**Doctoral thesis submitted to
the Faculty of Behavioural and Cultural Studies
Heidelberg University
in partial fulfillment of the requirements of the degree of
Doctor of Philosophy (Dr. phil.)
in Psychology**

Evaluation of an Internet-delivered support program
for patients with bulimic symptomatology

presented by
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year of submission
2014

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Acknowledgements

First and foremost, it has been an honor to have the possibility to study as a PhD student under the supervision of Professor Dr. Peter Fielder at the Heidelberg University. His positive and motivating attitude was an example throughout this period. Although we had to work from distance, I felt the support and the stimulation he provided continuously, which I am truly grateful for.

I would like to express my gratitude to Professor Dr. Ferenc Túry, who not only provided me with the infrastructure and resources to conduct my research study in Hungary but also a home environment in which I could express my potential with respect to compassion, persistence and endurance during the pursuit of my PhD. He has given me the freedom to get involved in several projects and contributed considerably to my personal and professional life. I have learned a lot from his guidance, empathy and enormous clinical experience which will go on inspiring throughout my life. I would also like to express my sincere gratitude to him for proofreading my thesis and his valuable comments.

This work would not have been possible without the support, knowledge and encouragement I received from Dr. Stephanie Bauer. I am glad to have the chance to express my heartfelt gratitude for her constant supervision and stimulation during my PhD. Steffi has always been a resource for empowerment and she has been an excellent role model as a researcher and as a colleague. I am grateful for the collaboration we have developed throughout the years based on mutual responsibility and commitment. I also would like sincerely thank to her for proofreading my thesis and for insightful suggestions and comments.

The EDINA software was provided by the Center for Psychotherapy Research at the University Hospital Heidelberg within the Marie Curie Research Training Network, INTACT (Individually Tailored Stepped Care for Women with Eating Disorders) funded by the European Commission. I would like to thank to all the colleagues who were involved in the implementation of the program and especially Dr. Hans Kordy as the coordinator of this project. I also would like to acknowledge the great experience I had within the Marie Curie Research Training Network as an Early Stage Researcher which gave me the opportunity to meet many young researchers around Europe and participate in several scientific meetings and workshops to improve my knowledge with well-known experts in the field. My thanks are due to the staff of the Center for Psychotherapy Research for their hospitality which made me feel part of the team whenever I visited them at the Center for Psychotherapy Research in Heidelberg.

I would like express my gratitude to Dr. Markus Moessner for inspiring discussions, constant support on data analyses and stimulating thoughts and comments throughout my PhD. His input was remarkable and contributed considerably to the success of this work. I am very thankful to Dr. Elisabeth Kohls for providing a great working experience and an invaluable support during my PhD. Besides, I would like to express my gratitude for the collaboration during the data collection phase of our projects and her valuable comments on an earlier draft of this dissertation. I would like to thank to Ágnes Mezei for moderating the chat module of the program under the supervision of Professor Dr. Ferenc Túry and for her support during the data collection of the project. I would like to thank to Dr. Edit Czeglédi and Adorján Fritz for their collaboration in the content analyses of the chat scripts of the program. I would like to thank to Márta Varga for moderating the chat module of the program at the beginning of the project under the supervision of Professor Dr. Ferenc Túry. I would like to express my gratitude to the staff of the Institute of Behavioural Sciences at the Semmelweis University for their generous hospitality. I especially appreciate the stimulating and helpful discussions of the eating disorder working group. I am grateful to Dr. Bernadett Babusa for her valuable comments on the final draft of this dissertation.

I would like to express my gratitude to Professor Dr. med. Manfred Cierpka for accepting to become the second reviewer of this dissertation.

I am thankful to all the participants who accepted to take part in the project and provided data for evaluation.

I would like to thank to all my friends, who were always there for me and provided continuous encouragement and motivation during hard times. Finally, I wish to thank to my family for the unconditional love and support they have given me from distance during the pursuit of my PhD.

Hayriye Güleç

January, 2014

List of publications for the publication based dissertation

I. Publication
Gulec, H., Moessner, M., Mezei, A., Kohls, E., Túry, F. & Bauer, S. (2011). Internet-based maintenance treatment for patients with eating disorders. *Professional Psychology–Research and Practice, 42(6)*, 479-486.

II. Publication
Gulec, H., Moessner, M., Túry, F., Fiedler, P., Mezei, A. & Bauer, S. A randomized controlled trial of an Internet-based post-treatment care for patients with eating disorders. *Telemedicine and e-Health (accepted).*

III. Publication
Mezei, Á., Gulec, H., Czeglédi, E., Fritz, A. & Túry, F. Linguistic characteristics of patients with bulimic symptomatology in an online post-treatment program. *Submitted to Eating and Weight Disorders.*

1.   General introduction

Eating disorders are serious conditions with high risk of morbidity, chronicity and mortality (Arcelus, Mitchell, Wales, & Nielsen, 2011; Wonderlich et al., 2012). Post-treatment recovery rates for these disorders are 30 to 50 percent even under best treatment conditions available (Brown & Keel, 2012; Bulik, Berkman, Brownley, Sedway, & Lohr, 2007; Fairburn & Harrison, 2003; Hay, Bacaltchuk, Stefano, & Kashyap, 2009; Mitchell, Agras, & Wonderlich, 2007; Shapiro et al., 2007) and the maintenance of treatment gains is highly challenging with particularly pronounced rates of relapse in the first months following treatment termination (Carter et al., 2012; McFarlane, Olmsted, & Trottier, 2008; Olmsted, Kaplan, & Rockert, 2005; Richard, Bauer, & Kordy, 2005). Interventions supporting these patients at post-treatment have been scarce despite the high rates of relapse reported.

Growing evidence lends support to the use of information and communication technologies in the health care delivery of patients with various health conditions including mental disorders. Thus far, different forms of communication technologies and media have been introduced along the health care spectrum and their potential has been studied with promising results. (Andersson, Ljotsson, & Weise, 2011; Barak, Hen, Boniel-Nissim, & Shapira, 2008). These technology-enhanced applications range from minimum support through pure online information resources (psychoeducation), to online support groups (e.g., forums, message boards), short message service, e-mail, chat, web telephony, palmtop computers, mobile applications, Internet multimedia programs, telemedicine and virtual reality. The advantages of using new technologies lie in its convenience for users (e.g., easy access, attractiveness of the medium) and its ability to extend the reach of the treatment providers (e.g., bridging the geographical distances, providing contact between the therapy sessions and reaching underserved populations). Moreover, they enable easy access and storage of large amounts of text that can be studied with respect to the content and language use.

Recent studies have found encouraging evidence for the use of information and communication technologies in management of patients with eating disorders as well (Aardoom, Dingemans, Spinhoven, & Van Furth, 2013; Bauer & Moessner, 2013). Yet, no study has reported on the effects of an Internet-based intervention to address patients with bulimic symptomatology following treatment termination. The research presented in this dissertation aimed at filling this gap. For this purpose, an Internet-based multimedia program with several online components was developed within a European collaboration. In the first pilot study, the intervention strategy of the program was introduced and its feasibility and

acceptability was investigated. In the second study, the efficacy of the intervention in maintaining and/or enhancing treatment gains was studied in routine care against a waiting list control condition (treatment as usual). The third study was concerned with text analyses of the moderated group chat sessions that were part of the intervention. The aim was to provide insights into the themes of the chat interactions and to investigate the linguistic predictors of improvement in participants' eating disorder related attitudes, symptoms and general psychological well-being.

2.   Theoretical and empirical background

This section will provide the theoretical and empirical background for the development and examination of an Internet-based intervention for post-treatment care of patients with eating disorders. First, the rationale for care continuity following treatment termination will be outlined. Second, e-health as a way to extend the health care delivery and its applications in eating disorders will be introduced. Then, the focus will be the study of language use and online and offline linguistic characteristics of patients with eating disorders. Finally, an overview of the dissertation will be provided.

2.1. Classification of eating disorders

Eating disorders are characterized by significant disturbances in eating behavior and by self-critical, negative thoughts and feelings about body weight and food, which disrupt normal body function and daily activities. The fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 2000) classifies anorexia nervosa (AN) and bulimia nervosa (BN) as the two main categories of eating disorders. Under eating disorders not otherwise specified (EDNOS) category, subthreshold and atypical eating syndromes are classified and provisional criteria for binge eating disorder (BED) are provided for further study.

AN is a serious disorder marked by an inability to maintain a normal healthy body weight (below 85% of the ideal body weight expected for age and height) and excessive dietary restriction due to intense fear of weight gain and body image disturbances. The DSM-IV identifies two subtypes of AN: restricting type and binge eating/purging type. The subtypes are distinguished by the presence or absence of binge eating and purging behavior which include self-induced vomiting or misuse of laxatives, diuretics and enemas. BN is characterized by body image disturbances and recurrent binge eating episodes (consuming large amounts of food in a discrete period of time with a feeling of loss of control) in combination with some form of inappropriate compensatory behavior to prevent weight gain. The DSM-IV identifies two subtypes of BN based on the form of the compensatory behavior employed: purging type (self-induced vomiting, misuse of laxatives, diuretics, or enemas) and non-purging type (excessive exercise, fasting). Eating disorders not otherwise specified (EDNOS) are the most commonly diagnosed type of eating disorder in the DSM-IV both in clinical and community samples (Fairburn & Bohn, 2005). This category includes subthreshold syndromes of AN and BN, purging disorder, night eating syndrome and BED.

Provisional criteria for BED are listed in the appendix of the DSM-IV for further study. BED is characterized by recurrent binge eating episodes in the absence of compensatory behaviors to control weight. It is commonly encountered among the obese in weight control programs (18-47%) but obesity is not a criterion for its classification (de Zwaan, Mitchell, Raymond, & Spitzer, 1994). Binge eating occurs due to a general tendency to overeat in BED rather than a consequence of rigid dietary restriction which discriminates BED from BN and explains its association with obesity (Dingemans, Bruna, & van Furth, 2002; Fairburn & Harrison, 2003).

The American Psychiatric Association Task Force suggested several changes to the classification of eating disorders in the proposed fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), which was released in May, 2013 (American Psychiatric Association Task Force, 2013). According to this, the criterion which requires amenorrhea or absence of three menstrual cycles for the diagnosis of AN is eliminated. For BN, the frequency requirements of binge eating and compensatory behaviors are reduced from twice weekly to once weekly. BED is recognized as a distinct category of eating disorders and frequency requirement of binge eating is reduced from twice weekly to once weekly, and the duration requirement from 6 months to 3 months. A new condition is added called feeding and eating disorders not elsewhere classified that accounts for the current EDNOS diagnosis but includes more homogeneous conditions such as atypical AN, subthreshold BN, subthreshold BED, purging disorder and night eating syndrome. The DSM-5 also incorporates the diagnoses of pica, rumination and avoidant/restrictive food intake disorder as separate categories, which were previously listed under the Disorders Usually First Diagnosed in Infancy, Childhood or Adolescence chapter of the DSM-IV.

2.2. Course and outcome of eating disorders

2.2.1. Anorexia nervosa

For AN, an average point prevalence of 0.3% has been reported across studies (Favaro, Caregaro, Tenconi, Bosello, & Santonastaso, 2009; Smink, Hoeken, & Hoek, 2012) and the reported lifetime prevalence rates range from 0.3% to 2.2% in community samples (Bulik et al., 2006; Favaro, 2003; Keski-Rahkonen et al., 2007; Preti et al., 2009; Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011; Wade, Bergin, Tiggemann, Bulik, & Fairburn, 2006). Although it mainly affects young females with high incidence rates between 15-19 years of age (Micali, Hagberg, Petersen, & Treasure, 2013; Smink et al., 2012), the female-

to-male ratio is expected to be less than the previously reported 10:1 ratio in the recent studies (Hudson, Hiripi, Pope, & Kessler, 2007; Preti et al., 2009).

AN is a self-perpetuating disorder with significant physical and emotional impairment and represents a chronic course. Approximately 46-50% of the individuals with AN recover after 10 or more years following presentation, whereas one third improve only partially and 20% remain chronically ill over the long term (Berkman, Lohr, & Bulik, 2007; Keel & Brown, 2010; Steinhausen, 2002). The mortality ratio is more than that reported for other psychiatric disorders and due to suicide for one in five individuals (standardized mortality ratio: 5.86) (Arcelus et al., 2011). Besides the considerable mortality rate, psychiatric comorbidity with mood and anxiety disorders, substance use disorders, obsessive compulsive disorder and obsessive compulsive personality disorder is frequently diagnosed during the course of the illness with indications for unfavorable outcome (Steinhausen, 2002). Recent evidence indicates longer duration of follow-up as a mitigating factor of the outcome (Steinhausen, 2009). Thus, following up patients for extended periods is recommended from a clinical perspective (Keel & Brown, 2010). Large population-based studies that investigated the natural course of AN yielded relatively favorable outcomes but the burden of the illness was considerable: The illness duration was longer than two years in two thirds of the sufferers and in half of them it was longer than three years before achieving clinical recovery (Keski-Rahkonen et al., 2009). Only a minority of the sufferers was asymptomatic (49%) after 14 years (Wade et al., 2006) and 12% still had a chronic course after 18 years (Wentz, Gillberg, Anckarsater, Gillberg, & Rastam, 2009).

Thus far, no evidence based psychological or psychopharmacological treatment has proven its efficacy for adults with AN (Bulik et al., 2007; Wilson, Grilo, & Vitousek, 2007). Some studies suggested the benefit of olanzapine, an atypical antipsychotic medication, on weight-related outcomes but the results are preliminary (Bulik et al., 2007; Wilson et al., 2007). Family based treatment (FBT) is the best studied and the most effective treatment for children and adolescents with AN (Lock & Le Grange, 2013). FBT focuses on identifying how the family is organized around the problem of AN and aims at identifying and changing maladaptive behaviors that may maintain the disorder (Eisler, 2005). Studies have shown FBT to be associated with improvements in body mass index (BMI) and eating disorder related attitudes in children and adolescents with AN (Lock, 2011). The National Institute for Clinical Excellence (NICE) in the United Kingdom, which has provided a comprehensive guideline for treatment of eating disorders based on a grading system from "A" (strong empirical support from well-conducted randomized controlled trials) to "C" (expert opinion with no empirical support), recommends family interventions for children and adolescents

with a grade of "B" (National Institute for Health and Care Excellence, 2004). Research indicates that FBT performs better than individual treatment at follow-up (Couturier, Kimber, & Szatmari, 2013; Lock et al., 2010), has lasting effects (Eisler et al., 1997) and is associated with a reduced rate of relapse (Lock et al., 2010). With the recent evidence, FBT emerges as the first-line treatment of adolescents with AN (Couturier et al., 2013; Hay, 2013; Lock, 2011; Lock et al., 2010; Loeb & le Grange, 2009). However, full remission rates are only around 50% across studies and it remains a challenge to effectively treat those who do not respond to FBT as there are no other evidence-based treatments to offer (Lock, 2011). Other limitations include costly nature of FBT due to extensive therapist hours necessary for its implementation and obstacles related to its dissemination (Dalle Grave, Calugi, Doll, & Fairburn, 2013; Lock, 2011).

2.2.2. Bulimia nervosa

The generally accepted point prevalence of BN is 1% for young females (Fairburn & Beglin, 1990; Hoek & van Hoeken, 2003). The lifetime prevalence rates range from 0.5% to 2.9% for women (Fairburn & Beglin, 1990; Hoek & van Hoeken, 2003) and from 0.1% to 0.5% for men (Bushnell, Wells, Hornblow, Oakley-Browne, & Joyce, 1990; Garfinkel et al., 1995) in community samples. Despite lower mortality rates of BN, its outcome is only slightly better than in AN (Steinhausen, 2009). Similar to AN, psychiatric comorbidity with mood and anxiety disorders is frequently reported and a sizable portion of affected individuals suffer from personality disorders during the course of the illness (Steinhausen & Weber, 2009). Approximately 50% of full recovery and 20% of chronicity is estimated after five to 10 years, whereas, for the remaining 30% the course of the illness is protracted with relapses, the risk of which declines after four years following presentation (Keel & Mitchell, 1997). The estimation of a stable recovery rate for the first 5-6 years following intake is difficult (Quadflieg & Fichter, 2003) and not achieving remission by five years is associated with a risk of chronicity at 20 years (Keel & Brown, 2010). Recovery rates in community samples are similar to the reported recovery rates from the usual follow-up studies (Agras, Crow, Mitchell, Halmi, & Bryson, 2009; Fairburn, Cooper, Doll, Norman, & O'Connor, 2000; Grilo et al., 2007; Grilo, Pagano, et al., 2012; Grilo et al., 2003). In a nationwide population-based cohort study of twins in Finland, BN persisted for 23% of the sufferers after five years following onset (Keski-Rahkonen et al., 2009). Another population-based cohort study of twins in Australia reported 7% to receive BN diagnosis after a mean of 15 years but half of the sample had residual symptoms and thus were not symptom free (Wade et al., 2006). In

longer term, similar rates of remission were reported from different sources: The remission rate was 72% in a community sample at 20 years (Keel, Gravener, Joiner, & Haedt, 2010) and 70% following inpatient treatment and outpatient treatment at 12 and 10 years, respectively (Fichter & Quadflieg, 2004; Keel, Mitchell, Miller, Davis, & Crow, 1999).

The evidence suggests that cognitive behavior therapy (CBT), interpersonal psychotherapy (IPT) and fluoxetine, –an antidepressant medication with the most effective dose of 60 mg/day–, are superior to no treatment, placebo or other active treatment conditions for adults with BN (Brown & Keel, 2012). CBT is a theory-driven and manual based treatment which views core eating disorder pathology and its maintenance as the negative over-evaluation of body weight and shape resulting in dysfunctional eating behaviors (i.e. strict dieting and unhealthy weight control measures) (Fairburn, Marcus, & Wilson, 1993). The treatment is typically 16-20 sessions over a period of four to five months and delivered in individual, group or guided self-help formats (Wilson & Zandberg, 2012). The focus of treatment involves cognitive and behavioral procedures to replace dysfunctional eating behaviors and attitudes, enhance motivation for change and prevent relapse (Fairburn, Marcus, et al., 1993). IPT, which was originally developed to treat patients with depression, is a short term (eight–sixteen sessions) and structured therapy that sees the root of the psychological problems in current difficulties in interpersonal relationships (Klerman, 1984). The adapted version for BN focuses on interpersonal functioning and pursues therapeutic progress through amelioration of interpersonal relationships rather than a direct focus on eating disorder related symptoms (Fairburn, Jones, Peveler, Hope, & O'Connor, 1993; Murphy, Straebler, Basden, Cooper, & Fairburn, 2012). The rationale of IPT is consistent with the often observed relationship between poor interpersonal functioning and eating disorders in the literature (Striegel-Moore et al., 2005). There is strong evidence to suggest CBT as the first-line therapy for BN (Hay, 2013; Shapiro et al., 2007): CBT performs better than antidepressant drugs in reducing bulimic symptoms both in short term and long term and the combination of CBT and fluoxetine does not necessarily yield better outcomes than CBT alone although it does so compared to medication alone (Peterson & Mitchell, 1999; Shapiro et al., 2007; Whittal, 1999). Moreover, despite similarities of CBT and IPT in treatment efficacy at one year follow-up, it is shown that CBT is associated with more rapid treatment effects and higher remission rates than IPT at discharge and thus is preferred for faster improvement in symptomatology (Agras, Walsh, Fairburn, Wilson, & Kraemer, 2000; Fairburn et al., 1991; Fairburn et al., 1995; Wilson, Fairburn, Agras, Walsh, & Kraemer, 2002). The NICE evaluates the efficacy of CBT with a grade of "A" and recommends it as the treatment of choice for adults with BN (National Institute for Health and Care

Excellence, 2004). However, even with strong evidence, the reported remission rates are less than 50% across studies (Hay, 2013; Shapiro et al., 2007), the post treatment symptomatology is rarely within the normative range (Lundgren, Danoff-Burg, & Anderson, 2004), a considerable number of patients fail to respond to CBT (Agras & Robinson, 2008; Cooper & Fairburn, 2011; Mitchell et al., 2007) or drop-out before the end of treatment (Mitchell, 1991; Waller, 1997) and the rate of relapse is high following treatment termination (Olmsted et al., 2005). In addition, despite the strong research evidence, dissemination of CBT in routine clinical practice is limited (Haas & Clopton, 2003; Mussell et al., 2000).

2.2.3. Eating disorders not otherwise specified

EDNOS compromises the largest eating disorder category of the DSM-IV, which includes subthreshold and atypical eating syndromes and provisional criteria for BED. It has similar psychopathology to other eating disorders and especially to BN (Fairburn et al., 2007). Patients with EDNOS do not significantly differ from patients with full syndrome eating disorders in terms of functional impairment (Keel, Brown, Holm-Denoma, & Bodell, 2011). Results from a large population-based study in the United States reported lifetime prevalence rates of 4.78 for adolescents and 4.64% for adults (Le Grange, Swanson, Crow, & Merikangas, 2012). Consecutive population surveys have shown an increase in the spectrum of EDNOS in the successive cohorts in the last decade (Hudson et al., 2007; Preti et al., 2009; Swanson et al., 2011). A point prevalence of 2.4% was reported in a two-stage community sample of young females in Portugal (Machado, Machado, Goncalves, & Hoek, 2007). An increase in the incidence of EDNOS diagnosis was reported in the primary care registry of the United Kingdom between 2000 and 2009 making it the most commonly detected eating disorder diagnosis in the UK primary care system (Micali et al., 2013). Although short-term outcome studies with follow-up durations between one and four years report remission rates up to 78% in natural and treatment settings (Agras et al., 2009; Grilo et al., 2003; Schmidt, Lee, et al., 2008), a rate which is better than BN with similar durations (Keel & Mitchell, 1997), in the long term both EDNOS and BN represent similar course and outcome: At five years, the rate of remission was 74% for BN (Ben-Tovim et al., 2001; Grilo et al., 2007); 78% (Ben-Tovim et al., 2001) and 83% (Grilo et al., 2007) for EDNOS in two studies. In addition, a remission rate of 75% in a community sample at 20 years is similar to that reported for BN (72%) during the same time period (Keel et al., 2010).

EDNOS is the least stable eating disorder diagnosis with high rates of diagnostic cross-over to and from AN, BN and no eating disorder (Milos, Spindler, Schnyder, &

Fairburn, 2005). Some studies suggest EDNOS as a way-station diagnosis mainly because it is composed of patients with an eating disorder diagnosis transitioning to recovery or of patients at recovery transitioning to an eating disorder diagnosis (Agras et al., 2009; Fichter & Quadflieg, 2007; Helverskov et al., 2010). For example, in one study 18% of the patients with EDNOS were reported to recover and 12% to develop full AN or BN after a mean follow-up duration of 41 months, showing a similar trend towards recovery and full eating disorders syndromes, respectively (Herzog, Hopkins, & Burns, 1993). A prospective study of 385 participants with AN, BN, BED and EDNOS recruited through community and specialty clinics facilitated a direct comparison of the diagnostic categories via assessments at six-month intervals for four years (Agras et al., 2009). According to the results, only 18% of the EDNOS participants finished the study without crossing to another eating disorder diagnosis during the four-year follow-up, and the majority of patients who had started the study with an EDNOS diagnosis (78%) had had a past eating disorder diagnosis before. In another study, following successful CBT for BN, 81% of the participants who relapsed received an EDNOS diagnosis at four-month follow-up (Halmi et al., 2002). In a 12-year prospective follow-up study, the largest percentage of remissions from any eating disorder was through transition to EDNOS (Fichter & Quadflieg, 2007). For AN, diagnostic crossover to BN was either preceded by binge eating purging subtype of AN or by full or partial remission (EDNOS) (Castellini et al., 2011; Eddy et al., 2008; Fichter & Quadflieg, 2007). Applying the recent classification of eating disorders in the DSM-5, some studies reported reduced proportion of EDNOS (Machado, Goncalves, & Hoek, 2013) and decreased crossover rate from EDNOS to full syndrome eating disorders (Castellini et al., 2011). However, its nosological classification warrants further research.

Although EDNOS comprises the largest category of eating disorders and is associated with considerable impairment, the knowledge on its treatment is limited. In the absence of evidence, NICE recommends to follow the guidelines of the eating disorder that most closely resembles the individual's eating problem when treating EDNOS ("C") (National Institute for Health and Care Excellence, 2004). An enhanced form of CBT (CBT-E) has been developed to address a transdiagnostic sample of patients with eating disorders (Fairburn, Cooper, & Shafran, 2003). CBT-E extends the current cognitive theory of BN to all eating disorders by incorporating four maintaining factors that are assumed to be common in all eating disorders (i.e. clinical perfectionism, core low self-esteem, mood intolerance and interpersonal difficulties) (Fairburn, 2008). In one study, CBT-E was found to improve outcomes among non-underweight EDNOS and BN patients who had additional problems related to mood intolerance, clinical perfectionism, low self-esteem, or interpersonal

difficulties (Fairburn et al., 2009). However, the results are preliminary and no established treatment strategy exists for patients with EDNOS, yet.

BED is more prevalent than other eating disorders and is associated with significant psychiatric comorbidity, psychosocial impairment, and obesity (Hudson et al., 2007; Preti et al., 2009). Population-based studies suggest lifetime prevalence rates between 1% and 3.5% in community samples (Hay, 1998; Hudson et al., 2007; Tong et al., 2013). The gender difference is less pronounced compared with AN and BN (Striegel-Moore & Franko, 2003): In a population-based survey of six European countries, the lifetime prevalence of BED was 1.9% for females and 0.3% for males (Preti et al., 2009). Since its first proposal as a diagnostic category in 1991 (Spitzer et al., 1991), few studies have been published on the course and outcome of BED. Two studies investigated its natural course in random community samples and reported 48% of partial remission at six months (Cachelin et al., 1999) and 77% of abstinence at five years (Fairburn et al., 2000), respectively. The recovery rates ranged between 25% and 80% in controlled treatment trials with one to three year follow-up periods (Berkman et al., 2007; Brownley, Berkman, Sedway, Lohr, & Bulik, 2007; Grilo & Masheb, 2005; Keel & Brown, 2010; Munsch, Meyer, & Biedert, 2012; Ricca et al., 2010). At four-year follow-up, a remission rate of 82% was reported among participants recruited through community and specialty clinics in the United States (Agras et al., 2009). Comparable recovery rates were 57% for AN and 47% for BN during the same time period indicating a higher rate of remission for patients with BED. The evidence on the long-term course of BED is limited. Fichter and colleagues investigated the treatment outcome of inpatients after six and 12 years following presentation in Germany. The reported rates of remission were 79% at six years (Fichter, Quadflieg, & Gnutzmann, 1998) and 67% at 12 years (Fichter, Quadflieg, & Hedlund, 2008). These rates were similar to those reported for BN with similar durations (Fichter & Quadflieg, 2004; Grilo et al., 2007).

A specifically adapted form of CBT and IPT are identified as the best treatment approaches for patients with BED. The rationale of CBT is based on normalizing eating behavior through regular meals and snacks and improving self-image and weight and shape concerns to disrupt the restraint–binge cycle in BED (Agras & Apple, 2008). Both CBT and IPT are superior to no treatment and behavioral weight loss treatment conditions in terms of reducing binge frequency while their efficacy on weight loss outcomes is limited (Wilfley et al., 2002; Wilson, Wilfley, Agras, & Bryson, 2010). Pharmacological interventions in BED mainly focused on selective serotonin reuptake inhibitors and reported positive results in reducing binge frequency compared to placebo conditions (McElroy, Guerdjikova, Mori, & O'Melia, 2012). However, their effects are inferior to psychological treatments that utilize

cognitive behavioral approaches (Vocks et al., 2010). Most patients with BED are overweight or obese and have higher BMI than obese people with no BED (Villarejo et al., 2012). Behavioral weight loss treatment (BWL), a common treatment of obesity which aims at controlling food intake and facilitates weight loss through improved nutrition, caloric restriction, and physical activity has been studied as a treatment alternative for patients with BED (Wing, 1998). Although BWL performs better than CBT and IPT in terms of weight loss and BMI, its efficacy in reducing binge frequency is limited and regaining weight following treatment termination is a common problem (Iacovino, Gredysa, Altman, & Wilfley, 2012; Vocks et al., 2010). Moreover, the combination of CBT and either medication or BWL does not improve weight related outcomes although it has some benefits in reducing the frequency of binge eating episodes (Vocks et al., 2010).

SUMMARY

Eating disorders are persistent, chronic and self-perpetuating disorders. Although some maintenance factors have been identified such as thin ideal internalization, body dissatisfaction, perfectionism, and negative affect (Stice, 2002), the evidence on efficacious treatments are constrained (Dalle Grave, 2011). In the current standing, there is growing evidence to suggest FBT as the first-line treatment for adolescents with AN. When treating adults with BN, the treatment of choice is CBT but some initial steps may involve suggesting evidence based self-help and fluoxetine. In addition, IPT may be suggested as an alternative to CBT but it is recommended to inform patients that it takes 8-12 months to achieve results comparable to CBT (National Institute for Health and Care Excellence, 2004). For BED, both CBT and IPT are equally effective in reducing binge eating but treatments that improve both weight loss and binge eating are yet to be established. Even with strong research support, substantial number of patients does not respond to these interventions and the rate of relapse is remarkable. The current challenges involve developing and evaluating treatments for adults with AN, adolescents with BN and patients with EDNOS in general, improving the dissemination and efficacy of evidence based treatment approaches and developing strategies to deal with those who do not respond to the established treatment approaches.

2.3. Relapse in eating disorders

Maintenance of treatment gains is a challenge when treating patients with eating disorders. Studies consistently indicate that the majority of the patients are not symptom free at the end of the treatments, the treatment effects are maintained only in the short term and the long term course is often associated with a high risk of relapse and chronicity (Keel & Mitchell, 1997; Pike, 1998). Few studies investigated the rate and predictors of relapse among patients with eating disorders. Although the definitions of the terms, follow-up periods and methodologies varied considerably across studies (Olmsted et al., 2005), the reported rates of relapse ranged between 22% to 63% and thus were considerable. The results from these studies will be summarized in this section.

For AN, when relapse was defined as a drop in body weight below 85% of average or as failing to maintain the Morgan-Russell classification of good outcome (weight is within 15% of average and the person has normal cyclic menstruation) at follow-up (Morgan & Russell, 1975), studies reported relapse rates between 22% (Strober, Freeman, & Morrell, 1997) and 42% (Eckert, Halmi, Marchi, Grove, & Crosby, 1995). At a median of 12 years, the predictors of relapse emerged as shorter duration of illness, younger age and more severe psychiatric status at presentation (Deter & Herzog, 1994). In a longitudinal study of adolescents with 10 to 15 years of follow-up period, the risk of relapse was particularly high within the first 12 months after hospital discharge and time to relapse was significantly shorter for those who had a compulsive drive to exercise at discharge or represented a more chronic status during the course of the follow-up period (Strober et al., 1997). Analysis of the weight curves of adolescents who experienced relapse after inpatient treatment revealed the first nine months following discharge as a high risk period for renewed weight loss and re-admission (Lay, Jennen-Steinmetz, Reinhard, & Schmidt, 2002). When relapse was defined as a BMI of less than or equal to 17.5 for three consecutive months or at least one episode of binge eating and purging behavior per week for three consecutive months, a relapse rate of 41% was found among 100 weight restored patients with AN and the highest risk period for relapse was 4–9 months following discharge. The predictors of relapse included binge-purge subtype of AN and severity of checking behaviors at pretreatment, decrease in motivation to recover during treatment and lower motivation to recover at post-treatment (Carter et al., 2012).

For BN, some studies examined the rate of relapse prospectively in longitudinal designs while others reported the rate of relapse at follow-up of controlled treatment trials using cross-sectional study designs. The reported estimates of relapse ranged from 27%

(Fairburn, Peveler, Jones, Hope, & Doll, 1993) to 63% (Field et al., 1997; Keller, Herzog, Lavori, Bradburn, & Mahoney, 1992) depending on the specific conceptualizations of relapse and recovery. Studies that investigated the timing of relapse in longitudinal designs reported elevated risk within the first months (3-7) following treatment termination which tended to level off around one year of partial or full remission status (Field et al., 1997; Keller et al., 1992; McFarlane et al., 2008; Mitchell, Davis, & Goff, 1985; Olmsted et al., 2005; Richard et al., 2005). In controlled treatment trials, the rate of relapse ranged between 27% within 12 months of recovery (Fairburn, Peveler, et al., 1993) and 44% within four months of recovery (Halmi et al., 2002). Predictors of relapse at four-month follow-up of patients who had achieved abstinence through CBT were shorter duration of illness at presentation, higher preoccupation and ritualization of eating at discharge, and shorter duration of abstinence during treatment (Halmi et al., 2002). At 12-month follow-up, patients who had relapsed after short-term psychological treatments (CBT, behavioral CBT or IPT) had higher residual attitudinal disturbance with respect to weight and shape at post-treatment (Fairburn, Peveler, et al., 1993). At two-year follow-up, two studies reported relapse rates of 31% (Olmsted, Kaplan, & Rockert, 1994) and 29% (Maddocks, Kaplan, Woodside, Langdon, & Piran, 1992) following intensive group treatment based on cognitive behavioral approach. Higher vomiting frequency both at baseline and at the end of treatment was predictive of relapse. These results are striking since even under best treatment conditions available, a substantial portion of patients with BN experience relapse after treatment termination.

Some studies provided a direct comparison of relapse rates between AN and BN in longitudinal designs. Among 246 women seeking treatment for AN (N= 136) or BN (N= 110), a relapse rate of 40% for AN and 35% for BN was reported after 7.5 years (Herzog et al., 1999). At nine-year follow-up, rates of 36% were reported for AN and 35% for BN, and body image disturbances at discharge was associated with a high risk of relapse for both patients with AN and BN while worse psychosocial functioning was found to be predictive of relapse for patients with BN (Keel, Dorer, Franko, Jackson, & Herzog, 2005). Similarly, body dissatisfaction emerged as the main predictor of poor outcome at 12 years in a prospective longitudinal study following extensive multimodal inpatient treatment including CBT (Fichter et al., 2008). In another study, the symptomatic status of patients with AN (N= 233) and BN (N= 422) was examined prospectively over a period of two and a half years following inpatient treatment. By the end of the follow-up period, the relapse rates were 33% for AN and 37% for BN and especially high within the first 6-7 months of discharge for both disorders. In addition, while the risk for relapse decreased linearly over time for AN, patients

with BN relapsed more frequently in the first months of discharge than in the later months (Richard et al., 2005).

Two studies addressed the natural course of BN (N= 23) and EDNOS (N= 69) in longitudinal designs and reported rates of relapse after five and six years. According to that, 47% of patients with BN and 42% of patients with EDNOS had relapsed by the end of five years (Grilo et al., 2007) while the comparable rates at six-year follow-up were 46% and 41%, respectively (Grilo, Pagano, et al., 2012). In addition, higher stress related to work and social/friendship domains were predictive of relapse for both BN and EDNOS at the end of six years (Grilo, Pagano, et al., 2012). In a four-year prospective study, time to relapse was not significantly different among remitted EDNOS, BED and BN cases and the rate of relapse was particularly high within the first six months of remission (Agras et al., 2009). Using a transdiagnostic approach which recommends AN, BN and EDNOS as a single unitary diagnostic category due to their similarities and high crossover rates (Fairburn et al., 2003), a combined sample of patients (AN= 16; BN= 18; EDNOS= 24) was examined over a two-year follow-up period following intensive cognitive behavioral group therapy (McFarlane et al., 2008). By the end of the follow-up period, 41% of the participants had relapsed and the predictors of relapse included severe caloric restriction before treatment, slower response to the prescribed meal plan during treatment and residual symptoms and higher weight-related self evaluation at discharge.

2.4. Post-treatment care in eating disorders

Multiple illness episodes and protracted course of eating disorders result in a considerable burden for sufferers, carers and treatment providers that eventually result in elevated health care utilization and costs following diagnosis (Coomber & King, 2013; Simon, Schmidt, & Pilling, 2005; Striegel-Moore, Leslie, Petrill, Garvin, & Rosenheck, 2000). The prevention of chronicity is essential to reduce the psychological and economic burden of these disorders. Despite the high relapse rates and poor prognosis, attempts to improve the long-term outcome of eating disorders have been scarcely studied in the literature.

For AN, FBT promises to have lasting effects (Eisler et al., 1997) and is found to be associated with a reduced rate of relapse in a recent report (Lock et al., 2010). For adults, preliminary evidence indicated CBT to be superior to nutritional counseling in preventing relapse in a randomized controlled trial of 33 patients (Pike, Walsh, Vitousek, Wilson, & Bauer, 2003). Results from pharmacological approaches were inconsistent. In one study fluoxetine was found to be superior to placebo among 35 patients with AN (Kaye et al., 2001), while no benefit was found among 93 patients in another study (Walsh et al., 2006).

There is limited evidence with respect to maintenance approaches for BN and no post-treatment intervention has been introduced for patients with EDNOS. The effects of continued fluoxetine in preventing relapse in BN were investigated in two placebo controlled trials (Fichter, Kruger, Rief, Holland, & Dohne, 1996; Romano, Halmi, Sarkar, Koke, & Lee, 2002). Although the results indicated some benefit of continued medication in preventing relapse, the reported rates of attrition were high in both trials. Only one study utilized a psychological approach (Mitchell et al., 2004). In this study, patients abstinent from binging and purging at the end of CBT were randomly assigned to a crisis intervention or a follow-up only condition. Patients in the crisis intervention condition were told to re-contact their clinic if they felt or feared a relapse so that they could receive timely additional visits when necessary for a period of 17 weeks following discharge. By the end of the follow-up period, none of the participants in the crisis intervention group who had relapsed (37%) had contacted their clinic which indicates that merely encouraging patients to contact their clinic when they deteriorate is not a sufficient strategy among this patient group.

Given the fact that eating disorders are associated with a poor long term outcome and the efficacy and dissemination of evidence-based treatments are at best poor, supporting patients after treatment may improve the long-term outcome and reduce rates of chronicity. In this respect, technology-enhanced interventions emerge as a viable alternative due to their easy dissemination and interactive nature.

2.5. Communication technologies and e-health

The vast availability of computers, mobile devices and the Internet changed communication behaviors in the last decades: E-mailing, instant messaging, text messaging, blogging, online chatting or posting in online forums, discussion groups and social media websites have become part of daily life for both work-related and private activities (BBC World Service Special Reports, 2013). As of 2013, the estimated number of Internet users is 2.7 billion (almost 40% of the world population) and represents a worldwide growth of 566.4% from 2000 to 2012 (International Telecommunication Union, 2013). Europe has the highest household Internet penetration: By 2012, 76% of the households in the European Union countries had Internet access and 58% of the individuals reported using the Internet daily (European Commission, 2013a, 2013b). A study of a representative sample of 7934 European citizens found that 77% of the Internet users accessed the Internet for health purposes and the main activities involved reading information, using the Internet to decide whether to see a doctor and to prepare for and follow up on doctors' appointments

(Andreassen et al., 2007). According to the results from a recent nationwide survey of 3014 adults living in the United States, 59% of the Americans with Internet access looked up health information online in the previous year and 35% used the Internet to figure out their medical condition (The Pew Internet & Americal Life Project, 2013). In addition, those who looked up information online also tried to find others who might have similar problems (16%), consulted online reviews or rankings of health care services (30%), and watched or read someone else's experience about health and medical conditions (23%). These results indicate that easy access and timeliness of the Internet may positively affect individuals' help seeking behavior and thus may reduce barriers to help-seeking among affected individuals.

E-health represents an intersection between health care and information technologies and is the delivery of health information and service via the Internet and related technologies. So far, various forms of communication and media ranging from minimum support through pure online information resources (psychoeducation), to online support groups (e.g., forums, message boards), e-mail, chat, web telephony, multimedia programs, telemedicine and virtual reality have been used in this context and their potential in promoting health and delivering treatment to various health conditions including mental disorders (i.e. e-mental health) has been studied (Andersson, Ljotsson, et al., 2011; Barak et al., 2008). The advantages of using new technologies lie in its convenience for users (e.g., easy access, attractiveness of the medium) and its ability to extend the reach of treatment providers (e.g., bridging the geographical distances, providing contact between the therapy sessions and reaching underserved populations).

Computer-mediated communication takes place both on individual and group basis (i.e. one-to-one, one-to-many or many-to-one) (Barak, 1999). It is mostly text-based and characterized by invisibility, a lack of nonverbal and physical cues and often by anonymity. Anonymity and invisibility are discussed as means to bring about faster and greater openness, also referred to as "online disinhibition effect" (Barak, 2004). For example, when assessed on sensitive topics such as criminal history, alcohol blackouts, sexual disorders and suicidality, clients reported more substantial information to a computer than to a clinician and more accurate prediction of suicide attempts were obtained via computer interviews than clinician administered interviews (Emmelkamp, 2005; Erdman, Greist, Gustafson, Taves, & Klein, 1987). Given that most people with eating disorders experience shame towards their body and appearance (Skårderud, 2003), the invisibility inherent to computer-mediated communication may be preferable and enhance higher disclosure and openness. Furthermore, although the lack of verbal communication, eye contact, and visual and non-verbal cues was criticized as barriers to communicate warmth and empathy or to evaluate patients' emotional

status, accumulating evidence shows computer delivered interventions to be similar to face-to-face interventions with respect to the therapeutic alliance (Knaevelsrud & Maercker, 2006; Sucala et al., 2012). In addition, using these novel approaches alone or in conjunction with face-to-face therapy settings is also discussed to reveal different aspects of the therapeutic relationship or help extend the therapy effect beyond the therapy sessions (Schmidt, 2003)

Computer mediated communication may take place in several formats and enables information sharing synchronously and asynchronously. For example, *Internet support groups* (e.g., using forums or message boards) are asynchronous communication platforms to facilitate mutual exchange between individuals who share the same problem and/or suffer from the same mental disorder. Such support groups are permanently available for asking questions, sharing experiences and providing support. They have been shown to be adequate means to provide peer support across a variety of mental health problems and are included as support components in many online interventions. Furthermore, they are frequently used by self-help groups. One study found out that majority of the members in an eating disorder support group participated in the group late at night, at a time when traditional sources of support was limited or unavailable (Winzelberg, 1997). However, challenges concern the sharing of erroneous information or the exchange of inappropriate messages or even the formation of unhealthy subgroups of users. For example, in the case of eating disorders this could be the exchange of pro-anorexic or pro-bulimic messages.

Another asynchronous form of interaction is the use of *e-mail*. E-mails have been offered to monitor patient status and treatment compliance, aid consultation and ongoing conversation between treatment providers or to deliver treatments (Yager, 2001, 2003). E-mail contact takes relatively less time than a face-to-face encounter and writing itself has been suggested as a powerful expressive therapeutic tool in improving health status (both physical and psychological) among people experiencing stressful life events (Esterling, L'Abate, Murray, & Pennebaker, 1999; Pennebaker, 1993). E-mail therapies are increasingly applied both separately and in conjunction with traditional therapies in clinical practice and are considered more convenient for people who prefer individual treatment in a more anonymous way (Robinson & Serfaty, 2003, 2008).

Communication in *Internet chat-rooms* represents a common form of synchronous communication. The text correspondence resembles face-to-face interaction and occurs in a common area (i.e. chat-room). Participants (e.g., client and therapist) get online at the same time and communicate in written format in real time. The interactive nature of the communication enables more active participation and immediate support and feedback about

questions and concerns from the participants involved. Chat-rooms allow delivering synchronous psychological support from distance at low cost. On the other hand, as all communication in the chat is written, the lack of nonverbal cues or the typing speed of participants in the chat-room can affect the flow of information and the amount of involvement. Using emoticons, like „:-)" or abbreviations (e.g., lol: laughing out loudly) is frequently encountered to compensate for the lack of nonverbal cues.

2.6. E-health in eating disorders

Over the past years, information and communication technologies have been used in a number of programs to prevent and treat eating disorders (Bauer & Moessner, 2013; Gülec, Moessner, & Bauer, 2011). There is increasing evidence pointing to the utility of these new modes of delivery especially for patients with BN, BED and EDNOS (Dolemeyer, Tietjen, Kersting, & Wagner, 2013; Hay, 2013).

The majority of studies in the field of eating disorder prevention evaluated "Student Bodies", an eight week online educational health promotion body image program based on a cognitive behavioral approach, which was developed for college age women at risk for eating disorders (Winzelberg et al., 1998). The program includes a moderated asynchronous discussion group like a bulletin board where participants can log in at any time to read posts or post their own messages. Several studies yielded significant decreases in body dissatisfaction and drive for thinness or eating attitudes at the end of the intervention and/or at follow-up evaluations (Celio et al., 2000; Taylor et al., 2006; Winzelberg et al., 2000; Winzelberg et al., 1998; Zabinski, Wilfley, Calfas, Winzelberg, & Taylor, 2004; Zabinski et al., 2001). In a meta-analytic review, the reported improvements on eating disorder related attitudes were comparable to those in conventional prevention approaches that are delivered face-to-face (Beintner, Jacobi, & Taylor, 2012).

In a recent study, the group dissonance-based prevention program "Body Project" which has been shown to be efficacious in eating disorder prevention (Stice, Marti, Spoor, Presnell, & Shaw, 2008; Stice, Mazotti, Weibel, & Agras, 2000) was compared to its online delivery "eBody Project" (Stice, Rohde, Durant, & Shaw, 2012). The results showed similar effects for both interventions compared to the control conditions (i.e. educational video condition and educational brochure condition). Moreover, the effect sizes for the online delivery were similar to the effect sizes previously reported for the group version of the program.

Another eating disorder prevention program ("Essprit") was developed as an Internet-based multimedia program, which targets college age women at risk for an eating disorder or experiencing subthreshold eating disorders. The program combines several support components at differing intensities to enable an adaptive prevention strategy (Bauer, Moessner, Wolf, Haug, & Kordy, 2009). First experiences with the use of the program indicated the feasibility of the intervention in Germany. An adapted version offered to at-risk students in Ireland provided further support for the individualized strategy (Lindenberg, Moessner, Harney, McLaughlin, & Bauer, 2011). Based on these experiences, an enhanced version of the program (entitled "Proyouth") is currently implemented in seven European countries (Czeh Republic, Germany, Hungary, Ireland, Italy, and Netherlands) for various target groups under support from the European Commission (Bauer & Moessner, 2013).

The results from controlled trials indicate the efficacy of self-help guides that use CBT treatment manuals with therapist guidance for patients with BN and BED (Hay, 2013; Hay et al., 2009). They are also suggested as the possible first steps in treatment of these conditions (National Institute for Health and Care Excellence, 2004). Recent evidence indicates the promising role of online-delivered guided self-help for patients with bulimic symptomatology (Dolemeyer et al., 2013; Hay, 2013). For example, an online self-help program, "Salut", based on psychoeducational and cognitive behavioral concepts that incorporated seven steps and weekly e-mail therapist guidance proved feasible and efficacious among patients with bulimic symptoms and obese people with BED (Carrard, Crepin, et al., 2011; Carrard et al., 2006; Fernandez-Aranda et al., 2009). In another controlled study, working through a self-help book based on a cognitive behavioral approach combined with additional weekly e-mail contact with a therapist regarding homework assignments and a private discussion forum to communicate with other participants was associated with clinically significant improvements in eating disorder related attitudes, self-esteem, depression and general life satisfaction among full and sub-threshold BN and BED patients (Ljotsson et al., 2007a). Two studies focused on an Internet delivered CBT treatment program „Overcoming Bulimia Online" which consists of eight interactive, multi-media, web-based CBT sessions including cognitive-behavioral, motivational, and educational strategies. The CD-ROM version of the program proved efficacious in a pilot study and a randomized controlled trial among adults with BN (Bara-Carril et al., 2004; Schmidt, Andiappan, et al., 2008). An adapted version of the program including peer support via message boards, and e-mail support from a clinician was associated with improvements in service contact and eating pathology and appeared promising as a first step in treatment of adolescents with bulimic symptomatology (Pretorius et al., 2009). An updated version of the

program included e-mail support from a therapist to motivate program use and was found superior to a wait-list control condition in terms of eating disorder related attitudes, binge frequency, affective symptoms and quality of life among students with BN and EDNOS (Sanchez-Ortiz et al., 2011). In addition to delivering online self-help, studies examined the potential of delivering CBT via telemedicine (Mitchell, Myers, Swan-Kremeier, & Wonderlich, 2003), online chat groups (Bulik et al., 2012) and e-mail (Robinson & Serfaty, 2003, 2008) and provided preliminary evidence for the use of these technologies in treating patients with BN and related eating pathology.

In the field of eating disorders, so far, only two randomized controlled studies investigated the potential of information and communication technologies in the maintenance treatment and relapse prevention. Fichter and colleagues developed and studied the efficacy of an Internet-based relapse prevention program among patients with AN over nine months following inpatient treatment in Germany (Fichter et al., 2012). The program contained written and behavioral exercises based on CBT techniques and incorporated monthly moderated group chat sessions and a message board as interactive components. At the end of the intervention period, participants who had completed the online program had gained more weight and showed a more favorable outcome in terms of sexual anxieties, bulimic symptoms, maturity fears and social insecurity than those in the treatment as usual (TAU) control condition. Bauer and colleagues developed and studied the efficacy of a four-month intervention delivered via the short message service (SMS) and text messaging for maintenance treatment of patients with BN and related EDNOS following inpatient treatment in Germany (Bauer, Okon, Meermann, & Kordy, 2012; Bauer, Percevic, Okon, Meermann, & Kordy, 2003). The intervention is based on a minimal intervention strategy: Each week, participants send text messages in a standard format about their key bulimic symptoms and receive tailored feedback on their weekly symptom fluctuations in return. Eight months after discharge, significantly more participants in the intervention group were classified as in remission compared to the TAU control group.

Overall, the above mentioned trials provide preliminary evidence for the feasibility and efficacy of e-health interventions to address patients with eating disorders across the healthcare spectrum. So far, no study has used an Internet-based approach to address patients with BN and related EDNOS at post-treatment. This fact motivated the research presented in this dissertation.

2.7. Psychological study of language use

The use of language is a vital fingerprint of human beings as what is said and how it is said reflects the way thoughts, feelings and emotions are organized. Language has been a topic of interest to understand the human nature since the early history of psychology. The focus of this line of research ranged from the acquisition of the language at a developmental level to the study of how spoken or written language is expressed at the individual and inter-individual level. The latter considers the style of language (i.e. how the language is expressed) as the fundamental expression of mental processes and links it to personality, social and situational fluctuations and interventions.

Methods for studying language patterns and word use in written and spoken text (i.e. text analysis) have been influenced by three broad approaches; interpretivist, linguistic, and positivist (Lacity & Janson, 1994). The interpretivist approach is concerned with the contextual components of the text produced and takes into account the author and the interpreter of the text as well as their cultural and situational circumstances (such as their experiences) during the process of text analysis. The linguistic approach is driven by the motivation to understand the type and structure of the utterances with respect to language–reality relation. According to that, the reality is constructed through the use of the language rather than it being a reflection of reality. Thus, studying language in its context (e.g., discourse analysis) can reveal insights about the use of power, discrimination, norms and any other social actions of interest. The assumption of the positivist approach is concerned with nonrandom variation in spoken or written language and views the language as an objective reflection of reality. According to this, studying the occurrence of certain language patterns in any given text (either written or spoken) could reveal insights about the inner mechanisms and mental processes, for an overview: Neuendorf (2002).

Methods for studying the use of language in psychology were first through implicit measures which assumed the expression of language as a sign of unconscious needs (e.g., projective tests like Thematic Apperception Test, Rorschach test) (Tausczik & Pennebaker, 2009). Other methods included content analysis methods that relied on judge-based coding schemes, word pattern analysis and word count strategies (Pennebaker, Mehl, & Niederhoffer, 2003). Judge-based coding schemes aim at determining the main themes of the text through empirical coding systems. Word pattern analysis and word count strategies are concerned with the co-occurrence and frequency of words, and aim at reaching an understanding of the text from its building blocks, i.e. the words. Word pattern analysis identifies the content of any given text by studying the covariance of words through factor

analytic methods. The word count strategies rely on the frequency of psychologically relevant content words (emotion words, insight words, etc.) or grammatical units (e.g., personal pronouns, nouns, verbs, etc.) and allow application of quantitative methods. Studying the physical occurrence of words rather than their semantic context is based on the assumption that not only what is said (content) but also with which words it is said (style) could reveal processes that could otherwise be undetected (Pennebaker et al., 2003). Word count strategies have become much easier through the introduction of computer-assisted text analyses programs which distill the components of the written or spoken text systematically. Researchers nowadays have the advantage to combine these qualitative and quantitative methods for a better understanding of the use of language in psychological contexts.

The study of language use has been inspired by the consistent finding from several studies which indicated that writing about emotional upheavals could affect individuals' psychological and physical health (Esterling et al., 1999; Frattaroli, 2006; Pennebaker, 1993; Pennebaker et al., 2003; Sloan & Marx, 2004a; Tausczik & Pennebaker, 2009). According to the writing paradigm, writing about emotional topics for 3-5 days for 15-30 minutes per day is associated with improved physical and mental health (Pennebaker & Beall, 1986). A meta-analysis of studies on this written disclosure paradigm in healthy participants revealed positive outcome of medium effect sizes for physiological functioning (d= .68), psychological well-being (d= .66), physical health (d= .42), and general functioning (d= .33) with an average effect size of d= .47 (Smyth, 1998). A meta-analysis of expressive writing in individuals with physical and psychiatric disorders showed a significant improvement on health outcomes with a weighted mean effect size of d= .19 (Frisina, Borod, & Lepore, 2004). Based on the work of Pennebaker and colleagues, a linguistic "fingerprint" associated with improvements observed in health outcomes following expressive writing interventions can be identified. According to that, individuals were more likely to benefit from expressive writing when they used a higher number of positive emotion words, a moderate number of negative emotion words and an increasing number of cognitive (i.e. casual and insight) words from beginning to the end of the intervention (Pennebaker, Mayne, & Francis, 1997). Besides content words, studies examined the use of function words, especially pronouns, and found that their use might be associated with health status and improvements. For example, people experiencing physical or emotional pain tended to use more first-person singular pronouns in their self expressions (Rude, Gortner, & Pennebaker, 2004). Also, changes in personal pronoun use over time (i.e. perspective shifting) in expressive writing experiments was associated with more health benefits compared to continuously writing in first person pronouns (Campbell & Pennebaker, 2003).

2.8. Language use of patients with eating disorders

There is evidence for the potential of writing in the treatment of people with eating disorders (Robinson & Serfaty, 2008; Schmidt, 2003; Schmidt, Bone, Hems, Lessem, & Treasure, 2002; Yager, 2003) but clearly further research is necessary. In one study, the effects of three writing tasks on eating disorder symptoms and related cognitive, affective and interpersonal factors were investigated in a student population (East, Startup, Roberts, & Schmidt, 2010). The experimental conditions included the expressive writing paradigm (i.e. participants wrote about their deepest emotions and thoughts about a difficult or stressful life event for three consecutive days) or a perspective shifting task (i.e. participants wrote about their deepest emotions and thoughts about a difficult or stressful life event from own perspective, from the perspective of someone involved and from a big picture perspective view) while the participants in the control condition wrote about superficial topics without exploring thoughts and feelings. The results showed benefits of the experimental conditions on eating disorder symptomatology and eating behaviors compared with the control condition. However, when the effects of therapeutic writing as an intervention were studied in students with bulimic symptomatology compared with a control group who wrote about superficial topics, the two writing interventions were not significantly different with respect to their effects and expressive writing was discussed to offer limited benefit for patients with BN due to the characteristics of emotional intolerance and avoidance (Johnston, Startup, Lavender, Godfrey, & Schmidt, 2010). Similarly, when college students were randomly assigned to an expressive writing condition relating to past trauma or a control condition where they wrote about their future plans, both interventions resulted in decreased stress over time in both groups and there was no indication that the expressive writing paradigm was effective with respect to disordered eating and its associated psychopathology (Frayne & Wade, 2006).

Few studies examined the language style of patients with eating disorders. Using the Linguistic Inquiry and Word Count software (LIWC) (Pennebaker & Francis, 1996) the effects of written traumatic emotional disclosure on eating disorder related behaviors and cognitions of patients with eating disorders were investigated in an expressive writing study (Gamber, Lane-Loney, & Levine, 2013). The results revealed that patients with eating disorders wrote more negative emotion, insight, cognitive function, and filler words on all writing days compared to controls who wrote about an emotionally devoid task. However, no health benefits of the writing experiment could be shown. In another study, inpatients at an eating disorder unit were asked to participate in a journaling exercise and their essays were compared to the essays from a student population and the message board entries of recovered

patients with AN (Wolf, Sedway, Bulik, & Kordy, 2007). The results of the LIWC analyses indicated that the essays of patients with eating disorders involved the highest rate of self-related words and negative emotion words, and the lowest rate of positive emotion words compared to the control conditions. In addition, compared to recovered patients with AN, patients with current eating disorders used more anxiety words, and fewer words related to social processes and eating concerns. One study investigated the verbal expression of emotion words in eating disorders (Davies, Swan, Schmidt, & Tchanturia, 2012). Patients with AN, BN and healthy controls were videotaped when talking about discrete emotional experiences and the transcripts were analyzed using the LIWC. The results indicated differences between AN and BN patients with respect to the expression of emotions: Patients with AN used fewer words when expressing emotions and used fewer affect words in total than the healthy controls whereas patients with BN were similar to the healthy controls with respect to the total number of words and the number of positive words they used. In contrast to Wolf et al. (2007), who reported increased use of negative emotion words in journals of patients with eating disorders compared to healthy controls, both AN and BN patients used a similar number of negative emotion words to healthy controls in this study but they used suppression as emotion regulation strategy more frequently than healthy controls.

2.9. Language use through online mediums in eating disorders

Nowadays, information and communication technologies enable easy access and storage of large amounts of text that can be studied with respect to language characteristics, e.g., Tausczik, Faasse, Pennebaker, and Petrie (2012). Recent studies investigated linguistic characteristics associated with computer mediated communication such as online discussion groups, forums and chats among different patient groups, e.g., patients with cancer (Alpers et al., 2005; Chen, 2012; Owen, Yarbrough, Vaga, & Tucker, 2003; Seale, Ziebland, & Charteris-Black, 2006); and conditions like emotional, personality, and behavioral disorders (Haug, Strauss, Gallas, & Kordy, 2008; Wolf, Chung, & Kordy, 2010).

In the eating disorder field, so far, the analyses of online communication mainly focused on online discussion forums and pro-anorexia (pro-ana) websites (Gavin, Rodham, & Poyer, 2008; Juarascio, Shoaib, & Timko, 2010; Keski-Rahkonen & Tozzi, 2005; Lyons, Mehl, & Pennebaker, 2006). In an exploratory Internet-based study, Keski-Rahkonen and Tozzi (2005) studied the postings in an unmoderated eating disorder discussion group to understand the use of the word „recovery" among eating disorders sufferers. The results indicated that the individuals' views of recovery changed according to their motivational

state of change (e.g., mentioning recovery was least likely during precontemplation and relapse). Those at the earlier stages of change found the Internet discussion group beneficial whereas at later stages being a member of the discussion group was viewed as delaying recovery. Motivation to recover expressed as willpower and ceasing to identify with eating disorder identity was found important for recovery. In addition, recovery was linked to strong emotions and the most frequently mentioned emotion word was "encouragement". Other studies focused on issues of how the self is expressed or formed through these online mediums, given their text-based, invisible and mostly anonymous nature. For example, Lyons and colleagues (2006) studied the online self presentations of anorectic individuals on pro-ana and pro-recovery websites using the LIWC. According to that, individuals using pro-ana websites wrote more positive emotions, and less anxiety words, a lower degree of cognitive reflection and self-directed attention than those at pro-recovery websites. Using an interpretive phenomenological analysis, one study investigated the forum entries of a famous online pro-ana discussion forum and identified that the users maintained and strengthened their identities through validation and acceptance of pro-ana behaviors and thoughts in their interactions. In addition, group bond due to sharing a secret identity was associated with inhibition of coming out to friends and family offline (Gavin et al., 2008). In another study, pro-ana groups on two social networking websites (i.e. Facebook and MySpace) were examined and the interactions were classified under two main themes using a general inductive approach: social support and interaction content and eating disorder specific content (Juarascio et al., 2010). So far, no study has investigated the linguistic characteristics of patients with eating disorders using an online synchronous medium like therapist-guided group chats.

2.10. The aims of the dissertation

The intervention studied in this dissertation aims to provide a care continuum for patients with eating disorders using the Internet to deliver post-treatment support. Given the chronic and relapsing course of eating disorders and the ability of the technology-enhanced interventions to extend the health care delivery, an Internet-based program for patients who were treated for bulimic symptomatology (i.e. patients with BN, BED and bulimic variants of EDNOS) was developed. The program followed an adaptive strategy which incorporated several modules of differing intensity acknowledging that the treatment outcome and thus the requirements for the intensity of support necessary at post-treatment are heterogeneous.

Since there were no published data using an Internet-based intervention following intensive treatment of patients with bulimic symptomatology, the feasibility of the intervention was introduced in a pilot study and utilization, acceptance and satisfaction ratings of the participants were reported (Publication 1: Gulec, H., Moessner, M., Mezei, A., Kohls, E., Túry, F. & Bauer, S. (2011). Internet-based maintenance treatment for patients with eating disorders. *Professional Psychology–Research and Practice, 42(6)*, 479-486). Second, the efficacy of the Internet-based program on eating disorder related symptoms and attitudes and general psychological well-being in a waiting list randomized controlled trial was examined (Publication 2: Gulec, H., Moessner, M., Túry, F., Fiedler, P., Mezei, A. & Bauer, S. A randomized controlled trial of an Internet-based post-treatment care for patients with eating disorders. *Telemedicine and e-Health (accepted)).* The third study was concerned with the linguistic characteristics of patients participating in the moderated group chat sessions of the program. The relevant themes of the chat scripts and the linguistic predictors of improvement in eating disorder related attitudes, behaviors and psychological well-being of patients with eating disorders were investigated (Publication 3: Mezei, Á., Gulec, H., Czeglédi, E., Fritz, A. & Túry, F. Linguistic characteristics of patients with bulimic symptomatology in an online post-treatment program. *Submitted to Eating and Weight Disorders*). In the next sections, the three papers are provided.

3. Internet-based maintenance treatment for patients with eating disorders[1]

Abstract

The sustainability of treatment effects is a major challenge in clinical practice. As in most other mental disorders, patients with eating disorders frequently experience relapses following treatment termination. This calls for feasible maintenance strategies that can be implemented in clinical routine at reasonable cost and effort for both treatment providers and patients. This article introduces an Internet-based intervention for maintenance support of patients with bulimia nervosa and related eating disorders not otherwise specified. The program comprises several online components for psychoeducation, self-help, peer support, and professional counseling. In the present pilot study, 22 women had access to the program for 4 months. The intervention proved feasible and well accepted, and participants' satisfaction with the program was high. Adherence to the various program components was overall acceptable. Patterns of utilization support the assumption that patients with eating disorders have heterogeneous needs for support following treatment termination. The study confirms the potential of flexible and individually tailored Internet-based interventions for the optimization of care for these patients.

Key words: eating disorders, Internet, maintenance treatment

3.1. Introduction

Clinical practitioners often wonder whether their patients will manage to maintain the improvements they achieved in treatment after their discharge. Some patients do; however, in many clinical conditions the majority of patients need more professional support than just one single treatment episode. This is true for the treatment of eating disorders as well: While there are effective approaches to treat bulimia nervosa (BN) and related eating disorders not otherwise specified (EDNOS) (Hay et al., 2009), a considerable number of patients fail to respond to these treatments (Agras & Robinson, 2008; Mitchell et al., 2007; Wilson et al., 2007) drop out (Mitchell, 1991; Waller, 1997), or relapse after achieving remission (Keel & Mitchell, 1997; Olmsted et al., 1994).

Relapse rates following eating disorder treatment range from 27% to 63% (depending on the definition of the concepts and the follow-up period) (McFarlane et al., 2008; Olmsted et al., 2005) and are especially pronounced in the first six to seven months after treatment (Olmsted et al., 1994; Richard et al., 2005). Thus, the need to provide additional support to patients after they finish treatment is evident in order to consolidate the gains achieved during treatment, enhance continuous improvement and recovery, prevent relapse, and facilitate transition from treatment to everyday life. Few maintenance approaches have been developed for BN and EDNOS so far. Pharmacologic approaches that have been studied as a continuation of pharmacotherapy among patients with BN have shown some benefit in comparison with placebo. Nevertheless, the attrition was high, which clearly limits the use of maintenance pharmacotherapy as a stand-alone strategy (Fichter et al., 1996; Romano et al., 2002). In the only study that used a psychological maintenance approach, patients with BN who successfully completed cognitive–behavioral therapy (CBT) were told to recontact their clinic if they experienced or feared a reoccurrence of symptoms (Mitchell et al., 2004). By the end of the follow-up period, none of the patients had recontacted their clinic, although 37% had returned to bingeing or purging. Hence, these results indicate the need for more proactive and easy-access strategies for relapse prevention.

Internet-based programs may offer such opportunities by providing patients with easy access support following treatment termination. Several studies reported promising results using technology in the areas of self-help, prevention, and treatment of eating disorders (Engel & Wonderlich, 2010). However, only one approach used technology-enhanced care as a step-down component following discharge from treatment: Bauer and colleagues developed an intervention on the basis of text messaging to support patients on a weekly

basis after they completed treatment (Bauer, Hagel, Okon, Meerman, & Kordy, 2006; Bauer et al., 2003; Robinson et al., 2006).

To date, no data on the use of Internet-based programs as a maintenance strategy in eating disorders have been published. In this article we introduce an online support program for patients with BN and related EDNOS. The efficacy of the program in maintaining treatment gains is currently studied in a randomized controlled trial. In the present pilot study, we investigated the adherence, acceptability, and satisfaction of this innovative program.

3.2. Online support program EDINA

The program is named *EDINA* and is currently studied in Hungary as part of a collaborative European project. EDINA stands for "Internet-based Aftercare for Patients with Eating Disorders" in the Hungarian language (*E*vési Ren*d*ellenességek *In*ternetre *A*daptált Utókezelése). The program provides an online information and communication platform for peer support and professional consultation of patients with BN and related EDNOS. Some of the modules are offered on a regular basis (i.e. weekly symptom monitoring, supportive feedback, and group chat sessions), whereas others can be used flexibly depending on the individual needs of the participants (psychoeducation, forum, individual chat sessions). The structure of the program is similar to that of an Internet-based eating disorder prevention program that proved feasible and well accepted in two recent studies (Bauer et al., 2009; Lindenberg et al., 2011). In the following, the various modules of the program are described in detail.

3.2.1. Psychoeducation

Comprehensive content on eating disorders is provided along with descriptions of the key symptoms, risks/complications, and treatment approaches. Furthermore, the topics of recovery and relapse are discussed, and self-help strategies are introduced on how to counteract setbacks or relapses. The self-help strategies, in particular, focus on topics that are important following treatment termination, such as recognizing signs of relapse, making a list of risky situations, regular eating, recognition of emotional changes during the day, and expanding support networks and preventing isolation.

3.2.2. Forum

The forum allows participants to post individual messages, discuss specific topics with each other, and provide peer support. The online counselors also use the forum to communicate with participants (e.g., posts on topics that came up in the chat sessions to stimulate further discussion). The EDINA team monitors all postings on a daily basis to promote positive communication among participants.

3.2.3. Monitoring and feedback

All participants automatically receive weekly emails that include a link to a short online monitoring assessment. The monitoring assessment consists of three questions assessing body dissatisfaction, the frequency of binge eating episodes, and the frequency of compensatory behaviors during the past week. After completing the questions, participants receive an immediate feedback message via e-mail. The aim of the feedback messages is to enhance participants' self-monitoring skills, to increase their awareness on their own symptom course, to reinforce improvements, and to suggest alternative behaviors in cases of deterioration. The procedure is similar to the text messaging approach developed for the aftercare of patients with BN (Bauer et al., 2003): The monitoring system evaluates participants' entries to the three criteria (body dissatisfaction, frequency of binge eating episodes, and frequency of compensatory behaviors) and selects a feedback message. The feedback messages are based on improvement or deterioration of these symptoms in comparison with the previous week. For instance, a participant may report improvement in compensatory behaviors and deterioration in body satisfaction and the frequency of binge eating episodes in comparison with the previous week. An example of one of the numerous feedback messages that this particular participant could receive consists of the following: "*Congratulations for successfully controlling compensatory behaviors. Nevertheless, we are worried about your binge eating episodes. Do not leave leftover food lying around. Actually, it is better if you throw leftovers away than for them to represent a threat to your control over your eating. Don't go shopping when you are hungry. Moderate exercising on a regular basis and a well-balanced diet are the best way to feel positive about your body. Don't give up!*" On the basis of the same algorithm described by Bauer and colleagues (2003), a total of 656 feedback messages were formulated (i.e. several messages for each possible symptom change from week to week are available). Incoming and outgoing emails as well as the data assessment and feedback generation is processed by the underlying software, Web-Akquasi,

which was specifically developed for the purpose of outcome monitoring (Percevic, Lambert, & Kordy, 2004). Additionally, if any of the participants report severe deterioration in their weekly monitoring, the software automatically sends an e-mail to the online counselors who, in turn, contact the participants to invite them to an individual chat session (see below). Table 3.1 illustrates further examples of the feedback e-mails.

Table 3.1. Examples of the feedback messages (Adapted from Bauer et al. 2003)

Change in symptoms			
B S	**B E**	**C B**	Feedback e-mail
I	**I**	**I**	Well done for your healthier eating behaviors and accepting your body! We hope you maintain these improvements and get yourself completely out of the burden of eating problems.
F	**F**	**F**	We are pleased that you are managing your eating so well. Your positive feelings towards your body also become another success that you should be proud of. Seize this opportunity to lead a healthier and happier life!
D	**D**	**D**	The combination of persistently bad feelings about your body, binge eating episodes, compensatory behaviors (i.e. self-induced vomiting, excessive exercise, taking laxatives, etc.) and excessive preoccupation with your shape and weight worry us greatly. Try once more to abstain from binge eating episodes and compensatory behaviors before they become habit. This also is the best way to feel better about your body as your eating behavior and feelings about your body are closely related to each other. There might be times you feel that you will shop for a binge. You should be prepared for these times. Here are some tips that may help. Take small amount of money with you and prepare a detailed list before you go shopping. Buy only the foods which are on your shopping list. Prepare your shopping list when you are not hungry. When you do shopping, don't buy food more than for two days so that you will manage to cut down the amount and the type of food you store at home. You can, as well, ask for tips using EDINA forum or EDINA counselors.

N	**N**	**N**	We are concerned about your results. It seems that you had hard times controlling your eating behavior last week and your feelings towards your body were not positive. Can it be possible that some other problems may prevent you from practicing healthy eating habits? Sometimes, binge eating episodes and the compensatory behaviors may result from these worries. They may also affect the way you feel towards your body and yourself. Unless you detect them, you cannot move towards a healthy track. Just stop for a second and write down the problems that may prevent your healthy behaviors on a sheet of paper. Try to write down a couple of alternative solutions that comes to your mind. Having them written will help you practice them in your daily life and see whether they are working. You also can share your problems with EDINA counselors in an individual chat session. Don't give up, you can manage!
D	**F**	**F**	We are proud that you are able to maintain healthy eating habits! Your body will definitely benefit from this. Try not to think about your appearance that much. This is not helpful and can jeopardize your improvements. Whenever you realize these feelings, try to distract yourself by calling a friend or taking an action you like.
F	**F**	**N**	Well done for maintaining control over the binge eating episodes. Your body will benefit from it! On the other side, we are worried about the compensatory behaviors (i.e. self-induced vomiting, excessive exercise, taking laxatives, etc.). They are unhealthy weight control measures which have no effect at losing/controlling weight but they damage your health and negatively affect the quality of your life. Try once more to control them. This will make you feel even more satisfied with yourself as eating behaviors and feelings towards your body are related to each other. Put effort in preserving your established improvements and try to cut down the unhealthy compensatory behaviors. We are sure you will make it soon!

Note: B S, body satisfaction; B E, frequency of binge eating episodes; C B, frequency of compensatory behaviors; I, improved; D, deteriorated; F, unchanged at functional range; N, unchanged at nonfunctional range

3.2.4. Group chat

EDINA uses chat technology to provide online professional counseling. All registered participants are asked to log in to the 90-min group chat sessions at a fixed time every week. The groups generally consist of five to eight participants. Participants receive a reminder via text message on the day of the chat session. The sessions do not follow a manual-based therapeutic approach. Their main aim is to provide a support platform for professional advice and peer support. Therefore the sessions focus on the "here and now" and on the specific tasks that participants face in their everyday life following treatment termination (e.g., on the challenges of implementing into their daily routine what they have learned in treatment). The counselors are doctoral students in clinical psychology who are supervised by a senior clinician and researcher specialized in eating disorders. The counselors are experienced in individual and group therapy of patients with eating disorders and pay close attention to enhance positive communication among participants. They are aware of the medical consequences of eating disorders, potential suicidal ideation, self-harm, and possible symptom substitutions. They assess such aspects routinely during the chat sessions. The counselors also have access to the symptom course of the participants from the weekly monitoring system. Thus, they can take immediate action in cases of symptom deteriorations (see below). An illustration of the chat room is shown in Figure 3.1.
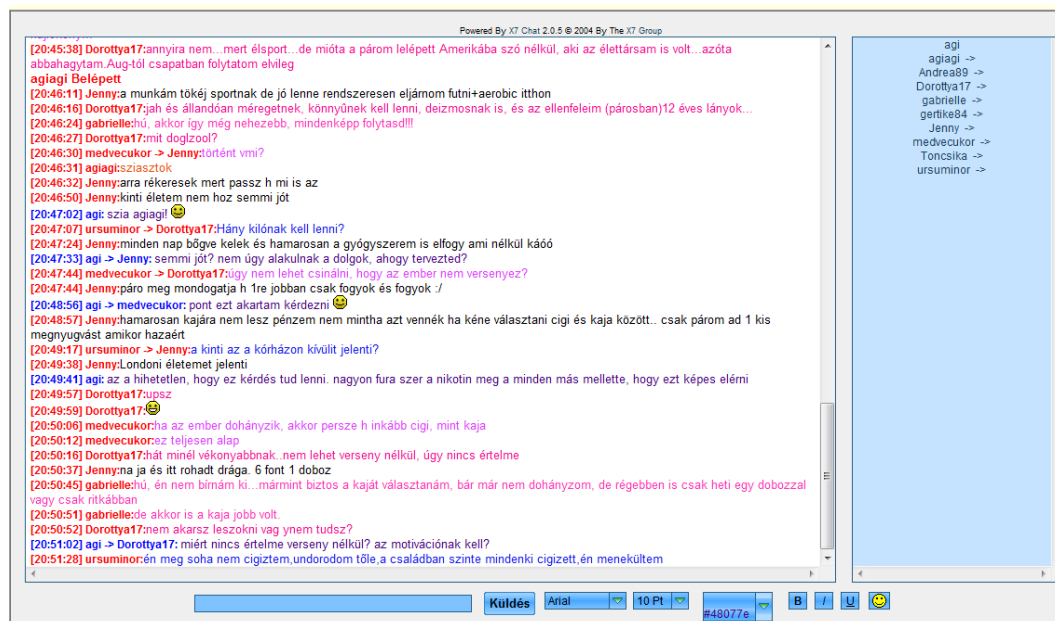

Figure 3.1. Screenshot of the EDINA chat room

3.2.5. Individual chat

On a voluntary basis, participants can book 30-min individual chat sessions to discuss questions or problems with an online counselor. Such individual sessions may also be initiated by an online counselor in cases in which a participant reports a body mass index (BMI) below 17, or binge eating or compensatory behaviors several times during a day for three consecutive weeks in the monitoring assessments. In these cases the online counselor receives an automatic e-mail by the software and then invites this participant to an individual chat session. The aim of the individual chat sessions is then to discuss the reasons for deterioration, give advice to counteract setbacks, and offer intense online support depending on the participant's needs. When it turns out that the online support is not sufficient for a participant, the online counselor discusses face-to-face support options in an outpatient or inpatient treatment facility with the participant and helps to initiate contact if needed.

3.3. Safety procedures

If a participant experiences severe medical complications or reports critical information (worst case, suicidal ideation) during a chat session or on the forum, and the situation cannot be resolved by the online counselors (e.g., if a participant refuses to get help), a safety procedure is followed in accordance to the suggestions of Golkaramnay, Bauer, Haug, Wolf, and Kordy (2007): Prior to their participation in the program, all participants have to provide information on an "emergency professional" close to where they reside. These professionals are the participants' outpatient providers (psychologist, psychiatrist, or general practitioners) and informed about the patients' participation in the study. In the event of an emergency, they are required to take immediate action. If the professionals cannot be reached, the counselors immediately contact the nearest emergency service to the patients' residences. In addition, the program homepage contains an SOS section providing numbers of telephone hotlines that participants can contact anonymously at any time.

3.4. Feasibility, acceptability, and satisfaction

The following describes the first experiences with the use of EDINA in clinical routine. Eligible participants were women aged 16 years or older who completed inpatient or outpatient treatment for BN or related EDNOS in Hungary within the last 12 months and had Internet access at home. Exclusion criteria were as follows: A BMI lower than 17.5, meeting

Diagnostic and Statistical Manual of Mental Disorders (4th ed.; American Psychiatric Association, 2000) criteria for an eating disorder at the time of study entry, major organic and substance induced disorders, comorbid psychosis, acute suicidality, and insufficient knowledge of the Hungarian language. Informed consent was obtained from all participants and their parents when participants were younger than 18 years of age. The study was approved by the Institutional Research Ethics Board of the Semmelweis University, Budapest.

Participants were recruited between August 2009 and December 2010 via visits to inpatient and outpatient treatment centers in Hungary and through online and paper advertisements in the community. Interested individuals underwent a telephone or online screening. Eligible participants were invited to attend a personal interview. During this interview, a psychologist provided further information about the program and obtained written informed consent from the participants or their parents when required. All participants provided details of an emergency professional to be contacted in case of an emergency. To create their personal account for the EDINA platform, each participant chose a pseudonym and a password. Following this, the psychologist introduced each module on the website in detail and answered any questions that the participants may have had. All participants received a program folder including the information about the study and the program user manuals (interactive CD format and booklet format). Following this introductory session, participants received their first weekly monitoring assessments via e-mail and were expected to attend the next weekly group chat session. They could also utilize the flexible components of EDINA depending on their own interest. In terms of measures, an initial baseline questionnaire was used to assess sociodemographic variables and key eating disorder symptomatology. On completion of each weekly group chat session, participants submitted an online session evaluation questionnaire. At the end of the four months, the participants completed a questionnaire on the use, acceptability, and helpfulness of each program component. Furthermore, they evaluated the dose and intensity of support (i.e. duration of the program, effort required to participate and frequency of the group chats) and rated their overall satisfaction with the program. Finally, two open-ended questions asked for negative and positive comments about the program. Adherence to the program components (e.g., frequency of login) was tracked automatically in the database.

In the present pilot study, a total of 22 participants had access to EDINA for four months. Baseline data from four participants and satisfaction ratings from one participant are missing. All participants were female, Caucasian, and Hungarian. The mean age of the sample was 27.0 years ($SD = 6.5$, $Mdn = 24$), and the mean BMI was 20.7 ($SD = 2.8$, $Mdn =$

20.9). The majority of participants completed outpatient treatment (81.81%, 18/22). The remaining four participants completed inpatient treatment (18.18%, 4/22). More than half of the participants (55.55%, 10/18) reported an illness duration of more than five years. All 22 participants took up the intervention (i.e. they logged in to the EDINA website or utilized the monitoring and feedback component at least once). On average they logged in to the program on 15.27 days ($SD = 12.84$, $Mdn = 12.00$, range = 0–54) during the four months. During this period, participants joined a mean of 7.45 group chat sessions ($SD = 5.16$, $Mdn = 7.00$, range = 0–16).

All but two participants joined at least one group chat session (90.90%), and 19 out of 22 joined at least two group chat sessions (86.36%). Participants filled in the weekly monitoring assessments 9.95 times on average ($SD = 5.09$, $Mdn = 11.00$, range = 0–17). Only one participant did not complete any monitoring assessments. Almost all participants utilized at least one voluntary component (psychoeducation, forum, individual chats) (95.45%, 21/22). Seven participants booked individual chat sessions (31.81%), six participants (27.27%) posted messages on the forum, and 17 participants (77.27%) reported using the psychoeducational contents on the website. Following the four-month period, participants were offered to stay in the program. Seventeen out of 22 participants (77.27%) continued to use the program, which also indicates the acceptability of the intervention.

The majority of the participants were satisfied with the program (81.81%, 18/22), and almost all would recommend it to others (95.45%, 21/22). As displayed in Table 3.2, the quality of the support was rated as excellent (31.81%, 7/22), good (54.54%, 12/22), or fair (13.63%, 3/22), and none of the participants evaluated it as poor. In general, participants reported that their needs had been met and that they had received the kind of support they wanted. With the exception of three, all participants expressed their willingness to come back to EDINA if they were in need of support in the future. Most of the participants also stated that participation in EDINA was helpful (71.42%, 15/21). Table 3.2 summarizes the satisfaction and acceptability ratings.

When asked for their satisfaction with the modules of EDINA, participants viewed the various components positively. The ratings on the helpfulness of each component were moderate to high (see Table 3.3) (When interpreting these numbers, it should be noted that not all participants have utilized all of the components, i.e. they could not actually rate them as helpful). Participants were additionally asked to indicate which components of EDINA were particularly helpful to them. According to this, the group chat sessions were rated by far the most helpful module of the program (70%, 14/20), followed by the forum (30%, 6/20) and the psychoeducational content (30%, 6/20).

Table 3.2. Satisfaction and acceptability (N=22)

	N	(% of participants)
How would you rate the quality of the support you have received by EDINA?		
Excellent	7	(31.81%)
Good	12	(54.54%)
Fair	3	(13.63%)
Poor	0	(0.00%)
Did you get the kind of support you wanted?		
No, I definitely did not	0	(0.00%)
No, not really	4	(18.18%)
Yes, generally	13	(59.09%)
Yes, I definitely did	5	(22.72%)
To what extent did EDINA meet your needs?		
Almost all of my needs were met	3	(13.63%)
Most of my needs were met	11	(50.00%)
Only a few of my needs were met	6	(27.27%)
None of my needs were met	2	(9.09%)
If a friend were in need of a similar help, would you recommend EDINA to him or her?		
No, definitely not	0	(0.00%)
No, I do not think so	1	(4.54%)
Yes, I think so	10	(45.45%)
Yes, definitely	11	(50.00%)
How satisfied have you been with EDINA?		
Very satisfied	8	(36.36%)
Mostly satisfied	10	(45.45%)
Indifferent or mildly dissatisfied	3	(13.63%)
Quite dissatisfied	1	(4.54%)
Has EDINA helped you deal with your problems more effectively?		
Yes, it helped a lot	7	(31.81%)
Yes, it helped a bit	10	(45.45%)
No, it did not help	4	(18.18%)
No, it seemed to make things worse	1	(4.54%)

If you were to seek help again, would you come back to EDINA?		
No, definitely not	0	(0.00%)
No, I do not think so	3	(13.63%)
Yes, I think so	12	(54.54%)
Yes, definitely	7	(31.81%)
Overall, the idea of an online aftercare support is good (N= 21)		
Does not apply	0	(0.00%)
Applies somewhat	3	(14.28%)
Applies mostly	6	(28.57%)
Totally applies	11	(52.38%)
Do not know	1	(4.76%)
Was the participation in EDINA helpful for you? (N = 21)		
Yes, it was very helpful	2	(9.52%)
Yes, it was mostly helpful	13	(61.90%)
It was neither helpful nor harmful	5	(23.80%)
No, it was mostly harmful	1	(4.76%)
How do you think you would have done during these 4 months without EDINA? (N = 21)		
Much better	0	(0.00%)
A bit better	2	(9.52%)
The same	8	(38.09%)
Worse	9	(42.85%)
Much worse	2	(9.52%)

Table 3.4 gives an overview on participants' reasons for participation and what areas of support were considered most helpful. The most frequently reported reasons for participation were the curiosity about getting online help, the opportunity to get expert advice after treatment, the possibility to ask questions whenever needed, and the ability to get help without having to travel.

Table 3.3. Acceptability of and satisfaction with the program components (N=21)

Program components	N	(% of participants)
Monitoring		
Good concept	13/20	(65.00%)
Feedback appropriate	10/18	(55.55%)
Helpful	6/17	(35.29%)
Individual consultation chat		
Good concept	15/18	(83.33%)
Helpful	7/14	(50.00%)
Group consultation chat		
Good concept	15/19	(78.94%)
Helpful	12/19	(63.15%)
Forum		
Good concept	16/20	(80.00%)
Helpful	8/17	(47.05%)

Note. The items were rated on a 5-point scale (1 = does not apply 2 = applies somewhat 3 = applies mostly 4 = totally applies 5 = do not know). The scale was dichotomized: Scores 1 and 2 are presented as disagreement, 3 and 4 are presented as agreement to the items. Scores of 5 were excluded, thus the total number of ratings varies between components.

Participants' opinions on the intensity of the intervention were also investigated (i.e. duration of the program, frequency of the group chats). The results indicate that 47.61% (10/21) of the participants felt the four-month program duration was too short, and 42.85% (9/21) felt the duration of the program was appropriate. Only two of the participants (9.52%) felt that it was too long. Most participants considered the weekly frequency of the group chat sessions appropriate (71.42%, 15/21). Five participants would have preferred more than one session per week (23.80%), and only one participant felt that the weekly sessions were too frequent (4.76%).

At the end of each group chat session, participants were asked to complete an online session evaluation questionnaire. Fourteen out of 22 participants completed a total of 82 session evaluation questionnaires. In general, participants evaluated the group chat sessions positively in these weekly evaluations. Hardly any technical problems were reported (2.43%, 2/82), and participants stated that the technical environment did not limit their ability to express their thoughts (87.80%, 72/82). Figure 3.2 summarizes the results of the session evaluation questionnaires. Participants' free text comments to the open-ended questions concerning positive and negative feedback about the program may provide additional insight

to the acceptability of the intervention. Examples of participants' comments are listed in Table 3.5.

Table 3.4. Reasons for participation and satisfaction at the end of intervention (N = 21)

Reasons for participation		
	N	(%)
Curiosity about getting online help	13/21	(61.9%)
The opportunity to get expert advice after treatment	11/21	(52.4%)
The possibility to ask questions whenever needed	11/21	(52.4%)
The ability to get help without having to travel	10/21	(47.6%)
Free help, no cost	7/21	(33.5%)
Lack of other support options	4/21	(19.0%)
Anonymity	3/21	(14.3%)
Other	3/21	(14.3%)
What was particularly helpful?		
The opportunity to get professional advice	10/21	(47.6%)
The feeling that somebody was looking after my health	9/21	(42.9%)
The feeling I was doing something about my health	8/21	(38.1%)
The opportunity to talk to the other participants in the forum	8/21	(38.1%)
Advice from other participants	7/21	(33.3%)
The opportunity to meet the others in weekly group chat sessions under supervision of a counselor	6/21	(28.6%)
Tips and information from the psychoeducational materials	6/21	(28.6%)
Receiving information on how to transfer treatment gains into everyday life	5/21	(23.8%)
Weekly feedback E-mails about my general well-being	2/21	(9.5%)
Nothing helped	2/21	(9.5%)

3.5. Future directions and implications

How can we increase the sustainability of treatment effects? Practitioners face this question on a daily basis in clinical routine. This question has motivated us to develop the Internet-based intervention presented in this article. Although a number of technology-enhanced interventions have been introduced for prevention, self-help, and treatment of eating disorders (Engel & Wonderlich, 2010; Myers, Swan-Kremeier, Wonderlich, Lancaster, &

Mitchell, 2004), only one previous approach has been introduced for aftercare and relapse prevention (Bauer et al., 2003). There is no doubt among clinicians and researchers that the majority of the patients with eating disorders need additional support following treatment termination.
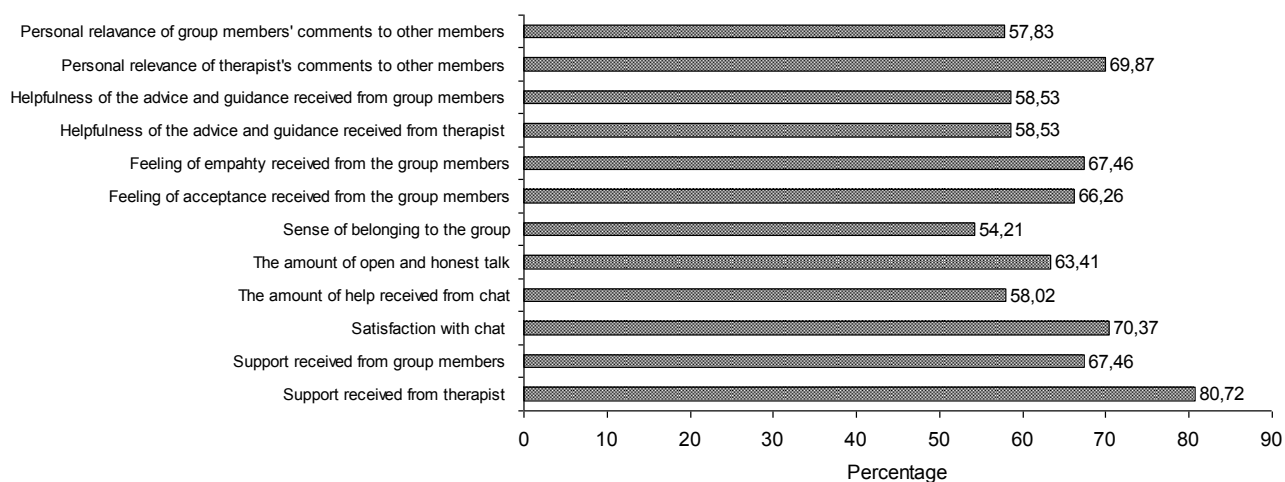

Figure 3.2. Session evaluation of weekly group chat sessions

Note. The 6-point Likert scale (1 = not at all 2 = a little 3 = somewhat 4 = considerably 5 = very much 6 = extremely) was dichotomized. Scores ≥ 4 are presented as agreement to the items.

The findings of the present study are promising and indicate that the Internet-based program is a feasible and well-accepted intervention to provide such additional support. All study participants took up the intervention, and all but one completed the satisfaction and acceptability questionnaires. Most participants reported high satisfaction with the various components and stated that they would recommend the program to a friend in a similar situation. The majority confirmed that they would come back to EDINA if they felt a need for further support. The adherence rates showed that participants completed almost 60% of the weekly monitoring assessments and joined roughly half of the foreseen group chat sessions (47%). Almost all participants utilized at least one voluntary component of the program (psychoeducation, the forum, individual chats).

The most frequent reasons for participation were expert advice, curiosity about receiving online help, and the ease of receiving support (e.g., no travel costs, possibility to ask questions whenever needed). Participants reported that it was especially helpful to be supported by other participants and the online counselor in addition to being proactive themselves about their health. The majority of participants went on using the program after the end of four months, which also points to its acceptability.

Table 3.5. Examples of participants' positive and critical comments on the intervention

Positive comments
I really liked that I could talk about my problems and share something with those who have similar problems.
It was good to know that I am not alone, I enjoyed the company of others and it was great to get support and tips from the other members.
It was nice to listen to others' experiences. Sometimes listening to someone else's problem helped me to get closer to the solution of my own problems.
I felt safe. I knew that I could contact EDINA any time. The practical advice in the group chats was helpful. Realizing that it was not easy for others helped me cope.
The individual chats are really good. It is also good to know at the group chat sessions that you are not alone with your sick thoughts and habits.
Critical comments
The program itself is really good but the time of the group chat was not always suitable for me.
At the end of the program some of the topics were not up to date for me anymore. I think I was doing better at that time. However, it was good to be updated about the others. It would have been enough biweekly than weekly for me.
Maybe more concrete advice in the feedback messages would be better. I think daily monitoring would be more helpful: Knowing the exact date of my binge and purge episodes would help, something like a report or binge purge diary.
I think it would be good to meet face-to-face with participants once in two months. I am quite slow with typing.
The group chat sessions should be more often and longer.

In contrast to typical manual-based approaches that provide the same dose of support to all patients, EDINA offers various support components that allow individuals to tailor the intensity of the support in accordance to their individual needs. It is expected that this flexible concept better fits the heterogeneous needs of patients following treatment termination. A key component in this respect is the weekly monitoring, which continuously informs the online counselors on symptom courses of the participants and allows for timely reaction in cases of symptom deterioration.

3.6. Limitations

The current study had some limitations such as relying on subjective self-report measures and the fact that the sample was heterogeneous in terms of degree of impairment, diagnosis, and type and length of treatment prior to participation in the online program. The small sample size limited our ability to determine participant characteristics that were associated with utilization, acceptance, and satisfaction rates. For instance, the level of care that the participants had completed (inpatient vs. outpatient) prior to the intervention could have an impact on motivational patterns. Further research is necessary to shed light on these aspects. However, the current sample represented the clinical profile of patients with eating disorders in daily practice. Thus, high acceptance rates of the program may promise the viability of its use among a mixed group of patients with eating disorders. As an important next step, the efficacy and cost-effectiveness of the intervention in maintaining treatment gains need to be addressed. Future research may also study adaptations of the program for other populations such as patients with anorexia nervosa, men with eating disorders, and individuals with different ethnicities.

3.7. Conclusion

Technology has increasingly affected all areas of our lives over the past 20 years. Not surprisingly, technology is also increasingly used in the clinical context to optimize health care delivery. The present pilot study is the first study showing the feasibility and acceptability of an online maintenance intervention for patients with eating disorders. We demonstrated that Internet technology can help clinicians extend their reach to maintain contact to those with eating disorders after treatment termination. These findings are in line with research on patients with other mental disorders that were successfully supported via Internet chat groups following the termination of inpatient treatment (Bauer, Wolf, Haug, & Kordy, 2011; Golkaramnay et al., 2007).

4. A randomized controlled trial of an Internet-based post-treatment care for patients with eating disorders[2]

Abstract

Background: Despite effective treatment approaches, relapses are frequent in eating disorders. Post-treatment care is essential to enhance continuous recovery and prevent deterioration. Objective: To evaluate the effects of an Internet-based intervention following routine care. Materials and methods: 105 women who received treatment for bulimia nervosa and related eating disorders not otherwise specified were randomly assigned either to an immediate Internet-based support program (EDINA) over four months or to a four-month waiting list treatment as usual control condition (TAU). The primary outcome was eating disorder related attitudes at baseline and after four months assessed by the Eating Disorder Examination Questionnaire (EDE-Q). Results: The program proved feasible and was well-accepted. A significant reduction in eating disorder related attitudes could be shown for both groups at the end of the four months. In tendency, participants of the aftercare intervention showed better results on all outcome measures. 40.6% (13/32) of the EDINA participants and 24.4% (10/41) of the TAU participants showed statistically reliable improvement on the EDE-Q total score by the end of the intervention period (χ^2 (1) = 2.195, p = 0.138). Conclusions: The Internet-based support program was feasible and well accepted but did not prove efficacious in a heterogeneous sample of patients following routine care.

Key words: bulimia nervosa, maintenance treatment, eating disorder, Internet

4.1. Introduction

The chronic and relapsing course of bulimia nervosa (BN) and related eating disorders not otherwise specified (EDNOS) has been well documented (Bohon, Stice, & Burton, 2009; Wonderlich et al., 2012). Although effective treatments exist for these disorders (Berkman et al., 2007; Brown & Keel, 2012; Brownley et al., 2007; Hay et al., 2009; Mitchell et al., 2007; Shapiro et al., 2007), sustained recovery and maintenance of treatment gains remain a challenge: Around half of the patients relapse within six to 12 months after initial presentation (Keel & Mitchell, 1997; McFarlane et al., 2008; Olmsted et al., 2005) and the relapse rates are particularly high in the first months following treatment termination (Olmsted et al., 1994; Richard et al., 2005). Furthermore, a considerable number of patients fail to respond to the suggested treatments (Agras & Robinson, 2008; Mitchell et al., 2007; Wilson et al., 2007) or drop out prematurely (Fassino, Piero, Tomba, & Abbate-Daga, 2009; Mitchell, 1991; Waller, 1997), which jeopardizes treatment outcome.

Only a handful approaches that aim at supporting patients with BN and related EDNOS beyond treatment termination have been studied so far. A pharmacological approach as continuation of pharmacotherapy (Fichter et al., 1996; Romano et al., 2002) and a psychological approach following successful cognitive behavioral therapy (CBT) (Mitchell et al., 2004) were investigated in controlled trials. Although the pharmacological approach showed significant benefit in reducing the occurrence of bulimic behaviors compared with the placebo control condition, the high attrition rate limited its utility. In the psychological approach, patients abstinent from bingeing and purging at the end of CBT were randomized either to a crisis intervention condition or to a follow-up only condition. Participants in the crisis intervention condition were told to re-contact their clinic if they felt or feared a relapse so that they would receive timely additional visits when necessary. According to the follow-up assessments, none of the participants who had relapsed (37%) had contacted their clinic in advance (Mitchell et al., 2004). These results indicate the need for alternative relapse prevention strategies.

Information and communication technologies are increasingly used in the health care delivery during the last decades. Low threshold, easy access and interactive nature of these approaches promise to extend the reach of traditional care. Several studies investigated the potential of technology-enhanced interventions in the areas of prevention (Bauer et al., 2009; Beintner et al., 2012; Jacobi, Volker, Trockel, & Taylor, 2012; Stice et al., 2012; Taylor et al., 2006), self-help (Carrard, Crepin, et al., 2011; Carrard, Fernandez-Aranda, et al., 2011; Carter et al., 2003; Wagner et al., 2013; Wilson & Zandberg, 2012) and treatment (Bulik et

al., 2012; Fernandez-Aranda et al., 2009; Moessner & Bauer, 2012; Pretorius et al., 2009; Sanchez-Ortiz et al., 2011; Shapiro et al., 2010) of eating disorders. Some maintenance approaches have also been introduced using technology to maintain treatment gains and to prevent relapse (Bauer et al., 2012; Bauer et al., 2003; Fichter et al., 2012; Gulec et al., 2011). Overall the findings are promising with respect to feasibility and efficacy of such interventions, but there is a clear need for further research as only very few adequately powered randomized controlled trials have been completed so far (Aardoom et al., 2013; Bauer & Moessner, 2013).

A relapse prevention program using SMS and text messaging technology proved feasible (Bauer et al., 2003) and efficacious (Bauer et al., 2012) among patients with BN and related EDNOS. Bauer and colleagues studied the efficacy of this intervention among 165 patients after discharge from inpatient treatment against a treatment-as-usual (TAU) control condition (Bauer et al., 2012). During the four-month intervention period, text messages were exchanged between the participants and the provider. Each week, participants sent text messages in a standard format about their key bulimic symptoms and received supportive feedback messages on their symptom fluctuations in return. Eight months after discharge from treatment, significantly more participants were classified as remitted in the intervention group than in the control group.

To our knowledge, no study has addressed the efficacy of an Internet-based intervention as a step-down strategy, i.e. lower intensity support following intensive treatment, among patients with BN and related EDNOS. For this purpose, an Internet-based program was developed as part of a collaborative European project and the preliminary use and acceptance of the program was investigated among 22 participants (Gulec et al., 2011). In the present paper, we examined the efficacy of this intervention in maintaining and/or enhancing treatment gains against a wait-list TAU control condition. We hypothesized that intervention group participants would improve more compared to control group participants at the end of the four-month intervention period on eating disorder related outcomes. In addition, we investigated the feasibility of the program within a larger sample.

4.2. Participants and procedures

Participants were recruited at the Semmelweis University's psychosomatic treatment unit and at other inpatient and outpatient units in Hungary. Recruitment took place between August 2009 and May 2012. Eligible participants were females aged 16 or older, who had completed treatment for BN or related EDNOS in Hungary within the last 12 months prior to

the study inclusion, and had Internet access at home. All participants gave informed consent before randomization. When participants were younger than 18, parental consent was sought additionally.

Participants were randomized during a personal interview with a psychologist either to the intervention group or to the wait-list control group, stratified by prior treatment facility (Semmelweis University or other). After randomization participants received further information about the program and created their personal account on the website. Intervention group participants received the online support program immediately after randomization for four months. Participants in the wait-list control group waited for four months before they got access to the program components. As maintenance programs following treatment for BN are hardly available and thus are not part of routine care, the TAU condition was not offered any specific aftercare support during the four-month waiting period. However, additional treatment was not restricted, i.e. both intervention and control group participants could seek professional treatment during their participation in the study. For safety reasons, participants had to provide contact details of an outpatient therapist close to where they resided who could be contacted in case of an emergency situation. Ethical approval for the study was obtained from the Institutional Research Ethics Board of the Semmelweis University, Budapest.

4.3. Intervention

The intervention "EDINA" was an online platform to provide information and to facilitate peer support and professional consultation. The program consisted of information materials, weekly group sessions in a chat room, a forum, and a monitoring and feedback system. If required, participants could also book additional 30-minute one-to-one chat sessions with a counselor. Information materials provided psychoeducational content related to eating disorders and incorporated self-help strategies to fight any setbacks and relapses. The forum provided a platform for sharing ideas and peer support. The entries were monitored to promote positive communication among the participants. The group chat sessions were 90 minutes long and took place in a password-protected, encrypted, text-based chat room of the program at a fixed time every week. The sessions were moderated by online counselors, i.e. doctoral students in clinical psychology who were supervised by a senior clinician and researcher in eating disorders. The groups were open and generally consisted of five to eight participants. Participants received reminders via text message on the day of the chat sessions. In addition, participants could book optional 30-minute one-to-one chat appointments at an

appointment schedule provided by the counselors. Via the <u>monitoring and feedback system</u>, participants received an e-mail with a link to an online questionnaire every week. The online questionnaire assessed the frequency of key bulimic symptoms (body dissatisfaction, frequency of binge eating, and frequency of compensatory behaviors) in the past week. Based on their replies, participants received immediate feedback that referred to their status and the changes in these key bulimic symptoms. The main aim of the monitoring and feedback system was to increase the self monitoring skills of the participants and to provide continuous support to enhance their well-being. This module also served as an alarm system: When participants reported severe deterioration in these weekly assessments, the software would send an e-mail to the online counselors, who would then invite these participants to a one-to-one chat session to discuss the reasons for deterioration, provide support and determine the need for more intense support (e.g. face-to-face referral).

4.4. Assessments and measures

Participants completed self-report online questionnaires at baseline (T1) and at the end of the four-month intervention period (T2).

For measuring the core eating disorders symptoms and attitudes, the Eating Disorder Examination Questionnaire (EDE-Q) was used (Fairburn & Beglin, 1994). The EDE-Q is a 28-item self-report version of the semi-structured Eating Disorder Examination Interview (Fairburn & Cooper, 1993), which emerges as a gold standard for eating disorders assessment. Similar to the interview version, the EDE-Q is comprised of one global score and four subscale scores; restraint, weight concern, shape concern, and eating concern. It also assesses the frequencies of binge and purge behaviors. In the current study, the EDE-Q was translated into the Hungarian language, edited and back-translated by a bilingual Hungarian translator. Original and back translated versions were reviewed and adjusted by the study team. Internal consistencies for the total and subscale scores were satisfactory (Cronbach's alpha = 0.726–0.873).

The Depression Anxiety Stress Scale (DASS-21) was used to assess negative emotional states of depression, anxiety and stress (Lovibond & Lovibond, 1995). The DASS-21 shows satisfactory psychometric properties among clinical and community samples (Antony, Bieling, Cox, Enns, & Swinson, 1998). In the current study, the Hungarian translation suggested by the DASS group was administered and yielded high internal consistencies for the total and scale scores (Cronbach's alpha = 0.829–0.943).

Additionally, participants in the intervention group completed a satisfaction questionnaire at the end of the four-month intervention period. Besides their overall satisfaction with the program, they evaluated the helpfulness of the program components and reported on their reasons for the uptake of the intervention.

4.5. Primary and secondary outcomes

The primary outcome consisted of the core eating disorder impairment assessed by the EDE-Q total score. The secondary outcomes were the EDE-Q subscale scores and anxiety and depression (DASS-21).

4.6. Statistical analyses

Repeated measures analyses of variance (ANOVA) were performed for the primary and the secondary outcomes. In addition, the proportions of participants who showed reliable improvement on the primary outcome measure in both groups were compared. Rates of reliable change were calculated using the reliable change index (RCI) as defined by Jacobson and Truax (1991). The RCI was calculated using the internal consistency (Cronbach's alpha) of the EDE-Q total score assessed in a normative sample (Mond, Hay, Rodgers, Owen, & Beumont, 2004). Chi-square tests were used to analyze percentage differences between the study groups with regard to the reliable improvement on the primary outcome variable and the frequencies of the binge and purge behaviors at T2. Two-tailed testing was applied throughout the analyses. An alpha level of .05 was used as the significance criterion. Analyses were performed using SPSS 20.

4.7. Results

A total of 105 participants were randomized to the intervention group (EDINA; n= 52) or to the wait-list control group (TAU; n=53). Eight participants in the intervention group and two participants in the wait-list control group dropped out from the study before baseline data collection. Therefore, the final study sample comprised 95 participants (EDINA; n= 44; TAU; n= 51). Figure 4.1 displays the participant flow throughout the study.
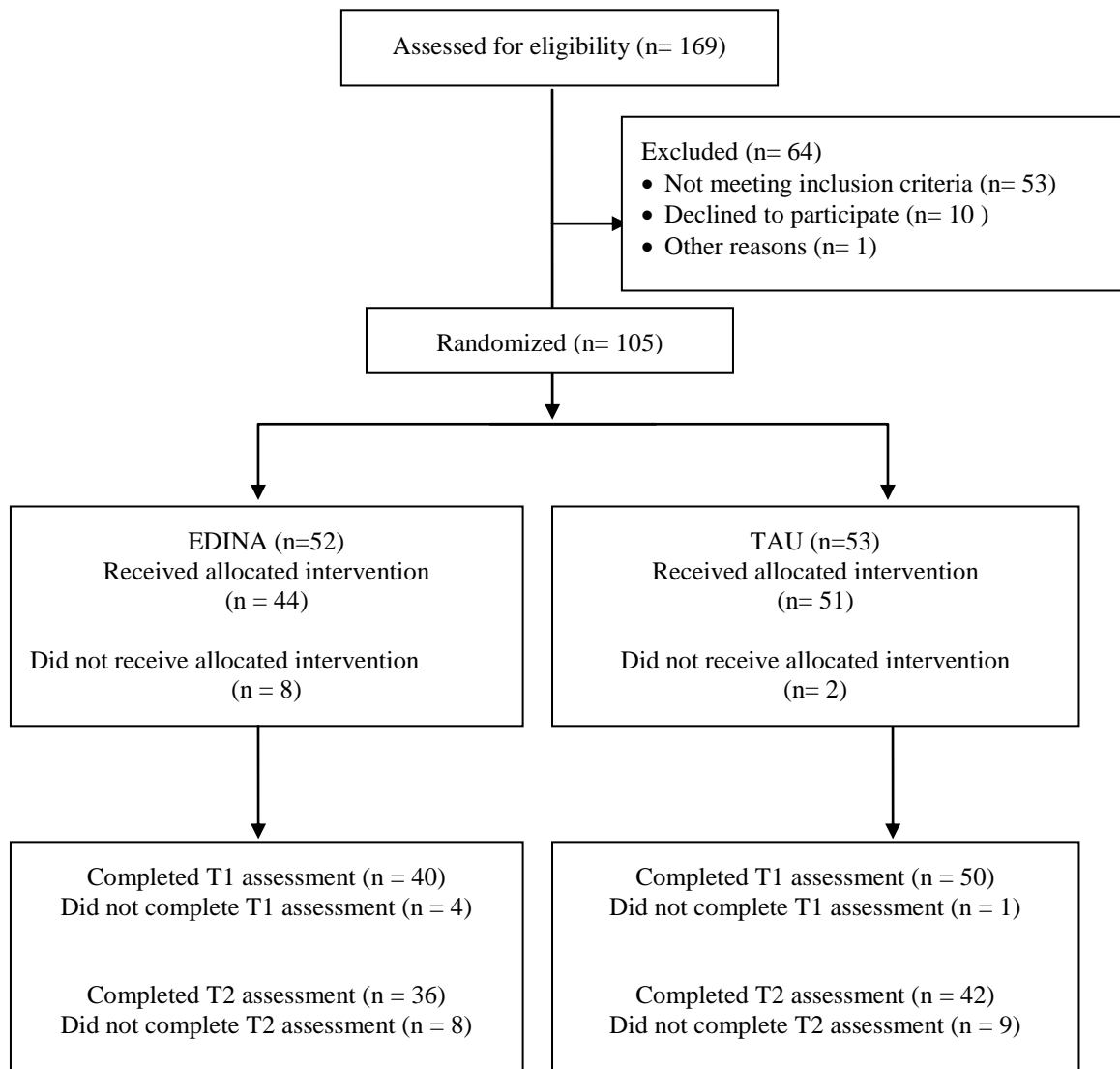
```
                    ┌─────────────────────────────────┐
                    │  Assessed for eligibility (n= 169) │
                    └─────────────────────────────────┘
                                  │
                                  │        ┌──────────────────────────────────────┐
                                  │───────▶│ Excluded (n= 64)                     │
                                  │        │ • Not meeting inclusion criteria (n= 53) │
                                  │        │ • Declined to participate (n= 10 )   │
                                  │        │ • Other reasons (n= 1)               │
                                  │        └──────────────────────────────────────┘
                                  ▼
                    ┌─────────────────────────────────┐
                    │     Randomized (n= 105)          │
                    └─────────────────────────────────┘
```

Fig. 4.1. Flow diagram of participants

EDINA (n=52)
Received allocated intervention
(n = 44)

Did not receive allocated intervention
(n = 8)

TAU (n=53)
Received allocated intervention
(n= 51)

Did not receive allocated intervention
(n= 2)

Completed T1 assessment (n = 40)
Did not complete T1 assessment (n = 4)

Completed T2 assessment (n = 36)
Did not complete T2 assessment (n = 8)

Completed T1 assessment (n = 50)
Did not complete T1 assessment (n = 1)

Completed T2 assessment (n = 42)
Did not complete T2 assessment (n = 9)

Note: Out of eight EDINA participants, who did not complete T2 assessments, two requested to terminate their participation prematurely and one's account was deactivated due to borderline personality characteristics. TAU: treatment as usual

The majority of the participants (n= 85) had completed outpatient treatment and the remaining ten participants were discharged from inpatient treatment in the 12 months before entering the study. The median treatment duration was three months. Twelve participants in the intervention group and ten participants in the wait-list control group were on antidepressant medication at the time of the baseline assessment. Around half of the participants (n= 46) reported illness duration of longer than five years (EDINA: 45%; TAU: 54%). The majority of the participants reported binge eating (86%) and vomiting (60%) at the start of the study. At the end of the observation period 22 participants utilized outpatient treatment (EDINA: 28%; TAU: 31%). Additionally, two participants in the wait-list control group were admitted to inpatient and day hospital care respectively. Sample characteristics are described in Table 4.1.

Table 4.1. Sample characteristics

Characteristic	Total sample	EDINA	TAU
n	95	44	51
Age (in years), mean (S.D.) [a]	28.17 (7.80)	27.19 (6.16)	29.02 (8.95)
Marital status, n (%) [a]			
Single	78 (83.9)	38 (88.4)	40 (80.0)
Married	12 (12.9)	5 (11.6)	7 (14.0)
Separated/divorced	3 (3.3)	0 (0.0)	3 (6.0)
Children (one or more), n (%) [a]	9 (9.7)	1 (2.3)	8 (16.0)
Education, n (%) [a]			
Still studying	25 (26.9)	13 (30.2)	24 (24.0)
Primary school	1 (1.1)	0 (0.0)	1 (2.0)
High school	29 (31.2)	13 (30.2)	16 (32.0)
Technical certificate	4 (4.3)	1 (2.3)	3 (6.0)
University/college	34 (36.6)	16 (37.2)	18 (36.0)
Main activity, n (%) [a]			
Studying full-time	22 (25.6)	11 (25.6)	11 (22.0)
Full-time gainful activity	26 (27.9)	13 (30.2)	13 (26.0)
Part-time gainful activity	13 (14.0)	7 (16.3)	6 (12.0)
Not employed	32 (34.4)	12 (27.9)	20 (40.0)
More than one treatment, n (%) [b]	50 (54.3)	23 (54.8)	27 (54.0)
BMI, mean (S.D.) [a]	21.3 (5.43)	21.21 (3.90)	21.36 (6.49)
EDE-Q total score, mean (S.D.) [c]	3.24 (1.32)	3.22 (1.24)	3.25 (1.39)
Objective binges, mean (S.D) [c]	13.6 (19.37)	14.75 (17.54)	12.70 (20.85)
Purge episodes, mean (S.D) [c]	21.88 (25.83)	20.88 (19.82)	22.69 (29.96)
Dietary restraint, mean (S.D) [c]	3.08 (1.75)	3.06 (1.62)	3.11 (1.87)
Weight concern, mean (S.D) [c]	3.29 (1.40)	3.34 (1.27)	3.26 (1.50)
Shape concern, mean (S.D) [c]	3.83 (1.34)	3.84 (1.33)	3.82 (1.37)
Eating concern, mean (S.D) [c]	2.7 (1.60)	2.64 (1.52)	2.82 (1.66)

[a] Information is missing from one participant in the intervention group and one participant in the wait-list control group, [b] Information is missing from two participants in the intervention group and one participant in wait-list control group, [c] Information is missing from four participants in the intervention group and one participant in the wait-list control group, EDE-Q, Eating Disorder Examination Questionnaire; EDINA, Internet-based program; TAU, treatment as usual; BMI, body mass index; S.D., standard deviation.

Participants in the intervention group attended a mean of 5.93 group chat sessions (SD = 5.19, Mdn = 5.00, range = 0-17) and filled in a mean of 7.27 (SD = 4.48, Mdn = 6.00, range = 0-17) monitoring assessments during the four-month intervention period. Eleven participants (25%) booked at least one individual chat session (range = 1–10), 16 participants (36%) posted at least one entry in the forum (range = 1–7), and 34 participants (77%) reported using the information material on the website. The mean rate of using the information pages was between "somewhat" and "a little" (M = 2.37, SD = 0.82, range from 1 "a lot" to "4 not at all").

Evaluation and satisfaction ratings were available from 38 intervention group participants (86%). The mean satisfaction rating was between "very satisfied" and "mostly satisfied" (M = 1.87, SD = 0.81, scale ranging from 1 "very satisfied" to 4 "quite dissatisfied"). When participants were asked to indicate the program components that were particularly helpful to them, group chat sessions were chosen by the majority (63.2%, n = 24). This was followed by the monitoring and supportive feedback module (31.6%, n = 12) and the information pages (31.6%, n = 12). The most frequent reasons for the uptake of the online intervention were the opportunity to get expert advice after treatment (52.6%, n = 20), the possibility to ask questions whenever needed (52.6%, n = 20) and the curiosity about getting online help (50%, n = 19). Table 4.2 summarizes the means, standard deviations, and results for the primary outcome measure and the EDE-Q subscales.

There was a statistically significant main effect of time on the primary outcome variable (F (1, 71) = 15.814, p< 0.001). The mean EDE-Q total score reduction from T1-to-T2 was greater for the intervention group participants but the time by group interaction was not statistically significant (F (1, 71) = 2.17, p= 0.148). The reliable change indices indicated that 40.6% (13/32) of the intervention group participants and 24.4% (10/41) of the wait-list control group participants had achieved a statistically reliable improvement on the EDE-Q total score by the end of the intervention period (χ^2 (1) = 2.195, p = 0.138). The percentage of participants who reported binge eating (EDINA: 92%; TAU: 79%) and vomiting episodes (EDINA: 58%; TAU: 52%) did not differ significantly between the groups at T2 (binge episodes: χ^2 (1) = 2.554, p = 0.129; vomit episodes: χ^2 (1) = 0.278, p = 0.652). None of the time by group interactions reached significance with regard to the DASS-21 scores (See Table 4.3).

Table 4.2. Repeated measures analysis of variance (ANOVA) for primary outcomes

EDE-Q		T1 (baseline) Mean (S.D.)	T2 (month 4) Mean (S.D.)	group x time F p value	group F p value	time F p value
Total score	EDINA	3.22 (1.24)	2.40 (1.47)	2.17	1.02	15.78
	TAU	3.25 (1.39)	2.91 (1.47)	0.148	0.315	**<0.001**
Restraint	EDINA	3.06 (1.62)	2.16 (1.79)	2.52	1.41	5.84
	TAU	3.11 (1.87)	2.87 (1.78)	0.117	0.239	**0.018**
Eating concern	EDINA	2.64 (1.52)	2.00 (1.48)	0.37	0.36	12.12
	TAU	2.82 (1.66)	2.30 (1.71)	0.543	0.549	**0.001**
Shape concern	EDINA	3.84 (1.33)	2.93 (1.57)	1.82	1.03	18.03
	TAU	3.82 (1.37)	3.44 (1.68)	0.182	0.313	**<0.001**
Weight concern	EDINA	3.34 (1.27)	2.53 (1.50)	1.66	0.60	9.23
	TAU	3.26 (1.50)	3.02 (1.61)	0.202	0.443	**0.003**

EDE-Q: Eating Disorder Examination Questionnaire; EDINA, Internet-based program; TAU, treatment as usual; S.D., standard deviation.

4.8. Discussion

To our knowledge, this was the first randomized controlled trial that investigated the effects of an Internet-based post-treatment care for patients with BN and related EDNOS following routine care. The program proved feasible and was well accepted. The mean satisfaction ratings were between "very satisfied" and "mostly satisfied". The high satisfaction ratings support the acceptability of the intervention strategy among a heterogeneous group of patients and promise its applicability as an adjunct to routine care. The group chat sessions, the monitoring and supportive feedback system, and the information pages were evaluated as the most relevant program components. The most frequent reasons for the uptake of the intervention were its accessibility (asking questions and reaching expert advice whenever needed) and novelty.

The program could not prove its efficacy. Nevertheless, participation in the online program was associated with higher reductions on variables related to eating attitudes (i.e. EDE-Q total and subscale scores), improvements on measures of general mental health (i.e. DASS-21 total and subscale scores), and a higher rate of reliable change. In summary, there

was a trend for all outcomes showing that participation in the program accelerated well-being compared to the TAU condition. Lack of statistical significance may be a result of the large within-group variances and the low power due to the relatively small sample size.

Table 4.3. Repeated measures analysis of variance (ANOVA) for secondary outcomes

DASS21		T1 (baseline) Mean (S.D.)	T2 (month 4) Mean (S.D.)	group x time F p value	group F p value	time F p value
Depression	EDINA	16.05 (11.48)	14.28 (11.34)	1.53	0.77	0.00
	TAU	16.08 (12.14)	18.23 (13.52)	0.220	0.383	0.943
Anxiety	EDINA	12.10 (8.45)	8.61 (9.06)	2.90	2.51	1.75
	TAU	12.94 (10.65)	13.12 (11.27)	0.093	0.118	0.191
Stress	EDINA	19.90 (8.53)	17.06 (9.26)	0.35	1.65	0.01
	TAU	19.76 (10.87)	20.65 (10.70)	0.558	0.203	0.911
Total score	EDINA	48.05 (25.38)	39.44 (25.93)	1.71	1.73	0.20
	TAU	48.78 (30.81)	52.00(33.63)	0.195	0.193	0.65

DASS21, Depression Anxiety Stress Scale-21; EDINA, Internet-based program; TAU, treatment as usual; S.D., standard deviation.

The duration of participation in EDINA was based on previous research (Bauer et al., 2012). However, in the current study a large variation concerning participants' impairment, and level, duration and intensity of first-level treatment (i.e. treatment prior to participation in the maintenance program) was observed. Thus, it is possible that the four-month duration might have been too short for part of this heterogeneous sample.

There were eight participants (15.4%) in the intervention group and two participants (3.8%) in the wait-list control group who did not show up at the start of the study. In addition, eight (15.4%) participants in the intervention group and nine (17%) participants in the wait-list control group dropped out during the four-month observation period. Two of the T2 drop-outs in the intervention group asked to deactivate their account. They reported a mixture of lack of time and the belief that the online support would not be helpful as reasons for their withdrawal. Compared to the drop-out rates reported for Internet-based

interventions in general, the drop-out rate of the current study was moderate and the compliance with the program was satisfactory. One integrated systematic review on barriers to the uptake of computerized CBT (cCBT) for depression and anxiety reported a substantial number of participants who dropped out before commencing trials with limited explanation, that the drop-out rates were higher in the cCBT groups as opposed to the control groups of the trials, and adherence to the full course of the cCBT treatment was only a median of 56% (Waller & Gilbody, 2009). Another review found the drop-out rates in the Internet-based treatments for psychological disorders to range from 2% to 83% with a weighted average of 31% and no specific variables for dropping-out could be identified (Melville, Casey, & Kavanagh, 2010). Future studies are necessary to investigate the specific factors associated with drop-out and early withdrawal from post-treatment technology-enhanced interventions among patients with eating disorders.

Besides the limitations such as relatively small sample size, missing data, and a relatively short observation period, one main limitation of the current study was related to its implementation. The program was originally planned as an aftercare intervention to be offered to patients immediately following discharge from treatment. However, this could not be achieved due to a lack of infrastructure for implementing this recruitment strategy in Hungary. Therefore, the program was not directly connected to the routine care and majority of the participants had to be approached individually after discharge by the research team whom they did not have previous contact with. This is in contrast to the previously investigated successful aftercare approaches (SMS and chat groups) (Bauer et al., 2012; Bauer et al., 2003; Fichter et al., 2012; Golkaramnay et al., 2007) where the interventions were connected to well-established service structures (e.g., inpatient treatment) and offered as part of the treatment programs by the initial treatment providers. Further research is necessary to investigate whether connecting such interventions to the previous level of care is a key to their success. Limited feasibility and moderately low acceptance of the SMS aftercare program reported in one study when the intervention was not integrated into the treatment program might also support this assumption (Robinson et al., 2006).

In our sample, we did not observe a significant difference between the study groups in terms of the additional treatment they utilized at the end of the observation period. In the previous successful SMS approach, although the overall treatment utilization rates were similar between the groups, the results indicated that a higher proportion of intervention group participants sought additional treatment when they needed it compared to the control group participants, suggesting an association between the uptake of the intervention and better allocation of treatment resources to contribute to the favorable results obtained (Bauer

et al., 2012). Availability of the therapy offers could play a role in this respect: Although the intervention might have resulted in a similar mechanism to seek further support among the intervention group participants in case they needed it, the relative scarcity of healthcare resources in Hungary could have hindered its manifestation in the current study compared to Germany, where the SMS approach was studied.

High drop-out rates and unfavorable outcomes are common obstacles in the management of patients with eating disorders. Thus, continuity of treatment and availability of support options is vital to promote continuous recovery and to prevent deterioration. Approaches that utilize information and communication technologies in post-treatment care appear promising as they require less therapist assistance compared with conventional approaches, and provide easy access and continuous support to patients who completed the initial treatment and are at risk for relapse. In addition, in case of limited availability of specialist ED units (e.g., as in Hungary), experts may provide the service centrally (e.g., nationwide) so that patients may receive maintenance support independent of their place of living. The current study adds to the limited knowledge in this field. Our results indicate that participation in the online intervention was associated with improvements on all primary and secondary measures among a heterogeneous sample of patients following routine care although the efficacy could not be demonstrated. Given the need to provide further support to patients with bulimic symptomatology at post-treatment and the advantages that the Internet can offer in delivering such support (Bauer & Moessner, 2012), further research in larger trials is necessary to determine the predictors of good outcome and drop-out. Adoption of such interventions in a stepped care approach may enable timely interventions and facilitate long term favorable outcome for subgroups of patients.

5. Linguistic characteristics of patients with bulimic symptomatology in an online post-treatment program[3]

Abstract

Background: No former investigation has been performed related to the linguistic characteristics of patients with eating disorders using online synchronous communication mediums like chats. Objective: The purpose of this study was to investigate the linguistic predictors of improvement in eating disorder related attitudes, behaviors and psychological well-being of patients with eating disorders. Methods: Twenty-eight women, who had received treatment for bulimia nervosa or related eating disorders not otherwise specified, utilized the moderated therapeutic group chats of an Internet-based program for four months. The main themes of 134 session transcripts were created using a general inductive approach. The frequency of dictionary words in the text corpus was processed by the NooJ linguistic software. Eating Disorder Examination Questionnaire and Depression Anxiety Stress Questionnaire was administered at the beginning and at the end of four months. Results: According to the results of multiple linear regression analyses, higher ratio of words related to "family of origin" was associated with improvements in eating disorder related attitudes, emotional distress, and reduction in the frequency of binge eating episodes ($\beta = 0.73$, p <0.001; $\beta = 0.67$, p = 0.002; $\beta = 0.53$, p = 0.039, respectively). Discussion: The results underline the significance of the topic of "family of origin" in the online communication of patients with eating disorders. As a clinical consequence, the family therapeutical approach is proposed in the style of chat moderation.

Key words: new technologies, e-mental health, bulimia nervosa, group chat, linguistic analysis

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5.1. Introduction

The new communication technologies have changed the medicine, and a new subdiscipline emerged. E-health is the use of modern communication technologies in health care delivery with a role in prevention, diagnostics, therapy, rehabilitation and health education of several disorders. There is accumulating evidence indicating usefulness of these new methods for patients with bulimia nervosa (BN), binge eating disorder, and eating disorders not otherwise specified (EDNOS) (Bauer & Moessner, 2013; Gülec et al., 2011; Hay, 2013). Over the past decade an emerging direction in e-health has been the evaluation of the linguistic characteristics of patients using various Internet platforms, such as forums, support groups, chats and e-mails. Research in this field has investigated e.g., patients with cancer (Alpers et al., 2005; Chen, 2012; Owen et al., 2003; Seale et al., 2006), and conditions like emotional, personality, or behavioral disorders (Haug et al., 2008; Wolf et al., 2010). Few studies investigated the online linguistic characteristics of patients with eating disorders within the context of Internet pro-recovery discussion groups (Keski-Rahkonen & Tozzi, 2005), pro-anorexia ("pro-ana") and pro-recovery message boards and web pages (Lyons et al., 2006), pro-ana social networking sites (Juarascio et al., 2010), and pro-ana online discussion forums (Gavin et al., 2008). However, the knowledge on the use of language among patients with eating disorders utilizing interactive mediums such as Internet chat rooms is not existent.

Communication in Internet chat rooms is generally text-based and the text correspondence resembles face-to-face interactions as both of them take place in real time. However, features such as invisibility and lack of visual cues in Internet chat rooms are discussed to bring about faster and greater openness compared to traditional therapy settings, also referred to as "online disinhibition effect" (Barak, 2004). In addition, in case of eating disorders, the invisibility of the body could allow different aspects of therapeutic relationship to appear compared to face-to-face settings, where the body is approachable (Skårderud, 2003). Given the increasing use of e-health interventions in health care delivery of patients with eating disorders, knowledge on these processes may provide valuable information into the poorly understood process and course of eating disorders and inform about the best practice approaches in such interventions. For this purpose, in an exploratory study we investigated the online written language of patients with bulimic symptomatology within moderated therapeutic group chats of an Internet-based support program, and investigated linguistic predictors of improvement in eating disorder related attitudes, behaviors and psychological well-being. To our knowledge, this is the first study to conduct linguistic

analysis of text written during therapeutic group chat sessions of patients with eating disorders.

5.2. Participants and recruitment

Participants who were studied as part of an online support program (EDINA) within a European collaboration constituted the sample of the current study (Gulec et al., 2011). Eligible participants were females, at least 16 years of age and had available Internet access at home. All had received treatment for BN or EDNOS in Hungary within the last 12 months before study participation. In the present study, the sample consisted of 28 participants who utilized the group chat component of the program for four months and provided available questionnaire data. Data were collected between February 2010 and June 2012. All participants provided informed consent before study inclusion and parental consent was obtained when participants were younger than 18 years. The study was approved by the Institutional Research Ethics Board of the Semmelweis University, Budapest.

5.3. Measures

Participants completed self-report online questionnaires which assessed sociodemographic variables including age, years of education, anthropometric data (i.e. body weight and height), duration of illness, eating disorder related features and emotional distress at baseline and at the end of the four months. The core eating disorder symptoms and attitudes were assessed by the Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn & Beglin, 1994). For the current study, EDE-Q was translated into Hungarian language, edited and translated back by a bilingual translator. Both versions were reviewed by the study team, and if necessary, adjustments were made. Internal consistencies of the total and subscale scores were acceptable (Cronbach's alphas range from 0.66 to 0.94). Emotional distress was assessed by the Depression Anxiety Stress Scale (DASS-21) (Lovibond & Lovibond, 1995). The DASS-21 consists of a total and three subscale scores (i.e. depression, anxiety and stress). For the current study, the Hungarian version of DASS-21 suggested by the DASS working group was adopted and yielded good internal consistencies (Cronbach's alphas range from 0.77 to 0.94).

5.4. The online intervention

EDINA offers participants an information and communication platform for peer support and professional counseling, and was described elsewhere (Gulec et al., 2011). The modules of the program include online information material, a forum, online symptom monitoring and supportive feedback system and chats (group and individual). The 90-minute long group chat sessions took place at the password protected chat room of the program at a fixed time every week and were moderated by a trained therapist (A.M.), who received supervision from a senior clinician and researcher in eating disorders (F.T.). The groups were open, anonymous and generally consisted of 5–8 participants. The group chats focused on „here and now" topics and aimed at providing professional support and the opportunity to meet virtually with other people who suffer or suffered from the same problem. Each session was stored by the underlying software Web-Akquasi (Percevic et al., 2004).

5.5. Content analysis

The chat scripts were extracted and the typos and grammatical mistakes were corrected by the study team before conducting the content analysis. In the extracted documents each line belonged to one participant or the online counselor, and was indicated by the time of sending the message (hh:mm:ss) and the pseudonym. In total, transcripts of 134 chat sessions from 39 participants in Hungarian were available during the study period. The mean group size was 8.2 (SD = 2.15; range = 3-14). The participants who wrote less than 50 words in a group chat session or did not have available data at the beginning or at the end of four-month chat period were excluded (N= 11; 28%). The four-month long chat corpus was created by compiling four monthly text corpora which contained four group chat sessions each. The final chat corpus consisted of 135805 words. On average, participants wrote 3482.2 words (SD = 2551.83; range = 326-8783) during four months. For calculating the absolute and relative occurrence of the words in the text corpus, NooJ linguistic software was used (Silberztein, 2013). Relevant themes of the chat scripts were identified based on a general inductive approach (Thomas, 2006). First, the chat scripts were overviewed with respect to the main themes and then the central themes were subsequently created for the description of the online content. Six trained and independent judges classified each word into these categories to create the corpus-based dictionary of the study. If four of the six judges (2/3) classified a word into one of these categories, the place of the word was finalized. Different forms of the words were retained in the dictionary (e.g., plural, tenses, and cases). The

following nine word categories were formed: body and clothing (643 words: e.g., body shape, face, bottom), expressed negative emotions (25 words: e.g., hate, anger), family of origin (269 words: e.g., grandparents, parents, siblings), food and eating (762 words: e.g., kcal, apple, chocolate), illness, symptoms and therapy (876 words: e.g., ill, anorexia, depression, treatment), important others (241 words: relatives, friends, children, husband), physical aggression (57 words: e.g., beat, hit, kick), sexuality and intimacy (137 words: e.g., love, desire, sex), sports and physical activity (139 words: e.g., bicycling, training, running). In addition, we included first person pronouns (34 words: e.g., myself, for me, with me, with us) to assess the predictive value of self-reference on assessed dimensions. To determine the monthly ratio of each word category, the frequency of words was divided by the total number of words in the monthly corpus for each participant. Then, the mean of the monthly ratios relating to each word category was calculated for the four-month study period. Further statistical analyses were carried based on these indices.

5.6. Statistical analyses

The internal consistencies of the questionnaires were estimated using the Cronbach's alphas. For continuous variables paired samples t-test was computed to compare the scores at baseline and the end of four months, and the effect sizes were calculated using the Cohen's d (Cohen, 1992). A composite score of purge behaviors was calculated by adding the number of vomit episodes and laxative misuse episodes. Changes in eating disorder attitudes and behaviors (EDE-Q), and in emotional distress (DASS-21) were calculated subtracting the values at the end of four months from the baseline values, where higher change scores indicated more improvement. Change scores of cognitive and behavioral symptoms of eating disorders and emotional distress were correlated with the average ratio of the word categories in the chat corpus. In case of non-normal distribution, Spearman's rank correlation was used. Based on the significant correlations between the change scores and word categories, multiple linear regression analyses were conducted adjusting for potential confounding variables. In case of non-normal distribution, Spearman's partial rank correlation coefficient was calculated.

5.7. Results

Participants were on average 27.5 (SD = 6.36, range = 19-49) years old and had a mean education duration of 14.7 (SD = 2.40, range = 10-20) years. For 11 (39%) participants, the illness duration was longer than five years. There were no significant differences between the baseline and end of four-month scores with respect to eating disorder related behaviors and attitudes, emotional distress and body mass index (BMI) (Table 5.1).

The total ratio of the word categories constituted 5.5% (7460 words) of the total text produced by the participants during the four-month group chat attendance. In a similar study by Wolf et al. (2010), the ratio of the dictionary nouns constituted 3% of the total words and they argued that this percentage is acceptable as around 50% of the words used in natural languages consist of particles. The mean ratio of the word categories in the corpus are represented in Figure 5.1.

During the four-month period, the mean reduction in binge eating episodes was 0.64 (SD = 5.59, range = -11 − 9) and the mean reduction in purging episodes was 1.71 (SD = 6.40, length: -16–19). According to the correlational analyses, family of origin word category demonstrated significant positive moderate to strong associations with most of the variables except change in purge behaviors. The word category of important others showed significant positive moderate correlation with the change in purge behaviors. In addition, significant positive moderate to strong relationships were found between the expressed negative emotions word category and change in eating concerns and weight concerns scales of the EDE-Q (Table 5.2).

Based on the results of the correlational analyses, the relevant word categories were tested in multivariate models adjusting for age, baseline BMI, years of education, chronicity, baseline frequency of binge eating and purging behaviors, baseline eating disorder related cognitive attitudes (EDE-Q total score), and baseline emotional distress (DASS-21 total score). According to the results of the multiple linear regression analyses, higher ratio of words related to family of origin ($\beta = 0.73$, $p < 0.001$), higher baseline BMI ($\beta = 0.46$, $p = 0.003$), lower baseline frequency of binge eating episodes ($\beta = -0.42$, $p = 0.025$), and lower baseline emotional distress (DASS-21 total score; $\beta = -0.45$, $p = 0.022$) were significantly associated with improvements in eating disorder related attitudes assessed by the EDE-Q total score at the end of four months. In addition to that, higher ratio of words related to expressed negative emotions ($\beta = 0.24$, $p = 0.088$) and higher baseline EDE-Q total score ($\beta = 0.37$, $p = 0.068$) were associated with improvements in eating disorder related attitudes at a tendency level. The model explained 70.7% of the variance (Table 5.3).

Table 5.1: Comparisons of baseline and end of four-month scores of eating disorder related behaviors and attitudes, emotional distress, and BMI

Variables	Baseline M (SD)	End of 4 months M (SD)	t (p)	Cohen's d
BMI	21.33 (4.23)	21.50 (4.01)	-0.562 (p = .579)	-0.15
EDE-Q				
Restraint	2.86 (1.70)	2.40 (1.91)	1.654 (p = .110)	0.45
Eating concerns	2.21 (1.40)	1.97 (1.30)	0.959 (p = .346)	0.26
Weight concerns	3.27 (1.25)	2.89 (1.50)	1.167 (p = .253)	0.31
Shape concerns	3.78 (1.41)	3.39 (1.52)	1.161 (p = .256)	0.31
Total	3.03 (1.25)	2.66 (1.38)	1.470 (p = .153)	0.39
Binge eating episodes	8.00 (11.34)	7.36 (9.67)	0.609 (p = .548)	0.17
Purge episodes	9.57 (15.49)	7.86 (13.12)	1.42 (p = .168)	0.41
DASS-21				
Depression	15.20 (11.03)	16.32 (11.64)	-0.443 (p = .662)	-0.13
Anxiety	10.72 (9.45)	9.20 (8.60)	0.967 (p = .343)	0.27
Stress	17.04 (7.83)	18.24 (8.74)	-0.573 (p = .572)	-0.16
Total	42.96 (25.89)	43.76 (25.82)	-0.146 (p = .885)	-0.04

EDE-Q: Eating Disorder Examination Questionnaire; DASS-21: Depression Anxiety Stress Scale.
Note: n= 25-28.

With regards to eating disorder related behaviors, higher ratio of words related to family of origin ($\beta = 0.53$, p = 0.039) was significantly associated with reduction in the frequency of binge eating episodes. The model explained 28.2% of the variance (Table 5.4).

According to the result of Spearman's partial rank correlational analysis, using higher rate of words related to important others showed marginally significant association with reduction in purge behaviors (Spearman $r_p = 0.42$, p = 0.065). Lastly, using higher ratio of words related to family of origin ($\beta = 0.67$, p = 0.002) and longer duration of illness ($\beta = 0.45$, p = 0.046) were significantly associated with improvements in emotional distress assessed by the DASS-21 total score at the end of four months. Higher BMI at baseline showed relationship with improvements in emotional distress at a tendency level ($\beta = 0.29$, p = 0.070). The model explained 59.7% of the variance (Table 5.5).
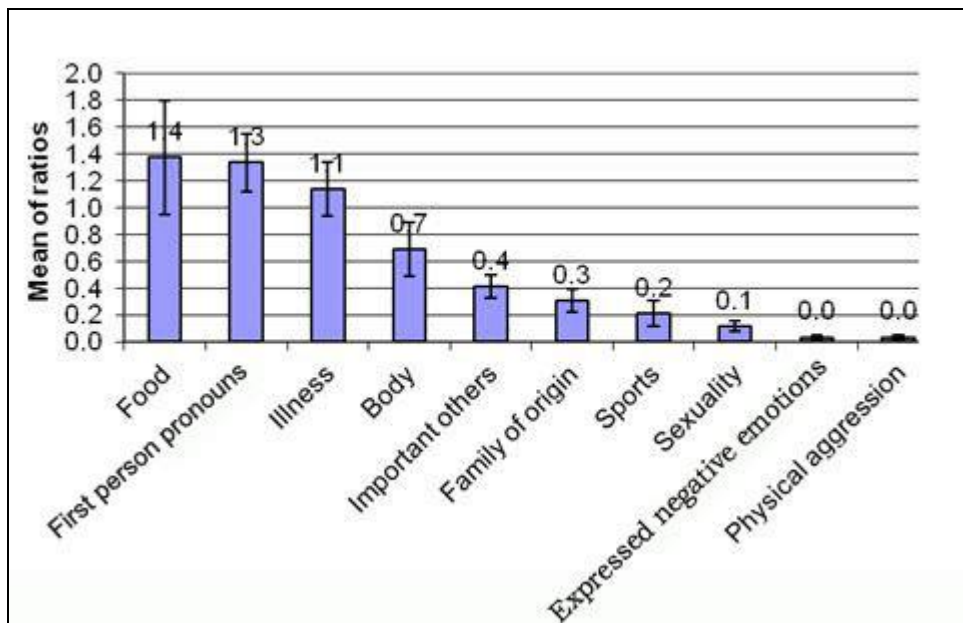

Figure 5.1: The mean ratios of the word categories in the chat corpus

during the four-month period

Note: 95% confidence intervals of means are represented.

5.7. Discussion

In the current study, we investigated the linguistic characteristics of patients with eating disorders who had treatment for BN or related symptomatology and utilized the weekly moderated group chat sessions of an Internet-delivered support program (EDINA) following treatment termination for four months (Gulec et al., 2011). To the best of our knowledge, this was the first study to analyze a synchronous online communication medium in patients with eating disorders.

Table 5.2: Correlations between the word categories and the change relating to eating disorder related behaviors, attitudes and emotional distress

Change scores	Physical aggression	Illness	Family of origin	Expressed negative emotions	Food	Important others	Sport	Sex	Body	First person pronouns
EDE-Q										
Restraint	-0.18	0.07	0.50**	0.12	0.00	0.34[+]	-0.02	-0.11	0.08	0.08
Eating concerns	-0.08	-0.08	0.65***	0.40*	-0.10	0.34[+]	0.05	0.18	0.12	0.03
Weight concerns	0.05	-0.04	0.53**	0.46*	-0.15	0.07	-0.05	0.14	0.02	-0.03
Shape concerns	0.04	-0.03	0.52**	0.33[+]	-0.03	0.15	0.14	0.00	0.20	0.09
Total	-0.04	-0.02	0.65***	0.39*	-0.08	0.25	0.04	0.06	0.13	0.05
Frequency of binge eating episodes	-0.05	-0.25	0.54**	0.33[+]	-0.07	0.21	0.20	0.14	0.19	0.03
Frequency of purge episodes	*-0.19*	*-0.26*	*0.34[+]*	*0.20*	*0.14*	*0.41**	*0.20*	*0.17*	*0.14*	*-0.28*
DASS-21										
Depression	-0.05	-0.02	0.51**	0.36[+]	-0.17	-0.07	0.28	-0.08	0.25	-0.13
Anxiety	-0.20	-0.02	0.59**	0.17	-0.09	0.15	-0.02	-0.06	0.01	-0.23
Stress	-0.26	-0.06	0.57**	0.27	-0.01	-0.02	0.07	0.08	0.29	-0.29
Total	-0.18	-0.04	0.62**	0.32	-0.11	0.00	0.15	-0.02	0.23	-0.24

Note: n= 25-28.

EDE-Q: Eating Disorder Examination Questionnaire; DASS-21: Depression Anxiety Stress Scale.

[+] p <.10, * p <.05, ** p <.01, *** p <.001. Italic type means Spearman's rank correlation coefficient.

The present study consistently showed that using higher ratio of words related to family of origin (i.e. grandparents, parents, siblings) during chat sessions was associated with improvements in eating disorder related attitudes, frequency of binge eating episodes and emotional distress from baseline to end of four months. These results are remarkable and highlight the importance of family issues in enhancing the treatment outcome and provide preliminary evidence to address this topic during online chat moderation of patients with bulimic symptomatology at post-treatment.

Table 5.3: Results of the multiple linear regression analyses for improvement in eating disorder related cognitions

Variables	Improvement in eating disorder related cognitions[a]		
	Beta	t	Sig.
Family of origin	0.73***	4.889	<0.001
Expressed negative emotions	0.24[+]	1.834	0.088
Age	0.22	1.385	0.188
BMI at baseline	0.46**	3.625	0.003
Years of education	0.16	1.012	0.329
Chronicity	-0.01	-0.029	0.977
Binge eating episodes at baseline	-0.42*	-2.512	0.025
Purge episodes at baseline	0.18	1.022	0.324
EDE-Q total score at baseline	0.37[+]	1.979	0.068
DASS-21 total score at baseline	-0.45*	-2.582	0.022
Adjusted R^2			

Note: n= 25
[a]: Based on change in Eating Disorder Examination Questionnaire (EDE-Q) total score
[+] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$
Adjusted R^2 = 70.7%

There is accumulating evidence to indicate family-based therapy (FBT) as the first-line treatment of adolescents with AN (le Grange, Lock, Loeb, & Nicholls, 2010; Lock, 2011; National Institute for Health and Care Excellence, 2004). Recently, a transdiagnostic model of FBT has been suggested as a promising approach for outpatient treatment of patients with AN, BN and their EDNOS variants (Loeb, Lock, Grange, & Greif, 2012). The

transdiagnostic model of FBT focuses on how the disorder affects the family level variables that contribute to the maintenance of the disorder, and addresses these mechanisms for its resolution.

Table 5.4: Results of the multiple linear regression analyses for improvement in frequency of binge eating episodes

Variables	Improvement in frequency of binge eating episodes[b]		
	Beta	t	Sig.
Family of origin	0.53*	2.260	0.039
Age	0.25	1.008	0.330
BMI at baseline	0.20	1.017	0.325
Years of education	0.25	1.044	0.313
Chronicity	-0.22	-0.801	0.435
Binge eating episodes at baseline	0.27	1.007	0.330
Purge episodes at baseline	0.07	0.243	0.811
EDE-Q total score at baseline	0.20	0.712	0.487
DASS-21 total score at baseline	-0.22	-0.792	0.440

Note: n= 25
[b]: Based on change in frequency of binge eating assessed by the EDE-Q
* $p < .05$
Adjusted $R^2 = 28.2\%$

The results of the current study which suggest an association between participants' higher use of family of origin words and their improved general and eating disorder related well-being may provide further support to the assumption of FBT and extend this assumption beyond the treatment termination. Moreover, addressing the family within a group chat context may allow a similar approach to individual systemic therapy (Jenkins & Asen, 1992) which tackles the family issues without the presence of the family members, decrease the therapist investment compared with face-to-face interventions and can be disseminated at low cost. The chat sessions in the current study focused on "here and now" topics and did not follow a manual-based approach. We relied on the frequency of words in each word category for the analyses. Thus, we can not speculate on the context within which they were produced. Nevertheless, the online moderator followed a neutral and reactive manner, motivated interaction between the participants and used positive reframing and emotional support with respect to the familial topics during chat sessions. This is in line with the

assumption of FBT which regards the family as a resource of treatment and views the blaming of the family as a therapeutic fault (le Grange et al., 2010).

Although at a tendency level, the linear association between the frequent use of words relating to important others (e.g. relatives, friends, children, husband) and improvements in purge behaviors may reflect that these symptoms have often strong interpersonal message − e.g., the purging symptoms may serve as regulating factors in intimacy (Cooper, Todd, & Wells, 2009; Van den Broucke, 1997). Dealing with fear of intimacy in an anonymous environment through writing own emotions and "listening" to the others' could have improved awareness on emotional conflicts and contributed to the development of healthier coping mechanisms.

Table 5.5: Results of the multiple linear regression analyses for improvement in emotional distress

Variables	Improvement in emotional distress[c]		
	Beta	t	Sig.
Family of origin	0.67**	3.846	0.002
Age	-0.15	-0.795	0.439
BMI at baseline	0.29^{+}	1.949	0.070
Years of education	0.16	0.876	0.395
Chronicity	0.45*	2.174	0.046
Binge eating episodes at baseline	-0.28	-1.445	0.169
Purge episodes at baseline	0.23	1.134	0.275
EDE-Q total score at baseline	-0.15	-0.699	0.495
DASS-21 total score at baseline	0.34	1.654	0.119

Note: n= 25
[c]: Based on change in Depression Anxiety Stress Scale (DASS-21) total score
$^{+}$ $p <.10$, * $p <.05$, ** $p <.01$
Adjusted $R^2 = 59.7\%$

We found, at a tendency level, a linear association between using higher ratio of words relating to expressed negative emotions (e.g., hate, anger) and improvements in eating disorder related attitudes. Studies showed positive psychological and somatic effects of writing about emotions in different populations (Pennebaker, 1997; Pennebaker et al., 2003; Tausczik & Pennebaker, 2009). After a disclosure writing intervention, it was found that participants who wrote a high number of positive emotion words, a moderate number of negative emotion words, and an increasing number of cognitive (i.e. causal and insight)

words related to traumas over three days were more likely to benefit from the intervention (Pennebaker et al., 1997). In the current study, we did not investigate the use of emotion and cognitive words separately. Thus, it is difficult to compare the relative importance of these linguistic patterns with respect to psychological change. However, our results provide further support to the finding that writing about emotional upheavals may be essential to coping (Pennebaker et al., 2003). In addition, availability of others to provide support during expression of such emotional upheavals could result in a different mechanism in chat communication than found in disclosure writing interventions. For example, one study reported slightly increased use of affective words among participants within an Internet chat aftercare with increasing group size (Haug, Wolf, & Golkaramnay, 2005). Further research will be helpful in understanding the association between the expression of positive and negative emotion words, and the improvements in eating related cognitions during chat interactions.

One interesting finding was the linear association between improved emotional distress and longer duration of illness, i.e. those who had a more chronic illness course reported better well-being at the end of the chat groups. One explanation might be that weekly moderated group chats provided continuity between treatment and everyday life for dealing with chronic behavioral patterns that contributed to the amelioration of experienced emotional distress over time. This is also supported by participants' comments which evaluate the feeling of being proactive about their health as helpful during their participation in the online program (Gulec et al., 2011). Determining the salient aspects of chat communication that boost emotional well-being in chronic patients with eating disorders could enable further adaptations of the intervention. To this end, one study investigated the text-based group processes within an Internet chat aftercare and found that higher satisfaction with the chat sessions, higher frequency of being mentioned by the other members and the therapist, and higher relative activity in comparison to the other group members were associated with improvements in psychological well-being of patients with affective, neurotic, and personality disorders (Haug et al., 2008).

The associations between higher baseline BMI and improvements observed in eating disorder related cognitions and emotional distress highlight the importance of BMI as a predictor of improved outcome and is in line with previous research. Jones and colleagues found that BMI and motivation indirectly influenced the treatment outcome via the ability to complete the day therapy programme (Jones, Bamford, Ford, & Schreiber-Kounine, 2007). Sly and Bamford (2011) described that higher body weight at start of inpatient treatment was related to better outcome.

This study has several limitations. Due to the small sample size the statistical power is low. The high number of correlational analyses would require Bonferroni correction but this was not taken into consideration due to the same reason. The content of the chat scripts were defined based on qualitative approach. Computerized approaches to identify the themes of the chat scripts, e.g., meaning extraction method: Chung and Pennebaker (2008), could have been considered. We used the NooJ linguistic software (Silberztein, 2013) to calculate the frequency of corpus-based dictionary words. Relying on the frequency of the words limited our ability to determine the context within which they appeared under each theme. For example, the preferred usage of eating related words may be a sign of forming a subculture, as in the "pro-ana" websites (Lyons et al., 2006). Although this was not the case in the current study as chat moderation guaranteed positive communication between the participants, it is possible that the family therapeutic orientation of the online counselor played a role in the results obtained. Further analyses of the language style of the online counselors could give insights on the moderator perspective in such synchronous communication mediums.

Despite the limitations, our study is informative for further prospective investigations. More studies are needed to clarify other linguistic characteristics. E.g., it would be interesting to analyze the verb tenses, which draws attention to time, from past to future – or first-person and second person pronouns, which relate to the relationship quality (Tausczik & Pennebaker, 2009). This may have therapeutic consequences.

To sum up, the expression of family of origin words following treatment termination was a linguistic predictor of improvement during group chat communication of patients with bulimic symptomatology in the current study. From a clinical perspective the family therapeutical approach might be a suitable style in chat moderation. Further research on the language use of patients with eating disorders is necessary to give insights with respect to the maintenance factors after treatment. This can facilitate development of effective strategies to address them through online and offline communication mediums.

6.   General discussion

6.1. Main findings

Little is known about the optimal strategies to support patients with eating disorders following treatment termination. In the current intervention, an individualized strategy was followed, which allowed participants tailor the intensity of program components during their participation in the program. This strategy takes into account the heterogeneous outcome of first level eating disorder treatment outcome and acknowledges that patients differ with respect to the intensity of support they need following treatment termination. Therefore, besides receiving continuous support through weekly components (i.e. group chat sessions and symptom monitoring and supportive feedback), participants had access to psychoeducational materials incorporating self-help strategies to counteract relapse, an online forum for peer support and individual chat sessions to meet an online counselor on one-to-one basis. In the next sections the main findings, limitations, and clinical implications of the research presented in this dissertation will be discussed and future directions will be outlined.

6.1.1. Feasibility and acceptability of the intervention

The intervention proved feasible and well-accepted. Participants evaluated the program components positively and indicated that they would suggest the program to a friend in a similar need and would come back if they needed support in the future. No major technical problems were reported. Adherence to the program components was acceptable. Participants completed almost 60% of the monitoring assessments and attended roughly half of the foreseen group chat sessions (47%) during the four-month period. Sixty four percent of the total sample attended at least three group chat sessions, 89% completed at least three monitoring assessments and almost all participants utilized at least one voluntary component of the program during their participation (psychoeducation, forum and/or individual chat): 11 participants (25%) booked at least one individual chat session, 16 participants (36%) posted at least one entry on the forum and 34 participants (77%) reported using the information material on the website. Overall, the patterns of utilization support the assumption that patients with eating disorders have heterogeneous needs for support following treatment termination. Monitoring and supportive feedback system allowed to assess symptom deteriorations continuously and enabled actions to increase the intensity of care when

necessary (e.g., individual chat sessions). The group chat sessions, the monitoring and supportive feedback system, and the information pages were evaluated as the most relevant program components. The most frequent reasons for the uptake of the intervention were its accessibility (asking questions and reaching expert advice whenever needed) and novelty.

The majority of the participants rated the group chat sessions as helpful, evaluated the professional support positively and felt accepted and understood by the group members. This suggests therapist contact within a group context to be a convenient way to provide support to patients with bulimic symptomatology at post-treatment and is in line with studies that reported the feasibility of Internet chat technology to provide support to other patient groups following treatment termination. For example, Fichter et al. (2012) studied the efficacy of an online relapse prevention program following inpatient treatment of AN against a TAU condition in a randomized controlled trial over nine months. Besides written and behavioral exercises based on CBT techniques and a message board for peer support, the program incorporated moderated group chat sessions on a monthly basis. The program was feasible and associated with significant weight gain in the intervention group participants. The results indicated that 77 participants used the chat sessions during participation (60%): Fourteen of them participated once, 36 participated 2–5 times, and 27 participated 6–9 times. In a controlled naturalistic study, participants who attended weekly group chat sessions for 12–15 weeks following inpatient treatment for mental disorders were at lower risk for negative outcome and the intervention was feasible with high session attendance (85%) and a low dropout rate (9%) (Bauer et al., 2011; Golkaramnay et al., 2007). In a pilot randomized controlled trial, chat aftercare following back pain treatment was associated with decreased post-treatment disability compared with a TAU control condition and proved feasible with 63% of the participants joining at least one chat session during the participation period (Moessner, Schiltenwolf, & Neubauer, 2012).

The symptom monitoring and supportive feedback component of the program provided automated, low threshold and easy access support to 1) enhance self-monitoring skills, 2) increase self awareness of symptom course 3) reinforce positive change and 4) suggest alternative behaviors in cases of deterioration. Self-monitoring is the systematical observation of one's own behavior and is often associated with increased self awareness and self-efficacy which serve as the precursors for behavior change (Bandura, 1977; Bandura, Adams, & Beyer, 1977). Personalized feedback which addresses personally relevant information has been found to be more effective than generic and targeted feedback in bringing about behavior change (DiClemente, Marinilli, Singh, & Bellino, 2001). There is evidence to support the use of new technologies for self-monitoring of behaviors as their

integration into daily life is much easier and they allow accurate (time/day stamps) and immediate recording of behaviors compared to paper self-monitoring diaries (Piasecki, Hufford, Solhan, & Trull, 2007).

A number of studies assessed the feasibility and efficacy of mobile technologies for self-monitoring of eating behaviors and provision of tailored feedback. An SMS and the text-messaging program, which assessed core eating disorder related behaviors and provided tailored feedback on the symptom course, proved feasible with high adherence (87%) and acceptance ratings, symptom remission and treatment engagement when offered as a self-monitoring tool within the context of CBT for BN in a proof-of-principle study (Shapiro et al., 2010). When offered as a maintenance strategy following inpatient treatment of BN and related EDNOS, 61% of the participants adhered to the program for the complete study duration and more intervention group participants were classified as remitted at the end of the follow-up period compared to the TAU control condition (Bauer et al., 2012). Self-monitoring of diet, exercise and weight is associated with weight loss outcomes and integral part of obesity treatment (Burke, Wang, & Sevick, 2011). The potential of self-monitoring and provision of tailored feedback on eating behaviors, exercise and emotions was studied to enhance the effects of a 38-week lifestyle intervention using SMS and text messaging technology in overweight and obese children. After receiving 12 weeks of CBT-based childhood obesity treatment, children were assigned either to an SMS maintenance treatment or no SMS maintenance treatment condition for the remaining period of the lifestyle intervention. According to the results, the SMS approach was feasible with 67% of adherence rate (Bauer, de Niet, Timman, & Kordy, 2010) and associated with a reduced rate of drop-out from the lifestyle intervention (de Niet, Timman, Bauer, van den Akker, de Klerk, et al., 2012) although the efficacy in terms of weight outcome could not be demonstrated (de Niet, Timman, Bauer, van den Akker, Buijks, et al., 2012). A text-messaging and MMS program that provided daily interactive and personally weight-relevant text-messaging based on self-monitoring data was a feasible weight loss intervention among obese people with 60-69% of adherence rates in a randomized control trial but did not result in weight loss difference at six and 12 months compared to participants who received monthly e-newsletters in a control condition (Shapiro et al., 2012). In the current study, the monitoring and supportive feedback component was delivered via e-mail technology. The adherence rates were comparable to the interventions which utilized text-messaging for self-monitoring of eating behaviors and were better than the compliance rates reported for paper-pencil diaries (Stone, Shiffman, Schwartz, Broderick, & Hufford, 2002). One advantage of using e-mails instead of SMS and text messaging was the possibility to generate longer

feedback texts addressing relevant dimensions of the symptom status. In addition, the Internet/e-mails can easily be accessed via smartphone/tablet users nowadays, which might further increase the adherence to this component in the future. As a continuous and low threshold component, participants utilized weekly symptom monitoring and supportive feedback component comparably more frequently (M= 9.95, SD= 5.09, range= 0–17) during the four-month intervention period than the weekly group chat sessions (M= 7.45, SD= 5.16, range= 0–16).

6.1.2. Efficacy of the intervention

The efficacy of the intervention in improving eating disorder related symptoms, attitudes and general mental health against a waiting list TAU control condition was investigated during the four-month intervention period. Outcomes were assessed through self-report measures at baseline and at the end of the four-month intervention period in terms of mean change over time and reliable change index (Jacobson & Truax, 1991). Despite the evidence in a previous study which used SMS and text-messaging to maintain treatment gains in patients with BN and related EDNOS (Bauer et al., 2012), the efficacy of the intervention could not be shown in the current study. Nevertheless, participation in the online program was associated with higher reductions on variables related to eating attitudes (i.e. EDE-Q total and subscale scores), improvements on measures of general mental health (i.e. DASS-21 total and subscale scores), and a higher rate of reliable change on the EDE-Q total score. Overall, the results indicated that participation in the program accelerated well-being compared to the TAU condition at a tendency level. Lack of statistical significance may be explained by the large within-group variances and the low power due to the relatively small sample size.

Another possible explanation for the unfavorable results obtained might be related to the recruitment strategy of the current study. Originally, the intervention was planned as an aftercare intervention to be offered to patients immediately following discharge from treatment. However, this could not be achieved due to a lack of infrastructure in Hungary. Previous technology-enhanced aftercare interventions that proved efficacious were connected to well-established service structures (e.g., inpatient treatment) and integrated into the treatment programs by the treatment providers (Bauer et al., 2012; Bauer et al., 2003; Bauer et al., 2011; Fichter et al., 2012; Golkaramnay et al., 2007). In our case, the program was not directly connected to the routine care and majority of the participants had to be approached individually after discharge by the research team whom they did not have previous contact with. This might have had an impact on the results. Thus, whether

integration of such technology-enhanced interventions to the previous treatment regimen contributes to the favorable outcome needs to be investigated. This assumption is supported by the results from a study which reported limited feasibility and modest acceptance of the SMS approach when the program was not connected to the previous treatment (Robinson et al., 2006).

The absence of a stronger effect of the intervention might also have been caused by another mechanism. We did not observe a significant difference between the study groups with respect to the utilization of additional treatment in the current study. In the previous successful SMS approach (Bauer et al., 2012), although the groups did not differ significantly with respect to the additional treatment they utilized, the use of the SMS intervention was associated with a better allocation of treatment resources. Specifically, a higher proportion of participants in the intervention group might have utilized additional treatment when they needed it and a higher proportion stayed without treatment when they felt fine with the SMS intervention only, which might have contributed to the favorable results in the absence of differences in service utilization on the group level. It is possible that the relative scarcity of healthcare resources in Hungary limited the manifestation of this mechanism in comparison to Germany where the SMS approach was studied. Taken together, the infrastructure of the healthcare system could mediate the results obtained in such technology enhanced interventions and implementation of these strategies might be premature without a well-established service structure. This was also evident by the high number of sufferers who contacted the study team during the recruitment process to receive treatment. Due to the lack of psychotherapy offers for people suffering from eating disorders in routine care, the treatment offers of the Semmelweis University's treatment unit were expanded.

Since this was the first intervention to address patients with eating disorders using the Internet at post-treatment, several questions remain to be answered. For example, more research is necessary to determine the optimum duration that is associated with significant improvements. The four-month duration may have been too short to reach a significant degree of improvement given the heterogeneity of the current sample. We studied the efficacy of the intervention in a waiting list controlled randomized trial to decrease the rate of drop-out in the control group. Waiting for "the intervention" might have had a positive effect given the limited health care resources. Lack of follow-up data limits our ability to detect the mechanisms of change that took place in the groups after the end of the observation period.

Another question relates to the optimum intensity of the intervention that is associated with significant degree of improvement. The current intervention strategy allowed participants to tailor the intensity of the support during their participation in the program. The results indicated the acceptability of an individually tailored intervention strategy in the maintenance treatment of patients with bulimic symptomatology. Some other studies also investigated the potential of delivering Internet-based tailored interventions to patients with mood and anxiety disorders, recently. For example, a tailored Internet-delivered treatment for anxiety disorders where patients could decide which modules to endorse during their participation was associated with significant improvements and minimal drop-out rates in an open trial (Andersson, Estling, Jakobsson, Cuijpers, & Carlbring, 2011). When an Internet based guided self-help treatment, which consisted of 19 CBT modules derived from previous Internet-based CBT trials on panic disorder, generalized anxiety disorder, social phobia and depression was tailored by the therapists to address comorbid conditions of patients with panic disorders, the intervention proved feasible and was associated with similar effects reported for trials that excluded patients with comorbid symptoms (Silfvernagel et al., 2012). The efficacy of an Internet-based guided self-help treatment tailored to address people with depression along with comorbid symptoms was studied against a standardized guided self-help treatment with no tailoring and a control condition (i.e. a monitored online discussion group) in a randomized controlled trial. The results indicated that both interventions were associated with better results compared to the control condition and the tailored intervention was more effective than the standardized intervention (Johansson et al., 2012). These approaches are guided by the assumption that patients differ in terms of the intensity of support they require and make use of the flexibility of Internet-based interventions for tailor-made support. More research is necessary to investigate the potential of tailored Internet-based interventions (either tailored by patients themselves or by treatment providers) as opposed to manualized approaches that suggest the same dose of support to everyone. The role of choice inherent to individually tailored interventions might promise to improve the self-efficacy of individuals by encouraging proactive behavior. In the current study, participants' comments that being active about their health was helpful also support this assumption.

Several adaptations could be considered to enhance the efficacy of the program studied in this dissertation. For example, the frequency of self-monitoring could be increased (e.g., from weekly to daily). There is some evidence to suggest enhanced effectiveness of health behavior interventions when messages, reminders, or brief e-mails are sent more frequently (Fry & Neff, 2009). Recently, the potential of smartphone applications has been

investigated with preliminary evidence on their acceptance and feasibility in weight loss outcomes (Carter, Burley, Nykjaer, & Cade, 2013; Turner-McGrievy et al., 2013). Delivering the symptom monitoring and supportive feedback component as a smartphone application could increase its accessibility. Moreover, given the automatized nature of this component, increasing its intensity or format can be achieved at low cost.

Another adaptation might be concerned with the psychoeducation component of the program. The psychoeducational material in the current program incorporated self-help strategies that participants could utilize to counteract setbacks and relapses. The majority of the participants reported using them and rated their helpfulness positively. In a recent randomized controlled trial Internet-based guided self-help was compared to conventional guided bibliotherapy, the gold standard of self-help, among patients with BN and both interventions were found to be equivalent in their effects (Wagner et al., 2013). In that study, the majority of the participants had received psychotherapy before receiving the self-help intervention and was similar to the current study population in this respect. It is possible that the self-help strategies and psychoeducational material served initial low-threshold support step that participants could intensify through therapist guidance during the chat sessions in the current study. In another study the efficacy of a self-help program based on a cognitive behavioral approach in combination with Internet support for patients with full and sub-threshold BN and BED was examined in a controlled trial (Ljotsson et al., 2007b). According to that, participants received the self-help book "Overcoming Binge Eating" and had e-mail contact with a graduate psychology student focusing mostly on the homework assignments of the self-help book. Participants also had access to a discussion forum. The results supported the feasibility and effectiveness of the self-help approach that was guided via e-mail and combined with an Internet-based discussion forum. Importantly, the authors pointed the advantages of offering a discussion forum as part of the intervention. They postulated that specific group processes in the forum could positively impact the potential of the self-help book. These processes included providing and receiving peer support, receiving encouragement from others in the same situation, knowing that one is not alone, reduction of feelings of guilt, and working through the program together with a group, and being able to discuss current topics in each step of the program. In the light of these findings, one adaptation of the program studied in this dissertation might be to incorporate the symptom monitoring, supportive feedback and the forum into a self-help format within the psychoeducation component to increase the connection between the program components and the quality of peer support, where the intensity could be increased via therapist guidance in a group chat context.

Given the high acceptance and satisfaction ratings, sustaining the group chat sessions on a weekly basis seems reasonable. One might consider weekly therapist contact to be associated with significant costs. However, it is advantageous compared to traditional approaches in terms of saving time and costs associated with traveling and scheduling appointments, it is attractive as a novel approach and overall increases access to care at post-treatment. Supporting this, participants in the current study reported accessibility (asking questions and reaching expert advice whenever needed) and novelty as the most frequent reasons for the uptake of the intervention. Nevertheless more research is necessary to investigate the cost-effectiveness of Internet-based maintenance interventions for eating disorders once their optimum intensity and duration to provide significant effects are determined.

6.1.3. Online chat themes and linguistic predictors of improvement

The text produced during the weekly chat sessions provided a unique opportunity to explore the language use of patients with bulimic symptomatology following treatment termination. To our knowledge, this is the first study to conduct linguistic analyses of text from patients with eating disorders using a synchronous communication medium after treatment. Since there was no former investigation, we first identified the online themes of the moderated group chat sessions based on a general inductive approach (Thomas, 2006). Then, six trained and independent judges classified each word into one of these identified themes to create a corpus-based dictionary. Words were retained in the dictionary if there was at least 67% agreement between the judges about which category they belonged to. Different forms of the words were retained in the dictionary (e.g., plural, tenses, and cases) to investigate whether the frequency of the words in each theme was associated with improvements in eating disorder related attitudes, behaviors and psychological well-being of participants.

Despite the small sample size, the results consistently indicated that the frequency of using family of origin words (i.e. grandparents, parents, siblings) was associated with improvements in eating disorder related attitudes, frequency of binge eating episodes and emotional distress from baseline to end of four months. The pattern of interpersonal reactions within the family that may maintain or lead to the progression of an eating disorder has been discussed earlier. The organization of the family around the eating disorder has been conceptualized using an AMC model in the Maudsley model of maintenance of eating disorders (Treasure et al., 2008). According to that, shared traits such as compulsivity,

anxiety, and disordered eating within the family are the antecedents (A) that determine the meaning (M) of the eating disorder symptoms for the family members, and the meanings attributed to the symptoms lead to consequences (C) (reactions) which inadvertently reinforce the eating disorder symptoms in return. For example, family members with high trait anxiety evaluate the negative consequences of the illness as tragic. This sensitive vulnerability coupled with difficulties associated with living with someone with an eating disorder may result in dysfunctional reactions (e.g., withdrawal from the family, over protective parenting style, temper) that induce anxiety in the individual with an eating disorder to only exacerbate symptoms of the eating disorder in response. Addressing the eating disorder within the family context has been regarded as a source for treatment as well. Identifying how the family is organized around the eating problem and changing the maladaptive behaviors that may maintain the eating disorder has been the focus of family based treatment (FBT) (le Grange & Eisler, 2009; Lock, 2001). There is accumulating evidence to indicate FBT as the treatment of choice for children and adolescents with AN (Couturier et al., 2013; Hay, 2013). Some preliminary evidence supports its efficacy in treatment of adolescents with BN (le Grange, Crosby, Rathouz, & Leventhal, 2007) although the evidence is not well-grounded yet (Schmidt et al., 2007). Driven by the transdiagnostic formulation of eating disorders which assumes eating disorders as a single diagnostic category due to their similarities and high cross-over rates (Fairburn et al., 2003), a transdiagnostic model of FBT has been suggested recently (Loeb et al., 2012). Transdiagnostic FBT follows an atheoretical approach to the etiology and maintenance of eating disorders and does not focus on the family to reveal the familial pathology behind the occurrence of the disorder. Rather, it acknowledges the family as a resource for recovery and tries to identify the family level variables that may lead to the progression or maintenance of the eating disorder and works with them for its resolution. The current results provide evidence on the importance of the family level variables through sufferers' own words after the end of treatment and may extend the assumption and applicability of FBT beyond treatment termination. This is in line with studies that reported significant effects of FBT to reduce the rate of relapse at follow-up among adolescents with AN (Lock et al., 2010) and demonstrated specific positive effect of addressing familial mechanisms at post-hospitalization of severe AN (Godart et al., 2012). Further research on the effects of the FBT as a maintenance approach in transdiagnostic samples across developmental stages is necessary.

There was an association between using higher ratio of words relating to important others (e.g., relatives, friends, children, and husband) and improvements observed in purge

behaviors at a tendency level. Poor interpersonal functioning in patients with eating disorders is often reported in the literature (Striegel-Moore et al., 2005). One longitudinal study found worse psychosocial functioning to be predictive of relapse at nine-year follow-up in patients with BN (Keel et al., 2005). Another study assessed the natural course of BN and EDNOS longitudinally and reported the experienced stress in social/friendship domains to be predictive of relapse at the end of six years (Grilo, Pagano, et al., 2012). Addressing interpersonal relationships rather than a direct focus on eating disorder symptoms as suggested by IPT approaches has been found to be associated with improvements in patients with BN and BED (Agras et al., 2000; Fairburn, Jones, et al., 1993; Murphy et al., 2012; Wilson et al., 2010). Some others discussed purge behaviors as regulating factors in intimacy in the context of eating disorders (Cooper et al., 2009; Van den Broucke, 1997). Thus, it is possible that dealing with interpersonal topics such as fear of intimacy, as reflected in higher use of words related to important others in an anonymous environment during moderated group chat sessions improved awareness on emotional conflicts and contributed to the development of healthier coping mechanisms.

Writing about emotional upheavals has been found to be associated with psychological and health change in a number of populations (Pennebaker, 1997; Pennebaker et al., 2003; Tausczik & Pennebaker, 2009). One study reported that participants who wrote a high number of positive emotion words, a moderate number of negative emotion words, and an increasing number of cognitive (i.e. causal and insight) words related to traumas over three days were more likely to benefit (Pennebaker et al., 1997). A similar pattern of language use was also reported among patients with eating disorders in a writing experiment although the intervention was not associated with benefits on eating disorder related symptoms and attitudes (Gamber et al., 2013). Three models have been suggested to explain the psychological and health benefits gained through expressive writing experiments: Emotional inhibition, cognitive adaptation, exposure/emotional processing (Sloan & Marx, 2004b). The emotional inhibition model explains the mechanism of change through disinhibition of emotions that takes place during writing experiments. According to that, people who inhibit their emotions are at greater risk for psychological dysfunctions and physical ailments compared to those who can express their emotions openly. Releasing the inhibited emotions in writing experiments leads to stress reduction and eventually improve the immune system and health outcomes. The cognitive adaptation model denotes that processing traumatic experiences requires changing the existing schemas as they are disrupted by the traumatic event. The incongruence experienced after the traumatic experience needs to be compensated by reestablishing a conceptual system that incorporates

the experienced event with the existing schema either by re-establishing the existing schema or by assimilating the experience into the existing schema. Writing about traumatic experiences is considered to facilitate insight into these cognitive processes which in turn results in decreased stress and improved health. The exposure/emotional processing model views the writing experiment itself as the exposure to the emotionally aversive stimuli (i.e. the traumatic experience). According to that, repeated exposure to the feared experience during writing experiments allows proper processing of the emotional experience and could explain the cognitive changes that occur during writing interventions. Currently, research does not favor one approach over the other and mechanisms of change observed in writing experiments need to be investigated further.

Using the advantages of computer-mediated communication that enables the study of text-based processes, the effects of writing from an online group process perspective was studied, examining the patterns of language use during moderated therapeutic chat interactions. We did not investigate the use of emotion and cognitive words separately as the analyses were based on the main themes of the chat sessions and thus we cannot compare their relative importance with respect to psychological change. Nevertheless, at tendency, the association between using higher ratio of expressed negative emotion words during chat sessions and the improvements in eating disorder related attitudes is in line with the studies that showed the positive effects of writing and provides support to the notion that writing about emotional upheavals may be essential to coping (Pennebaker et al., 2003). In addition, compared to writing experiments, chat is an interactive medium and the expression of emotions might well be mediated by the interactions in the chat room. For example, one study reported a slightly increased use of affective words among participants within an Internet chat aftercare with increasing group size (Haug et al., 2005). Further research will be helpful in understanding the association between the expression of emotion words and improvements in eating disorder related cognitions during chat interactions.

Participants who had a longer duration of illness reported better well-being at the end of the chat groups in the current study. The chat module might have provided continuity and adequate means to deal with chronic behavioral patterns and facilitated amelioration of emotional distress among those who adhered to this component over time. One study investigated text-based group processes within an Internet chat aftercare and found that higher satisfaction with the chat sessions, higher frequency of being addressed by other members and the therapist, and higher relative activity in comparison to the other group members were associated with improvements in psychological well-being of patients with affective, neurotic, and personality disorders (Haug et al., 2008). Further research is

necessary to study the mechanisms that are associated with improved emotional well-being in chat conversations of chronic patients with eating disorders.

6.2. Limitations and future research directions

The studies presented in this dissertation have several limitations such as relying on subjective self-report measures, low power due to relatively small sample size, lack of follow-up data, missing data and a relatively short observation period. Participants varied with respect to the level and intensity of the treatments they underwent prior to participation in the study. The current sample mimics the situation in routine care. However, the heterogeneity of the sample might have resulted in high within-group variance and reduced the intervention effects. As mentioned earlier, one main limitation was failure to connect the maintenance intervention directly with the treatment at the recruitment centers. Further research is necessary to examine whether this is crucial to the success of post-treatment technology-enhanced interventions. For the content analysis, we assessed a subsample of the intervention group participants who adhered to the group chat component and provided data at the beginning and at the end of the intervention period, and thus the results have limited generalizability. In addition, the high number of correlational analyses to identify the associations between the word categories and assessed outcomes would require Bonferroni correction but this was not taken into consideration due to the small sample size. We used the NooJ linguistic software (Silberztein, 2013) to calculate the frequency of corpus-based dictionary words. Relying on the frequency of the words limited our ability to determine the context within which they appeared under each theme. We did not investigate the linguistic style of the online moderator during the chat conversations. Although a neutral and reactive style was followed during the chat sessions which motivated interaction and positive communication between the participants and provided positive reframing and emotional support, the analyses of the language style of the online counselors could give further insights into the moderator perspective in such synchronous communication mediums. For example, the family therapeutic orientation of the online counselor might have played a role in the results obtained.

Compared to the drop-out rates reported for Internet-based interventions in general (Farvolden, Denisoff, Selby, Bagby, & Rudy, 2005; Melville et al., 2010), the drop-out rate of the current study was moderate and the compliance with the program was satisfactory. There were eight participants (15.4%) in the intervention group and two participants (3.8%) in the wait-list control group who did not show up at the start of the study. In addition, eight

(15.4%) participants in the intervention group and nine (17%) participants in the wait-list control group dropped out during the four-month observation period. Further research is necessary to study the characteristics associated with drop-out and early withdrawal. The vast majority of technology-enhanced interventions in prevention and treatment of mental disorders has focused on self-help or guided self-help strategies where the therapist involvement is substantially reduced and self-management is reinforced. However, these interventions are associated with high attrition rates (Eysenbach, 2005) and limited adherence to the full course of treatment (Waller & Gilbody, 2009). Our results indicate the inclusion of synchronous support via moderated group chat sessions to be a convenient way to provide support following treatment termination. This is indicated by participants' high satisfaction ratings, positive comments and acceptable compliance. Some recent studies reported acceptable adherence rates in therapist-assisted Internet-based treatment of BN (Ruwaard et al., 2013) and relapse prevention of AN (Fichter et al., 2012). In general, larger effect sizes are obtained for Internet-based interventions with therapist involvement compared to those with no therapist involvement (Andersson & Cuijpers, 2009; Cuijpers et al., 2009; Spek et al., 2007). However, the results are mixed with respect to whether adherence or frequency of online therapist support predicts better results. In one study adherence to a multimedia program, which, among other components, incorporated monthly group chat sessions for relapse prevention of patients with AN, was associated with significant increase in body weight (Fichter et al., 2012) whereas frequency of the therapist support was not associated with better effects in Internet-delivered treatment of depression (Ruwaard et al., 2009) and panic disorder (Klein et al., 2009) in two meta-analytic reviews. Further research is necessary to investigate the importance of this aspect in Internet-based interventions in general and in post-treatment care of patients with eating disorders in particular. We found a significant association between longer duration of illness and better psychological well-being among those who adhered to the group chat component of the program. It would be interesting to study whether the chronicity of the illness moderate the association between adherence patterns and positive outcome in such interventions. In one study patients with a more chronic illness course were reported to utilize an Internet-based chat aftercare program more frequently and actively following inpatient treatment compared to those with shorter duration of illness. Moreover, when participants of chat aftercare and control group participants who had not received additional outpatient therapy following inpatient treatment were compared, the results indicated that the intervention was associated with a reduced rate of relapse for chat participants with a chronic course of illness compared to the control participants (Zimmer, Moessner, & Kordy, 2010).

The content of the chat scripts were identified based on qualitative approach. Computerized approaches to identify the themes of the chat scripts, e.g., meaning extraction method: Chung and Pennebaker (2008), could have been considered. For example, one study investigated the e-mailing themes of inpatients following treatment termination in an aftercare program using meaning extraction method (Wolf et al., 2010). The meaning extraction method is concerned with co-occurrence of words and applies an inductive approach to identify the themes of the given text. The investigation of the most commonly used nouns indicated nine themes among patients who completed inpatient psychotherapy: life decisions and coping, relationship conflict, psychological and physical symptoms, family of origin, social and leisure activities, present family and household, treatment, exercise and diet, and work. This study indicated that younger participants were more likely to write about their family of origin and exercise and diet. In addition, those who did not improve during inpatient treatment were more likely to write about their symptoms compared to those who improved. Using a qualitative approach, we found that first person personal pronouns, and words related to food and illness themes were commonly used during chat interactions of participants following treatment termination. Although not significant, we observed negative correlations between using higher ratio of words related to these themes and the outcomes assessed. More research is needed on the themes that might be associated with deterioration or poor outcome during chat interactions following treatment termination.

First person personal pronouns were commonly used during chat interactions which confirm that particles i.e. pronouns, articles, conjunctions, prepositions, and auxiliary words, constitute the most commonly used words in natural language (Wolf et al., 2010). The use of personal pronouns inform about the attentional focus in people's language use. A recent direction in the study of language use has been to focus on these commonly used words, especially pronouns, to see whether their use is related to health outcomes. One study reported that changes in personal pronoun use over time (i.e. perspective shifting) in expressive writing experiments was associated with more health benefits compared to those who always write in first person pronouns (Campbell & Pennebaker, 2003) while in another study writing from first person perspective was associated with more perceived benefits and higher use of cognition words regardless of the experimental conditions the participants were assigned (i.e. perspective taking: when participants were instructed to write from first-person, second-person or third-person perspective vs. perspective shifting: when participants wrote one from each perspective in a counter-balanced order) (Seih, Chung, & Pennebaker, 2011). In the current study, there was no relation between the use of first person pronouns in chat interactions and the assessed outcomes. Comparing pronoun use of participants who

improve over time to those who do not would provide insights about the mechanisms of change associated with pronoun use in chat interactions. Taking the results of expressive writing experiments into account, further research could also focus on positive emotion words, negative emotion words and insight words to see whether the changes in the expression of these words over time is associated with better outcomes. Lastly, in the current program, participants could increase the intensity of synchronous support via scheduling individual chat sessions where they could meet with an online counselor on a one-to-one basis. A next logical step of research would be to investigate whether the themes or patterns of language use in individual chat context differ from those of group chat context.

6.3. Implications for clinical practice

Continuous recovery and maintenance of treatment gains is a major challenge for clinicians who deal with people with eating disorders as these disorders are associated with chronicity and high relapse rates that ultimately increase the burden for patients, therapists and the healthcare system. There is increasing demand for the provision of healthcare delivery despite the scarcity of healthcare resources.

Some recent evidence gives promise to the use of stepped-care approaches over standard treatment procedures in BN and BED. In comparison to the standard treatment procedures that offer the same intensity of support to individuals, stepped-care approaches are based on maximizing the efficiency of resource allocation in healthcare delivery. According to that, lower intensity interventions are offered first and the intensity of these interventions are increased (more costly and lengthy) for those who do not sufficiently improve with the initial interventions (Bower & Gilbody, 2005; Haaga, 2000). In a recent randomized controlled trial, the effects of a stepped care model were compared to an augmented model of CBT among patients with BN. Patients in the augmented model received the treatment of choice, CBT, and if indicated, medication (fluoxetine) was added to the treatment procedure. Patients in the stepped care model started with guided self-help CBT which was sequenced with fluoxetine and then full course individual CBT in case of no response. At one year follow-up, the stepped care model was superior and more cost-effective than the augmented model and the results suggested guided self-help CBT as a possible alternative to immediate CBT when used in a stepped care model (Crow et al., 2013; Mitchell et al., 2011). Another study compared CBT and behavioral weight loss treatment (BWL) in a randomized controlled trial and found that obese patients with BED who had a rapid treatment response to BWL (binge reduction $\geq 70\%$ by the fourth week of

treatment) were more likely to achieve binge remission, reductions in binge frequency and weight loss at 12-month follow-up compared to non-responders. In comparison, patients in the CBT group reported reduced binge eating and eating related psychopathology regardless of rapid response and did not achieve weight loss at 12-month follow up. Thus, given the easy dissemination of BWL, it was suggested as an initial intervention in stepped care interventions where its intensity could be increased (i.e. CBT) in case of no response after one month (Grilo, White, Wilson, Gueorguieva, & Masheb, 2012).

Internet-based interventions have the advantage of enhanced reach, including traditionally underserved populations at relatively low cost. Moreover, the possibility to continuously monitor psychological impairment and symptoms over time thorough automatized components in such interventions may enable their adoption into a stepped approach for the provision of tailored interventions prior to regular psychotherapy (step-up care) or thereafter (step-down care). We addressed a neglected area by stepping-down the intensity of treatment using information and communication technologies in patients with BN and related EDNOS following routine care. Our results suggest that an individually tailored Internet-based program which incorporates several modules of differing intensity is a suitable approach to maintain contact following treatment termination. Although the efficacy could not be demonstrated, accelerated improvements observed in the intervention group encourage further research to determine for whom such interventions work to enable their integration into stepped care interventions in the future.

Analyses of the chat scripts provided preliminary evidence on the importance of the family of origin from sufferers' own words as a predictor of improvement on both eating disorder related and general psychological well-being of patients with bulimic symptomatology after treatment termination. Although preliminary, what could be the implications of this finding for the online counselors who provide counseling to these patients at post-treatment? The majority of the self-help and treatment approaches are based on manualized CBT techniques. This is understandable given the extended evidence on the efficacy of CBT as the first-line treatment of patients with bulimic symptomatology (Hay, 2013; National Institute for Health and Care Excellence, 2004). Nevertheless, the dissemination of CBT is limited in clinical practice (Mussell et al., 2000; Shafran et al., 2009) and thus patients are treated by a variety of approaches in routine care. The current sample mimics the routine practice in this respect. The positive effects of talking about familial mechanisms after treatment termination suggest integration of this theme into chat interactions of patients for post-treatment support regardless of the level and intensity of the previous treatment they utilized. Some advantages of using group chat communication in this

respect need to be noted: First, it may allow a systemic approach to address the family without the presence of the family members. The systemic approach refers to the theoretical framework that guides the therapists' actions during therapy. According to that, the therapist stimulates the patient by leading inquiries towards establishing new ways of looking at familiar concerns and developing alternative solutions (Jenkins & Asen, 1992). Second, the therapist investment can be decreased compared with face-to-face interventions. Third, the dissemination of this approach might be more feasible and cost-effective compared to its individual face-to-face delivery. Moreover, having the opinion of others who share the same problem within a group context might be empowering. The following example illustrates an interaction between participants and the counselor about the family of origin theme during a chat session:

Patient A: I am afraid that my parents will dislike my decisions.

Patient B: This is what being grown-up means. You have to make your own decisions.

Counselor: There are several situations, when we do not decide according to the will of our parents.

Patient A: In our family the only acceptable opinion is my father's.

Patient B: Do you want to meet their requirements because you are afraid they will turn away from you?

Patient A: Yes.

Patient A: I moved to the other end of the town, and it was already hard for them to accept. I am really afraid that if I go to England, they will reject me.

Patient B: They will not reject you!

Patient A: It is as if I have to decide between my family and my boyfriend.

Patient B: Your boyfriend is the family you choose, he is your future. It is your parents' task to accept that you are not a child anymore.

Counselor: Did any of you experience similar feelings like Patient A did?

Patient C: It was very hard for my parents when I moved. But then they accepted finally.

Patient A: Thank you so much, Patient B!

6.4. Conclusion

The studies in this dissertation aimed at evaluating an Internet-based support program for patients with bulimic symptomatology following routine care. The results point to the feasibility of an individually tailored intervention in a heterogeneous sample of patients and

demonstrate that the Internet technology may help extend the reach of treatment providers after treatment termination. At a tendency level, the intervention was associated with higher mean reductions on measures pertaining to eating disorder related symptoms and attitudes and general mental health and resulted in higher reliable changes although the efficacy could not be demonstrated in terms of statistical significance. Several methodological and practical limitations have been discussed and suggestions have been made to enhance the intervention effects. The analyses of the linguistic characteristics of participants who utilized the moderated group chat sessions helped identify relevant themes for patients with bulimic symptomatology following treatment termination. The consistent association between using a higher ratio of family of origin words during chat interactions and improvements observed in behavioral and cognitive symptoms of eating disorders and emotional distress highlight the importance of family of origin for continued recovery after treatment termination and may extend the assumption and applicability of FBT beyond treatment termination. Although these findings are preliminary, they add to the limited knowledge on technology-enhanced post-treatment care of patients with eating disorders and may stimulate further investigations in this field.

Abstract

Eating disorders are often characterized by multiple illness episodes and chronic courses. Despite well established and effective treatment options, a considerable number of patients fail to respond to these treatments or drop-out prematurely. Even after successful treatment, patients experience a high risk of relapse that is particularly pronounced in the first months following treatment termination. Maintenance of treatment gains and promotion of continued recovery is highly relevant to improve outcome and ultimately reduce the burden of illness. Interventions based on new technologies have the potential to extend the reach of treatment providers and to provide such maintenance support at reasonable cost and effort. Acknowledging the widespread use of communication technologies in today's world and the increasing evidence to support the potential of e-health interventions in prevention, self-help, treatment and maintenance treatment of patients with eating disorders, the three studies presented in this dissertation were concerned with developing and evaluating an Internet-based support program as a step-down strategy for patients with bulimic symptomatology following discharge from treatment. Thus far, no study has addressed patients with BN and related EDNOS using the Internet at post-treatment. The program was developed within a European collaboration and followed an individually tailored intervention strategy which incorporated several modules of differing intensity. In the first study, the feasibility of the program was investigated among 22 participants who utilized the online program for four months. The results indicated the viability of an individually tailored intervention strategy in a heterogeneous sample with high satisfaction and acceptance ratings. In the second study, the efficacy of the intervention in maintaining and/or enhancing treatment gains was studied among 105 women who had received treatment for an eating disorder with bulimic symptomatology in routine care against a wait-list TAU control condition. It was hypothesized that intervention group participants would improve more compared to the control group participants at the end of the four-month intervention period on eating disorder related outcomes. In addition, the feasibility of the program was investigated within a larger sample. The program proved feasible and well-accepted. In tendency, participants of the aftercare intervention showed better results on all outcome measures, but the efficacy could not be demonstrated. Further research and larger trials are needed to determine the optimum intensity and duration of the intervention as well as patient characteristics associated with outcome. The third study was concerned with the text analyses of the moderated group chat sessions of the program to study relevant online themes of the chat interactions following treatment termination. In addition, the linguistic predictors of eating disorder related and

general psychological well-being were investigated. The results indicate that using a higher ratio of words related to family of origin was significantly associated with improvements in eating disorder related attitudes, emotional distress, and a reduction in the frequency of binge eating episodes. This is the first study to show the importance of family level variables through sufferers' own words after the end of treatment and may speak to the use of family-based treatment beyond treatment termination.

In sum, the Internet-based intervention to address patients with bulimic symptomatology after discharge was feasible, well-accepted and associated with accelerated improvements on eating disorder related attitudes and general psychological well-being compared to a TAU condition although its efficacy could not be demonstrated in terms of statistical significance. A higher ratio of using family of origin words emerged as a linguistic predictor of improvement. Overall, the three studies discussed here add to the limited knowledge in the field of technology-enhanced interventions for eating disorders and may stimulate further research activities.

Curriculum vitae

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EDUCATION

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1997 – 2002   BA, Psychology, Middle East Technical University, Faculty of Arts and Sciences, Ankara, Turkey

PUBLICATIONS

Gulec, H., Moessner, M., Túry, F., Fiedler, P., Mezei, A. & Bauer, S. A randomized controlled trial of an Internet-based post-treatment care for patients with eating disorders. *Telemedicine and e-Health (accepted).*

Túry F., **Güleç, H.** & Mezei Á. (in press). Disorders of eating and body image at the beginning of the 21st century – what the future will bring us? (Hungarian) (Az evés és a testkép zavarai a 21. század elején – mit hoz a jövő?). Lege Artis Medicinae.

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SELECTED CONFERENCE CONTRIBUTIONS

Workshops
Bauer, S., Moessner, M. & **Güleç, H**. (2010, June 10–12) Maintenance treatment and long-term support for eating disorders: Extending the reach of specialized treatment centers. Workshop presented at the Academy for Eating Disorders 2010 International Conference on Eating Disorders, Salzburg, Austria.

Kohls, E., **Güleç, H.** & Túry, F. (2009, October 22–24). Assessment methods for eating disorders and body image disorders. Workshop presented at the 17th International Conference on Eating Disorders, Alpbach, Austria.

Oral presentations
Gülec, H., Moessner, M., Bauer, S., Mezei, A. & Túry, F. (2013, October 17–19). Internet-based maintenance treatment of patients with eating disorders: A randomized controlled trial. Paper presented at the Eating Disorders Alpbach 2013, 21st International Conference, Alpbach, Austria.

Güleç, H., Bauer, S., Moessner, M., Mezei, Á., Kohls, E. & Túry F. (2012, August 29–September 1). Experiences with an Internet-based maintenance treatment of patients with eating disorders. Paper presented at the 12th International Congress of Behavioural Medicine, Budapest, Hungary.

Güleç, H., Bauer, S., Moessner, M., Kohls, E., Varga, M., Babusa, B. & Túry F. (2010, June 10–12). An online support program for the maintenance of treatment gains. Paper presented at the Academy for Eating Disorders 2010 International Conference on Eating Disorders, Salzburg, Austria.

Güleç, H., Bauer, S., Moessner, M., Kohls, E. & Túry F. (2010, April 14–17). Yeme bozukluğu hastalarına tedavi sonrasında önerilen çevrimiçi destek programı (An online support program for maintenance treatment of patients with eating disorders). Paper presented at the 16th National Psychology Conference, Mersin, Turkey.

Güleç, H., Varga, M., Kohls, E. & Túry F. (2010, January 27–30). New technologies in management of eating disorders. Paper presented at the Annual Meeting of the Hungarian Psychiatric Association, Budapest, Hungary.

Güleç, H., Bauer, S., Moessner, M., Kohls, E. & Túry F. (2009, September 11–13) Development of an Internet-delivered support program for patients with bulimic symptomatology. Paper presented at the European Council on Eating Disorders, 20 Year Anniversary Meeting, London, United Kingdom.

Poster presentations
Mezei Á., **Güleç, H.,** Kohls, E. & Túry F. (2011, June 30–July 2). Experiences with chat communication in maintenance treatment for patients with bulimic symptomatology. Poster presented at the XIV EACLPP Annual Scientific Meeting, Budapest, Hungary.

Güleç, H., Bauer, S., Moessner, M., Mezei, A., Kohls, E. & Túry, F. (2010, September 9–10). Preliminary experiences with an online support program for maintenance of treatment gains. Poster presented at the European Conference on Eating Disorders, Anorexia-Bulimia: Innovative Strategies in Treatment, Research, and Public, Lyon, France.

Kohls, E., Zimmer, B., Bauer, S., **Güleç, H.** & Túry, F. (2009, September 11–13). Therapy process and outcome study on eating disorders in Hungary: The predictive role of early response to treatment. Poster presented at the European Council on Eating Disorders, 20 Year Anniversary Meeting, London, United Kingdom.

Mezei, A., **Güleç, H.**, Bauer, S., Moessner M., Kohls, E. & Túry, F. (2010, September 9–10). Online support for patients with eating disorders: The counsellor's perspective. Poster presented at the European Conference on Eating Disorders, Anorexia-Bulimia: Innovative Strategies in Treatment, Research, and Public, Lyon, France.

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List of abbreviations

DSM-IV = fourth edition of the Diagnostic and Statistical Manual of Mental Disorders

AN = anorexia nervosa

BN = bulimia nervosa

EDNOS = eating disorders not otherwise specified

BED = binge eating disorder

DSM-V = fifth edition of the Diagnostic and Statistical Manual of Mental Disorders

FBT = family based treatment

NICE = National Institute for Clinical Excellence

BMI = body mass index

CBT = cognitive behavior therapy

IPT = interpersonal psychotherapy

BWL = behavioral weight loss treatment

CBT-E = enhanced form of cognitive behavior therapy

TAU = treatment as usual

SMS= short message service

LIWC = Linguistic Inquiry and Word Count Software

Pro-ana = pro-anorexia

EDE-Q = Eating Disorder Examination Questionnaire

DASS-21 = Depression Anxiety Stress Scale

RCI = reliable change index

cCBT = computerized cognitive behavior therapy

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Original Articles

Internet-Based Maintenance Treatment for Patients With Eating Disorders

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The sustainability of treatment effects is a major challenge in clinical practice. As in most other mental disorders, patients with eating disorders frequently experience relapses following treatment termination. This calls for feasible maintenance strategies that can be implemented in clinical routine at reasonable cost and effort for both treatment providers and patients. This article introduces an Internet-based intervention for maintenance support of patients with bulimia nervosa (BN) and related eating disorders not otherwise specified (EDNOS). The program comprises several online components for psychoeducation, self-help, peer support, and professional counseling. In the present pilot study, 22 women had access to the program for 4 months. The intervention proved feasible and well accepted, and participants' satisfaction with the program was high. Adherence to the various program components was overall acceptable. Patterns of utilization support the assumption that patients with eating disorders have heterogeneous needs for support following treatment termination. The study confirms the potential of flexible and individually tailored Internet-based interventions for the optimization of care for these patients.

Keywords: eating disorders, Internet, maintenance treatment

Clinical practitioners often wonder whether their patients will manage to maintain the improvements they achieved in treatment after their discharge. Some patients do; however, in many clinical conditions the majority of patients need more professional support than just one single treatment episode. This is true for the treatment of eating disorders as well: While there are effective approaches to treat bulimia nervosa (BN) and related eating disorders not otherwise specified (EDNOS) (Hay, Bacaltchuk, Stefano, & Kashyap, 2009), a considerable number of patients fail to respond to these treatments (Agras & Robinson, 2008; Mitchell, Agras, & Wonderlich, 2007; Wilson, Grilo, & Vitousek, 2007), drop out (Mitchell, 1991; Waller, 1997), or relapse after achieving remission (Keel & Mitchell, 1997; Olmsted, Kaplan, & Rockert, 1994).

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THIS WORK WAS SUPPORTED by the Research Training Network INTACT, funded by the European Commission in the Marie Curie Program (MRTN-CT-2006–035988). We thank BSc Graham Hughes for proofreading the manuscript.

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Relapse rates following eating disorder treatment range from 27% to 63% (depending on the definition of the concepts and the follow-up period) (McFarlane, Olmsted, & Trottier, 2008; Olmsted, Kaplan, & Rockert, 2005) and are especially pronounced in the first 6 to 7 months after treatment (Olmsted, Kaplan, & Rockert, 1994; Richard, Bauer, Kordy, & Cost Action B6, 2005). Thus, the need to provide additional support to patients after they finish treatment is evident in order to consolidate the gains achieved during treatment, enhance continuous improvement and recovery, prevent relapse, and facilitate transition from treatment to everyday life.

Few maintenance approaches have been developed for BN and EDNOS so far. Pharmacologic approaches that have been studied as a continuation of pharmacotherapy among patients with BN have shown some benefit in comparison with placebo. Nevertheless, the attrition was high, which clearly limits the use of maintenance pharmacotherapy as a stand-alone strategy (Fichter, Krüger, Rief, Holland, & Döhne, 1996; Romano, Halmi, Sarkar, Koke, & Lee, 2002). In the only study that used a psychological maintenance approach, patients with BN who successfully completed cognitive–behavioral therapy (CBT) were told to recontact their clinic if they experienced or feared a reoccurrence of symptoms (Mitchell et al., 2004). By the end of the follow-up period, none of the patients had recontacted their clinic, although 37% had returned to bingeing or purging. Hence, these results indicate the need for more proactive and easy-access strategies for relapse prevention.

Internet-based programs may offer such opportunities by providing patients with easy access support following treatment termination. Several studies reported promising results using technology in the areas of self-help, prevention, and treatment of eating disorders (Engel & Wonderlich, 2010). However, only one approach used technology-enhanced care as a step-down component following discharge from treatment: Bauer and colleagues developed an intervention on the basis of text messaging to support patients on a weekly basis after they completed treatment (Bauer, Hagel, Okon, Meerman, & Kordy, 2006; Bauer, Percevic, Okon, Meerman, & Kordy, 2003; Robinson et al., 2006).

To date, no data on the use of Internet-based programs as a maintenance strategy in eating disorders have been published. In this article we introduce an online support program for patients with BN and related EDNOS. The efficacy of the program in maintaining treatment gains is currently studied in a randomized controlled trial. In the present pilot study, we investigated the adherence, acceptability, and satisfaction of this innovative program.

Online Support Program EDINA

The program is named *EDINA* and is currently studied in Hungary as part of a collaborative European project. EDINA stands for "Internet-based Aftercare for Patients with Eating Disorders" in the Hungarian language (*Evési Rendellenességek Internetre Adaptált Utókezelése*). The program provides an online information and communication platform for peer support and professional consultation of patients with BN and related EDNOS. Some of the modules are offered on a regular basis (i.e., weekly symptom monitoring, supportive feedback, and group chat sessions), whereas others can be used flexibly depending on the

individual needs of the participants (psychoeducation, forum, individual chat sessions). The structure of the program is similar to that of an Internet-based eating disorder prevention program that proved feasible and well accepted in two recent studies (Bauer, Moessner, Wolf, Haug, & Kordy, 2009; Lindenberg, Moessner, McLaughlin, Harney, & Bauer, 2011). In the following, the various modules of the program are described in detail:

Psychoeducation

Comprehensive content on is provided along with descriptions of the key symptoms, risks/complications, and treatment approaches. Furthermore, the topics of recovery and relapse are discussed, and self-help strategies are introduced on how to counteract setbacks or relapses. The self-help strategies, in particular, focus on topics that are important following treatment termination, such as recognizing signs of relapse, making a list of risky situations, regular eating, recognition of emotional changes during the day, and expanding support networks and preventing isolation.

Forum

The forum allows participants to post individual messages, discuss specific topics with each other, and provide peer support. The online counselors also use the forum to communicate with participants (e.g., posts on topics that came up in the chat sessions to stimulate further discussion). The EDINA team monitors all postings on a daily basis to promote positive communication among participants.

Monitoring and Feedback

All participants automatically receive weekly emails that include a link to a short online monitoring assessment. The monitoring assessment consists of three questions assessing body dissatisfaction, the frequency of binge eating episodes, and the frequency of compensatory behaviors during the past week. After completing the questions, participants receive an immediate feedback message via e-mail. The aim of the feedback messages is to enhance participants' self-monitoring skills, to increase their awareness on their own symptom course, to reinforce improvements, and to suggest alternative behaviors in cases of deterioration. The procedure is similar to the text messaging approach developed for the aftercare of patients with BN (Bauer et al., 2003): The monitoring system evaluates participants' entries to the three criteria (body dissatisfaction, frequency of binge eating episodes, and frequency of compensatory behaviors) and selects a feedback message. The feedback messages are based on improvement or deterioration of these symptoms in comparison with the previous week. For instance, a participant may report improvement in compensatory behaviors and deterioration in body satisfaction and the frequency of binge eating episodes in comparison with the previous week. An example of one of the numerous feedback messages that this particular participant could receive consists of the following: "Congratulations for successfully controlling compensatory behaviors. Nevertheless, we are worried about your binge eating episodes. Do not leave leftover food lying around. Actually, it is better if you throw leftovers away than for them to represent a threat to your control over your eating. Don't go

shopping when you are hungry. Moderate exercising on a regular basis and a well-balanced diet are the best way to feel positive about your body. Don't give up!"

On the basis of the same algorithm described by Bauer et al. (2003), a total of 656 feedback messages were formulated (i.e., several messages for each possible symptom change from week to week are available). Incoming and outgoing emails as well as the data assessment and feedback generation is processed by the underlying software, Web-Akquasi, which was specifically developed for the purpose of outcome monitoring (Percevic, Lambert, & Kordy, 2004). Additionally, if any of the participants report severe deterioration in their weekly monitoring, the software automatically sends an e-mail to the online counselors who, in turn, contact the participants to invite them to an individual chat session (see below).

Group Chat

EDINA uses chat technology to provide online professional counseling. All registered participants are asked to log in to the 90-min group chat sessions at a fixed time every week. The groups consist of 5–8 participants. Participants receive a reminder via text message on the day of the chat session. The sessions do not follow a manual-based therapeutic approach. Their main aim is to provide a support platform for professional advice and peer support. Therefore the sessions focus on the "here and now" and on the specific tasks that participants face in their everyday life following treatment termination (e.g., on the challenges of implementing into their daily routine what they have learned in treatment). The counselors are doctoral students in clinical psychology who are supervised by a senior clinician and researcher specialized in eating disorders. The counselors are experienced in individual and group therapy of patients with eating disorders and pay close attention to enhance positive communication among participants. They are aware of the medical consequences of eating disorders, potential suicidal ideation, self-harm, and possible symptom substitutions. They assess such aspects routinely during the chat sessions. The counselors also have access to the symptom course of the participants from the weekly monitoring system. Thus, they can take immediate action in cases of symptom deteriorations (see below).

Individual Chat

On a voluntary basis, participants can book 30-min individual chat sessions to discuss questions or problems with an online counselor. Such individual sessions may also be initiated by an online counselor in cases in which a participant reports a body mass index (BMI) below 17 kg/m^2, or binge eating or compensatory behaviors several times during a day for 3 consecutive weeks in the monitoring assessments. In these cases the online counselor receives an automatic e-mail by the software and then invites this participant to an individual chat session. The aim of the individual chat sessions is then to discuss the reasons for deterioration, give advice to counteract setbacks, and offer intense online support depending on the participant's needs. When it turns out that the online support is not sufficient for a participant, the online counselor discusses face-to-face support options in an outpatient or inpatient treatment facility with the participant and helps to initiate contact if needed.

Safety Procedures

If a participant experiences severe medical complications or reports critical information (worst case, suicidal ideation) during a chat session or on the forum, and the situation cannot be resolved by the online counselors (e.g., if a participant refuses to get help), a safety procedure is followed in accordance to the suggestions of Golkaramnay, Bauer, Haug, Wolf, and Kordy (2007): Prior to their participation in the program, all participants have to provide information on an "emergency professional" close to where they reside. These professionals are the participants' outpatient providers (psychologist, psychiatrist, or GPs) and informed about the patients' participation in the study. In the event of an emergency, they are required to take immediate action. If the professionals cannot be reached, the counselors immediately contact the nearest emergency service to the patients' residences. In addition, the program homepage contains an SOS section providing numbers of telephone hotlines that participants can contact anonymously at any time.

Feasibility, Acceptability, and Satisfaction

The following describes the first experiences with the use of EDINA in clinical routine. Eligible participants were women aged 16 years or older who completed inpatient or outpatient treatment for BN or related EDNOS in Hungary within the last 12 months and had Internet access at home. Exclusion criteria were as follows: A BMI lower than 17.5 kg/m^2, meeting *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 2000) criteria for an eating disorder at the time of study entry, major organic and substance induced disorders, comorbid psychosis, acute suicidality, and insufficient knowledge of the Hungarian language. Informed consent was obtained from all participants and their parents when participants were younger than 18 years of age. The study was approved by the Institutional Research Ethics Board of the Semmelweis University, Budapest.

Participants were recruited between August 2009 and December 2010 via visits to inpatient and outpatient treatment centers in Hungary and through online and paper advertisements in the community. Interested individuals underwent a telephone or online screening. Eligible participants were invited to attend a personal interview. During this interview, a psychologist provided further information about the program and obtained written informed consent from the participants or their parents when required. All participants provided details of an emergency professional to be contacted in case of an emergency. To create their personal account for the EDINA platform, each participant chose a pseudonym and a password. Following this, the psychologist introduced each module on the Website in detail and answered any questions that the participants may have had. All participants received a program folder including the information about the study and the program user manuals (interactive CD format and booklet format). Following this introductory session, participants received their first weekly monitoring assessments via e-mail and were expected to attend the next

weekly group chat session. They could also utilize the flexible components of EDINA depending on their own interest.

In terms of measures, an initial baseline questionnaire was used to assess sociodemographic variables and key eating disorder symptomatology. On completion of each weekly group chat session, participants submitted an online session evaluation questionnaire. At the end of the 4 months, the participants completed a questionnaire on the use, acceptability, and helpfulness of each program component. Furthermore, they evaluated the dose and intensity of support (i.e., duration of the program, effort required to participate and frequency of the group chats) and rated their overall satisfaction with the program. Finally, two open-ended questions asked for negative and positive comments about the program. Adherence to the pro-

Table 1
*Satisfaction and Acceptability of EDINA (*N = 22)

Question	N	% of participants
How would you rate the quality of the support you have received by EDINA?		
Excellent	7	31.81%
Good	12	54.54%
Fair	3	13.63%
Poor	0	0.00%
Did you get the kind of support you wanted?		
No, I definitely did not	0	0.00%
No, not really	4	18.18%
Yes, generally	13	59.09%
Yes, I definitely did	5	22.72%
To what extent did EDINA meet your needs?		
Almost all of my needs were met	3	13.63%
Most of my needs were met	11	50.00%
Only a few of my needs were met	6	27.27%
None of my needs were met	2	9.09%
If a friend were in need of a similar help, would you recommend EDINA to him or her?		
No, definitely not	0	0.00%
No, I do not think so	1	4.54%
Yes, I think so	10	45.45%
Yes, definitely	11	50.00%
How satisfied have you been with EDINA?		
Very satisfied	8	36.36%
Mostly satisfied	10	45.45%
Indifferent or mildly dissatisfied	3	13.63%
Quite dissatisfied	1	4.54%
Has EDINA helped you deal with your problems more effectively?		
Yes, it helped a lot	7	31.81%
Yes, it helped a bit	10	45.45%
No, it did not help	4	18.18%
No, it seemed to make things worse	1	4.54%
If you were to seek help again, would you come back to EDINA?		
No, definitely not	0	0.00%
No, I do not think so	3	13.63%
Yes, I think so	12	54.54%
Yes, definitely	7	31.81%
Overall, the idea of an online aftercare support is good (N = 21)		
Does not apply	0	0.00%
Applies somewhat	3	14.28%
Applies mostly	6	28.57%
Totally applies	11	52.38%
Do not know	1	4.76%
Was the participation in EDINA helpful for you? (N = 21)		
Yes, it was very helpful	2	9.52%
Yes, it was mostly helpful	13	61.90%
It was neither helpful nor harmful	5	23.80%
No, it was mostly harmful	1	4.76%
How do you think you would have done during these 4 months without EDINA? (N = 21)		
Much better	0	0.00%
A bit better	2	9.52%
The same	8	38.09%
Worse	9	42.85%
Much worse	2	9.52%

gram components (e.g., frequency of login) was tracked automatically in the database.

In the present pilot study, a total of 22 participants had access to EDINA for 4 months. Baseline data from 4 participants and satisfaction ratings from 1 participant are missing. All participants were female, Caucasian, and Hungarian. The mean age of the sample was 27.0 years ($SD = 6.5$, $Mdn = 24$), and the mean BMI was 20.7 ($SD = 2.8$, $Mdn = 20.9$). The majority of participants completed outpatient treatment (81.81%, 18/22). The remaining 4 participants completed inpatient treatment (18.18%, 4/22). More than half of the participants (55.55%, 10/18) reported an illness duration of more than 5 years.

All 22 participants took up the intervention (i.e., they logged in to the EDINA Website or utilized the monitoring and feedback component at least once). On average they logged in to the program on 15.27 days ($SD = 12.84$, $Mdn = 12.00$, range = 0–54) during the 4 months. During this period, participants joined a mean of 7.45 group chat sessions ($SD = 5.16$, $Mdn = 7.00$, range = 0–16). All but 2 participants joined at least one group chat session (90.90%), and 19 out of 22 joined at least two group chat sessions (86.36%). Participants filled in the weekly monitoring assessments 9.95 times on average ($SD = 5.09$, $Mdn = 11.00$, range = 0–17). Only 1 participant did not complete any monitoring assessments. Almost all participants utilized at least one voluntary component (psychoeducation, forum, individual chats) (95.45%, 21/22). Seven participants booked individual chat sessions (31.81%), 6 participants (27.27%) posted messages on the forum, and 17 participants (17.27%) reported using the psychoeducational contents on the Website. Following the 4-month period, participants were offered to stay in the program. Seventeen out of 22 participants (77.27%) continued to use the program, which also indicates the acceptability of the intervention.

The majority of the participants were satisfied with the program (81.81%, 18/22), and almost all would recommend it to others (95.45%, 21/22). As displayed in Table 1, the quality of the support was rated as excellent (31.81%, 7/22), good (54.54%, 12/22), or fair (13.63%, 3/22), and none of the participants evaluated it as poor. In general, participants reported that their needs had been met and that they had received the kind of support they wanted. With the exception of 3, all participants expressed their willingness to come back to EDINA if they were in need of support in the future. Most of the participants also stated that participation in EDINA was helpful (71.42%, 15/21). Table 1 summarizes the satisfaction and acceptability ratings.

When asked for their satisfaction with the modules of EDINA, participants viewed the various components positively. The ratings on the helpfulness of each component were moderate to high (see Table 2) (When interpreting these numbers, it should be noted that not all participants have utilized all of the components, i.e., they could not actually rate them as helpful). Participants were additionally asked to indicate which components of EDINA were particularly helpful to them. According to this, the group chat sessions were rated by far the most helpful module of the program (70%, 14/20), followed by the forum (30%, 6/20) and the psychoeducational content (30%, 6/20).

Table 3 gives an overview on participants' reasons for participation and what areas of support were considered most helpful. The most frequently reported reasons for participation were the curiosity about getting online help, the opportunity to get expert

Table 2
Satisfaction With the Various Modules (N = 21)

Program components	N	% of participants
Monitoring		
Good concept	13/20	65.00%
Feedback appropriate	10/18	55.55%
Helpful	6/17	35.29%
Individual consultation chat		
Good concept	15/18	83.33%
Helpful	7/14	50.00%
Group consultation chat		
Good concept	15/19	78.94%
Helpful	12/19	63.15%
Forum		
Good concept	16/20	80.00%
Helpful	8/17	47.05%

Note. The items were rated on a 5-point scale (1 = does not apply; 2 = applies somewhat; 3 = applies mostly; 4 = totally applies; 5 = do not know). The scale was dichotomized: Scores 1 and 2 are presented as disagreement; 3 and 4 are presented as agreement to the items. Scores of 5 were excluded; thus the total number of ratings varies between components.

advice after treatment, the possibility to ask questions whenever needed, and the ability to get help without having to travel.

Participants' opinions on the intensity of the intervention were also investigated (i.e., duration of the program, frequency of the group chats). The results indicate that 47.61% (10/21) of the participants felt the 4-month program duration was too short, and 42.85% (9/21) felt the duration of the program was appropriate. Only 2 of the participants (9.52%) felt that it was too long. Most participants considered the weekly frequency of the group chat sessions appropriate (71.42%, 15/21). Five participants would have preferred more than one session per week (23.80%), and only 1 participant felt that the weekly sessions were too frequent (4.76%).

At the end of each group chat session, participants were asked to complete an online session evaluation questionnaire. Fourteen out of 22 participants completed a total of 82 session evaluation questionnaires. In general, participants evaluated the group chat sessions positively in these weekly evaluations. Hardly any technical problems were reported (2.43%, 2/82), and participants stated that the technical environment did not limit their ability to express their thoughts (87.80%, 72/82). Figure 1 summarizes the results of the session evaluation questionnaires.

Participants' free text comments to the open-ended questions concerning positive and negative feedback about the program may provide additional insight to the acceptability of the intervention. Examples of participants' comments are listed in Table 4.

Future Directions and Implications

How can we increase the sustainability of treatment effects? Practitioners face this question on a daily basis in clinical routine. This question has motivated us to develop the Internet-based intervention presented in this article. Although a number of technology-enhanced interventions have been introduced for prevention, self-help, and treatment of eating disorders (Engel & Wonderlich, 2010; Myers, Swan-Kremeier, Wonderlich, Lan-

Table 3
Reasons for Participation and Satisfaction With Different Types of Support (N = 21)

	N	%
Reasons for participation		
Curiosity about getting online help	13/21	61.9%
The opportunity to get expert advice after treatment	11/21	52.4%
The possibility to ask questions whenever needed	11/21	52.4%
The ability to get help without having to travel	10/21	47.6%
Free help, no cost	7/21	33.5%
Lack of other support options	4/21	19.0%
Anonymity	3/21	14.3%
Other	3/21	14.3%
Which type of support was particularly helpful?		
The opportunity to get professional advice	10/21	47.6%
The feeling that somebody was looking after my health	9/21	42.9%
The feeling I was doing something about my health	8/21	38.1%
The opportunity to talk to the other participants in the forum	8/21	38.1%
Advice from other participants	7/21	33.3%
The opportunity to meet the others in weekly group chat sessions under supervision of a counselor	6/21	28.6%
Tips and information from the psychoeducational materials	6/21	28.6%
Receiving information on how to transfer treatment gains into everyday life	5/21	23.8%
Weekly feedback e-mails about my general well-being	2/21	9.5%
Nothing helped	2/21	9.5%

caster, & Mitchell, 2004), only one previous approach has been introduced for aftercare and relapse prevention (Bauer et al., 2003).

There is no doubt among clinicians and researchers that the majority of the patients with eating disorders need additional support following treatment termination. The findings of the pres-
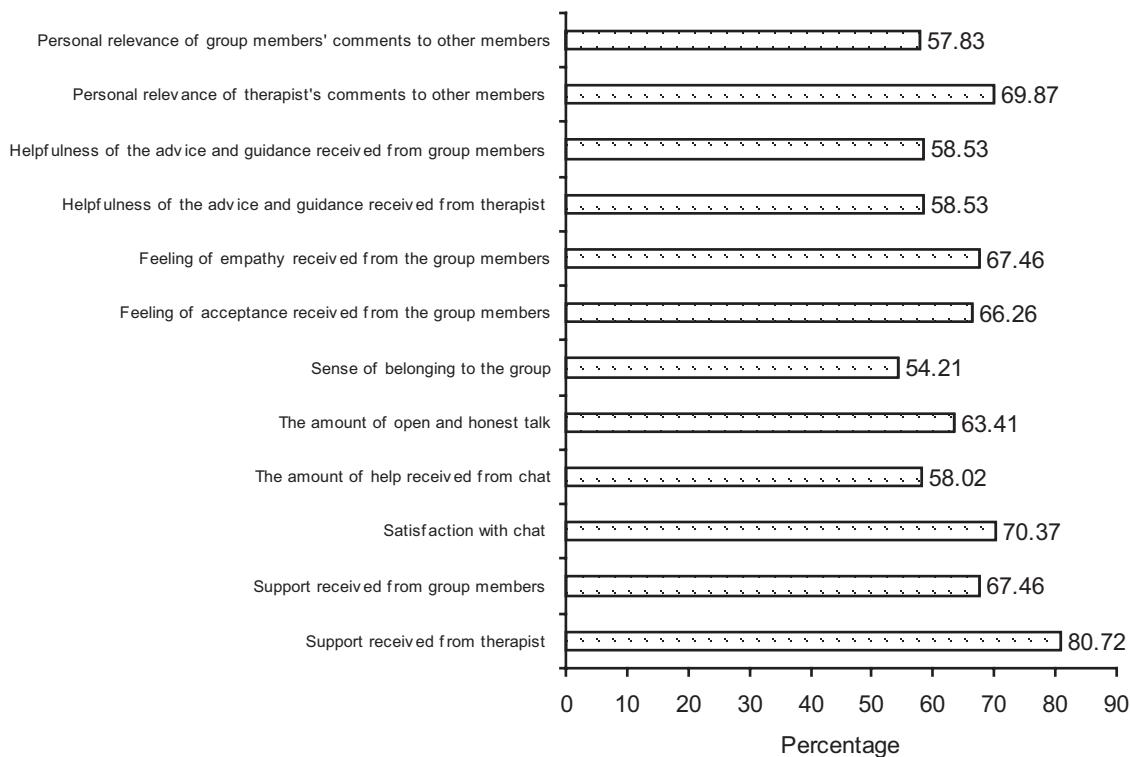

Figure 1. Session evaluation of weekly group chat sessions. The 6-point Likert scale (1 = not at all; 2 = a little; 3 = somewhat; 4 = considerably; 5 = very much; 6 = extremely) was dichotomized. Scores ≥ 4 are presented as agreement to the items.

Table 4
Examples of Participants' Positive and Critical Comments on the Intervention

Positive comments
I really liked that I could talk about my problems and share something with those who have similar problems.
It was good to know that I am not alone, I enjoyed the company of others and it was great to get support and tips from the other members.
It was nice to listen to others' experiences. Sometimes listening to someone else's problem helped me to get closer to the solution of my own problems.
I felt safe. I knew that I could contact EDINA any time. The practical advice in the group chats was helpful. Realizing that it was not easy for others helped me cope.
The individual chats are really good. It is also good to know at the group chat sessions that you are not alone with your sick thoughts and habits.

Critical comments
The program itself is really good but the time of the group chat was not always suitable for me.
At the end of the program some of the topics were not up to date for me anymore. I think I was doing better at that time. However, it was good to be updated about the others. It would have been enough biweekly than weekly for me.
Maybe more concrete advice in the feedback messages would be better. I think daily monitoring would be more helpful: Knowing the exact date of my binge and purge episodes would help, something like a report or binge purge diary.
I think it would be good to meet face-to-face with participants once in two months. I am quite slow with typing.
The group chat sessions should be more often and longer.

ent study are promising and indicate that the Internet-based program is a feasible and well-accepted intervention to provide such additional support. All study participants took up the intervention, and all but one completed the satisfaction and acceptability questionnaires. Most participants reported high satisfaction with the various components and stated that they would recommend the program to a friend in a similar situation. The majority confirmed that they would come back to EDINA if they felt a need for further support. The adherence rates showed that participants completed almost 60% of the weekly monitoring assessments and joined roughly half of the foreseen group chat sessions (47%). Almost all participants utilized at least one voluntary component of the program (psychoeducation, the forum, individual chats).

The most frequent reasons for participation were expert advice, curiosity about receiving online help, and the ease of receiving support (e.g., no travel costs, possibility to ask questions whenever needed). Participants reported that it was especially helpful to be supported by other participants and the online counselor in addition to being proactive themselves about their health. The majority of participants went on using the program after the end of 4 months, which also points to its acceptability.

In contrast to typical manual-based approaches that provide the same dose of support to all patients, EDINA offers various support components that allow individuals to tailor the intensity of the support in accordance to their individual needs. It is expected that this flexible concept better fits the heterogeneous needs of patients following treatment termination. A key component in this respect is the weekly monitoring, which continuously informs the online counselors on symptom courses of the participants and allows for timely reaction in cases of symptom deterioration.

Limitations

The current study had some limitations such as relying on subjective self-report measures and the fact that the sample was heterogeneous in terms of degree of impairment, diagnosis, and type and length of treatment prior to participation in the online program. The small sample size limited our ability to determine

participant characteristics that were associated with utilization, acceptance, and satisfaction rates. For instance, the level of care that the participants had completed (inpatient vs. outpatient) prior to the intervention could have an impact on motivational patterns. Further research is necessary to shed light on these aspects. However, the current sample represented the clinical profile of patients with eating disorders in daily practice. Thus, high acceptance rates of the program may promise the viability of its use among a mixed group of patients with eating disorders.

As an important next step, the efficacy and cost-effectiveness of the intervention in maintaining treatment gains need to be addressed. Future research may also study adaptations of the program for other populations such as patients with anorexia nervosa, men with eating disorders, and individuals with different ethnicities.

Conclusion

Technology has increasingly affected all areas of our lives over the past 20 years. Not surprisingly, technology is also increasingly used in the clinical context to optimize health care delivery. The present pilot study is the first study showing the feasibility and acceptability of an online maintenance intervention for patients with eating disorders. We demonstrated that Internet technology can help clinicians extend their reach to maintain contact to those with eating disorders after treatment termination. These findings are in line with research on patients with other mental disorders that were successfully supported via Internet chat groups following the termination of inpatient treatment (Bauer, Wolf, Haug, & Kordy, 2011; Golkaramnay et al., 2007).

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