ERD. Sloan et al. (2017) emphasized in a review of 67 studies including 4659 predominantly adult participants that in virtually all studies ERD decreased following therapy alongside primary or comorbid diagnoses of anxiety, depression, substance use, EDs, and BPD. In MacDonald et al. (2017), early change in  $DERS_{STRATEGIES}$  significantly predicted fewer depressive symptoms at end of treatment in BN patients. Haynos, Roberto, and Attia (2015) hypothesized that the association between ERD and ED symptoms is strongest in the absence of a comorbid disorder, as in this case ERD are expressed solely through disordered eating pathology rather than by the means of for instance anxiety-related symptoms. This suggests that the occurrence of comorbid symptoms stands for dysfunctional ER, just as the symptoms of disordered eating supposedly do. Hence, shared underlying factors, in this case ERD, are held responsible for the co-occurrence of mental disorders (Smith et al., 2018).

In sum, the examination of psychiatric comorbidity as a marker of treatment outcome is explorative so far, but theoretical considerations underpin this suggestion.

## 5 Research question and hypotheses

The major purpose of the present thesis is to explore the relationship between ERD and features of EDs in young women. Despite a sophisticated theoretical framework, including sociocultural modeling of EDs, the specific associations between dimensions of ERD and specific features of EDs remain unclear. The full potential of ER(D) has not yet been exploited in the quest for answers regarding the origins and the maintenance of ED symptoms. Both research and practice would benefit from better information on the link between ERD and symptomatology, in order to inform nosological classification and to shape interventions that are adequately adapted to mental disorders.

For the sake of providing comprehensive results, the exploration of these associations will be approached from three different angles in this thesis.

*First*, the scope will be the implication of ERD in the momentary activation of ED symptomatology in response to an acute in-lab thin ideal exposure. The aim is to understand why some, but not all young women experience an increase in ED symptoms following media exposure, by introducing ERD as a moderator. *Second*, this thesis aims at exploring the predictive role of ERD in ED features, bearing in mind the limitations of correlational data. Results will shed light on which dimensions of ERD relate specifically to thin ideal internalization, body image dissatisfaction, as well as cognitive and behavioural symptoms of disordered eating. *Third*, one further goal of this thesis is to explore the predictive value of ERD changes in ED treatment outcome, focusing on outcome markers relating to eating disorder psychopathology, as well as other specific features such as body-related

concerns or psychiatric comorbidity. The aim is to identify which dimensions of ERD are of relevance when predicting treatment outcome in EDs.

This study relies on the conceptualization of ERD relating to the DERS by Gratz and Roemer (2004). This instrument is undoubtedly adequate for multidimensional assessment of ERD. It remains to be determined which of the subdimension of the DERS relate to specific features of EDs amongst a broad selection of symptoms.

This thesis proposes to fill the recurrent gaps in research, recently pointed out by Mallorquí-Bagué et al. (2018), who emphasized the necessity of additional cross-sectional and longitudinal studies to map out particularities of ERD. Questionnaire-based results were therefore extracted from a study encompassing experimental, cross-sectional, and longitudinal data. The heterogeneous sample reflects clinical reality by including a broad range of disorders, comorbidities, and different levels of illness severity. The study further includes a large sample of undergraduate young women, which are at high risk for developing ED symptoms (Keski-Rahkonen & Mustelin, 2016). Hypotheses will be outlined briefly in the following sections.

## **5.1 Hypothesis 1**

The detrimental role of mass media promoting the thin ideal in the emergence and maintenance of ED symptoms in young women has been pictured previously in numerous studies. The strongest evidence for the effect of media has been provided in experimental studies compared to correlational or longitudinal studies (Striegel-Moore & Bulik, 2007). In a recent publication using the same experimental design as the present thesis, ERD moderated the impact of media exposure on mood (Humbel et al., 2018). However,

evidence of a moderating role of ERD on the relationship between media exposure, body-related concerns, and disordered eating is lacking. Therefore, this first hypothesis aims at examining the role of ERD in the relationship between laboratory magazine exposure to the thin ideal and three ED features, based on the assumption that self-ideal discrepancy, body image dissatisfaction, and disordered eating behaviours increase following thin ideal exposure (Dittmar et al., 2009; Naumann et al., 2016). Concretely, the hypothesis is proposed that the impact of thin ideal exposure on self-ideal discrepancy, body image satisfaction, and the urge to engage in dysfunctional eating behaviours is moderated by ERD in a heterogeneous sample. Considering that the effect of thin ideal exposure is reportedly independent of ED pathology (Hawkins et al., 2004; Loeber et al., 2016; Wyssen, Coelho, et al., 2016) and that ERD are highly confounded with psychopathology, specifically in this sample (Humbel et al., 2018), analyses will be performed without differentiating between participant groups. The perceived intensity of exposure will be controlled for as suggested by Wyssen, Coelho, et al. (2016), as well as if the magazine had been looked at during exposure.

## **5.2 Hypothesis 2**

The association between ERD and questionnaire-based assessment of ED symptoms has been repeatedly explored in women with and without EDs (Wolz et al., 2015). Moreover, it is assumed that the association between the DERS and clinically relevant features of EDs reveal different patterns depending on the subdimension of ERD (Gratz & Roemer, 2004; Lafrance Robinson et al., 2014). Nonetheless, these associations have not yet been examined in one and the same study nor in a sample with young females with

and without mental disorders. Correlational results identifying which dimensions of ERD are associated with specific features of EDs would, however, provide important information on the mechanisms underlying ED psychopathology, and would allow to better guide both prevention and treatment. Thus, it is hypothesized that differing subdimensions of ERD predict thin ideal internalization, body image dissatisfaction, and cognitive and behavioural symptoms of disordered eating in a heterogeneous sample. Age and BMI will be controlled for, in accordance with Hughes and Gullone (2011) and Sim and Zeman (2006).

### **5.3 Hypothesis 3**

Last, the association between ERD and ED symptomatology among patients with EDs will be explored in a longitudinal design, including assessment at the beginning and after treatment. Based on the assumption that ERD manifest through ED symptoms, positive changes in ERD are expected to be associated with the reduction of symptoms at discharge (Sloan et al., 2017). Similarly to the previous hypothesis, it is assumed that some but not all subdimensions of ERD are specifically associated with remission (Gratz & Roemer, 2004; Peterson et al., 2017). These associations will be the object of the third hypothesis, using a heterogeneous sample of in- and outpatient with a diagnosis of AN or BN. The prerequisite stating that ERD improve throughout treatment has been validated in previous studies, independently of the type of intervention and regardless of whether therapy directly targeted ER or not (Gratz et al., 2015; Peterson et al., 2017). In addition, different aspects of treatment outcome in EDs will be considered in order to determine to which ones ERD relate, and to overcome the restrictive unidimensionality

often attributed to the concept of remission (Bachner-Melman et al., 2006). To do so, outcome will be defined in terms of overall remission status at discharge, but also more particularly in terms of change in cognitive and behavioural ED symptoms. Additionally, decrease in thinness internalization and body image dissatisfaction will be brought to the fore as potentially relevant individual markers of treatment outcome in EDs. Since specific associations between features of disordered eating and particular comorbid disorders have been revealed (Spindler & Milos, 2007), it can be assumed that psychopathology manifests in varying forms depending on underlying factors such as ERD. Therefore, the frequency of comorbidity, but also depressive symptoms and anxiety symptoms, will be considered as outcome measures.

In sum, it is hypothesized that changes in specific subdimensions of ERD are associated with treatment outcome in ED patients. Relevant markers of outcome will be determined first, before proceeding to the analyses of the predictive value of ERD on the selected outcomes. The use of a heterogeneous ED sample presenting multiple comorbid disorders is conform to clinical reality, where individuals with single diagnoses are rare (Krueger & Markon, 2006). BMI, age, and type of treatment (inpatient vs. outpatient treatment) were included as covariates. Previous studies had emphasized the predictive role of BMI in outcome (Vall & Wade, 2015), as well as the role of age (Agüera et al., 2015). The type of treatment may impact on outcome regarding duration and intensity. In addition, inpatient treatment had been associated with more severe cases, particularly in AN (Rowell et al., 2016).

## **6 Methods**

This thesis is based on a multi-site experimental trial, assessing cross-sectional and longitudinal data. Design and protocol of the study “Psychological and physiological consequences of exposure to mass media in young women – the role of moderators” are described in Munsch (2014). In short, the main goal of the study is the examination of the psychological and physiological correlates of thin ideal exposure in young women with and without mental disorders. Study procedures were reviewed and approved by the Ethics Research Committee of the Department of Psychology at the University of Fribourg (reference no. 2012\_001), the Ethics Committees of the Cantons of Fribourg (reference no. 023/12-CER-FR), Zurich (reference no. 2013–0457), Aargau (reference no. 2013/057), and Thurgau (reference no. 2013/24) and the Ethics Committee of the Faculty of Psychology at the Ruhr-University Bochum in Germany (reference no. 142). The study followed the guidelines of the Declaration of Helsinki and the Good Clinical Practice Directive of Switzerland. The trial is registered in the German Clinical Trials Registry (trial number: DRKS00005709).

The study encompasses a large sample of patients and HC, and an elaborated study design, which will be detailed in the following sections.

### **6.1 Participants**

#### **6.1.1. Inclusion and exclusion criteria**

Participants with mental disorders as well as healthy undergraduate students were recruited for the study. Only female participants aged 18 to 35 were included. Specific requirements for study participation in the case of patients

were meeting diagnostic criteria for a primary diagnosis of AN, BN, depressive disorders, anxiety disorders, or somatoform disorders, based on a semi-structured diagnostic interview. Starting therapy in one of the participating clinical units was also a requirement. No restrictions were set in terms of comorbidity, illness duration or treatment history.

For all participants, exclusion criteria included insufficient language skills, current pregnancy or breastfeeding, psychotic disorder, severe somatic illness with potential effects on eating, mood or physical health, past bariatric surgery, and pharmacological treatment of arrhythmias. Further, participants with depressive disorders, anxiety disorders or somatoform disorders were excluded if they currently had a diagnosis of an ED. For HC, a current diagnosis of any mental disorder or past ED was also an exclusion criteria as well as meeting criteria for a body dysmorphic disorder (SCID; Structured Clinical Interview for DSM-IV Axis I, Section G, Body Dysmorphic Disorder; Wittchen, Zaudig, & Fydrich, 1997) and a total score higher than 2.5 at the EDE-Q (Fairburn & Beglin, 1994), in accordance with Fischer, Meyer, Hermann, Tuch, and Munsch (2012).

### **6.1.2. The sample**

Participants were recruited over a period of 3 years (July 2014-April 2017). 1000 young undergraduate women were reached through flyers at University of Fribourg and several vocational schools in the canton of Fribourg, Switzerland. Around 350 patients were informed about the study in 4 Swiss and 6 German mental health units, providing inpatient or outpatient treatment in accordance with current clinical practice guidelines. They were located in

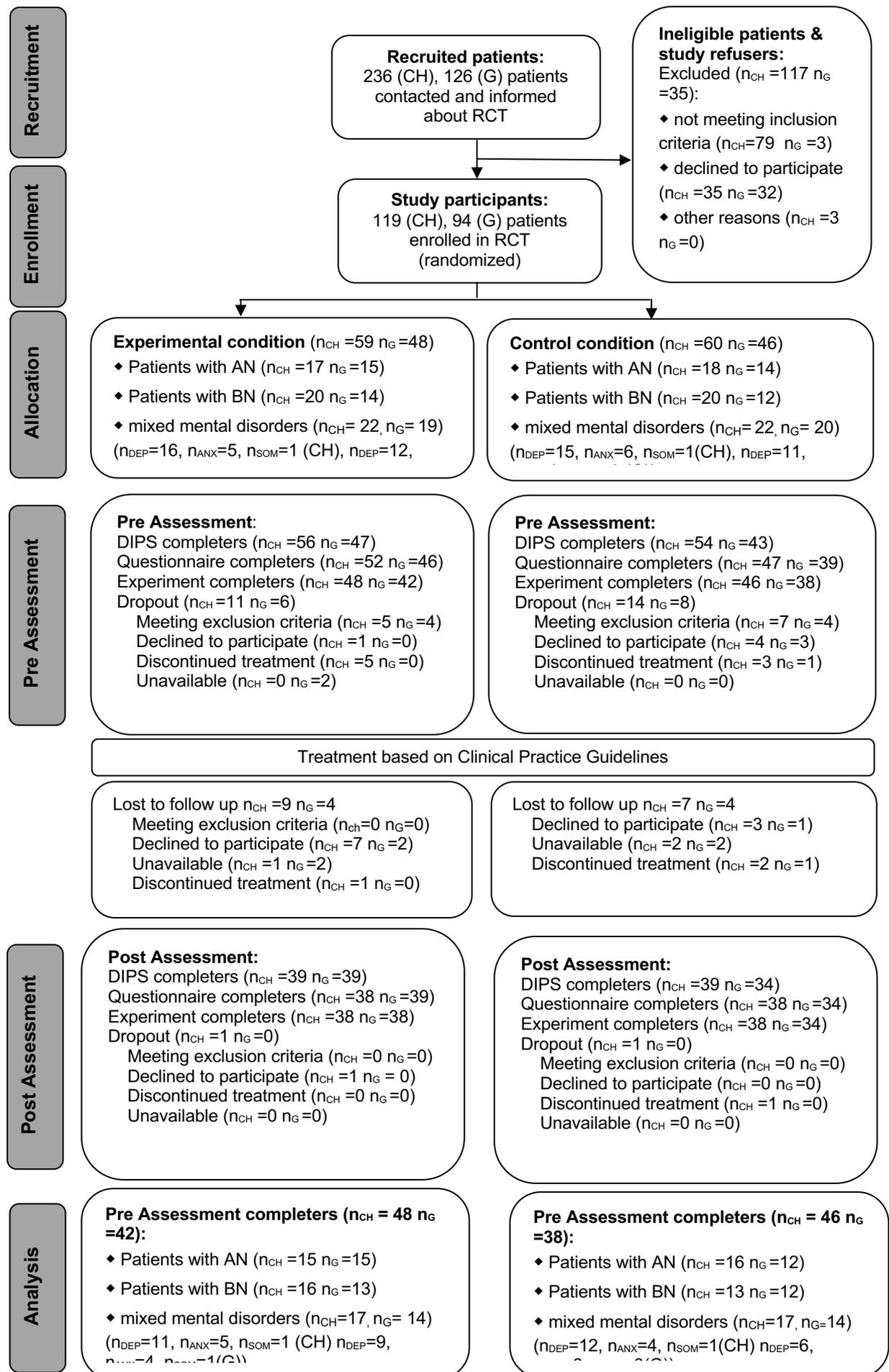
the Swiss cantons of Zurich, Aargau, and Thurgau or in the German Ruhr area.

213 patients and 128 HC were initially enrolled, whereof 130 patients with EDs (64 AN, 66 BN) and 83 patients with MMD (depressive disorders n=54, anxiety disorders n=26, somatoform disorders n=3). 39 patients and 27 HC dropped out before the end of pre-treatment<sup>5</sup> assessment, because of preliminary termination of treatment, exclusion criteria or not wanting to participate anymore. 174 patients and 101 HC completed pre assessment. 26 patients and 1 HC dropped out of the study between the two assessment time points or during the course of the second part of the assessment. 148 patients and 100 HC completed both time points of assessment. Figure 1 displays recruitment, randomization, dropouts, and study completers.

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<sup>5</sup> Pre-treatment and post-treatment assessment will be referred to as pre assessment and post assessment, since HC did not undergo treatment.

## Clinical sample



## Healthy controls

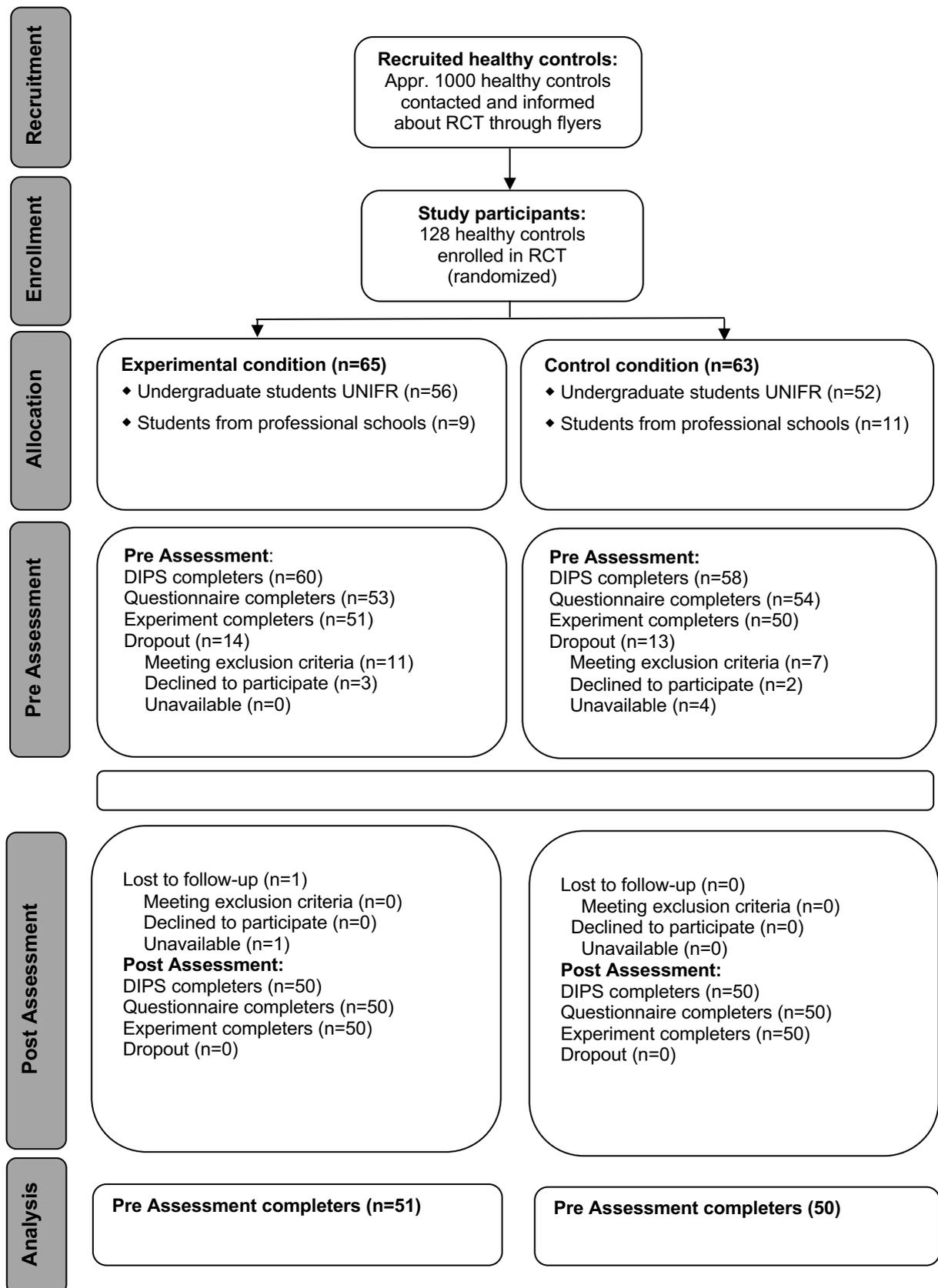


Figure 1. Participant Flow.

## **6.2 Procedure**

### **6.2.1 Overall procedure**

The study was conducted on-site in the participating institutions in Germany and Switzerland, as well as at the University of Fribourg in Switzerland for the HC sample. Patients who fulfilled basic requirements for participation were routinely informed about the study at admission. HC were reached through flyers. Extensive written information about voluntary participation as well as informed consent was handed out to those who were interested in participating. The actual purpose of the study was not revealed until completion of the study. Participants were solely told that the study aims at exploring mental well-being and psychophysiological stress reactivity relating to body image satisfaction in young adults. Participants were randomly assigned to either the experimental condition (EC, exposure to a fashion magazine followed by vivid imagination of female ideal bodies) or control condition (CC, neutral nature magazine exposure followed by vivid imagination of landscapes) and a code was attributed to each participant, so that anonymity was ensured.

Immediately after receiving signed informed consent, the research team contacted the participant to set three appointments. Study participation included a diagnostic interview, a set of online questionnaires and an experiment, which had to take place within the first weeks of treatment in the case of patients. HC were not bound to such constraint, therefore starting the procedure was possible at any time. The 3 appointments were separated by an interval of exactly one week. The whole procedure was repeated after 3 months, also with HC. More specifically, post assessment was set 12 weeks

after the first assessment, in accordance with the mean treatment duration for ED patients in the chosen clinical units. Time frame was strictly respected and rare exceptions were only granted to ensure the feasibility of the study. Assessors were master and doctoral students, who were trained and regularly supervised by post-docs.

The procedure was the same at both pre and post assessment and started with a diagnostic interview, which took place after a brief duration of accommodation to the treatment unit in the case of patients. Diagnostic interviews with outpatients and HC were conducted over the phone, whereas in vivo interviews were conducted with inpatients. All interviews were audiotaped. Interviews at post assessment were conducted over the phone rather than in vivo, except for a few cases of inpatients, who were still staying at the care unit.

One week later, an email with a link to self-report questionnaires was sent to the participants, redirecting to an open source online survey platform. Filling in the questionnaires took approximately 45 minutes and was possible on any device featuring an internet connection. Questionnaires contained the assessment of physical and mental health history but also standardized instruments assessing different domains of psychopathology (detailed description will be provided in the section “6.3 Instruments”). A tabular feedback of the evaluation of the questionnaires was handed out to the clinical units for each participant. Feedback was also sent to the participants after study completion.

In the third week of the procedure, participants were convoked to an individual testing afternoon, either at the corresponding care unit or at University of

Fribourg in the case of HC. Prior to the testing afternoon, participants were informed by email about necessary restrictions relating to physiological assessment, including not drinking or smoking one hour prior to the experiment. The experiment took place between 2 and 4.30 p.m. with respect to circadian rhythms and to ensure comparability of results. In case of last-minute cancellation, the testing afternoon was postponed to the next possible afternoon.

Patients received financial compensation for study completion as well as for public transportation fees, for those who had to return to the treatment unit after discharge for the testing afternoon. HC were compensated with credit points or received financial compensation if they were not enrolled at the University of Fribourg.

### **6.2.2 Experimental protocol and procedure**

Prior to each experiment, experimenters had to set up the equipment. Each experiment was carried out with one participant at the time. During the entire duration of the experiment, participants were seated in front of a laptop (Apple mac book pro) and were only allowed to leave their seat when intended by the procedure. Participants progressed through the standardized experimental procedure by the means of a Power Point Presentation on the laptop. The experimenter gave additional scripted instructions to the participants throughout the procedure. The procedure did not differ between randomization groups, with the exception of the magazine provided during exposure and the instruction of vivid imagination.

In order to guarantee comparability of results, especially regarding physiological data, strict predefined time stamps had to be respected. Time stamps were recorded automatically during the presentation as well as manually, in order to prevent loss of data due to technical problems. The procedure took account of varying speeds of completion for each task, thus intervals rather than the total duration of the experiment had to be strictly adhered to.

The experimental procedure was built around magazine exposure and a subsequent short vivid imagination. Vivid imagination only will be used for the purpose of this study. The elements of the experimental procedure used for this substudy are highlighted in figure 2. Before and after each of both manipulations, sets of self-report questionnaires were administered online. Heart rate was recorded continuously during the whole experiment with an electrocardiogram breast belt, salivary cortisol and salivary alpha-amylase were assessed through 9 saliva samples collected with cotton rolls, which the participants had to keep in their mouth for two minutes.

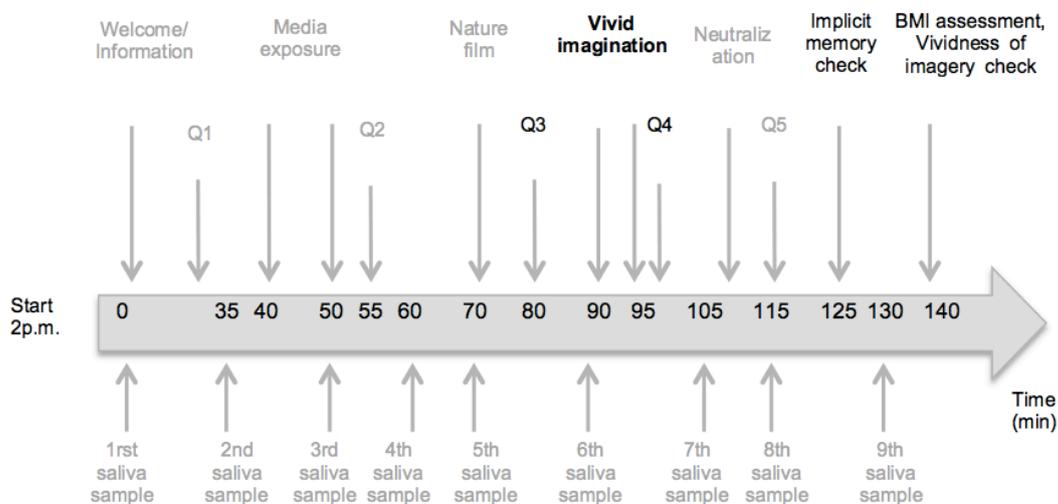


Figure 2. Timeline of the experimental manipulation.

The experiment started with an introductory set of instructions, as well as sociodemographic and baseline questionnaire assessment, followed by an exhaustive emotion recognition task, based on computerized assessment of the quantity of information necessary to decode facial expression of emotion<sup>6</sup>. Media exposure started after 40 minutes. Magazine exposure was inspired by the waiting room design by Turner, Hamilton, Jacobs, Angood, and Dwyer (1997), which has high ecological validity in terms of daily real life situations. Participants were seated in another room for 10 minutes, being told that this time was necessary for the assessment of baseline heart rate. The experimenter left the room but came back after two minutes, handing over a magazine to the participant. The written support was either a fashion magazine (Vogue Germany) or a nature magazine (Geo Special Germany), depending on prior randomization. Participants were explicitly invited to look at the pictures in the magazines. The waiting room was free from any distraction.

Between magazine exposure and vivid imagination an 8 minutes nature film was presented to bridge time, besides another set of questionnaires to fill in.

Vivid imagination took place 40 minutes after media exposure. The procedure was conducted in accordance with Coelho, Carter, McFarlane, and Polivy (2008), Radomsky, De Silva, Todd, Treasure, and Murphy (2002), and Shafran, Teachman, Kerry, and Rachman (1999). During the 4-minutes imagination task, participants were instructed to close their eyes, and were asked to remember and vividly imagine the most attractive picture referring to the magazine previously viewed through guided instructions aiming at

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<sup>6</sup> Physiological assessment and emotion recognition tasks will not be further described, since they are not part of this thesis.

deepening the experience. Participants were given standardized instructions specific to either one of the conditions, both aiming at focusing on the most salient features of the ideal body or landscape. If the participant had not looked at the magazine, instructions referred to any attractive body or landscape. Immediately after the imagination task, participants were asked to write down on a sheet of paper a short description of their impressions of the female body or the landscape they just imagined. They were told to start the description with "*I imagine...*".

As previously mentioned, participants filled in self-report questionnaires immediately before and after magazine exposure and vivid imagination, assessing momentary mood, body image satisfaction, and disordered eating. Shortly after vivid imagination, participants had the opportunity to neutralize their feelings. They were left alone in the experimental room for 5 minutes with a brief instruction about possible recovery strategies. Afterwards, participants were administered a short picture recognition task to assess whether they correctly recognized the pictures presented in the magazine. The experiment ended with a second emotion recognition task. Finally, participants were asked to rate the perceived vividness of the imagination task. The procedure ended with the assessment of weight and height. Participants were instructed not to reveal the content of the experiment to the other participants. 24 hours after the experiment, participants received a link to a short post-event processing questionnaire, which assessed the effects of the viewed images. The whole experimental procedure was analogously repeated at post assessment, with additional information given to participants about the aim of the study and compensation.

## 6.3 Instruments

Figure 3 shows the administered questionnaires used in this thesis in chronological order.

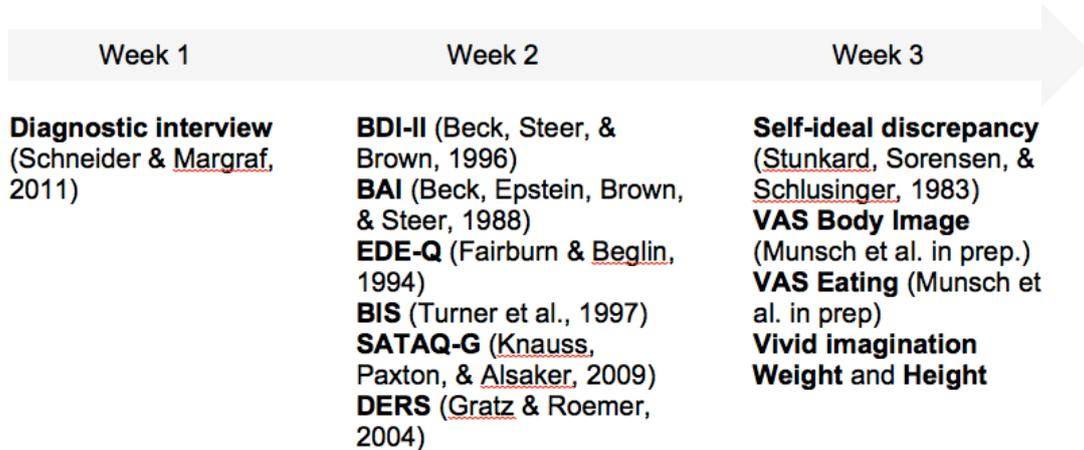


Figure 3. Sequence of assessment.

### 6.3.1 Diagnostic interview

Current mental disorders were assessed using the German version of the Diagnostic Interview for Mental Disorders (Diagnostisches Interview bei psychischen Störungen, DIPS; Schneider & Margraf, 2011), a structured interview based on the 4<sup>th</sup> edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; APA, 2000). For the purpose of this study, criteria, subtypes, and severity rating of the ED section were adapted according to the DSM-5 (APA, 2013). The DIPS has an interrater-reliability ranging from .57 to .92, and retest-reliability ranges from Cohen's Kappa .35 to .94 (Schneider & Margraf, 2011). In our study, 10% of the interviews were randomly selected and coded twice to calculate interrater-reliability, which was satisfying with Fleiss K=.803. All interviewers were trained and supervised by the principal investigators.

### 6.3.2 Online questionnaires

#### Emotion regulation difficulties

The Difficulties in Emotion regulation scale (DERS; Gratz & Roemer, 2004, German version by Ehring, Fischer, Schnülle, Bösterling, & Tuschen-Caffier, 2008) was administered to participants. Answers to the 36 items of the scale are given on a 5-point scale ranging from “almost never” (1) to “almost always” (5). Approximately a third of all items are reverse-coded. The DERS scores range from 36 to 180, the higher the total score the greater the difficulties with ER. The items load on the 6 factors: ‘Goals’ (e.g. *When I’m upset, I have difficulty focusing on other things.*); ‘Impulse’ (*When I’m upset, I lose control over my behaviours.*); Awareness (*When I’m upset, I take time to figure out what I’m really feeling.*); ‘Clarity’ (*I am confused about how I feel.*); ‘Non-acceptance’ (*When I’m upset, I become irritated with myself for feeling that way.*); and ‘Strategies’ (*When I’m upset, I believe that I will remain that way for a long time.*). The DERS has high internal consistency, good test-retest reliability, and adequate construct and predictive validity (Gratz & Roemer, 2004). Internal consistency in our sample at pre assessment was excellent with  $\alpha = .97$  for the total score and  $\alpha$ 's = .91, .88, .83, .91, .93, .94 for the subscales.

#### Sociocultural influences of the thin ideal

The adherence to the thin ideal was measured with the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-G; initial version by Heinberg, Thompson, & Stormer, 1995; German version of the SATAQ-G by Knauss, Paxton, & Alsaker, 2009). 16 items measure the sociocultural impact of body ideal standards and the efforts to achieve the ideal (e.g. *Attractiveness is very*

*important if you want to get ahead in our culture.*). Items are summarized by the mean score of 3 subscales assessing the perceived pressure from the media to achieve the thin ideal, the awareness of the body ideal, and the internalization of the media body ideal. Scores range from 1 to 5 (“not at all” to “absolutely true”). Knauss et al. (2009) reported good internal consistency for the three subscales. Cronbach’s  $\alpha$  in our study was .93 at pre assessment.

### **Body image dissatisfaction**

Body dissatisfaction was assessed with the Body Image Satisfaction Scale (BIS; Turner et al., 1997; German version in prep. by Munsch et al.). A short version of 15 items (e.g. *I am pleased about my body.*) was used in this study, including items relating to body image satisfaction, preoccupation with thinness, and attitudes and behaviours towards dieting. Scores range from 1 to 5 (“never” to “always”). The higher the total score, the higher the dissatisfaction with the own body. Cronbach’s  $\alpha$  in our study was .94 at pre assessment.

### **Disordered eating symptoms**

The Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994; German version by Hilbert & Tuschen-Caffier, 2006) was used to assess disordered eating symptomatology. The 28 items assess eating concerns, weight concerns, restraint eating, and shape concerns (e.g. *On how many days of the past 28 days have you had a definite desire to have a totally flat stomach?*), as well as core behaviours of disordered eating. The scale assesses the relevant attitudinal characteristics of EDs on 4 subscales over a period of the past 28 days with 22 items on a 7 point rating scale (0 “not present” to 6 “present every day”). The mean of the 22 items is computed to a

total score as well as scores for each subscale. Additional 6 items assess the frequency of disordered eating behaviours. For the purpose of this study, the self-reported frequencies of inappropriate compensatory behaviours (vomiting, laxative abuse, and driven exercise) over the past 28 days were computed to a mean score. The EDE-Q has good psychometric properties and is suitable to detect ED symptoms in the general population (Mond et al., 2006). Cronbach's  $\alpha$  of the German version was of .97 for the total score (Hilbert, Tuschen-Caffier, Karwautz, Niederhofer, & Munsch, 2007), same as in our sample.

### **Depressive symptoms**

Severity of depressive symptoms was assessed with the Beck depression inventory II (BDI-II; Beck, Steer, & Brown, 1996; German version by Hautzinger, Keller, & Kühner, 2009). 21 items assess the severity of symptoms during the past 2 weeks (e.g. *Loss of pleasure.*). For each item four answers to choose from were provided ("not present" to "severe"). Total score was computed by adding the scores of all items and ranged between 0 and 63. The BDI has good psychometric properties (Beck et al., 1996). The Cronbach's  $\alpha$  of the German version is  $\geq .84$  (Hautzinger et al., 2009). For the present sample a Cronbach's  $\alpha$  of .96 was obtained.

### **Anxiety symptoms**

The severity of anxiety symptoms was assessed with the Beck anxiety inventory (BAI; Beck, Epstein, Brown, & Steer, 1988, German version by Margraf & Ehlers, 2007). 21 items assess the physiological and cognitive symptoms of anxiety during the past week (e.g. *Heart pounding/racing.*). For each item, four answers were provided ("not present" to "severe"). A total

score, ranging between 0 and 63, was computed by adding the scores of all items. The BAI has good psychometric properties (Goldschmidt, 2008). For the present sample Cronbach's  $\alpha$  was .93.

### **6.3.3 Assessment during the experimental procedure**

#### **Experimental manipulation**

For the purpose of this thesis, vivid imagination of the thin ideal was used as experimental manipulation of thin ideal media exposure (see section 6.2.2 for a detailed description). Previous results showed that mere magazine exposure failed to reveal any effects on outcomes, in contrast to vivid imagination (Loeber et al., 2016; Wyssen, Coelho, et al., 2016). It is suggested that thin ideal visualization acts as reinforcement of magazine-based media exposure.

Additionally, the participant's rating of the perceived vividness of the imagination task was assessed on a scale from 1 (little vivacious) to 10 (very vivacious). A picture recognition task was also performed. This task consisted in showing 10 images from the magazine previously viewed and 10 pictures taken from another issue of the same magazine. The aim of the task was to assess the level of attention and confrontation with the study material in terms of ratio of correctly or incorrectly recognized pictures.

#### **Self-ideal discrepancy**

Self-ideal discrepancy was assessed by the means of figure rating scales (Stunkard, Sorensen, & Schlusinger, 1983), administered before and after vivid imagination. The linear scales showed 7 female figures of increasing body size in terms of body fat from very thin to obese, and a gradual numeric scale from 1 to 7. Participants had to rate their current body size, the ideal

size of their own body, and their perception of the societal ideal. Self-ideal discrepancy was measured by computing the difference between actual and ideal size for pre- and post-vivid imagination. Positive results refer to a larger discrepancy between the self and the ideal, and thus to the wish to be thinner. Negative results mean that the own body is perceived as being thinner than the ideal.

### **Body image satisfaction**

Body image satisfaction was assessed on a visual analog scale (in preparation by Munsch et al., see appendix A) of 11 items. Participants rated each item on a 100-mm visual analog scale (0 “not at all” to 100 “completely”), before and after vivid imagination. The scale was designed to capture change in body image satisfaction, and assesses the momentary satisfaction with body, weight, and appearance, well-being related to the own body, and body-related emotions. Negatively formulated items were reverse-coded (e.g. *How much are you worrying about your appearance at the moment?*). The lower the mean of all items, the lower the satisfaction with the appearance. Results will be interpreted in terms of body image dissatisfaction, although the scale assesses satisfaction with the own body. Reliability was  $\alpha=.96$  in our sample.

### **Disordered eating symptoms**

Dysfunctional eating behaviours were assessed using a visual analog scale (in preparation by Munsch et al., see appendix B) of 7 items, before and after imagination. Participants rated each item on a 100-mm visual analog scale (0 “not at all” to 100 “completely”). The scale assesses the immediate desire to eat or to engage into eating and weight regulatory behaviours (bingeing, dieting, excessive exercising, use of laxatives). Total score was computed

using the mean of all items. The higher the total score, the higher the urge to engage in dysfunctional eating behaviours. For the present sample Cronbach's  $\alpha$  was .76.

## **BMI**

Weight and height of all participants were assessed using an electronic personal scale (Seca 899, Basel, Switzerland) and a stadiometer (Seca, Basel, Switzerland). Participants were asked to take their shoes off for the measurements. BMI was then calculated as body mass index by weight in kilograms divided by the square of the body height in meters ( $\text{kg}/\text{m}^2$ ).

### **6.3.4 Assessment of remission at discharge**

Criteria for the definition of remission of each primary diagnosis were developed based on Agras et al. (2000), Stice, Marti, and Rohde (2013), and Zipfel et al. (2014) in the case of EDs and Riedel et al. (2010) for depressive disorders, and Goldschmidt (2008) and Margraf and Ehlers (2007) for anxiety disorders<sup>7</sup>.

#### **Eating disorders**

A transdiagnostic definition for AN and BN was used. Full remission was defined as not meeting criteria for an ED at discharge according to the DIPS (Schneider & Margraf, 2011), a BMI over 18 and a global EDE-Q score of less than 2.3. For partial remission, a BMI over 18 and a reduction of 30% of the initial ED pathology (EDE-Q total score) was required. If scores were already under 2.3 at pre assessment, they had to remain so at post assessment. Further, a 30% reduction of restrictive eating, bingeing, and compensatory behaviours was necessary. If no behaviours were reported in the self-report

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<sup>7</sup> Remission of depressive and anxiety disorders was assessed for descriptive purpose only.

questionnaire at the first measurement time point, they had to remain absent at the second measurement. No remission was attributed if neither full nor partial remission applied.

### **Depressive disorders**

Full remission was attributed if criteria for a depressive disorder at discharge were not met (full remission according to the DIPS) and if BDI total score was fewer or equal to 13 (corresponding to minimal depression on the scale). Partial remission of depressive disorders was defined as a reduction of 30% of the initial depressive disorder pathology assessed by the BDI. If the total score was already lower than 13 at pre assessment, the score at post assessment had to be under 13. No remission was attributed if neither full nor partial remission applied.

### **Anxiety disorders**

Full remission was attributed if criteria for an anxiety disorder at discharge were not met (full remission according to the DIPS) and if BAI total score was fewer or equal to 7 (corresponding to minimal anxiety on the scale). Partial remission of anxiety disorders was defined as a reduction of 30% of the initial anxiety disorder pathology assessed by the BAI. If the total score was already lower than 7 at pre assessment, the score at post assessment had to remain under 7. No remission was attributed if neither full nor partial remission applied.

### **6.3.5 Additional treatment-related assessment**

After completion of the experiment, questionnaires were sent to the clinical institution and patients to gather information about treatment. Questions

relating to the specificity of interventions in EDs were based on the German evidence-based guidelines for diagnosis and treatment for AN and BN (Herpertz, Herpertz-Dahlmann, Fichter, Tuschen-Caffier, & Zeeck, 2011). Questions were presented either in open answer format or in multiple choice format. The content of the questionnaires was the same in the therapists' and patients' version, few additional questions were addressed in the therapist's version only (e.g. treatment duration). For the descriptive purposes of this thesis, therapists' data was used regarding duration of treatment (in number of sessions and weeks of treatment), the psychotherapeutical approach that influenced the administered treatment, whether treatment of comorbid disorders was carried out, and whether psychopharmacological treatment was administered or not.

## **6.4 Statistical data analysis**

IBM SPSS Statistics, Version 25, was used for data management and analyses. For hypothesis 1 and 2, analyses included data of all participants which completed pre assessment. Regarding hypothesis 3, analyses were performed on ED patients who additionally completed post assessment. Accordingly, varying sample sizes will be reported across analyses. DERS questionnaire data of two participants was missing. These two participants were excluded from correlational and regression analyses.

### **6.4.1 Hypothesis 1: experimental assessment**

For the main analysis, linear mixed models were conducted in order to test whether ERD moderate the relationship between thin ideal exposure and self-ideal discrepancy, body image satisfaction, and disordered eating at pre

assessment. Concretely, the models contained time point of assessment (before and after vivid imagination) as within-subjects predictor and condition (experimental or control) and ERD (DERS) as between-subjects predictors, as well as all interactions. Outcome measures were the discrepancy between actual and ideal self (figure rating scale), body image satisfaction (visual analog scale relating to body satisfaction), and the urge to engage into disordered eating behaviour (visual analog scale relating to disordered eating behaviours). Implicit memory check and vividness of imagery test were included as covariates.  $p$ -values were corrected for multiple testing using Benjamini and Hochberg's method (Benjamini & Hochberg, 1995). The  $p$ -values were 9 for testing changes in self-ideal discrepancy, body image satisfaction, and ED psychopathology before and after vivid imagination. Both uncorrected and corrected  $p$ -values are reported in the results section, but only the corrected values will be referred to when interpreting the results.

#### **6.4.2 Hypothesis 2: cross-sectional assessment**

In order to determine which dimensions of ERD are associated with ED symptoms, bivariate associations between variables were explored in a first step. Correlational analyses were conducted between ERD (DERS total score and subscales) and thin ideal internalization (SATAQ-G total score), body image dissatisfaction (BIS total score), and disordered eating cognitions and behaviours (EDE-Q total score and frequency of compensatory behaviours) at pre assessment. Since assumption-testing analyses revealed that distributions were not normally distributed but approximately symmetric, Pearson's correlations were performed. Spearman's correlation was used to explore the association between ERD and the count variable frequency of

compensatory behaviours, as well as for the covariates age and BMI, whose distributions were skewed. Correlation coefficients were considered medium if  $>.30$  and large if  $>.50$ . Only the significant results with a correlation coefficient of an absolute value of  $.20$  were retained for further analyses. Alpha level was set at  $p<.01$  to lessen the risk of Type I errors.

In a next step, a series of regression analyses were carried out to examine which DERS subscales predict thin ideal internalization, body image dissatisfaction, and cognitive and behavioural disordered eating symptoms. Separate hierarchical regression analyses were used to examine the association between ERD and each of the dependent variables, namely thin ideal internalization, body image dissatisfaction, and cognitive symptoms of disordered eating, over and above the effects of significant covariates. Regarding frequency of compensatory behaviours, it appeared most suitable to perform negative binomial regression with maximum likelihood estimation, due to overdispersion because of the heterogeneous sample. For each equation, the DERS subscales that were significantly associated with outcome variables in the preliminary correlational analyses were included. As the different dimensions of ER were specifically in the focus of the study, DERS total scale was not entered into the models. Conceptually relevant covariates, namely age and BMI, were considered as possible covariates in the models, but only if significantly related to the respective outcome variable. Further, thin ideal internalization was included in the model testing body image dissatisfaction as dependent variable and body image dissatisfaction was entered into the model testing cognitive and behavioural disordered eating symptoms as dependent variable. Alpha level was set at  $p<.05$ .

Regression models will be detailed for each dependent variable in the results section.

### **6.4.3 Hypothesis 3: longitudinal assessment**

Main analyses of the third hypothesis were conducted solely with ED patients who completed pre and post assessment. In a transdiagnostic framework, AN and BN were not differentiated in subsequent analyses, except for descriptive purposes. Descriptives of HC and MMD are also reported. More specifically, the third hypothesis examined the associations between change in ERD and several markers of ED treatment outcome. Predictor variables were pre-to-post assessment change scores of ERD ( $\Delta$ DERS subscales). Outcome variables were remission status at discharge and pre-to-post change in thin ideal internalization ( $\Delta$ SATAQ-G total score), body image dissatisfaction ( $\Delta$ BIS total score), cognitive and behavioural symptoms of disordered eating ( $\Delta$ EDE-Q total score and  $\Delta$ frequency of compensatory behaviours),  $\Delta$ frequency of psychiatric comorbidity, depressive ( $\Delta$ BDI total score), and anxiety symptoms ( $\Delta$ BAI total score). Additionally, change in thin ideal internalization was considered a predictor of change in BIS and change in body image dissatisfaction was considered a predictor of change in EDE-Q and in frequency of compensatory behaviours. Age, change in BMI, and type of treatment (inpatient or outpatient treatment) were handled as potential covariates. Change scores were obtained by subtracting pre assessment scores from post assessment scores. By doing so, negative values represented a decrease in symptomatology, null values represented absence of change, and positive values represented an increase in symptoms. For change in BMI, however, negative values showed a decrease in BMI, and

thus deterioration, and positive values signified an increase in BMI. Due to the expected low proportion of fully remitted ED patients, remission status was transformed into a dichotomous variable, coding “0” for no remission and “1” for partial or full remission. Remission status could not be determined in 4 cases, due to missing BMI data.

Preliminary data exploration revealed that variables, with the exception of some of the DERS subscales, were not normally distributed, but not skewed. Point biserial correlation (Pearson’s  $r$ ) was used to test the relationship between change in ERD measures and the dichotomous variable remission status. Pearson’s correlations were performed to examine the associations between change in ERD and changes in cognitive and behavioural symptoms of disordered eating, thin ideal internalization, body image dissatisfaction, as well as depressive and anxiety symptoms. One outlier in the BIS data and two outliers in the SATAQ-G data had to be removed from analyses. For the correlation between the change scores of the DERS subscales and the count variables frequency of compensatory behaviours and frequency of comorbid disorders, Spearman correlation was conducted. The association between covariates and outcome variables was analysed with Pearson’s correlations for age and for change in BMI, and point biserial correlation for type of treatment. Correlation coefficients were considered medium if  $>.30$  and large if  $>.50$ . Alpha was set at a significance level of  $.01$  for the interpretation of the correlations, in order to correct for multiple comparisons. Only the significant results with a correlation coefficient with an absolute value of  $.20$  at alpha  $.01$  level were retained for further analyses.

In the next step, a series of regression analyses were conducted. For each equation, the DERS subscales change scores and covariates that were significantly associated with outcome variables in preliminary correlational analyses were included. Since the subdimensions of ERD were of principal interest, DERS total score was not included. For each selected dependent variable, a separate model was built. Hierarchical regression models were conducted for continuous outcome variables, negative binomial regression was planned for the count outcomes and binary logistic regression was considered for the dichotomous remission status variable. Alpha level was set at  $p < .05$  for the interpretation of regression analyses. Each model will be detailed for each dependent variable in the results section, as models will be built upon significant correlations between potential predictors and outcome variables.

## 7 Results

### 7.1 Sample characteristics at pre assessment

The sample consisted of 36.7% HC, 40.7% EDs (21.1% AN, 19.6% BN), and 22.5% MMD (13.8% depressive disorders, 7.6% anxiety disorders, and 1.1% somatoform disorders). Characteristics of the sample who completed experimental pre assessment (n=275) are displayed in table 1.

Table 1

*Pre assessment demographic and clinical characteristics and comparisons by group (n=275)*

	AN (n=58)	BN (n=54)	MMD (n=62)	HC (n=101)	<i>p</i>
Status (%) (n=275)					
Inpatient	55.2	38.9	75.8	---	
Outpatient	44.8	61.1	24.2	---	
Age ( <i>M,SD</i> ) (n=275)	22.45 (4.18)	23.13 (4.10)	25.26 (4.69)	21.51 (2.20)	<.001
Range	18-35	18-35	18-35	18-33	
BMI ( <i>M,SD</i> ) (n=269)	17.22 (1.61)	22.73 (2.52)	24.50 (6.49)	22.09 (2.66)	<.001
Range	13.46- 20.73	18.44- 30.08	16.72- 48.22	16.48- 29.73	
DEERS total score ( <i>M,SD</i> ) (n=273)	113.69 (23.09)	115.63 (24.50)	113.85 (22.97)	66.67 (16.91)	<.001
Range	74-161	58-156	63-171	39-116	
BDI total score ( <i>M,SD</i> ) (n=274)	25.14 (11.75)	26.17 (11.67)	25.05 (9.68)	3.27 (3.91)	<.001
Range	3-54	5-51	0-44	0-20	
BAI total score ( <i>M,SD</i> ) (n=274)	20.18 (11.18)	19.48 (8.95)	22.40 (10.40)	4.31 (4.19)	<.001
Range	0-46	3-36	3-46	0-20	
SATAQ-G total score ( <i>M,SD</i> ) (n=274)	60.63 (12.71)	59.80 (12.75)	50.92 (15.91)	44.06 (11.68)	<.001
Range	25-80	22-79	19-77	16-69	
BIS total score ( <i>M,SD</i> ) (n=274)	3.55 (.58)	3.73 (.70)	2.73 (.88)	2.00 (.47)	<.001
Range	2.40-4.73	1.53-4.80	1.13-4.60	1.13-3.20	
EDE-Q total score ( <i>M,SD</i> ) (n=274)	3.73 (1.22)	4.19 (1.24)	1.62 (1.34)	.64 (.58)	<.001
Range	1.04-5.91	.91-5.78	.00-4.87	0-2.48	

EDE-Q behaviours ( <i>M,SD</i> ) (n=274) Range	14.86 (18.55) 0-104	28.37 (23.38) 0-100	1.15 (2.43) 0-10	.30 (1.17) 0-8	<.001
Duration of illness in months ( <i>M,SD</i> ) (n=108)	61.78 (55.90)	81.55 (53.72)	54.55 (59.68)	---	.124
Psychiatric comorbidities (%) (n=174) Yes	48.3	53.7	71.0	---	
Illness severity (%) (n=174)					
mild	28.1	16.0	13.8	---	
moderate	31.6	42.0	75.9	---	
severe	24.6	20.0	10.3	---	
extreme	15.8	20.0		---	

*Notes.* AN=Anorexia Nervosa, BN=Bulimia Nervosa, MMD=Mixed Mental Disorders, HC=Healthy Controls, BMI=Body Mass Index, DERS=Difficulties in Emotion Regulation Scale, BDI=Beck Depression Inventory, BAI=Beck Anxiety Inventory, SATAQ-G=Sociocultural Attitudes Towards Appearance Questionnaires, BIS=Body Image Dissatisfaction, EDE-Q=Eating Disorder Examination Questionnaire.

According to distribution of data, study characteristics were compared using one-way ANOVA or Kruskal-Wallis test. For orientation purpose only, cut-off values to determine clinically relevant impairment in our study were: ERD: DERS total score>99 (Gratz & Roemer, 2004); mild depressive symptoms: BDI total score>14 (Beck et al., 1996); mild anxiety: BAI total score>8 (Margraf & Ehlers, 2007); symptoms of disordered eating: EDE-Q total score>2.50 (Fairburn & Beglin, 1994).

Participants were mostly Swiss (47.8%) and German (45.6%). 69% had attained a diploma or job training, 16.1% a university degree, 13.1% had finished compulsory education, and 1.8% were still in school. A majority of participants were either not working or students (58.5%), 33.1% were employed, and 8.4% unemployed. 50.2% reported to be in a relationship or married. The majority had no children, only 3% had up to 3 children.

The AN sample consisted of exactly half of binge eating/purging type and half of restricting type AN. Main diagnoses within the MMD group were major depression disorder, social phobia, and general anxiety disorder. Among those participants who reported to regularly take medication, 42.5% of patients (and 1.0% of HC) were under psychopharmacological treatment.

HC showed significantly lower levels in all variables assessing psychopathology compared to patients. EDs had higher levels of disordered eating (including thin ideal internalization and body image dissatisfaction) but

did not differ from the MMD in terms of depression, anxiety, and ERD. AN and BN did not differ in any of the variables except from BMI and frequency of compensatory behaviours, BN reporting significantly more disordered eating behaviours. The MMD were significantly older than all other groups and had the highest mean BMI. Diagnostic interviews revealed that having one or more comorbid disorders was frequent across disorders, especially in MMD. Groups did not differ in terms of illness duration; mean duration across groups was of approximately 5 years.

## **7.2 Results of hypothesis 1**

### **7.2.1. Descriptives**

80.6% (n=275) of the 341 participants that initially enrolled in the study completed experimental pre assessment. 71% of the experiments took place in Switzerland, 29% in Germany. 98.2% of all participants looked at the magazine during exposure in the waiting room. The 5 participants who did not go through the magazine were not excluded from analyses, since instruction of vivid imagination was flexibly adapted for this case. Participants in the CC reported higher vividness of imagination than in the EC. Table 2 shows the descriptives of those participants, who completed experimental manipulation and of which DERS data was available (n=273).

Table 2

*Sample characteristics of pre assessment completers by experimental condition (n=273)*

	EC (n=141)	CC (n=132)	<i>p</i>
Composition (%)			
AN	21.3	20.5	
BN	20.6	18.9	
MMD	22.0	22.7	
HC	36.2	37.9	
Implicit memory test ( <i>M,SD</i> ) (n=254)	.50 (.31)	.52 (.25)	.581
Vividness of imagination ( <i>M,SD</i> ) (n=269)	6.48 (2.08)	7.307 (1.76)	.001
DERS total score ( <i>M,SD</i> ) (n=273)	98.15 (32.87)	95.17 (29.62)	.434
Self-ideal discrepancy pre ( <i>M,SD</i> ) (n=273)	.92 (1.12)	.64 (1.17)	.052
Self-ideal discrepancy post ( <i>M,SD</i> ) (n=272)	1.15 (1.34)	.72 (1.15)	.005
Body image satisfaction pre ( <i>M,SD</i> ) (n=273)	58.42 (27.58)	61.40 (26.08)	.361
Body image satisfaction post ( <i>M,SD</i> ) (n=272)	53.00 (29.02)	62.29 (26.45)	.006
Symptoms of disordered eating pre ( <i>M,SD</i> ) (n=270)	22.29 (18.16)	21.56 (18.06)	.739
Symptoms of disordered eating post ( <i>M,SD</i> ) (n=268)	24.98 (19.82)	21.26 (17.70)	.107

*Notes.* EC=Experimental Condition, CC=Control Condition, AN=Anorexia Nervosa, BN=Bulimia Nervosa, MMD=Mixed Mental Disorders, HC=Healthy Controls, BMI= Body Mass Index, DERS=Difficulties in Emotion Regulation Scale, pre=before vivid imagination, post=after vivid imagination. According to distribution of data, study characteristics were compared using one-way ANOVA or Kruskal-Wallis test.

### 7.2.2. Effects of ERD on self-ideal discrepancy, body image satisfaction, and disordered eating across experimental conditions

The results indicate that there was no significant impact of vivid imagination on self-ideal discrepancy (figure 4) nor was a moderating effect of ERD revealed. Neither the three-way interaction between time, condition, and DERS ( $F(1,251)=4.540, p=.034/.095$ ), nor the interaction of time and condition ( $F(1,253)=4.067, p=.045/.095$ ) nor time by DERS ( $F(1,251)=1.851, p=.175/.175$ ) were significant after correcting for multiple testing.

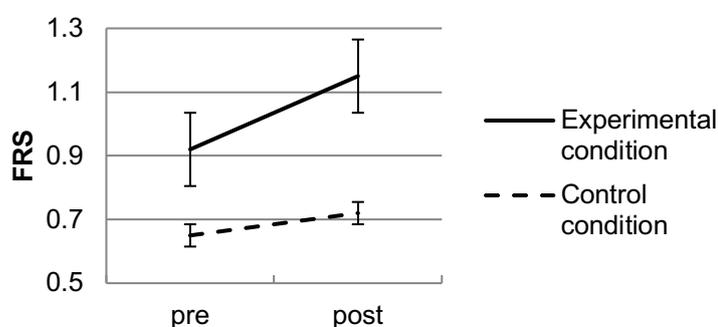


Figure 4. Changes in self-ideal discrepancy from pre to post vivid imagination including standard errors. FRS = Figure Rating Scale, pre = pre vivid imagination, post = post vivid imagination.

Regarding body image satisfaction, linear mixed models revealed a significant time x condition interaction ( $F(1,253)=37.819, p<.001/<.001$ )(figure 5). As expected, body image satisfaction decreased in the EC compared to the CC after vivid imagination. There was no significant time x DERS interaction ( $F(1,251)=3.217, p=.074/.095$ ) nor a significant three-way interaction of time x condition x DERS ( $F(1,251)=2.109, p=.148/.166$ ).

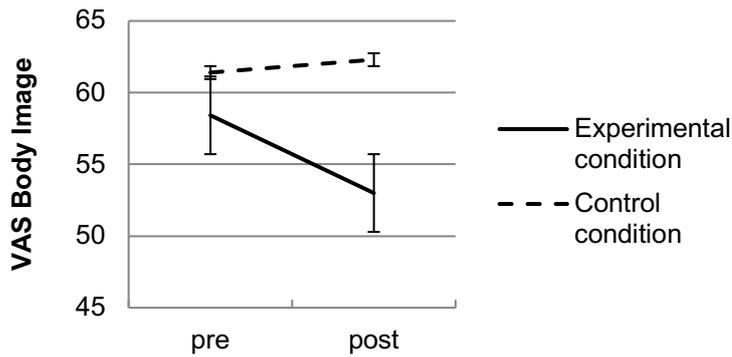


Figure 5. Changes in body image satisfaction from pre to post vivid imagination including standard errors. VAS = Visual Analog Scale, pre = pre vivid imagination, post = post vivid imagination.

Regarding disordered eating, there was a significant time x condition interaction ( $F(1,245)=12.987, p<.001/<.001$ )(figure 6), indicating an overall increase in the urge to engage in disordered eating behaviours in the EC and no change in the CC after vivid imagination. There was no significant time x DERS interaction ( $F(1,245)=3.759, p=.054/.095$ ). Furthermore, there was no significant three-way interaction of time x condition x DERS ( $F(1,245)=3.392, p=.067/=.095$ ).

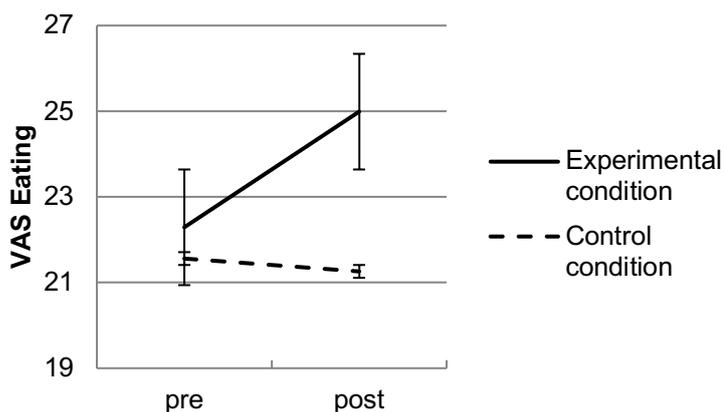


Figure 6. Changes in the urge to engage in disordered eating behaviours from pre to post vivid imagination including standard errors. VAS = Visual Analog Scale, pre = pre vivid imagination, post = post vivid imagination.

## 7.3 Results of hypothesis 2

### 7.3.1 Correlational analyses

All participants that completed experimental pre assessment, and of whom DERS data was available, were included in the analyses of hypothesis 2. The sample of  $n=273$  consisted of 37.0% HC, 40.7% EDs, and 22.3% MMD. Table 3 shows the results of correlational analyses examining the associations between ERD and ED symptomatology, as well as between potential covariates and outcomes.

Table 3

*Means (M), standard deviations (SD), and interrelations between DERS subscales and thin ideal internalization (SATAQ-G), body image dissatisfaction (BIS), cognitive and behavioural ED symptoms (EDE-Q), and covariates at pre assessment (n=273)*

	SATAQ-G	BIS	EDE-Q	EDE-Q behaviours	<i>M/SD</i>
DERS total score	.511***	.646***	.630***	.460***	96.71 (31.32)
DERS <sub>NONACCEPTANCE</sub>	.493***	.523***	.537***	.412***	15.86 (6.78)
DERS <sub>GOALS</sub>	.462***	.552***	.500***	.312***	14.90 (5.54)
DERS <sub>IMPULSE</sub>	.398***	.515***	.496***	.393***	14.05 (5.97)
DERS <sub>STRATEGIES</sub>	.492**	.583***	.568***	.380***	21.17 (9.17)
DERS <sub>AWARENESS</sub>	.199**	.409***	.430***	.368***	17.37 (5.43)
DERS <sub>CLARITY</sub>	.397***	.554***	.521***	.394***	13.34 (5.40)
SATAQ-G	---	.691***	.660***	.436***	52.12 (14.92)
BIS	---	---	.876***	.623***	2.83 (.97)
Age	.026	.093	.064	.048	22.90 (3.95)
BMI	-.081	.009	-.074	-.104	21.76 (4.48)
<i>M/SD</i>	52.12 (14.92)	2.83 (.97)	2.21 (1.84)	9.06 (17.41)	

Notes. \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

DERS total score was significantly positively associated with SATAQ-G, as were 5 of the DERS subscales with medium correlations ( $r_s > .397$ ,  $p_s < .001$ ). There was a significant association between the DERS subscale DERS<sub>AWARENESS</sub> and SATAQ-G with a small correlation ( $r = .199$ ,  $p < .01$ ). However, this association did not fulfill the criteria of  $r > .20$  and was therefore not retained for further analyses. Greater total ERD and ERD in all subscales were associated with higher levels of thin ideal internalization.

DERS total score was significantly positively associated with BIS, as were all of the DERS subscales with medium to high correlations ( $r_s > .409$ ,  $p_s < .001$ ). Greater total ERD and ERD in all subscales were associated with higher body image dissatisfaction.

DERS total score was significantly positively associated with EDE-Q, as were all of the DERS subscales with medium to high correlations ( $r_s > .430$ ,  $p_s < .001$ ). Greater total ERD and ERD in all subscales were associated with increased symptoms of disordered eating.

DERS total score was significantly positively associated with the frequency of compensatory episodes measured by the EDE-Q, as were all of the DERS subscales with medium correlations ( $r_hos > .312$ ,  $p_s < .001$ ). Higher total ERD and ERD in all subscales were associated with more frequent compensatory behaviours during the last 28 days.

There were no significant associations between the outcome variables and age nor BMI at alpha level .01. As expected, thin ideal internalization was significantly correlated with body image dissatisfaction. Body image dissatisfaction was significantly correlated with symptoms of disordered eating and frequency of compensatory behaviours.

### 7.3.2 Regression analyses

In order to test which subdimensions of ERD predict ED symptomatology, separate regression models were conducted for each outcome. In the case of hierarchical regression models, covariates that appeared to be significantly related with the outcome variable according to the preliminary correlational analyses were entered in the first block. Next, the DERS subscales that were significantly related to the outcomes were entered at once. Assumptions regarding linearity, independency of errors, and homoscedasticity were met for all regression models. Although several of the DERS subscales were highly correlated with each other ( $r > .70$ ), the collinearity statistics were all within accepted limits. Results were considered statistically significant at alpha .05 level.

The first multiple linear regression model examined the contribution of DERS subscales (except  $DERS_{\text{AWARENESS}}$ ) on thin ideal internalization. Due to non-significant correlations in previous analyses, no covariates were included in this model. The model including the 5 DERS subscales was significant ( $F_{(5,267)}=22.297$ ,  $p < .001$ ,  $R^2=.295$ ,  $R^2_{\text{Adjusted}}=.281$ ) and accounted for 29.5% of the variance in the SATAQ-G. Of the 5 DERS subscales scores included in the model, only the subscale  $DERS_{\text{NONACCEPTANCE}}$  was significantly uniquely associated with SATAQ-G total score ( $B=.610$ ,  $\beta=.277$ ,  $t=3.779$ ,  $p < .001$ ). As ERD increase by 1 point on the  $DERS_{\text{NONACCEPTANCE}}$  scale, thin ideal internalization increases by .610 points.

Regarding the examination of body image dissatisfaction, the first block of the model consisting of the SATAQ-G only was significant ( $F_{(1,271)}=247.298$ ,  $p < .001$ ), thin ideal internalization accounting for 47.7% of the variance in body

image dissatisfaction. Adding the 6 DERS dimensions in the second block accounted for an additional 12.9% of the variance in body image dissatisfaction ( $F_{\text{CHANGE}(6,265)}=14.521$ ,  $p<.001$ ). The overall model was significant ( $F_{(7,265)}=58.351$ ,  $p<.001$ ) and accounted for 60.7% of the variance in the BIS. In the full model, SATAQ-G significantly explained unique variance ( $p<.001$ ), as well as DERS<sub>AWARENESS</sub> ( $p=.001$ ) and DERS<sub>CLARITY</sub> ( $p=.045$ ). Regarding ERD, for every increase of one point on the DERS<sub>AWARENESS</sub> and DERS<sub>CLARITY</sub> scales, body image dissatisfaction increased by .028 and .023 points, respectively. The results of hierarchical regressions for body image dissatisfaction are presented in table 4.

Table 4

*Summary of hierarchical linear regression analysis, using thin ideal internalization (SATAQ-G) and DERS subscales to predict body image dissatisfaction (BIS) at pre assessment (n=273)*

	B	SE	$\beta$	t	R <sup>2</sup>	R <sup>2</sup> <sub>Adjusted</sub>
Step 1					.477***	.475***
SATAQ-G	.045	.003	.691	15.726***		
Step 2					.607***	.596***
SATAQ-G	.033	.003	.512	11.126***		
DERS <sub>NONACCEPTANCE</sub>	.002	.008	.014	.252		
DERS <sub>GOALS</sub>	.018	.013	.105	1.408		
DERS <sub>IMPULSE</sub>	.014	.010	.087	1.382		
DERS <sub>AWARENESS</sub>	.028	.009	.157	3.209**		
DERS <sub>STRATEGIES</sub>	.002	.009	.016	.184		
DERS <sub>CLARITY</sub>	.023	.011	.125	2.018*		

Notes. \* $p<.05$  \*\* $p<.01$  \*\*\* $p<.001$

The third regression model explored the contribution of 6 DERS subscales on symptoms of disordered eating, when controlling for body image dissatisfaction. The results of hierarchical regressions for ED symptomatology are presented in table 5.

Table 5

*Summary of hierarchical linear regression analysis, using body image dissatisfaction (BIS) and DERS subscales to predict ED symptoms (EDE-Q) at pre assessment (n=273)*

	B	SE	$\beta$	t	R <sup>2</sup>	R <sup>2</sup> <sub>Adjusted</sub>
Step 1					.768***	.767***
BIS	1.657	.055	.876	29.935***		
Step 2					.784**	.778**
BIS	1.530	.071	.809	21.534***		
DERS <sub>NONACCEPTANCE</sub>	.024	.011	.089	2.145*		
DERS <sub>GOALS</sub>	-.035	.018	-.105	-1.884		
DERS <sub>IMPULSE</sub>	.011	.014	.034	.732		
DERS <sub>AWARENESS</sub>	.027	.012	.079	2.179*		
DERS <sub>STRATEGIES</sub>	.020	.013	.100	1.566		
DERS <sub>CLARITY</sub>	-.018	.016	-.053	-1.150		

Notes. \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

In the first block of the model, body image dissatisfaction accounted for 76.8% of the variance in ED symptoms, ( $F_{(1,271)}=896.090$ ,  $p < .001$ ). Adding the 6 DERS dimensions in the second step accounted for an additional 1.6% of the variance in ED symptomatology, ( $F_{\text{CHANGE}(6,265)}=3.329$ ,  $p = .004$ ). The overall model was significant ( $F_{(7,265)}=137.468$ ,  $p < .001$ ) and accounted for 78.4% of the variance in the EDE-Q. Of the 6 DERS subscales scores included in the full model, DERS<sub>NONACCEPTANCE</sub> ( $p = .033$ ) and DERS<sub>AWARENESS</sub> ( $p = .030$ ) were

significant unique predictors of EDE-Q total score, alongside body image dissatisfaction ( $p<.001$ ). Regarding ERD, for every increase of one point on the  $DERS_{NONACCEPTANCE}$  or  $DERS_{AWARENESS}$  scales, symptoms of disordered eating increase by .024 and .027 points respectively.

The fourth model examined the contribution of 6 DERS subscales on the frequency of compensatory behaviours, controlling for body image dissatisfaction in a negative binomial generalized linear model. The overall model was significant  $\chi^2(7, N=273)=81.401, p<.001$ . Regarding the individual predictors, BIS (Wald  $\chi^2=44.466, p<.001$ ),  $DERS_{IMPULSE}$  (Wald  $\chi^2=5.249, p=.022$ ), and  $DERS_{AWARENESS}$  (Wald  $\chi^2=8.260, p=.004$ ) were significant predictors of the frequency of compensatory behaviours. For every one unit increase on  $DERS_{IMPULSE}$  or  $DERS_{AWARENESS}$ , the incidence rate ratio increases by 7.9% and 8.3%, respectively. Results are displayed in table 6.

Table 6

*Summary of regression analysis, using body image dissatisfaction (BIS) and DERS subscales to predict frequency of compensatory behaviours (EDE-Q) at pre assessment (n=273)*

	B	SE (B)	IRR	95%
BIS	1.196	.1793	3.305***	[2.326,4.697]
$DERS_{NONACCEPTANCE}$	.054	.0287	1.055	[.998,1.117]
$DERS_{GOALS}$	-.052	.0451	.949	[.869,1.037]
$DERS_{IMPULSE}$	.079	.0346	1.082*	[1.012,1.158]
$DERS_{AWARENESS}$	.083	.0289	1.087**	[1.027,1.150]
$DERS_{STRATEGIES}$	-.007	.0331	.993	[.931,1.060]
$DERS_{CLARITY}$	-.024	.0377	.976	[.906,1.051]

Notes. IRR= Incidence rate ratio. An IRR> 1 indicates that as the predictor variable increases, the IRR increases as well, whereas an IRR<1 indicates that as the predictor variable increases, the IRR decreases.

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

## **7.4 Results of hypothesis 3**

### **7.4.1 Descriptives**

#### ***7.4.1.1 Sample characteristics at post assessment***

Although hypothesis 3 is solely focusing on ED patients, post assessment data of the overall sample will be presented in this section for descriptive purposes. Data of 72.7% (n=248) of the 341 participants who initially enrolled in the study completed post assessment. No death was reported. None of the participants were pregnant at post assessment.

Regarding general psychopathology as measured by DERS, BDI, and BAI, patient groups did not differ from each other but had significantly higher levels than HC. Mean values were still above cut-offs at discharge. Regarding ED psychopathology, including SATAQ-G, BIS, and EDE-Q, EDs had higher levels than the other groups, but did not differ between AN and BN. Regarding the frequency of compensatory behaviours, there was no significant difference between AN and BN, unlike at pre assessment where BN had higher levels. AN had lowest mean BMI, MMD the highest. Overall, only few patients were fully remitted regardless of the disorder, and a majority of ED patients were still presenting full ED syndrome at discharge. Table 7 reports sample characteristics of the participants who completed post assessment and of whom DERS data was available. Remission status of somatoform disorders included in the MMD group are not reported due to small sample size (n=3).

Table 7

*Sample characteristics and comparisons by group at post assessment (n=248)*

	AN (n=52)	BN (n=47)	MMD (n=49)	HC (n=100)	<i>P</i>
BMI ( <i>M,SD</i> ) (n=244) Range	18.07 (1.50) 14.53-21.97	22.53 (2.74) 18.77-29.90	24.90 (6.64) 16.94-49.10	21.99 (2.55) 16.34-30.47	<.001
DERS total score ( <i>M,SD</i> ) (n=248) Range	105.73 (23.60) 55-155	106.15 (27.66) 59-161	105.98 (22.31) 53-157	66.08 (17.79) 36-114	<.001
BDI total score ( <i>M,SD</i> ) (n=248) Range	20.37 (12.24) 3-60	20.34 (12.43) 3-50	19.82 (11.40) 2-42	2.12 (2.92) 0-16	<.001
BAI total score ( <i>M,SD</i> ) (n=248) Range	14.83 (10.77) 1-49	16.21 (10.85) 0-41	17.27 (11.24) 0-44	3.36 (3.95) 0-20	<.001
SATAQ-G total score ( <i>M,SD</i> ) (n=248) Range	57.99 (14.38) 16-80	56.36 (17.61) 16-79	48.39 (17.71) 16-74	42.81 (11.77) 16-67	<.001
BIS total score ( <i>M,SD</i> ) (n=248) Range	3.41 (.67) 1.60-4.60	3.49 (.84) 1.60-4.87	2.66 (.88) 1.00-4.13	1.94 (.55) 1.00-3.40	<.001
EDE-Q total score ( <i>M,SD</i> ) (n=248) Range	3.22 (1.41) .61-5.74	3.38 (1.58) .17-5.96	1.53 (1.28) .00-4.74	.47 (.48) 0.00-2.00	<.001
EDE-Q behaviours ( <i>M,SD</i> ) (n=248) Range	16.77 (27.43) 0-112	21.81 (22.15) 0-87	.78 (2.90) 0-15	.17 (1.16) 0-10	<.001
Remission status (%)					
Full remission	0 (n=0)	4.3 (n=2)	D: 7.4 (n=2) A: 5.6 (n=1)	---	
Partial remission	5.9 (n=3)	19.1 (n=9)	D: 37.0(n=10) A: 50.0 (n=9)	---	
No remission	94.1 (n=48)	76.6 (n=36)	D: 55.6(n=15) A: 44.4 (n=8)	---	

*Notes.* AN=Anorexia Nervosa, BN=Bulimia Nervosa, MMD=Mixed Mental Disorders, HC=Healthy Controls, BMI=Body Mass Index, DERS=Difficulties in Emotion Regulation Scale, BDI=Beck Depression Inventory, BAI=Beck Anxiety Inventory, SATAQ-G=Sociocultural Attitudes Towards Appearance Questionnaires, BIS=Body Image Dissatisfaction, EDE-Q=Eating Disorder Examination Questionnaire, D=Depressive Disorders, A=Anxiety Disorders. According to distribution of data, study characteristics were compared using one-way ANOVA or Kruskal-Wallis test. For orientation purpose only, cut-off values to determine clinically relevant impairment in our study were: ERD: DERS total score>99 (Gratz & Roemer, 2004); mild depressive symptoms: BDI total score>14 (Beck et al., 1996); mild anxiety: BAI total score>8 (Margraf & Ehlers, 2007); symptoms of disordered eating: EDE-Q total score>2.50 (Fairburn & Beglin, 1994).

#### **7.4.1.2 Characteristics of ED patients at post assessment**

The ED sample at post assessment consisted of 52.5% AN and 47.5% BN. 48% had been treated as inpatients and 52% as outpatients. The AN sample consisted of 50.0% restricting type and 40.4% binge eating/purging type and in 9.6% information was either missing or status was in remission. According to diagnostic interview assessment, a minority of cases were diagnosed with moderate to extreme severity at discharge in both AN and BN. Amongst the most frequent comorbid diagnoses at discharge were depressive disorders (27.6%), anxiety disorders (26.5%), and to a lesser extent sleeping disorders, suspected diagnosis of BPD, somatoform disorders, and substance use disorders.

Regarding the questionnaires that were sent to each participant's therapist after treatment, 78.6% (n=77) were returned. Among the available answers, 94.7% of the therapists reported that therapy contained elements of CBT, 25.3% systemic components, 32.0% elements of dialectic behavioural therapy, 16.0% psychodynamic components, and 10.7% reported elements of acceptance commitment therapy. An additional psychopharmacological treatment was attributed in 37.8% cases (n=74). In 51.9% of the cases, one or more other disorders had been taken into account in treatment besides the primary ED diagnosis (n=77). The average duration of therapy was 13.31 (8.90) weeks (n=71). The average duration for inpatient treatment was 11.67 (8.22) and 17.50 (9.42) weeks for outpatient treatment.

Table 8 shows comparisons between pre and post assessment for the ED sample only. Significant improvement can be noted in all variables, except for the DERS<sub>IMPULSE</sub> and frequency of comorbid disorders ( $ps>.05$ ). Since DERS

data of 1 AN was missing, this participant was excluded from all upcoming analyses. 66.3% (n=65) of ED patients had improved in terms of ERD, 32.7% (n=32) showed an increase in ERD, and 1% (n=1) showed no change in the DERS total score.

Table 8

*Means, standard deviations and comparisons of predictor and outcome variables at pre and post assessment in ED patients (n=98)*

	Pre assessment	Post assessment	<i>P</i>
DERS total score	115.46 (23.94)	106.00 (25.60)	<.001
DERS <sub>NONACCEPTANCE</sub>	19.37 (6.02)	17.14 (6.07)	.001
DERS <sub>GOALS</sub>	17.43 (4.75)	15.37 (5.06)	<.001
DERS <sub>IMPULSE</sub>	16.89 (5.72)	15.75 (5.36)	.059
DERS <sub>STRATEGIES</sub>	25.54 (7.78)	23.17 (7.57)	.002
DERS <sub>AWARENESS</sub>	19.96 (4.93)	18.92 (4.86)	.038
DERS <sub>CLARITY</sub>	16.28 (5.01)	15.64 (5.14)	.048
EDE-Q total score	3.93 (1.25)	3.33 (1.49)	<.001
EDE-Q behaviours	21.68 (21.03)	19.33 (25.14)	.008
BMI	19.87 (3.52)	20.19 (3.13)	.018
SATAQ-G total score	60.39 (13.04)	57.26 (16.01)	.019
BIS total score	3.62 (.64)	3.45 (.75)	.002
BDI total score	25.93 (11.54)	20.31 (12.32)	<.001
BAI total score	19.90 (9.88)	15.54 (10.82)	<.001
Frequency of comorbid disorders	.88 (1.11)	.82 (1.11)	.523

*Notes.* AN=Anorexia Nervosa, BN=Bulimia Nervosa, MMD=Mixed Mental Disorders, HC=Healthy Controls, DERS=Difficulties in Emotion Regulation Scale, EDE-Q=Eating Disorder Examination Questionnaire, BMI= Body Mass Index, SATAQ-G=Sociocultural Attitudes Towards Appearance Questionnaires, BIS=Body Image Dissatisfaction, BDI=Beck Depression Inventory, BAI=Beck Anxiety Inventory. According to distribution of data, pre and post assessment values were compared using dependent t-tests for paired samples or Wilcoxon Z tests.

#### **7.4.2 Correlational analyses**

In a series of correlational analyses, the association between dimensions of ERD and several markers of treatment outcome were examined. The aim was to determine which predictors are statistically related to which particular outcome among remission status at post assessment, change in thin ideal internalization ( $\Delta$ SATAQ-G), body image dissatisfaction ( $\Delta$ BIS), cognitive and behavioural disordered eating symptomatology ( $\Delta$ EDE-Q),  $\Delta$ frequency of comorbid disorders as well as depressive symptoms ( $\Delta$ BDI), and anxiety symptoms ( $\Delta$ BAI). All variables are expressed in change scores between pre and post assessment, except for dichotomous remission status.

Results of point biserial, Pearson, and Spearman correlations are displayed in table 9.

Table 9

Means (*M*), standard deviations (*SD*), and interrelations between change in DERS subscales and markers of remission in ED patients (*n*=98)

	Remission status	Δ SATAQ- G	Δ BIS	Δ EDE- Q	Δ EDE-Q behaviours	Δ comorbid disorders	Δ BDI	Δ BAI	<i>M/SD</i>
Δ DERS total score	-.196	.408***	.461***	.313**	.119	.196	.412***	.404***	-9.46 (22.95)
Δ DERS NONACCEPTANCE	-.231*	.286**	.299**	.192	.220*	.125	.110	.160	-2.22 (6.03)
Δ DERS GOALS	-.135	.269**	.364***	.244*	.073	.170	.373***	.379***	-2.06 (5.20)
Δ DERS IMPULSE	-.069	.166	.204*	.194	.065	.062	.328**	.342**	-1.13 (5.63)
Δ DERS STRATEGIES	-.145	.351***	.378***	.262**	-.012	.023	.328**	.337**	-2.37 (7.24)
Δ DERS AWARENESS	-.163	.366***	.371***	.314**	.126	.236*	.346***	.191	-1.04 (4.90)
Δ DERS CLARITY	-.044	.236*	.293**	.056	-.117	.124	.230*	.250*	-.63 (4.10)
<i>M/SD</i>		-2.44 (9.84)	-.21 (.59)	-.62 (1.08)	-2.36 (21.11)	-.06 (1.05)	-5.62 (10.26)	-4.36 (10.05)	

Notes. Δ=change score pre to post assessment, SATAQ-G=Sociocultural Attitudes Towards Appearance Questionnaires, BIS=Body Image Dissatisfaction, EDE-Q=Eating Disorder Examination Questionnaire, BMI= Body Mass Index, BDI=Beck Depression Inventory, BAI=Beck Anxiety Inventory, DERS=Difficulties in Emotion Regulation Scale.

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

Change in DERS total score was significantly positively associated with change in SATAQ-G, as were the change scores of the DERS subscales DERS<sub>GOALS</sub>, DERS<sub>NONACCEPTANCE</sub>, DERS<sub>AWARENESS</sub>, and DERS<sub>STRATEGIES</sub> with small to medium correlations ( $r > .269$ ,  $p < .01$ ). Decrease in total ERD and ERD on the aforementioned subscales was associated with positive change in thin ideal internalization. Change in the DERS subscale DERS<sub>CLARITY</sub> was positively associated with change in SATAQ-G ( $r = .236$ ,  $p = .021$ ), however, not

at a significance level of  $p < .01$ . Change in the subscale  $DERS_{IMPULSE}$  was not significantly associated with change in SATAQ-G ( $p > .05$ ).

Change in DERS total score was significantly positively associated with change in BIS. In line, change in all DERS subscales ( $r_s > .293$ ,  $p_s < .01$ ), with the exception of  $DERS_{IMPULSE}$ , were significantly associated with change in BIS with small to medium correlations. Decrease in total ERD and ERD on the aforementioned subscales was associated with positive change in body image dissatisfaction. Change in the DERS subscale  $DERS_{IMPULSE}$  was positively associated with change in BIS ( $r = .204$ ,  $p = .045$ ), however not at significance level of  $p < .01$ .

Change in DERS total score was significantly positively associated with change in EDE-Q total score, as were the change scores of the DERS subscales  $DERS_{AWARENESS}$  and  $DERS_{STRATEGIES}$  with small to medium correlations ( $r_s > .262$ ,  $p_s < .01$ ). Decrease in total ERD and ERD on the aforementioned subscales with treatment was associated with positive change in ED symptomatology. Change in the DERS subscales  $DERS_{GOALS}$  was positively associated with change in ED symptomatology ( $r = .244$ ,  $p = .015$ ), however not at a significance level of  $p < .01$ . There was no significant association between the other subscales and ED symptomatology (all  $p_s > .05$ ).

Change in DERS total score was significantly positively associated with change in BDI. Change in all DERS subscales ( $r_s > .328$ ,  $p_s < .01$ ), with the exception of  $DERS_{NONACCEPTANCE}$  and  $DERS_{CLARITY}$ , was significantly associated with change in BDI with medium correlations. Decrease in total ERD and ERD on the aforementioned subscales was associated with positive

change in depressive symptoms. Change in the DERS subscale DERS<sub>CLARITY</sub> was positively associated with change in BDI ( $r=.230$ ,  $p=.023$ ), however this correlation did not fulfill the criteria of  $p<.01$ .

Change in DERS total score was significantly positively associated with change in BAI. Change in DERS subscales DERS<sub>GOALS</sub>, DERS<sub>IMPULSE</sub>, and DERS<sub>STRATEGIES</sub> was significantly associated with change in BAI ( $r_s>.337$ ,  $p_s<.01$ ). Decrease in total ERD and ERD on the aforementioned subscales was associated with positive change in anxiety symptomatology. Change in the DERS subscale DERS<sub>CLARITY</sub> was positively associated with change in BAI ( $r=.250$ ,  $p=.013$ ), however this correlation did not fulfill the criteria of  $p<.01$ .

Correlations between DERS total score and subscales and remission status at post assessment, change in frequency of compensatory behaviours, and change in frequency of psychiatric comorbidity were non-significant (all  $p_s>.01$ ).

Furthermore, the associations between potential covariates and the outcome variables significantly associated with ERD were examined. The type of treatment, age, and change in BMI altogether failed to be significantly related to changes in thin ideal internalization, body image dissatisfaction, disordered eating symptoms, and depression and anxiety (all  $p_s>.01$ ). Change in thin ideal internalization was significantly associated with change in body image dissatisfaction ( $r=.467$ ,  $p<.001$ ) and change in body image dissatisfaction with change in ED symptomatology ( $r=.627$ ,  $p<.001$ ). Change in thin ideal internalization and change in body image dissatisfaction will therefore be

included as covariates in the corresponding regression models in the next step.

### **7.4.3 Regression analyses**

Regression analyses were conducted to further examine the association between change in ERD and several markers of treatment outcome. Remission status, change in frequency of compensatory behaviours, and frequency of psychiatric comorbidity failed to be significantly associated with any domain of ERD, and therefore will not be further analysed. In contrast, change in ERD was associated with change in thin ideal internalization, change in body image dissatisfaction, change in disordered eating symptoms, as well as change in depressive and anxiety symptoms. For each of these outcome variables, a separate regression model was built, including DERS subscales according to previous correlational analyses and significantly related covariates. Assumptions regarding linearity, independency of errors, and homoscedasticity were met for all regression models. Although several of the DERS subscales were highly correlated with each other ( $r > .70$ ), the collinearity statistics were all within accepted limits and no problems with multicollinearity were identified. Results were considered statistically significant at .05 level.

The multiple linear regression model for the outcome variable change in thin ideal internalization including the 4 DERS subscales  $\Delta\text{DERS}_{\text{GOALS}}$ ,  $\Delta\text{DERS}_{\text{NONACCEPTANCE}}$ ,  $\Delta\text{DERS}_{\text{AWARENESS}}$ , and  $\Delta\text{DERS}_{\text{STRATEGIES}}$  was significant ( $F_{(4,91)}=6.965$ ,  $p < .001$ ), accounting for 23.4% of the variance. Change in  $\text{DERS}_{\text{AWARENESS}}$  was significantly uniquely associated with change in SATAQ-G total score ( $p = .002$ ).

The examination of the association between changes in ERD and body image dissatisfaction included a first block in the hierarchical linear regression model with change in thin ideal internalization as covariate. The first block was significant ( $F_{(1,93)}=25.968$ ,  $p<.001$ ), change in thin ideal internalization accounting for 21.8% of the variance in change in body image dissatisfaction. Adding the five DERS subscales  $\Delta\text{DERS}_{\text{GOALS}}$ ,  $\Delta\text{DERS}_{\text{NONACCEPTANCE}}$ ,  $\Delta\text{DERS}_{\text{AWARENESS}}$ ,  $\Delta\text{DERS}_{\text{STRATEGIES}}$ , and  $\Delta\text{DERS}_{\text{CLARITY}}$  in the second block, accounted for an additional 14.7% of the variance ( $F_{\text{CHANGE}(5,88)}=4.060$ ,  $p=.002$ ). The overall model was significant ( $F_{(6,88)}=8.423$ ,  $p<.001$ ) and accounted for 36.5% of the variance in BIS change. Change in SATAQ-G was significantly uniquely associated with change in body image dissatisfaction ( $p=.005$ ), as well as with change in  $\text{DERS}_{\text{GOALS}}$  ( $p=.047$ ) and change in  $\text{DERS}_{\text{AWARENESS}}$  ( $p=.012$ ). None of the other DERS subscales uniquely contributed to the variance in body image dissatisfaction ( $p>.05$ ).

The hierarchical linear regression model examining the association between changes in ERD subdimensions and symptoms of disordered eating included a first block with change in body image dissatisfaction. The first block was significant ( $F_{(1,95)}=61.547$ ,  $p<.001$ ), change in body image dissatisfaction accounted for 39.3% of the variance. Adding the two DERS subscales  $\Delta\text{DERS}_{\text{AWARENESS}}$  and  $\Delta\text{DERS}_{\text{STRATEGIES}}$  in the second block, accounted for an additional 1.0% of the variance, however, this contribution was not significant ( $F_{\text{CHANGE}(2,93)}=.789$ ,  $p=.457$ ). The overall model was significant ( $F_{(3,93)}=20.951$ ,  $p<.001$ ) and accounted for 40.3% of the variance in EDE-Q change. Change in body image dissatisfaction was significantly uniquely associated with

change in ED symptomatology ( $p < .001$ ). None of the DERS subscales were uniquely associated with the outcome ( $p > .05$ ).

The multiple linear regression model for the outcome variable change in depressive symptoms including the four DERS subscales  $\Delta\text{DERS}_{\text{GOALS}}$ ,  $\Delta\text{DERS}_{\text{IMPULSE}}$ ,  $\Delta\text{DERS}_{\text{AWARENESS}}$ , and  $\Delta\text{DERS}_{\text{STRATEGIES}}$  was significant ( $F_{(4,93)} = 8.007$ ,  $p < .001$ ) and accounted for 25.6% of the variance. Change in  $\text{DERS}_{\text{AWARENESS}}$  was significantly uniquely associated with change in BDI total score ( $p = .001$ ), and so was  $\text{DERS}_{\text{GOALS}}$  ( $p = .029$ ).

The multiple linear regression model for the outcome variable change in anxiety symptoms including the 3 DERS subscales  $\Delta\text{DERS}_{\text{GOALS}}$ ,  $\Delta\text{DERS}_{\text{IMPULSE}}$ , and  $\Delta\text{DERS}_{\text{STRATEGIES}}$  was significant ( $F_{(3,94)} = 6.100$ ,  $p = .001$ ) and accounted for 16.3% of the variance. None of the DERS subscales were significantly uniquely associated with change in BAI ( $p > .05$ ).

Results are displayed in table 10.

Table 10

Summary of linear regression analyses, using change scores of thin ideal internalization ( $\Delta$ SATAQ-G), body image dissatisfaction ( $\Delta$ BIS) and DERS subscales ( $\Delta$ DERS) to predict change in thin ideal internalization ( $\Delta$ SATAQ-G), body image dissatisfaction ( $\Delta$ BIS), ED symptoms ( $\Delta$ EDE-Q), and depressive ( $\Delta$ BDI) and anxiety symptoms ( $\Delta$ BAI) in ED patients ( $n=98$ )

	B	SE	$\beta$	t	R <sup>2</sup>	R <sup>2</sup> Adjusted
<b>Thin ideal internalization</b>					.234***	.201***
$\Delta$ DERS GOALS	.075	.279	.038	.267		
$\Delta$ DERS NONACCEPTANCE	.266	.169	.159	1.575		
$\Delta$ DERS AWARENESS	.597	.190	.299	3.143**		
$\Delta$ DERS STRATEGIES	.274	.199	.198	1.379		
<b>Body image dissatisfaction</b>						
<b>Step 1</b>					.218***	.210***
$\Delta$ SATAQ-G	.027	.005	.467	5.096***		
<b>Step 2</b>					.365***	.321***
$\Delta$ SATAQ-G	.016	.006	.282	2.878**		
$\Delta$ DERS NONACCEPTANCE	.003	.009	.036	.373		
$\Delta$ DERS GOALS	.030	.015	.265	2.016*		
$\Delta$ DERS AWARENESS	.029	.011	.248	2.566*		
$\Delta$ DERS STRATEGIES	-.004	.011	-.047	-.328		
$\Delta$ DERS CLARITY	.016	.014	.112	1.085		
<b>Disordered Eating Symptoms</b>						
<b>Step 1</b>					.393***	.387***
$\Delta$ BIS	1.124	.143	.627	7.845***		
<b>Step 2</b>					.403***	.384***
$\Delta$ BIS	1.039	.164	.580	6.330***		
$\Delta$ DERS AWARENESS	.023	.019	.104	1.207		
$\Delta$ DERS STRATEGIES	.003	.013	.023	.267		

<b>Depressive symptoms</b>					.256***	.224***
Δ DERS GOALS	.640	.290	.324	2.211*		
Δ DERS IMPULSE	.231	.218	.127	1.058		
Δ DERS AWARENESS	.688	.193	.329	3.557**		
Δ DERS STRATEGIES	-.088	.209	-.062	-.421		
<b>Anxiety symptoms</b>					.163**	.136**
Δ DERS GOALS	.447	.296	.231	1.511		
Δ DERS IMPULSE	.281	.226	.158	1.246		
Δ DERS STRATEGIES	.089	.211	.064	.420		

Notes. \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

## **8. Discussion**

### **8.1 Main findings**

The main objective of this thesis was to explore the association between ERD, assessed by the DERS (Gratz & Roemer, 2004), and multiple ED features, by the means of three different research designs in a heterogeneous sample of young women with and without mental disorders. The first hypothesis, which stated that the impact of an experimentally manipulated thin ideal exposure on ED features would be moderated by ERD, could not be confirmed. Thin ideal exposure did result in a decrease in body image satisfaction and increase in the urge to engage in disordered eating, but neither relationship was moderated by ERD. The second hypothesis aimed at exploring the specificity of association between certain subdimensions of ERD and features of EDs using cross-sectional questionnaire assessment in a heterogeneous sample. Subdimensions of ERD indeed correlated with thin ideal internalization, body image dissatisfaction, as well as cognitive and behavioural symptoms of disordered eating. Subsequent regression analyses revealed that the subscales  $DERS_{\text{AWARENESS}}$ ,  $DERS_{\text{NONACCEPTANCE}}$ , and  $DERS_{\text{CLARITY}}$  significantly predicted some of the outcomes, whereas  $DERS_{\text{IMPULSE}}$  was related to disordered eating cognitions and behaviours. The third hypothesis focused on the association between change in specific subdimensions of ERD and change in ED symptomatology in ED patients in a longitudinal design. First, results indicate that change in ERD correlated with change in some but not all intended markers of ED treatment outcome. Second, associations between subdimensions of ERD and outcomes appeared to be more restricted than in the previous cross-sectional analyses.

Two dimensions of ERD, namely  $DERS_{AWARENESS}$  and  $DERS_{GOALS}$ , stood out as unique predictors of symptom change in thin ideal internalization, body image dissatisfaction, and depressive symptoms.

In sum, the association between ERD and ED symptoms could be confirmed in cross-sectional and longitudinal data, but not in experimental data. Difficulties with being aware of one's emotions ( $DERS_{AWARENESS}$ ) were linked to most ED features in a heterogeneous sample. Improvement in this dimension was associated with an improvement in symptomatology following ED treatment.

## **8.2 Discussion of the results**

Regarding the first hypothesis, no significant impact of ERD on the relationship between thin ideal exposure and ED features could be revealed. The assumption, however, that thin ideal exposure would have negative consequences was verified for body image satisfaction and disordered eating behaviours. As expected, vivid imagination of landscapes in the CC had no significant impact on the outcome variables. Results corroborate previous findings about the impact of vivid imagination (Loeber et al., 2016; Wyssen, Coelho, et al., 2016). These are in line with general findings on the association between thin ideal aspiration in young women and body image dissatisfaction, as well as ED symptoms (Grabe et al., 2008; Harrison & Cantor, 1997; Hausenblas et al., 2013; López-Guimerà et al., 2010; Tiggemann et al., 2009). Nevertheless, caution is warranted when interpreting the results regarding body image satisfaction in our study and comparing them to other studies that have used assessment of body image dissatisfaction. Evidence that lower satisfaction equals higher dissatisfaction

with one's body, and that they involve the same processes, is lacking (Ahern et al., 2011). However, our approach implies that both concepts are on a continuum rather than being distinct. Future studies should reveal how these concepts are related.

Previous studies have mainly focused on the effects of thin ideal exposure on body image dissatisfaction, rather than on ED symptoms (Ferguson, 2013). Nonetheless, it is assumed that regarding disordered eating, cognitive components of disordered eating are more susceptible to the influence of thin ideal exposure, and thus to aversive emotion elicitation, than disordered eating behaviours are (Grabe et al., 2008; Wildes et al., 2012). One would expect thin ideal exposure to primarily trigger dysfunctional behaviour, since in theory, disordered eating behaviours are said to provide relief from negative affect in the short run (Haynos & Fruzzetti, 2011). This apparent contradiction has been explained previously by the overall difficulty to capture objective ED behaviours in a laboratory setting, not least because of the limited duration between exposure and assessment, which may not allow maladaptive behaviours to actually manifest (Hawkins et al., 2004). In our study, the urge to engage in disordered eating behaviours significantly increased following vivid imagination. Hence, our results emphasize the utility of behaviour related assessment of disordered eating using a visual analog scale. However, it is not possible to disentangle whether the increase in the urge to engage in disordered eating behaviours is directly triggered by thin ideal exposure or rather a side effect of the increase in body dissatisfaction or even of the decrease in mood previously found in Humbel et al. (2018). It can only be

speculated that thin ideal exposure exerts individual influences, since body image dissatisfaction may not systematically lead to disordered eating.

Notably, self-ideal discrepancy was the only outcome that did not reach a statistically significant increase after exposure in this study. The association between thin ideal exposure and self-ideal discrepancy ratings had, however, been previously shown in HC aged 18 to 60 (Petersen, 2005). Petersen (2005) used pictures of thin models in advertisement. These findings could indicate that discrepancies between the self and the ideal are triggered by mere picture exposure, but not necessarily by vivid imagination. Another explanation could be that, since participants were instructed to imagine themselves “being” the ideal body, the identification with the ideal may have inhibited upward social comparison processes, which are usually held responsible for the gap between the ideal and the self (Bissell & Rask, 2010; Grogan, 2007; Holmstrom, 2004). Also, EDs, and more particularly AN, may be more exclusively linked to self-ideal discrepancies than other individuals. In fact, the ideal weight AN are thriving for is thinner than the ideal of HC (Mölbart et al., 2018), and also thinner than the ideal of other EDs (Mizes, Heffner, Madison, & Varnado-Sullivan, 2004). Nevertheless, AN tend to overestimate their size (Hawkins et al., 2004; Mohr et al., 2011), but so do women in general (Rodin et al., 1984).

One other possible explanation for the lack of impact of exposure on self-ideal discrepancy relates to the stability of the concept. Self-ideal discrepancy may be less prone to fluctuation, and therefore less sensitive to brief thin ideal exposure compared to body image satisfaction or disordered eating behaviours. In fact, self-ideal discrepancy is considered a normative

phenomenon from early age on (Rodin et al., 1984), and young women constantly display elevated levels of discrepancy (Bissell & Rask, 2010). Further, the properties of the figure rating scale may not be as adequate as the visual analog scales used to assess body image dissatisfaction and ED symptoms, which were specifically developed to capture momentary change. The use of figure rating scales has been overtly criticized, mainly because they focus solely on perceptual aspects and on body size rather than considering individual features of appearance (Halliwell & Dittmar, 2006). Self-discrepancy is a multifaceted concept (Thompson, 2004), encompassing also self-self and self-ought discrepancy, which should be further examined in the context of thin ideal laboratory exposure.

This thesis introduced ERD as factor of influence, in order to contribute to answering the question why some, but by far not all women are negatively influenced by thin ideal exposure (Grabe et al., 2008; Polivy & Herman, 2004). However, three-way interactions including ERD as moderator failed to reach statistical significance, suggesting that the impact of imminent thin ideal exposure on ED features does not directly depend on the level of ERD. Up to this study, the moderating role of ERD had not been explored in-lab. Our results can therefore not be compared with previous findings. The ranges in our study corroborate the assumption that symptoms of body- or eating related concerns are also spread among HC (Berg, Frazier, & Sherr, 2009). Women with or without EDs are supposedly equally negatively affected by the thin ideal (Loeber et al., 2016), as the negative impact of thin ideal exposure is observable as well in non-clinical participants (Hawkins et al., 2004; Tuschen-Caffier, Vögele, Bracht, & Hilbert, 2003). HC displayed ERD levels

within normal range compared to EDs who showed serious impairments in ER. This information points to the conclusion that the impact of momentary thin ideal exposure on ED features occurs in individuals with both high and low ERD. Since ERD moderated the impact of thin ideal exposure on mood (Humbel et al., 2018), influences on body image dissatisfaction or disordered eating may be rather indirectly dependent on ERD and may be more directly relatable to affective states for instance.

One other explanation is that the DERS is not an adequate assessment tool in the context of imminent reactivity to aversive stimuli. Although the DERS total score has repeatedly proven to be a reliable holistic marker of ERD (Bardeen et al., 2016), a state version of the DERS has been developed more recently to capture repeated assessments over brief intervals rather than more trait-like tendencies to act (Lavender, Tull, DiLillo, Messman-Moore, & Gratz, 2017). General ERD may not be inherently congruent with the different facets of the ability to cope with aversive emotion in a specific situation. The present investigation was preliminary, which is also the reason why DERS subscales were not considered, despite possible associations between more selective difficulties with ERD and ED features following thin ideal exposure.

It could also be the case that the subjectively perceived emotional character of the imagination of the thin ideal conditioned the implication of ERD. It is interesting to note that vivid imagination in the EC was significantly less vivid compared to the CC, which may explain the relatively modest impact of thin ideal exposure. It had been shown previously that vividness of imagination is higher in pictures of prominent negative or positive valence compared to neutral pictures (Bywaters, Andrade, & Turpin, 2004). This would imply that

the imagination of landscapes was pleasurable rather than neutral in our study, and/or that thin ideal pictures were neither perceived as highly pleasant nor unpleasant. This is in line with the assumption that normative pictures of the thin ideal fail to trigger responses (Holmstrom, 2004). Conversely, it could also be that beautiful landscapes are easier to imagine than emotionally aversive and challenging pictures of the thin ideal. Further, a certain response-bias could have accounted for the lower reported vividness in the EC, as participants may feel inhibited to report how vivid their perception of the thin ideal is and how much they are influenced by such pictures.

To conclude, the most notable finding of the present analysis is that effects of media exposure were revealed in a sample including both women at risk of developing an ED and women who already have a diagnosis of an ED. Young women appear to be similarly vulnerable to momentary thin ideal exposure (Thomsen et al., 2001). This is irrespective of psychopathology and despite daily exposure to mass media. In order to verify this assumption, repeated exposure to the thin ideal needs to be examined. White et al. (2016) showed that the kind of disordered eating behaviour triggered by media exposure (bingeing vs restrictive behaviour) differed between momentary and daily assessment in AN. It would be interesting to explore more in depth how repeated exposure and momentary exposure relate and whether ERD are associated with daily exposure rather than laboratory exposure. Also, the use of virtual reality to simulate thin ideal exposure could add knowledge on reactivity to thin ideals in daily situations, and would inform about the ability to cope with emotionally aversive situations beyond trait or state assessment of ERD.

The second set of analyses revealed significant unique predictive value of certain DERS subscales on thin ideal internalization, body image dissatisfaction, and both cognitive and behavioural symptoms of disordered eating. So far, in the literature, findings have been rather heterogeneous across studies, in both ED patients and non-clinicals. In our study, difficulties with attending to and acknowledging one's emotions (DERS<sub>AWARENESS</sub>) significantly predicted both disordered eating cognitions and behaviours. This finding is in line with previous results in EDs (Monell et al., 2018; Pisetsky et al., 2017; Racine & Wildes, 2013), underpinning the general assumption that ED patients lack of emotional awareness, and that emotional awareness is also encountered in non-clinicals to a lesser extent (Cooper et al., 2014). According to Heatherton and Baumeister (1991), ED patients typically shift their focus away from emotional awareness, to avoid aversive emotional experiences, towards increased maladaptive self-awareness. Self-awareness may then focus on body-related concerns and ultimately lead to disordered eating.

Evidence on the association between the tendency to experience negative emotions in response to one's own emotional reactions (DERS<sub>NONACCEPTANCE</sub>) and disordered eating (in our case disordered eating cognitions) had also been revealed in for instance Monell et al. (2018), but not Lavender et al. (2014). However, identifying which emotion is primarily felt is a primordial prerequisite to successful regulation. As noted by Werner and Gross (2010), successful regulation implicates that we know what we are seeking to control. In addition, difficulties with remaining in control of behaviour when experiencing negative emotions (DERS<sub>IMPULSE</sub>) was a significant unique

predictor of ED behaviours. This is in agreement with previous findings in ED patients (Monell et al., 2018; Pisetsky et al., 2017; Racine & Wildes, 2013; Weinbach, Sher, & Bohon, 2017), as well as non-clinicals (Cooper et al., 2014; Haynos et al., 2018).

The focus on ER strategies rather than on other dimensions of ERD is striking in the literature. Our results could not confirm the importance commonly attributed to ER strategies ( $DERS_{STRATEGIES}$ ) in disordered eating (Monell et al., 2018; Pisetsky et al., 2017; Weinbach et al., 2017; Whiteside et al., 2007). For the most part, the use of ER strategies has been examined in HC only (Sloan et al., 2017). Contradictory findings are nonetheless surprising, since effects were revealed by the aforementioned authors in both ED patients and HC, when using the same instrument to assess disordered eating as we did. It is important to specify that  $DERS_{STRATEGIES}$  does not refer to the actual use of dysfunctional strategies to handle aversive emotions, but rather to the belief in the own capacity to recur to adequate strategies when needed. Confusions about the two concepts may lead to premature conclusions about the actual use of dysfunctional ER strategies.

One of the most notable finding is, that our results extended the attributed importance of accepting, understanding, and acknowledging one's emotion to body-related features of EDs beyond disordered eating cognitions or behaviours. The tendency to experience negative emotions in response to one's own emotional reactions ( $DERS_{NONACCEPTANCE}$ ) was a significant predictor of thin ideal internalization, whereas difficulties with attending to and acknowledging one's emotions ( $DERS_{AWARENESS}$ ) significantly predicted body image dissatisfaction. Findings regarding the direct association between ERD

subdimensions and thin ideal internalization are virtually nonexistent and findings regarding body image dissatisfaction are inconsistent, although an association with general ERD is assumed for the latter (Borjali et al., 2015). One study by Wolz et al. (2015) showed a lack of association between body image dissatisfaction and emotional awareness, in contrast to our findings. However, in the aforementioned study, body image dissatisfaction was included in the assessment of ED psychopathology severity, rather than being a marker on its own.  $DER_{CLARITY}$  was another significant predictor of body image dissatisfaction. Vine and Aldao (2014) had previously associated  $DER_{CLARITY}$  with symptoms of psychopathology such as depression, anxiety, or binge eating in undergraduate students. It has been suggested by Weinbach et al. (2017) that emotional clarity is linked more strongly to specific ED behaviours present in AN, which could explain the lack of significant association with other features of disordered eating.

Furthermore, thin ideal internalization significantly predicted body image dissatisfaction, which in turn was a predictor of disordered eating. In the latter case, body image dissatisfaction was chosen as covariate over thin ideal internalization, in order to avoid conceptual and statistical overlap by choosing two related predictors. Body image dissatisfaction, in combination with lack of emotional awareness, had been identified previously as predictor of disordered eating (Sim & Zeman, 2006). Regarding the amount of variance explained by ERD, it seems that ERD are more strongly related to thin ideal internalization or body image dissatisfaction than actual disordered eating, or in other words, that other factors than ERD have a more important influence on disordered eating symptoms. Overall, findings regarding the strengths of

associations are inconsistent in the literature. In our case, it is questionable whether stronger relationships would have been observed in a homogenous ED sample. Strikingly, similar amounts of variance explained by the DERS across outcome variables had been reported by Lavender and Anderson (2010), but in a male sample. Results hint at a gender non-specific sociocultural pathway leading to EDs.

In sum, results indicate that impairments in the evaluative component of emotional experience, assessed by  $DERS_{\text{AWARENESS}}$ ,  $DERS_{\text{NONACCEPTANCE}}$ , and  $DERS_{\text{CLARITY}}$ , seem to be implicated in thin ideal internalization, body image dissatisfaction, and disordered eating, whereas difficulties with taking action on aversive emotion, measured with  $DERS_{\text{IMPULSE}}$ , are more specifically related to disordered eating behaviours.

Finally, longitudinal data revealed that changes in ERD between pre assessment and discharge from treatment were positively related to changes in thin ideal internalization, body image dissatisfaction, cognitive and behavioural symptoms of disordered eating, depressive symptoms, and anxiety symptoms, but not to remission status, nor to changes in the frequency of compensatory episodes or frequency of psychiatric comorbidity. First of all, results are in line with the assumption that ERD are reversible (Harrison, Tchanturia, & Treasure, 2010) and associated with treatment outcome in EDs (Mallorquí-Bagué et al., 2018). ERD decreased between pre assessment and discharge in 2/3 of the cases in our study, despite treatment not directly targeting ER. Similar results had been reported previously (Sloan et al., 2017). Further, changes in difficulties with attending to and

acknowledging one's emotions ( $\Delta\text{DERS}_{\text{AWARENESS}}$ ) significantly predicted changes in thin ideal internalization, body image dissatisfaction, and depressive disorders, whereas difficulties concentrating and accomplishing tasks when experiencing negative emotions ( $\Delta\text{DERS}_{\text{GOALS}}$ ) predicted changes in body image dissatisfaction and depressive symptoms. None of the DERS subscales were unique significant predictors of disordered eating nor anxiety symptoms.

First of all, difficulties with attending to and acknowledging one's emotions ( $\Delta\text{DERS}_{\text{AWARENESS}}$ ) was positively associated with selective markers of treatment outcome. Emotional awareness may play a more important role in symptom change than other subdimensions of ERD, and could even be a necessary condition for improvement in symptomatology. In fact, emotional awareness signifies that emotional experience is allowed and endured. In contrast, individuals with lacking emotional awareness tend to immediately resort to dysfunctional behavioural avoidant reactions, when emotions rise (Werner & Gross, 2010). However, it could also be that changes in this particular ERD subdimension are faster to act and effects were therefore detectable at post assessment, in contrast to the effects of other subdimensions, which may be slower to manifest. A study on patients suffering from alcohol abuse showed that emotional awareness and clarity improved early in abstinence, whereas difficulties with impulse control did not improve until discharge (Fox, Hong, & Sinha, 2008). Either way, results point at a specific role of acknowledging one's emotions in the remission process, although these difficulties were not directly associated with disordered eating. Correlational data in the previous set of analyses (see hypothesis 2) had

already revealed a relatively weak impact of ERD on disordered eating. Since the third hypothesis is ED-specific, inferences on findings across hypotheses should not be made. Nevertheless, it seems that ERD are primarily associated with factors that lead to and maintain ED symptoms, rather than having a direct impact on disordered eating. Findings corroborate the assumption that overwhelming negative affect at least indirectly leads on to disordered eating by exacerbating certain risk factors such as thin ideal internalization and body image dissatisfaction.

One other subdimension of ERD that emerged as a significant predictor of symptom change in both body image dissatisfaction and depression is related to difficulties concentrating and accomplishing tasks when experiencing negative emotions ( $\Delta$ DERS<sub>GOALS</sub>). Hallion et al. (2018) had previously revealed that lower levels of this subscale were associated with poorer treatment response in a heterogeneous sample with different mental disorders. DERS<sub>GOALS</sub> was also a unique significant predictor of change in ED pathology in a study carried out with inpatient AN (Rowell et al., 2016). According to the authors, ED treatment positively acts on the capacity to stay goal-focused even when experiencing negative emotions, which ultimately leads to improvement of symptomatology. The awareness of individual long-term goals guides emotional responding (Werner & Gross, 2010) and gaining awareness alleviates distress. The association with the reduction of body image dissatisfaction and depressive symptoms is not surprising, since both suggest affective states of discontent and distress.

As it was the case for cross-sectional data, the predominant role attributed to changes in DERS<sub>STRATEGIES</sub> previously revealed by MacDonald et al. (2017)

could not be replicated. It has to be mentioned that the interest in the role of subdimensions of ERD in longitudinal treatment designs is relatively recent, not to mention the lack of studies that include different markers of treatment outcome. Among the currently available research, inconsistent findings may be attributed to varying study designs and not least to differing durations of treatment. Further, in our study, the capacity to identify and differentiate one's emotions ( $DERS_{CLARITY}$ ) was also not uniquely related with outcomes in longitudinal analyses. Rowsell et al. (2016) had identified change in  $DERS_{CLARITY}$  as significant predictor of ED symptoms reduction.  $DERS_{CLARITY}$  was solely a significant unique predictor of body image dissatisfaction in our cross-sectional design, and thus seems to play a rather secondary role in the course of ED psychopathology.

$\Delta DERS_{AWARENESS}$  and  $\Delta DERS_{GOALS}$  emerged as significant predictors of depressive symptom change. Both depression and anxiety disorders are related to ED severity (Spindler & Milos, 2007; Westmoreland, Krantz, & Mehler, 2016). The latter appear to be even more closely related to EDs, based on the assumption that anxiety disorders precede the development of EDs (Swinbourne et al., 2012). It somehow appears congruent that the impact of ERD was limited in both the improvement of disordered eating symptoms and anxiety symptoms. These symptoms are either more strongly influenced by other factors than improvement of ERD or they require more targeted intervention regarding ER. Regarding depression, Ebert, Hopfinger, Bockting, and Berking (2017) previously highlighted the importance of emotional acceptance, but not emotional awareness, in the remission of depressive symptoms in MMD. However, in the aforementioned study, another instrument

was used to assess ERD. In this thesis, preliminary results are given regarding psychiatric comorbidity of EDs, since only few studies have included outcome assessment of psychiatric comorbid disorders (Sloan et al., 2017).

Some of the markers of treatment outcome failed to show any association with ERD in our study, which might partly be inherent to the nature of the assessed variables. In fact, remission status was a dichotomous variable and frequency measures were expressed as change scores of count scores. However, continuous data is preferable, especially since change scores are per se problematic (Cafri, Van Den Berg, & Brannick, 2010). Nevertheless, the use of change scores is justified for the aim of this thesis, which was to analyze the relationship between change in ERD and change in ED symptomatology in analogy to for instance Rowsell et al. (2016). Most importantly, remission status is rarely assessed in a reliable fashion, therefore comparison is limited. Differing definitions and misleading use of concepts impact on remission reports across studies (Couturier & Lock, 2006). The definition used to determine remission status in our study was strict, especially because weight gain criteria was elevated, so that a common definition for AN and BN could be applied. Using a common definition for both EDs is, nonetheless, acceptable in a transdiagnostic perspective (Bardone-Cone et al., 2010). Stringent definitions of remission in EDs usually include cognitive, behavioural, and physical remission, conditions that are hard to fulfill (Bachner-Melman et al., 2006). In addition, remission presumes a longer period of time without clinically relevant symptoms. Overall, the poor remission rate in our study has to be stressed. Full remission was equally low

in the MMD group, however, a substantial amount was diagnosed as partially remitted. Low remission rates are considered normal in short-term follow-up studies, especially in AN (Brown et al., 2015). Particularly for chronic AN, attaining remission is extremely challenging for both therapists and patients (Hay et al., 2012). Even achieving partial remission is accompanied by high uncertainty about the future evolution of the illness, insofar as it is a phase of considerable instability (Kordy et al., 2002). In contrast, improvement rates of individual markers are generally higher compared to global outcome. Thus, including several markers allows to go beyond limiting results regarding remission and to capture symptom change in specific domains, which may be of relevance to remission in the long run.

Modest improvement in ED symptoms in our sample may be linked to the lacking change in the frequency of comorbid disorders. Spindler and Milos (2007) suggested that a vicious circle involving an interplay between disordered eating and psychiatric comorbidity exacerbates overall psychopathology and impacts on the course of illness and remission. In fact, frequency of comorbidity was the only outcome variable which showed no significant difference between pre and post assessment, suggesting the same mean amount of comorbid disorders at pre assessment and discharge. It has to be mentioned that in this study, comorbid disorders were explicitly treated only in approximately half of the cases. Nonetheless, it was assumed that treatment of the primary diagnosis leads to improvement in comorbid disorders across diagnoses (Bulik, 1995; Sloan et al., 2017). Attaining remission in comorbid disorders seems to be just as challenging as it is for the primary disorder and the course of comorbid disorders appears to be rather

autonomous. ED symptom change may even precede change in psychiatric comorbidity (Turner, Marshall, Wood, Stopa, & Waller, 2016). Nevertheless, significant achievement of improvement was noted for depressive and anxiety symptoms, although still being significantly elevated compared to HC. In a transdiagnostic framework assuming common underlying factors of psychopathology across disorders, results can be explained by a global maintenance or reduction of symptomatology. Maladaptive behaviours across diagnoses appear to be related to ERD in a cumulative way (Buckholdt et al., 2015). According to Lulé et al. (2014), comorbid disorders in AN patients persist and co-exist with ERD already in adolescence. Hence, symptoms appear to be closely related and are probably more difficult to treat when handled separately.

Lastly, results indicate that other factors than ERD impact on change of the frequency of compensatory behaviours, which significantly decreased over treatment in our study. For instance, the severity of the disorder itself may be of importance. Severity was predictive of the frequency of disordered eating behaviours at discharge in BN in Smith et al. (2017). Overall, severity decreased in our study, in line with the observed overall increase in mean BMI in AN and the decrease in mean frequency of compensatory behaviours in BN. Interestingly, the proportion of binge eating/purging type AN had decreased at post assessment, but not the proportion of restricting type AN. Either more binge eating/purging type than restricting type were in recovery at discharge or crossovers between disorders had occurred.

In accordance with cross-sectional findings, change in thin ideal internalization was a significant predictor of change in body image

dissatisfaction, the latter being the sole significant predictor of disordered eating change. None of the planned covariates were significantly associated with outcome variables in both the cross-sectional and longitudinal assessment. BMI appears to be an AN-specific covariate (Pisetsky et al., 2017), and may not necessarily be predictive of outcome in a heterogeneous sample (Mustelin et al., 2016; Steinhausen, 2002; Steinhausen & Weber, 2009). Concerning age, body image dissatisfaction for instance appears to be rather stable across adult life span in women (Bissell & Rask, 2010; Grabe et al., 2008; Grogan, 2007; Tiggemann, 2004). Regarding the type of treatment, previous findings had failed to reveal any difference between treatment setting or treatment duration with respect to EDs and outcome (Bell et al., 2017; Madden, Hay, & Touyz, 2015).

In sum, using a strict definition of remission did not allow to identify any association with ERD, in contrast to individual markers of treatment outcome. Body-related concerns shall be stressed in the definition of remission of EDs alongside change in overall cognitive ED symptoms. The hypothesis of an association between ERD and symptoms of comorbid disorders was explorative. Notwithstanding, results hint at a specific association between ERD and depressive symptomatology in EDs, rather than a general association with the magnitude or severity of psychiatric comorbidity.

More generally, results seem to indicate that being conscious about one's emotions plays a particular role in functional ER in the context of ED symptomatology. The use of effective strategies to regulate emotions

depends primarily on the individual character of emotional experience and may therefore be subsequent to emotional understanding.

### **8.3 General considerations**

Caution is warranted when interpreting correlational data. Inferences about causality should not be made, due to the very nature of cross-sectional data (Racine & Wildes, 2013; Stice & Shaw, 2002) and since the influence of unmeasured third variables cannot be excluded (Racine & Wildes, 2015). In fact, it cannot be ruled out that ED pathology lead to ERD (Racine & Wildes, 2013; Svaldi et al., 2012), or, that associations are at least bi-directional. The relationship between mass media, thin ideal internalization, body dissatisfaction, and disordered eating has to be considered with equal reservation (Grabe et al., 2008; Grogan, 2007; Harrison & Cantor, 1997; Keel & Forney, 2013). Although our experimental data seems to corroborate sociocultural theory, the presumed causal relationship linking the above mentioned concepts cannot be interpreted based on our data. Caution also applies to our longitudinal data. Since ERD were not assessed prior to the outcome, change supposedly co-occurred and difficulties with being aware of one's emotions could as well be a consequence of psychopathology. In other words, it is possible that psychopathology reduces emotional awareness, which then improves through ED symptom change. The same rationale had been proposed by Rowsell et al. (2016) regarding emotional clarity. Nevertheless, our study was based on the theoretical assumption that impaired ER is a key factor in the development of psychopathology (Wolz et al., 2015), hence the direction of association was predefined. There is in fact experimental evidence that ERD exclusively predict change in AN symptom

severity, but not the other way round (Racine & Wildes, 2015). In order to improve the predictive value, early treatment change in ERD should be assessed, the first weeks of treatment being crucial for outcome prediction in terms of ED symptoms (Nazar et al., 2017; Thompson-Brenner, Shingleton, Sauer-Zavala, Richards, & Pratt, 2015).

Further, the present study focused on a heterogeneous sample over and above the influence of mental disorder diagnoses. Refraining from making a distinction between groups of participants was based on a transdiagnostic framework and also on the assumption that psychopathology and ERD statistically and conceptually overlap, thus leading to a significant loss of variance attributable to ERD if both were included in the analyses. In fact, almost all individuals with high ERD were patients, those with low ERD were HC. Ultimately, statistical power was increased by combining mental disorder groups. The same rationale applies to ED subgroups. In our study, AN and BN did not differ regarding ED symptoms other than BMI and except for BN patients displaying more compensatory behaviours than AN at pre assessment. The majority of AN and BN were mild to moderate rather than severe or extreme, and both groups contained chronic and severe cases. Previous findings on ERD have failed to identify consistent patterns of association with disordered-specific symptoms that would distinguish AN from BN. Nevertheless, it would be of interest for future studies to examine specificities, as long as sample size is sufficient. Notably, the suggestion that ERD have a different impact on AN and BN throughout treatment (Mallorquí-Bagué et al., 2018) should be examined in future studies.

Lastly, modest explained variance across regression designs indicates that other predictors than ERD are implicated. In fact, numerous factors are involved in the course of EDs, including sociocultural factors, familial influences, and individual risk factors such as psychological factors and biological aspects (Fichter et al., 2006; Polivy & Herman, 2002), which in turn are interrelated (Maguire et al., 2008). The inclusion of predictors that share variance with ERD would have impaired unique predictive value of our variables of interest (Smith et al., 2018). Therefore, ERD were chosen as a proxy over other potentially correlating markers of psychopathology. Potential factors of influence alongside ERD are depressive symptoms (Racine & Wildes 2015), anxiety symptoms (Smith et al., 2018), impulsivity (Steinhausen & Weber, 2009), trauma (Becker et al., 2004; Lacoste, 2017), and low self-esteem (Loeber et al., 2016). Psychiatric comorbidity is in fact a confounding influence in the study of ER in psychopathology (Heber et al., 2014), especially in EDs (Haynos & Fruzzetti, 2011). Depressive symptoms are risk factor and consequence of disordered eating behaviours (Linardon, Wade, et al., 2017), whereas anxiety is assumed to be a predisposing factor to the development of EDs (Kaye et al., 2004). The impact they have on ED symptoms and how they relate to ERD has yet to be defined. In addition, impulsivity has been linked to both onset of BN (Treasure et al., 2015) and recovery from AN (Fichter et al., 2006; Zerwas et al., 2013) and is related to ERD. Further, sexual abuse has been linked to the onset of EDs (Fox & Power, 2009; Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004; Lacoste, 2017) and emotional maltreatment is involved in ED behaviour in adolescents (Mills, Newman, Cossar, & Murray, 2015). At last, low self-esteem has been

related to general psychopathology, and more specifically body-related concerns (Keel & Forney, 2013; Sim & Zeman, 2006; Thompson & Stice, 2001), and short and long-term outcome in EDs (Vall & Wade, 2015; Wild et al., 2016). Higher self-esteem, in contrast, is generally associated with body image satisfaction (Grogan, 2007) and treatment completion (Halmi et al., 2005). Recent findings corroborate the association between self-esteem and ERD (Gomez, Quiñones-Camacho, & Davis, 2018). Further research should study these individual factors of influence, but also their interrelation with ERD, since they all include emotional components.

#### **8.4 Limitations and strengths**

The current investigation has a certain number of limitations, especially regarding the third hypothesis. First, factors that were not included in the analyses, but which may significantly impact on symptom change, need to be addressed. In particular, duration of illness supposedly has an impact on treatment, and has therefore been included as a covariate in previous studies (Racine & Wildes, 2013). Duration of illness has been associated with treatment outcome at both discharge and in the long run (Cooper et al., 2016; Fichter & Quadflieg, 2016; Maguire et al., 2008). For instance, shorter duration of illness before treatment was associated with better long-term outcome in BN patients (Reas, Williamson, Martin, & Zucker, 2000). It is also assumed that treatment response worsens with longer duration of illness (Treasure et al., 2015). Determining illness trajectory is essential to detect chronic illness, which generally stands for poor outcome (Steinhausen, 2002; Steinhausen, 2009) and imposes additional challenges to caregivers. Severity of illness is another potential factor to consider. Generally, the use of illness

severity based on DSM-criteria, namely BMI and the frequency of compensatory behaviours, appears to be rather unreliable (Gianini et al., 2017; Jenkins et al., 2016; Nakai et al., 2017; Reas & Rø, 2017). Numerous studies exist with contradictory results regarding the differentiating value of DSM-5-based ED severity ratings (Grilo, Ivezaj, & White, 2015) and predictive value of DSM-5 severity ratings on various outcome measures in EDs (Dakanalis et al., 2017; Dakanalis, Timko, Colmegna, Riva, & Clerici, 2018; Gianini et al., 2017). Alternative classifications of severity have been proposed, such as the staging model in AN (Maguire et al., 2017). Remission becomes less likely with every stage of illness. Although self-reported onset of illness was assessed in our study, duration, chronicity or severity of illness would have been difficult to operationalize due to a large number of missing responses. The onset of the ED was obviously difficult to determine or to recall in many cases. Moreover, objective reports about the individual courses of illness were unfortunately not available.

Relatedly, the motivational component of recovery is another factor that impacts on treatment outcome (Nordbø et al., 2012). More precisely, the reluctance towards recovery has been linked to poorer treatment outcome. The negative attitude towards remission is probably due to the fear of losing the benefits associated with the illness (Nordbø et al., 2012). In addition, patient's and therapist's perception of illness and remission and expectations from therapy often mismatch, due to incongruent motivations (Bamford et al., 2015; Winkler et al., 2017), leading to resistance and withdrawal. These recent studies emphasize the importance of systematically assessing the willingness to adhere to treatment. Motivational aspects are ultimately

involved in treatment drop out (Gulliksen, Nordbø, Espeset, Skårderud, & Holte, 2016; Nordbø et al., 2008; Vall & Wade, 2015; Winkler et al., 2017; Zipfel et al., 2014), which is one of the most important challenges in ED treatment (and research). Drop out ranges between 20-73% across studies of in- and outpatient treatment (Fassino, Pierò, Tomba, & Abbate-Daga, 2009) and between 25-40% in research trials (Watson & Bulik, 2013). Regrettably, this thesis does not include an in-depth drop out analysis, although information about the role of ERD in premature termination of study participation or treatment would have been of particular interest. Future studies should explore whether ER abilities are linked to better adherence to treatment and whether the improvement of ER abilities prevents from preliminary termination of treatment.

A second limitation is that this investigation is lacking the inclusion of subjective markers of treatment outcome. Quality of life is recurrently cited as a factor of subjective well-being, beyond the objective often questionnaire-based assessment of psychopathology. Quality of life is especially low in AN patients and is related to BMI and general disordered eating symptoms (Bamford et al., 2015). It has been suggested that in severe cases of AN, improvement of the quality of life should be primarily in the focus of treatment, rather than the actual improvement of ED symptomatology (Hay et al., 2012; Treasure et al., 2015; Watson & Bulik, 2013; Wonderlich et al., 2012). In line, it has been recommended that the improvement of the quality of life should be included in the definition of remission (Lock et al., 2013; Winkler et al., 2017). Moreover, ERD have a negative impact on subjective life satisfaction and

specific domains of ERD are predictive of well-being (Saxena, Dubey, & Pandey, 2011). Hence, there is a possible association between improvement in ERD and better life satisfaction at discharge.

Adding objective assessment of physical health also appears important in order to evaluate recovery to its full extent. Physical impairment is a marker of illness severity, which has yet to be related with treatment outcome or prognosis (Maguire et al., 2008). The reversibility of physical impairment has surprisingly been left out of research, probably attributable to feasibility reasons, although NICE guidelines (2017) recommend including the assessment of physical health in the evaluation of treatment effectiveness.

Third, our data is limited to treatment discharge and is therefore not conclusive on remission in the long term. In general, longer duration of follow-up is positively associated with treatment outcome in EDs (Steinhausen, 2002; Steinhausen & Weber, 2009). Surprisingly, studies investigating symptom change over a longer period are scarce (Lock et al., 2013; Sloan et al., 2017). It would be of particular interest to assess long term effects of ERD, since some subdimensions of ERD may be slower to improve and act on specific markers of outcome. Moreover, Vall and Wade (2015) emphasized the importance of prediction studies of future remission based on end of treatment results, not last in order to identify patients which are at risk for relapse. It has been suggested that limited ER abilities after treatment are responsible for relapse in AN (Haynos & Fruzzetti, 2011).

Regarding the longitudinal design, it has to be mentioned that no treatment control condition was included. It is common practice not to include control

conditions in randomized controlled trials (Linardon, de la Piedad Garcia, & Brennan, 2017), which are more specifically of importance when evaluating mediators or moderators of treatment (Kraemer, Wilson, Fairburn, & Agras, 2002). However, it is not possible to make inferences on the effect of treatment on ERD and ED symptoms. Similarly, the dispensed treatment in the different participating centers could not be rigorously monitored, beyond the assumption of treatment as usual. In our particular case, the manipulation of varying degrees of ER interventions would have been of great interest and should be the object of future studies.

Fourth and more generally, besides general critics made about the factor structure of the DERS (Cooper et al., 2014), self-report has been branded controversial (Berking & Wupperman, 2012; Wolz et al., 2015). Especially concerning the assessment of emotional awareness, since individuals with high ERD may not be capable of acknowledging their own difficulties regarding emotions (Svaldi et al., 2012). The inclusion of physiological markers of ERD in complement to self-reported ERD has been recommended (Brockmeyer et al., 2014; Lavender et al., 2014; Wolz et al., 2015), such as heart rate variability (Williams et al., 2015) or salivary cortisol responses in response to stress (Treasure & Cardi, 2017). Such measures failed to be significant outcomes in Humbel et al. (2018), but may have a predictive value when used as independent variables, analogously to self-reported ERD.

Fifth, the current results cannot be generalized to males, adolescents, or women over 35, nor can results be generalized to other EDs, such as Binge

Eating Disorder. In addition, the conceptual and statistical reasons for not considering diagnostic groups in the hypotheses, which were already explained in the previous section, apply as well to AN subtypes. Nevertheless, differences between subtypes of AN have been revealed in some studies in terms of drive for thinness (Monteleone, Di Genio, Monteleone, Di Filippo, & Maj, 2011), ED symptoms (Reas & Rø, 2018), and psychiatric comorbidity (Fichter et al., 2006; Root et al., 2010). There is also evidence of an association between specific subdimensions of ERD and subtypes of EDs (Brockmeyer et al., 2014; Mallorquí-Bagué et al., 2018), also regarding improvement of symptomatology (Rowell et al., 2016). However, it seems that solely the subscale *DERS<sub>IMPULSE</sub>* is mainly differing between AN subtypes. Future studies should consider individual groups of participants regarding gender, age or psychopathology, in order to validate our findings.

Apart from the aforementioned limitations, our study has certain strengths. Firstly, our study included an exhaustive diagnostic interview unlike most studies which derive diagnostics from (self-report) questionnaires. It has been shown previously that questionnaire-based assessments of ED pathology and interviews significantly differ (Dakanalis et al., 2018). In our case, the stringency of the diagnostic process guaranteed the respect of inclusion and exclusion criteria during recruitment and precise determination of remission status at discharge. 10% of the interviews coded twice, as they were for instance in Racine and Wildes (2013) and interrater-reliability of diagnostic interviews was high in our study. The combination of telephone interviews and face-to-face interviews does not appear to be problematic, since there is

evidence about both type of collected information being consistent (Keski-Rahkonen et al., 2014). The use of recent DSM-5 criteria for diagnosis has to be emphasized as well. Many studies cited in this thesis were conducted prior to the implementation of the new criteria, which inevitably impacts on prevalence of EDs, but also on comparability of results. Generally, less cases of unspecified disorders are recorded with DSM-5 and more cases of AN due to amenorrhea criteria, which does no longer exist (Keel, Brown, Holm-Denoma, & Bodell, 2011; Nakai et al., 2017; Vo, Accurso, Goldschmidt, & Le Grange, 2017). Previous studies about prognostic factors of EDs should therefore be replicated based on DSM-5 criteria (Mustelin et al., 2016).

In addition to stringent diagnostics, our study applied some of the most frequently used questionnaires, with established psychometric properties, to assess psychopathology. These questionnaires have been used in studies cited throughout this thesis, such as SATAQ (Thompson et al., 2018), EDE-Q (Swinbourne et al., 2012), BDI (Linardon, Wade, et al., 2017), BAI (Haynos et al., 2015), as well as the combination of DERS and EDE-Q (Merwin, Zucker, Lacy, & Elliott, 2010; Pisetsky et al., 2017). Our results can therefore be interpreted in the light of existing evidence. In addition, our study appropriately distinguished between trait and state measures in terms of body image dissatisfaction and disordered eating symptoms. The assessment of body image dissatisfaction follows Thompson's suggestion not to apply a trait questionnaire when assessing the reaction to experimental thin ideal exposure (Thompson, 2004).

Further, our sample is clinically representative with a large majority of patients meeting criteria of more than one mental disorder, especially in the MMD

group. Noteworthy, the discrimination between patients and HC (and thus between high and low ERD) in our study is satisfying. In fact, the different groups of patients did not differ regarding overall psychopathology and ERD, but had significantly higher levels than HC. Mean scores of HC were within norms of healthy samples on all assessed variables. Mean EDE-Q in HC was even lower than reported for instance in Mond et al. (2006) in an Australian sample of more than 5000 young women aged 18-42.

As opposed to many of the cited studies conducted about the relationship between ERD and ED symptoms, our sample was solely constituted of female participants. In fact, a multitude of studies have relied on heterogeneous samples in terms of gender, which may not be a pertinent choice when examining for instance body image dissatisfaction (Thompson, 2004).

Finally, recruitment was designed to fulfill criteria of sufficient sample size (Munsch, 2014). Increasing the sample size would allow more complex analyses, especially on subsamples. Nevertheless, although issues with normality of data distribution and issues relating to the nature of some variables have to be kept in mind, the findings of this study are comprehensive and warrant close linkage to clinical reality. For instance, many previous studies have focused exclusively on either in- or outpatients, and more frequently on outpatients (Striegel-Moore et al., 2008). Our sample included both. Generally, the heterogeneous sample and the inclusion of various degrees of severity and multiple comorbidities allow interpreting the findings of this study in terms of clinical reality.

## **8.5 Clinical implications and Outlook**

### **8.5.1 Future challenges in media exposure research**

The findings of the current thesis corroborate the unfavorable impact of media exposure on young women, which has extensively been described in the literature. In addition to a plethora of studies on the impact of the thin ideal propagated in mass media on young women, the past 5 years have witnessed an upsurge in research about digital media and the emergence of new beauty standards. In fact, web-based media inevitably potentiated the harmful effects of beauty ideal exposure. Studies have linked higher frequency of active social media usage to thin ideal internalization (Mingoia, Hutchinson, Wilson, & Gleaves, 2017), as well as negative mood, body image dissatisfaction, and disordered eating (Brown & Tiggemann, 2016; Holland & Tiggemann, 2016). In parallel, the standard beauty ideal has shifted towards a lean, yet toned and athletic physique, rather than utter thinness. Shifts in beauty standards are not unusual and ideals have dramatically changed across centuries. The current ideal is bi-dimensional, combining the thrive for two contradictory and unrealistic ideals, namely thinness and muscularity (Uhlmann, Donovan, Zimmer-Gembeck, Bell, & Ramme, 2018). The so called “fitspiration” has genuinely emerged as a headwind to excessive unhealthy thinness (Ahern et al., 2011). However, the combination of excessive behaviours to achieve both thinness (through dietary restrictions) and muscularity (through exercising), is potentially detrimental for health (Benton & Karazsia, 2015; Uhlmann et al., 2018).

Research on the fit beauty ideal mediated through digital media is still in its infancy. Results are inconsistent (Derenne & Beresin, 2018) and mostly

limited to young HC users (Holland & Tiggemann, 2016). Nevertheless, the effect of digital media on body image dissatisfaction appears to be for the least similar to the effects of print media (Cohen & Blaszczynski, 2015). Also, the thin and the fit beauty ideal do not seem to differ in terms of negative impact on body image satisfaction (Benton & Karazsia, 2015; Tiggemann & Zaccardo, 2015). However, these findings were contradicted by a recent study, in which exposure to the athletic ideal led to higher body image dissatisfaction than the thin ideal in HC (Robinson et al., 2017). In contrast, fit ideal pictures did not trigger the engagement in actual exercise behaviour, in contrast to thin ideal pictures in the aforementioned study. Similarly, Uhlmann et al. (2018) showed that fit ideal internalization was associated with body image dissatisfaction but, unlike thin ideal internalization, was not associated with negative affect, nor bulimic symptoms or dieting in HC women.

Nonetheless, as claimed by Mingoia et al. (2017), digital media is potentially more harmful than traditional media, because peers are more directly involved. As pointed out in the tripartite influence model of Thompson et al. (1999), peers, parents and media are the primary influences leading to body image dissatisfaction and disordered eating. Social comparison processes are enhanced by social media. The danger lies within the fact that consumers are less critical towards pictures on social media platforms (Cohen & Blaszczynski, 2015; Tiggemann & Zaccardo, 2015). In fact, people do not seem to realize that pictures on social media platforms are equally altered than pictures in fashion magazines (Kleemans, Daalmans, Carbaat, & Anschütz, 2018; Mingoia et al., 2017). Further, social media ideals are wrongly perceived as accessible since they are portrayed as self-promoting

peers rather than unattainable celebrities. The effects of viewing pictures of celebrities or attractive peers on mood and body satisfaction were comparable in a study by Brown and Tiggemann (2016), since celebrities were pictured in their private environment. Digital media is insofar harmful as the target is an ever younger audience, propagating non-monitored content and promoting excessive consumption.

Within this context, specific areas of future research can be identified. So far, the prevalence of EDs has been associated with thin ideal idealization (Keel & Forney, 2013), contributing to explain the lower rates of occurrence in men. However, the fit beauty ideal might challenge the selectiveness of gender, since the ideal of a muscular physique had been established for a while in men (Keel & Forney, 2013). Further, there is tentative interest in studying disordered eating in transgender (Murray, Boon, & Touyz, 2013), which may also add a new perspective to sociocultural models of EDs. Furthermore, the use of social media platforms has been associated with orthorexia nervosa (Turner & Lefevre, 2017), a condition where diet is restricted based on the quality of food, leading to malnutrition and to impairments of daily functioning. The question has risen whether this condition should be considered as an own diagnosis within EDs in nosological classification (Dunn & Bratman, 2016). In sum, research needs to determine the importance of new standards and how they affect ED conceptualization.

Lastly, digital media might paradoxically be used to mitigate its own harmful impact. In fact, despite the negative connotation attributed to digital media, the world wide web is also an educational tool. Information is easy to spread among a wide audience. A more skeptical attitude towards the content of

digital media should be promoted to prevent the development of ED symptoms. Actions such as including disclaimers or warnings on pictures showed little effect so far (Ata et al., 2013; Tiggemann et al., 2017). It has long been revealed that media literacy programs have limited impact (Derenne & Beresin, 2018), for instance on preventing internalization of the thin ideal, but not on preventing from EDs (McLean, Paxton, & Wertheim, 2016). Psycho-educative media literacy programs should include sensible use of social networking media, including awareness when sharing content (Holland & Tiggemann, 2016). It has to be determined whether the development of literacy programs through digital media could be more efficient. In addition, digital media broadens the implementation of web-based therapeutic interventions. Web-based interventions reduce distance between patient and therapist, and also enable more self-directedness in the treatment process (Derenne & Beresin, 2018). This is particularly of interest since approximately only 30% of people suffering from disordered eating have access to treatment in Switzerland (Mohler-Kuo et al., 2016).

In sum, the thrive to fit into a media-created mold is more fashionable than ever. The consumption of mass media may not impair everyday functionality. Mass media are nevertheless a constant strain to vulnerable young women, which impacts on mood and well-being. Negative affect in turn may lead to body dissatisfaction, which eventually leads to severe physical and mental consequences, such as disordered eating, excessive exercising, depression, negative self-evaluation, and the ever more popular and addictive use of cosmetic surgery. Since the results of this thesis failed to attribute a moderating role to ERD in thin ideal exposure, ERD should be evaluated as a

vulnerability factor per se that leads young women into feeling pressured to seek advice in new media and to thrive for unhealthy new beauty standards.

### **8.5.2 Emotion Regulation Difficulties in current and future Eating Disorder research and clinical practice**

It has been a persistent critic that ED research and clinical practice do not adequately influence one other (Kazdin et al., 2017). According to a review by Pennesi and Wade (2016), among the various theoretical models of EDs, only the Dual-Pathway Model of BN (Stice, 2001) and the Transdiagnostic Maintenance Model of eating disorders (Fairburn, 2008) have led to the development of interventions that meet criteria of both efficacy and effectiveness in ED treatment. Nevertheless, the considerable progress that has been made in the field of ERD and psychopathology in the last decade has allowed establishing evidence-based ER interventions, such as Emotion Regulation Therapy (Renna, Quintero, Fresco, & Mennin, 2017). The evaluation of the spectrum of ER interventions is, however, still in its infancy, and research needs more stringent examination (Gratz et al., 2015), especially of the applicability of available ER interventions to EDs. It has to be mentioned that the promotion of CBT-based interventions is predominant, probably at the expense of other interventions. CBT-ED is considered the treatment of choice in EDs (NICE, 2017), despite limited evidence about its association with actual recovery (Slade et al., 2018). CBT-based interventions are reportedly limited in that they only indirectly addressed emotions, by the means of dysfunctional behaviours and cognitions (Haynos & Fruzzetti, 2011; Mallorquí-Bagué et al., 2018). It is therefore questionable whether particular interventions are more efficacious alternatives, or whether the evaluation of

other treatments has simply been ignored.

The results of the current thesis support the hypothesis that treatment is beneficial to the reduction of ERD, regardless of the degree to which ER is targeted (Gratz et al., 2015). A majority of therapists reported CBT-based intervention rather than the application of a more ER-oriented approach in our study. Certainly, future studies will examine 1) the benefits of addressing treatment of ED symptomatology in an ERD-oriented framework, 2) the proportion of ERD-based intervention that is necessary to achieve psychological, behavioural, and physical remission in EDs, 3) the time point *when* in the course of illness and treatment of mental disorders the focus should be on particular subdimensions of ERD.

One obstacle that has to be overcome to achieve consistency in ERD-targeting interventions is the persistent lack of standardized and substantial definition of ER(D) as pointed out by several authors (Berking & Wupperman, 2012; Gratz et al., 2015; Gross, 2015). For instance, some interventions solely address dysfunctional ER in terms of maladaptive strategy use. Targeting ER strategies is appropriate, since aversive behaviours such as symptoms of disordered eating are widely considered as dysfunctional strategies, aiming at escaping and providing relief from overwhelming emotion (Haynos & Fruzzetti, 2011). The clinical relevance of ER strategies has been criticized, not least because ER strategies are highly context-dependent (Gratz et al., 2015; Gross, 2015). Standardized interventions targeting dysfunctional ER skills may not be sufficient. In fact, reaching individual emotion-related goals is central to ER (Jazaieri et al., 2013), and thus guides

the means by which aversive emotion is handled. Most importantly, acting primarily on dysfunctional ER strategies is ambiguous. Removing this unique coping mechanism, would leave patients defenseless against the very aversive emotion they are absolutely trying to avoid (Tull & Aldao, 2015). Outside the boundaries of psychopathological intervention, patients are again at the mercy of individual emotional experience. Hence, the instauration of alternative functional strategies is crucial, but, considering our results, only in combination with promoting better understanding of emotional experience in the first place.

Some interventions emphasize the influence of the thoughts we have about emotions and how we experience them (Werner & Gross, 2010). For instance, Short Term Transdiagnostic CBT (Gaynor & Gordon, 2018) has been developed to target dysfunctional beliefs about the own capacity to cope with emotions. However, our findings suggest that difficulties in believing in the capacity to handle aversive emotion may not be primarily involved in the maintenance or remission of disordered eating. Rather, results point out that emotional awareness and acceptance are essential. It has been suggested that the tolerance of the full range of emotional experience is a first step towards understanding why maladaptive ER strategies are applied and towards the flexible use of a wider range of (functional) ER strategies (Barlow et al., 2017; Greenberg, 2008; Gross & Jazaieri, 2014). In a qualitative study, a substantial amount of AN patients recognized that emotional awareness is particularly useful, acknowledging the benefits of emotional experience (Money, Genders, Treasure, Schmidt, & Tchanturia, 2011). It is intuitively comprehensible that understanding why we feel how we feel, when we feel is

a primordial step for any further intervention and for long-standing improvement, and may also be part of prevention. The mechanisms of action of emotional awareness and acceptance of emotions on other domains of ER, for instance on the use of ER strategies (Berking et al., 2008) and subsequently on psychopathology, should be the object of future studies. For sure, enhancing emotional awareness and acceptance leads to the reduction of emotional avoidance (Barlow, Allen, & Choate, 2004), which is a key mechanism of psychopathology.

In sum, the question whether ER should be targeted in ED interventions is somehow obsolete. Instead, the dimensions of ER that have relevance to symptom remission need to be clearly defined. Many studies do not sufficiently elaborate the notion of ERD and do not characterize which domain of ER is targeted. “ER strategies” appears to be a favored hotchpotch notion. Further, it is arguable whether new interventions need to be developed or if the existing ones should be examined in depth, validated or adapted accordingly.

Despite relative importance attributed to ER in treatment, ERD are not yet an explicit and substantial part of diagnostic criteria of mental disorders. This statement may appear paradoxical, since ERD are indeed included in the theoretical description of various mental disorders. Werner and Gross (2010) even highlighted that emotional disturbance is part of most diagnoses in nosological classification tools such as the DSM at some degree. Nonetheless, Jazaieri et al. (2013) showed that solely 19.3% of the 176 surveyed DSM-IV-TR (APA, 2000) disorders included affective disturbance as

“guaranteed”, whereas affective disturbances were “likely present” in 40.3% of the cases. Further, more or less explicit ERD were part of the definition in only 21.6% of the diagnoses, according to the authors. Further, Gross and Jazaieri (2014) overtly criticized the absence of ERD in diagnostic criteria of BN in the DSM-5 (APA, 2013). It appears that the occurrence of emotional disturbances is acknowledged by nosological classification systems, but references made to ER process and ERD, which in the end are associated with psychopathology, are unsatisfactorily elaborated.

One possible reason why ERD are not explicitly mentioned in ED classification may simply be due to the fact that knowledge about the involvement of ERD remains limited. Although the implication of ERD in the etiology, maintenance, and remission of EDs is widely accepted, it has not been clearly stated yet, which domains of ERD are impaired in EDs (Gross & Jazaieri, 2014). Our results corroborate the hypothesis that specific subdimensions of ERD are associated with individual symptoms (Gratz & Tull, 2010; Lukas et al., 2018). Nevertheless, evidence may not be consistent enough to give a definite answer and further research is necessary.

More generally, the nature of the relationship between ERD and psychopathology has not yet been properly determined. In fact, it cannot be ruled out that ERD are consequence, rather than cause, of disordered eating (Berking & Wupperman, 2012), due to for instance physical states of starvation (Haynos et al., 2018; Racine & Wildes, 2013). Importantly, assumptions regarding the temporal dynamics of the occurrence of ERD and psychopathology would still not exclude bi-directional influences during the entire course of illness and recovery. Both ERD and psychopathology are

dynamic processes, with many factors of influence potentially acting on each of them at any time. The results of our study do not permit contributing to this discussion other than revealing a certain predictive value of ERD in ED psychopathology.

There is obviously a long way to go from acknowledging the involvement of ERD in research to being in a position of defining clinically relevant domains of impaired ERD. The recurrent problematic of lacking exchange between research and practice had been mentioned at the very beginning of this section. The numerous adaptations made to nosological classification systems such as the DSM over the decades testify for the flexibility and consideration of both research findings and experience emerging from clinical practice – although at a slow pace. It has to be mentioned that alternative conceptualizations of psychopathology have emerged to overcome restrictions that are inherent to categorical nosological classification systems. For instance, Wade, Bergin, Martin, Gillespie, and Fairburn (2006) classified illness severity and impaired functionality based on one of the core features, namely lifetime ED behaviours, regardless of the ED diagnosis. Further, classification based on transdiagnostic features of psychopathology can be resumed in an interesting 3 dimensional conceptualization of ED pathology, describing the “undercontrolled”, defined by impulsivity, risky behaviour, and emotional reactivity; the “overcontrolled”, defined by rigidity, compulsivity, and avoidance; and the low psychopathology ED patient, defined by the relative absence of comorbid psychopathology (Wildes & Marcus, 2013). The interesting aspect offered by this conceptualization is that impulsive and avoidant behaviours are understood as different manifestations of one and the

same underlying problem rather than being antagonisms. Despite limited evidence, this approach highlights promising results regarding the prediction of illness course and treatment response, and is interpretable in terms of ERD. ERD may in fact manifest in opposite ways across disorders, as it is the case for emotional hyperawareness that is typical for panic disorders, whereas lack of emotional awareness is often associated with EDs (Gross & Jazaieri, 2014).

Von Hausswolff-Juhlin, Brooks, and Larsson (2015) predicted a future shift from categorical to transdiagnostic conceptualization of EDs and psychopathology. This thesis has previously hinted at the question and longstanding debate of whether AN and BN are discrete entities or rather manifestations of one and the same disorder. From a historical perspective, the accreditation of AN as mental disorder is around a century older than BN. Theoretically, the origin of starvation in young women dates back to the Middle Ages, where some cases of religious asceticism were reported. The resemblance to the modern disease is questionable, but there is at least a potential evolutionary relationship (Striegel-Moore & Bulik, 2007). To date, a prominent distinction between AN and BN is the more striking mortality risk in AN, due to distinct physical and psychological impairment which result from either AN or BN. In fact, most of the medical complications related to AN such as cardiovascular abnormalities are direct consequences of malnutrition and weight loss (Leonard & Mehler, 2001), whereas those commonly related to BN, as for instance electrolyte and acid base alterations, are associated with purging behaviours, mostly self-induced emesis and laxative abuse (Arcelus et al., 2011; Mehler & Rylander, 2015). However, in line with a transdiagnostic

point of view, EDs share core features and similar attitudinal and behavioural manifestations (e.g. influence of shape concerns on self-evaluation). Thus, AN and BN would solely differ in the balance between under- and over-eating and its impact on body weight (Fairburn et al., 2003). The utility to distinguish between AN and BN has therefore been questioned, not least because they cannot occur at the same time, unlike other mental disorders. The transdiagnostic approach is underpinned by the instability of diagnosis in terms of frequency of crossovers<sup>8</sup> between AN and BN in the course of illness (Treasure et al., 2015), especially within subtypes of AN or from AN to BN (Eddy et al., 2008). Eddy et al. (2002) showed that by 8 years of follow-up, 62% of AN restricting type crossed over to AN binge eating/purging type and only 12% never reported regular binge/purge behaviours. Crossovers during the course of illness somehow testify for loose boundaries (Fox & Power, 2009). Nevertheless, the transdiagnostic approach of EDs has been openly challenged by Birmingham, Touyz, and Harbottle (2009), who acknowledged the frequent crossovers between diagnosis, but also highlighted that disorders are lacking consistency and coherence, since prevalence, mortality rates and prognosis differ between AN and BN.

Regarding ERD, theoretical definitions have related EDs, mostly AN, to emotional impairment (Hempel, Vanderbleek, & Lynch, 2018; Zipfel et al., 2015). Generally, it is assumed that AN and BN show little difference in terms of ERD (Svaldi et al., 2012), and so do AN subtypes (Brockmeyer et al., 2014; Harrison, Sullivan, et al., 2010; Haynos et al., 2014; Ruscitti, Rufino, Goodwin, & Wagner, 2016). In our study, AN and BN did not differ regarding ERD and

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<sup>8</sup> The terms "migration", "crossover", and "transition" (between AN and BN) appear in the literature.

associations between ERD and ED symptoms manifested in a heterogeneous sample. In contrast, AN displayed lower ERD than BN in a study by Wolz et al. (2015). However, results could be explained by greater severity of BN compared to AN in this particular study. Danner, Sternheim, and Evers (2014) warned from considering EDs transdiagnostically, although their results were limited to specific ER strategies. Thus, citing Tozzi et al. (2005), EDs may neither be entirely independent nor entirely overlapping conditions. It has to be kept in mind that every individual suffering from a mental disorder has its personal course of illness, displaying specific ERD (Gross & Jazaieri, 2014).

The main problem associated with categorical classification is “inflated comorbidity” (Aldao, Gee, De Los Reyes, & Seager, 2016), since disorders that potentially share underlying factors are handled as separate disorders. Consequently, the term “Disorders of Emotion Regulation” has established itself in the literature, assuming that common factors underlie psychopathology across mental disorders (Gross, 2015). EDs are likely to be variants of higher order psychopathology, since ERD are also a core feature of other mental disorders such as depressive or anxiety disorders, substance use disorders, somatoform disorders, schizophrenia, and BPD (Gilboa-Schechtman et al., 2006; Gratz & Tull, 2010; Heber et al., 2014; Sloan et al., 2017). ERD manifest through etiological similarities between disorders (Barlow et al., 2004) and in an analogy of symptoms across disorders (Spindler & Milos, 2007). For instance, both EDs and substance use disorders share ER-related mechanisms such as impulse control difficulties (Fox et al., 2008; Root et al., 2010). Furthermore, difficulties with the identification of

emotions are observed in EDs and somatoform disorders (Heber et al., 2014). Finally, shared psychopathology supposedly underlies EDs and BPD, since Dialectical Behavior Therapy (Linehan, 1987), an ERD-focused intervention originally developed for BPD, has shown effectiveness in the treatment of EDs (Navarro-Haro et al., 2018).

Several transdiagnostic interventions targeting ERD across the spectrum of mental disorders have been proposed (Gratz et al., 2015). Transdiagnostic, and more so ERD-based interventions, appear to be efficacious, especially in the treatment of both depressive and anxiety disorders (Mennin, Fresco, Ritter, & Heimberg, 2015; Newby, McKinnon, Kuyken, Gilbody, & Dalgleish, 2015). The application of the Unified Protocol for Transdiagnostic Treatment of Emotional Disorders (Barlow et al., 2004), targeting psychological maintenance factor of negative affect across disorders, has shown beneficial effects in residential ED patients (Thompson-Brenner, Boswell, Espel-Huynh, Brooks, & Lowe, 2018). However, the superiority of, for example, the unified protocol over single disorder protocols could not be shown regarding psychopathology (Steele et al., 2018).

To conclude, despite the development of transdiagnostic, ERD-based conceptualizations of mental disorders, the trend in ED conceptualization is still categorical (Norton & Paulus, 2016; Vall & Wade, 2015). However, categorical classifications are not designed to take into account psychiatric comorbidity, nor subthreshold cases, nor crossovers between ED subtypes (Kring & Sloan, 2009). Further, in its current form, classification does not sufficiently take into account the (shared) etiology of mental disorders (Renna

et al., 2017), which is crucial for the better understanding of psychopathology and the development of adequate interventions for both research and practice. Nevertheless, a fundamental reorganization of the classification of mental illness cannot be expected anytime soon, since categorical approaches offer a heuristic approach and clear boundaries between disorders, which are of interest for both research and practice. In addition, it still has to be evaluated whether similarities of symptoms are sufficient evidence for an emotion regulation disorder theory and whether there is one single or multiple explanatory core factor of psychopathology. One research field that may convincingly contribute to unravel the mystery of psychopathology involves biological research. The following section will provide an overview of biological research regarding ERD and psychopathology and identify interesting paths to consider in future studies.

### **8.5.3 Spot on biological factors linking Eating Disorder pathology and Emotion Regulation Difficulties**

Dynamic and complementary interactions between biological and sociocultural, environmental, and psychological factors are presumed to be involved in the emergence and maintenance of EDs (Levine & Smolak, 2014). The involvement of the neurochemical dopaminergic and serotonergic systems is of particular interest in ED research (Frank, 2016; Monteleone et al., 2018), because of the implication of those systems in ER(D) processes (Bailer & Kaye, 2010; Kanakam & Treasure, 2013).

The dopaminergic system is implicated in impaired reward processing. Momentary gratification character has been attributed to aversive behaviour

(Keating, Tilbrook, Rossell, Enticott, & Fitzgerald, 2012; Monteleone et al., 2018; Southgate, Tchanturia, & Treasure, 2005), such as disordered eating (Kaye, Wagner, Fudge, & Paulus, 2010; Monteleone et al., 2018). More specifically, the hypo-responsiveness to food stimuli in AN has been associated with ventral striatum activation, which is part of the reward system (Friederich, Wu, Simon, & Herzog, 2013; Keating et al., 2012; O'Hara, Campbell, & Schmidt, 2015; Södersten, Bergh, Leon, & Zandian, 2016). Hyper-responsiveness to food observed in BN has been linked to impaired activation in the inhibitory control network (Friederich et al., 2013), which allows the rewarding value of addictive behaviours (Kaye et al., 2013). The reward-related release of dopamine from the ventral tegmental area to amygdala and hippocampus is involved in associative learning, and thus in the reinforcement of the link between gratifying behaviours that match cognitive goals (for example the thrive for thinness) and positive emotions (Monteleone et al., 2018; Zink & Weinberger, 2010). The dopaminergic system is further related to appetite regulation (Kaye et al., 2010; Monteleone et al., 2018; O'Hara et al., 2015; Sjögren, 2017; Zink & Weinberger, 2010) and executive functioning such as motivation (Eichen, Matheson, Appleton-Knapp, & Boutelle, 2017; Kaye et al., 2010). Frank (2013; 2015a) proposed a complex dopaminergic circuitry of EDs, including the insula for sensory processing of food and prefrontal cortex, cingulate cortices, orbitofrontal cortex, and amygdala for higher-order processing. An analogous complex circuitry has been proposed for ER. It is assumed that the automatic processing of emotional stimuli activates reward circuitry, which in turn influences higher-order ER, involving areas such as the prefrontal cortex

(Hatch, Madden, Kohn, Clarke, Touyz, & Williams, 2010; Phillips, Drevets, Rauch, & Lane, 2003a). The ventral striatum has recently been linked to body-related rumination and negative affect in AN in an fMRI study (Seidel et al., 2018), whereas the anterior insular and cingulate cortices were linked to emotional awareness (Gu, Hof, Friston, & Fan, 2013; Lane et al., 1998).

In addition, altered brain serotonin 5-Hydroxytryptamine (5-HT) function has been associated with ED symptomatology (Bailer & Kaye, 2010; Kaye, Frank, Bailer, & Henry, 2005; Zink & Weinberger, 2010). AN has been linked to increased 5-HT activity, whereas in BN, a deficit is assumed (Connan, Campbell, Katzman, Lightman, & Treasure, 2003; Polivy & Herman, 2002). Genetic studies underpin the contribution of the serotonergic system to BN, although results about 5-HTTLPR polymorphism remain conflicting (Sjögren, 2017). Genetic studies offer an interesting perspective on the association between ERD and EDs, since the 5-HTTLPR gene has been associated with greater ERD, lower distress tolerance, and increased susceptibility to psychopathology (Hariri & Holmes, 2006; Hawn, Overstreet, Stewart, & Amstadter, 2015) and has been proposed as candidate gene of ER (Canli, Ferri, & Duman, 2009). BN carriers of the s allele of 5-HTTLPR in fact displayed more affective instability, behavioural impulsivity, and comorbid BPD (Sjögren, 2017).

Common biological and genetic factors have been attributed to EDs and comorbid disorders (von Hausswolff-Juhlin et al., 2015; Yilmaz, Hardaway, & Bulik, 2015), involving the dopaminergic and serotonergic systems (DeSocio, 2019; Schmitz, 2005; von Hausswolff-Juhlin et al., 2015). For instance, the dopaminergic and serotonergic systems are involved in the modulation of the

hypothalamic-pituitary-adrenal axis, whose dysregulation is reflected in maladaptive responses to stress (Schmitz, 2005). Dysregulations of this axis have been associated with EDs (Connan et al., 2003) and also with anxiety disorders, depressive disorders, substance use disorders, and schizophrenia (Sauro, Ravaldi, Cabras, Faravelli, & Ricca, 2008). Nonetheless, there is evidence that ER circuitry differs across mental disorders and that different brain areas are linked to specific subdimensions of ER (Aldao et al., 2016; Arnsten & Rubia, 2012; Phillips, Drevets, Rauch, & Lane, 2003b). These assumptions reflect our findings regarding the specificity of association between ERD and specific symptoms on a biological level. The alteration of ER attributable to the frontoamygdala region has been observed in anxiety disorders, whereas fronto-striatal circuitry of ER is supposed to be involved in depression (Aldao et al., 2016). In accordance, anxiety disorders develop in childhood and usually precede the onset of the ED (Bulik, 1995; Kaye et al., 2004; Swinbourne et al., 2012), whereas a rather reciprocal relationship is assumed between EDs and depressive disorders, developing after puberty (Stice, Hayward, Cameron, Killen, & Taylor, 2000). Nevertheless, ER neurocircuitry in depression and EDs show analogies in structural and functional alterations of the amygdala, ventral striatum, nucleus accumbens, anterior cingulate cortex, insula, and dorsolateral prefrontal cortex (Donofry, Roecklein, Wildes, Miller, & Erickson, 2016). In addition, shared genetic factors are presumed across mental disorders (Schmidt, 2003), such as EDs, obsessive-compulsive disorder, alcohol use disorder, depressive disorders, autism spectrum disorders, schizophrenia, and attention deficit/hyperactivity

disorder (Bulik, Kleiman, & Yilmaz, 2016). Early-onset anxiety may even represent a genetically mediated pathway to EDs (Kaye et al., 2004).

It is likely that individual factors influence the common underlying genetic and biological base of psychopathology, which can be held responsible for the development of particular symptoms or disorders (Culbert et al., 2015). This assumption is best illustrated by the crucial interplay between genetic and environmental factors in adolescence regarding the emergence of EDs (Schmidt, 2003; Kaye, 2008). Puberty is accompanied by increased hormone release, social influences, and maturation of social stimuli processing and brain maturation (Aldao et al., 2016; Connan et al., 2003; Culbert et al., 2015; Frank, 2016; Gross, 2015; Kaye et al., 2010; Southgate et al., 2005; Treasure, Tchanturia, & Schmidt, 2005). These factors exacerbate the vulnerability to both ERD and psychopathology and ultimately trigger the emergence of mental disorders in some but not all individuals. Similar dynamics could explain why some but not all young women are prone to the negative influence of mass media (Culbert et al., 2015), a phenomenon that sociocultural models have yet failed to explain (Levine & Smolak, 2014). Since biological impairment are already observed in adolescence, early identification of symptoms is crucial to prevent the development of full-blown syndromes (Solstrand Dahlberg et al., 2017).

Based on this brief overview of biological findings, it appears necessary to further map out neurocircuits underlying ERD and EDs, based on obvious genetic and biological analogies, not least for the improvement of psychotherapeutic and pharmacologic interventions (Kaye et al., 2010). The

many references made to psychopharmacology in recent studies' recommendations testify for a regained interest in such interventions (Frank, 2015b; Kanakam & Treasure, 2013; Monteleone et al., 2018; von Hausswolff-Juhlin et al., 2015). It is rather surprising, since modest effects have been attested to psychopharmacology in ED treatment (Hay & Claudino, 2012; Mitchell, Roerig, & Steffen, 2013; Slade et al., 2018; Svaldi et al., 2018), especially in AN (Wade et al., 2017). Selective serotonin reuptake inhibitors (SSRIs, e.g. Fluoxetine) lead to sole symptomatic relief in BN (Sjögren, 2017; von Hausswolff-Juhlin et al., 2015), but have little impact on recovery (Flament, Bissada, & Spettigue, 2012). The little efficiency attributed to SSRIs in AN has been explained by SSRIs relying on synaptic release of 5-HT, which is significantly reduced in AN (Kaye et al., 2005). Further, antipsychotics do act on serotonin and dopamine receptors with some efficacy to target weight gain and delusional body shape perception in AN (Kishi, Kafantaris, Sunday, Sheridan, & Correll, 2012). However, effects are non-specific to certain brain regions and may even negatively alter normal functioning, as well as recovery (Arnsten & Rubia, 2012; O'Hara et al., 2015). Given the modest effect of existing psychopharmacological interventions, treatment that act more specifically and directly on specific circuits should be considered. Notably, the biological reward system has earned little interest in ED interventions so far (O'Hara et al., 2015). The question is whether the reward system could be an instrument to promote functional associations regarding certain behaviours or treatment outcome. Zink and Weinberger (2010) hinted at reward responses being responsive to positive conditioning. Monteleone et al. (2018) suggested that the effects of agonists or antagonists

on modulators of reward could be examined. However, one fundamental question is whether impaired reward processing is at all reversible. The impact of malnutrition on neurocircuitry, hormonal change, and brain maturation has been debated (Frank, 2015b; Kaye, 2008; Kaye et al., 2010; Södersten et al., 2016; Southgate et al., 2005; Treasure et al., 2005). Biological impairments of the 5-HT system, which seem to predate the emergence of EDs, also appear to persist after recovery (Bailer & Kaye, 2010; Kaye, 2008; Kaye et al., 2005; Polivy & Herman, 2002; von Hausswolff-Juhlin et al., 2015). On the other hand, reversibility of physical impairment may simply be slower (Södersten et al., 2016). Flament et al. (2012) emphasized the importance of studies in adolescents, in which concurring influences of long-term malnutrition can be ruled out, and thus would provide interesting insights on biological recovery from EDs.

Striatum-limbic circuits relate to both psychopathology and emotion (Bang, Treasure, Rø, & Joos, 2017; van Elburg & Treasure, 2013). Hence, neural circuits of ERD could be targeted by pharmacological interventions in order to promote emotional awareness. Interestingly, neural systems seem to adapt to the shift between controlled and automatic behaviour that occurs in the course of habituation to dysfunctional ED behaviour (Steinglass & Walsh, 2016). Likewise, neural structures could be related to the shift from goal-directed to (dysfunctional) automatic ER. The development of pharmacological intervention targeting automatic ER is an interesting suggestion made by Hatch, Madden, Kohn, Clarke, Touyz, Gordon, & Williams (2010). Biological interventions should, however, be complemented on a psychotherapeutic level. It is already known that psychotherapy acts on potentiating prefrontal

activity and on decreasing limbic activity in order to engage in cognitively adaptive controlled processing, leading to adaptive ER (Messina, Sambin, Beschoner, & Viviani et al., 2016). In addition, transcranial magnetic stimulation showed promising results in treatment resistant AN (Bang et al., 2017; Glenn & Raine, 2008). Hill, Peck, Wierenga, and Kaye (2016) proposed a short neurobiological psychoeducational intervention about genetic and neurobiological factors influencing the emergence and maintenance of psychopathology in complement to AN treatment. It appears beneficial for patients to understand their condition from a biological perspective and encouraging to learn about vulnerability factors in remission and relapse (Bang et al., 2017).

One challenge for psychopharmacology is the necessity to take into account not only physical conditions in EDs, but also psychiatric comorbidity, which may lead to contraindication (DeSocio, 2019; Svaldi et al., 2018). It is important to remind that brain regions can be conversely altered across disorders (hypo- vs hyperactivation) (Glenn & Raine, 2008). Thus, it is important to promote transdiagnostic psychopharmacological interventions, which act on specific domains of ER rather than on specific syndromes. So far, little is known about medication directly targeting emotional functioning across disorders (Lewis, Haviland-Jones, & Barrett, 2010). Given the biological overlap between EDs and ERD via the dopaminergic and serotonergic systems (Frank, 2016; Kaye et al., 2010), future studies should design circuits and pathways to explain the role of ERD in psychopathology, so that adequate interventions can be implemented. The results of the Research Domain Criterion project by the National Institute of Mental

Health (NIMH), that aims at establishing a dimensional rather than categorical approach to psychopathology based on common phenotypes, neural circuits, genetic factors, and biological systems that underlie symptomatology across diagnostic categories, are highly anticipated (Aldao et al., 2016; DeSocio, 2019; Gross & Jazaieri, 2014; van Elburg & Treasure, 2013). Based on the currently available findings, the transdiagnostic perspective is underpinned by biological factors, which are associated with specific impairments or symptoms rather than diagnoses (Frank, 2016). Further insight might help to map out pathways of action and interaction and to answer basic questions such as why some mental disorders or at least specific symptoms are more frequently associated with each other (Dalle Grave, 2011; Spindler & Milos, 2007).

Several other ED- and ERD-related questions are in need of an answer. Body-related concerns have earned less attention in biological research so far (Riva, 2016). Findings show that the reward system is activated when viewing pictures of thin ideals, whereas brain areas implicated in emotional processing are activated when viewing pictures of overweight bodies in AN (Monteleone et al., 2018). There is also evidence of limbic activity through emotional activation and increased attention involved in social comparison when viewing standardized bodies in contrast to the own body in AN (Vocks et al., 2010). Future studies will allow identifying impaired brain areas or neural circuits coupled with associated behaviours, to model comprehensive intervention in a broader transdiagnostic perspective. Further, the occurrence of single cases of low ERD coupled with severe psychopathology has not been investigated yet. Likewise, little is known about natural recovery in EDs (Polivy & Herman,

2002) and the effect of resilience factors on a neurobiological level. Furthermore, the promotion of adaptive ER has somehow been overlooked in contrast to the reduction of maladaptive ER (Carl, Soskin, Kerns, & Barlow, 2013). No conclusions can be drawn on whether low ERD signify good ER abilities. Therefore, the role of ER as protective factor should be further elaborated on a biological basis.

To conclude, recurrent difficulties in communication between research and practice have to be overcome. Future research should perpetuate efforts aiming at redefining neurobiology in theoretical models and at including knowledge on biological aspects into therapeutic interventions in EDs. It appears reasonable to adopt a holistic perspective, based on the complex neurocircuits underlying psychopathology and ERD.

## **8.6 Conclusion**

The aim of this thesis was to contribute to the examination of the association between ERD and disordered eating symptomatology in a heterogeneous sample of young women based on experimental, cross-sectional, and longitudinal data. Most notably, general ERD may not be a moderator of the impact of thin ideal exposure on ED symptomatology, but certain subdomains of ERD appeared to play a role in certain features of EDs in both young healthy women and ED patients. The findings of the current thesis corroborate previous findings on specific associations between ERD and ED psychopathology. More importantly, they extend knowledge by emphasizing the importance of acknowledging, understanding and accepting emotions for

mental health. In contrast, action-oriented dimensions of ERD, which are usually closely linked to dysfunctional ED features, failed to be consistently related to our outcomes. In addition, this thesis showed that the specificity of association between particular dimensions of ERD and individual features of EDs is persistently observed in both cross-sectional and longitudinal data, regardless of whether the sample is constituted of patients with EDs, MMD or HC.

Our study was not designed to identify the nature, nor the mechanisms underlying the relationship between ERD and ED psychopathology. Nevertheless, our findings remind of a multitude of factors that are involved in the characterization of EDs and psychopathology in general, which have yet to be defined. EDs are influenced by genetic, neurobiological, biochemical, affective-motivational, cognitive, and behavioural factors and their complex interplay (Grzelak et al., 2017), which is in line with a transdiagnostic approach to EDs, but also psychopathology in general, adopted in this thesis. One particular challenge is to take into account different experiential trajectories in life rather than considering a homogeneous growth process, which is applicable to both ER and mental health. The course of EDs is subject to highly individual fluctuations rather than being linear and the way to achieve remission is paved by episodes of relapse and instable phases of partial remission (Kordy et al., 2002).

Although many questions are still open for EDs, evidence supports the efforts made towards an integrative approach of ERD and psychopathology.

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## Appendix

### A) VAS Body Image

#### Visual Analog Scale Body Image (VAS Body Image, Munsch et al., in preparation)

Im Folgenden sehen Sie verschiedene Aussagen, welche das Wohlbefinden und die Zufriedenheit mit Ihrem Körper betreffen. Bitte geben Sie auf der Skala von "überhaupt nicht" bis "völlig" an, wie sehr diese Aussagen gerade in diesem Moment auf Sie zutreffen.

---

1. Wie zufrieden sind Sie in diesem Moment mit Ihrem Körper?
  2. Wie zufrieden sind Sie in diesem Moment mit Ihrem Gewicht?
  3. Wie zufrieden sind Sie in diesem Moment mit Ihrem Äusseren?
  4. Wie wohl fühlen Sie sich im Moment in Ihrem Körper?
  5. Wie stark ekeln Sie sich im Moment vor Ihrem Körper?
  6. Wie sehr haben Sie im Moment Mühe damit, Ihren Körper zu ertragen?
  7. Wie stark belasten Sie im Moment Gedanken über Ihr Aussehen?
  8. Wie sehr wünschen Sie sich im Moment, bestimmte Partien Ihres Körpers verändern zu können?
  9. Wie stark beschäftigt Sie im Moment Ihre körperliche Erscheinung (Aussehen, Gewicht)?
  10. Wie sehr verspüren Sie im Moment Angst, an Gewicht zuzunehmen?
  11. Wie sehr haben Sie im Moment das Bedürfnis, Ihr Aussehen / Ihren Körper in einem Spiegel zu überprüfen?
- 

*Notes:* Participants rated each item on a 100-mm visual analog scale (0 not at all to 100 completely).

## **B) VAS Eating**

### **Visual Analog Scale Eating (VAS Eating, Munsch et al., in preparation)**

Im Folgenden sehen Sie verschiedene Aussagen, welche Ihr Essverhalten betreffen. Bitte geben Sie auf der Skala von "überhaupt nicht" bis "völlig" an, wie sehr diese Aussagen gerade in diesem Moment auf Sie zutreffen.

---

1. Wie stark haben Sie im Moment das Bedürfnis, sich mit Essen vollzustopfen?
  2. Wie stark haben Sie im Moment den Drang, Diät zu halten?
  3. Wie stark haben Sie im Moment den Drang, sich zu bewegen / Sport zu treiben?
  4. Wie stark haben Sie im Moment den Drang, Abführmittel / Medikamente einzunehmen, um Ihr Gewicht zu regulieren?
  5. Wie stark haben Sie im Moment den Drang, zu erbrechen?
  6. Wie sehr fühlen Sie sich schuldig, wenn Sie daran denken, etwas zu essen?
  7. Wie stark ausgeprägt erleben Sie im Moment ein Hungergefühl?
- 

*Notes:* Participants rated each item on a 100-mm visual analog scale (0 not at all to 100 completely).