



## Effects of an Internet-based intervention for subthreshold eating disorders: A randomized controlled trial<sup>☆</sup>

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### ABSTRACT

**Background:** Women reporting initial eating disorder (ED) symptoms are at highest risk for the development of an eating disorder. Preventive interventions should, therefore, be specifically tailored for this subgroup.

**Aims:** To adapt and evaluate the effects of the Internet-based prevention program “Student Bodies™” for women with symptoms of disordered eating and/or subthreshold eating disorder (ED) syndromes.

**Method:** 126 women, reporting subthreshold ED symptoms (high weight and shape concerns and below threshold bingeing, purging, chronic dieting or several of these symptoms) were randomly assigned to a Student Bodies™+ (SB+) intervention or a wait-list control group and assessed at pre-intervention, post-intervention, and 6-month follow-up. “Student Bodies™” was adapted to be suitable for subthreshold EDs. Main outcome measures were attitudes and symptoms of disordered eating. Pre-follow-up data were analyzed by ANCOVAs with mixed effects.

**Results:** At 6-month follow-up, compared to participants in the control group, participants in the intervention group showed significantly greater improvements on ED-related attitudes. Intervention participants also showed 67% (95% CI = 20–87%) greater reductions in combined rates of subjective and objective binges, and 86% (95% CI = 63–95%) greater reduction in purging episodes. Also, the rates of participants abstinent from all symptoms of disordered eating (restrictive eating, binge eating and any compensatory behavior) were significantly higher in the intervention group (45.1% vs. 26.9%). Post-hoc subgroup analyses revealed that for participants with binge eating the effect on EDE-Q scores was larger than in the pure restricting subgroup.

**Conclusion:** The adapted “SB+” program represents an effective intervention for women with subthreshold EDs of the binge eating subtype.

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### Introduction

Eating disorders are serious conditions which can have severe physical and psychological consequences (Roerig, Mitchell, Myers, & Glass, 2002; Taylor et al., 1998). Studies examining long term outcomes of women with clinical EDs have demonstrated that about half of the patients have a rather poor outcome (Zipfel, Löwe, Reas, Deter, & Herzog, 2000).

While gains have been made in preventing EDs in young women with high weight and shape concerns and very low levels of compensatory behaviors (e.g., Taylor et al., 2006), many women

show more frequent and severe symptoms and behaviors that may progress to full-syndrome eating disorders (Stice, Marti, Spoor, Presnell, & Shaw, 2008). Because rates of women with ED symptoms are much higher than those of women with full-syndrome EDs, early interventions targeting symptom progression might improve outcomes. Furthermore, recent evidence suggests that a continuum exists between subthreshold EDs and full-syndrome EDs (Gleaves, Brown, & Warren, 2004; Thomas, Vartanian, & Brownell, 2009; Williamson, Gleaves, & Stewart, 2005). While the issue of whether or not ED symptoms should be seen as continuous or dichotomous remains controversial, several authors suggest that lower level behaviors should be addressed because they can be accompanied by similar levels of impairment (Wilson & Sysko, 2009; see also [www.dsm5.org](http://www.dsm5.org)).

In recent years, considerable progress has been made in identifying risk factors for most EDs, especially bulimia nervosa (BN), binge eating syndromes and eating disorders not otherwise

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specified (EDNOS) (Jacobi & Fittig, 2010; Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004; Striegel-Moore & Bulik, 2007). Most of these risk factors (e.g., dieting, eating, weight and shape concern, low self-esteem, negative affect) could also be confirmed when examined in a sample of young women at higher risk initially, selected by high weight and shape concerns (Jacobi et al., 2011). Consequently, the most potent and best replicated risk factors before the onset of full-syndrome EDs should be targeted in preventive interventions. Meta-analyses on effects of prevention trials for EDs have shown that preventive interventions are most effective if they are interactive (vs. didactic), consist of multiple sessions, are offered solely to women, and are targeted for individuals at risk (Shaw, Stice, & Becker, 2009). Student Bodies™ is one of the programs fulfilling all of these criteria. It is an 8-session cognitive-behavioral online program over 8 weeks, targeting core risk factors for EDs, such as weight and shape concerns, negative body image and low self-esteem. It was originally developed at Stanford University School of Medicine and subsequently evaluated in several randomized controlled trials (Celio et al., 2000; Winzelberg et al., 1998). In the past years, Student Bodies™ has been adapted for Germany and evaluated both as a universal and targeted preventive program (Beintner, Jacobi, & Taylor, 2011; Jacobi et al., 2007), i.e., for students already at risk for an ED, and for different age groups. A recent meta-analysis (Beintner et al., 2011) comparing effects of all randomized controlled studies with Student Bodies™ conducted in both the USA and Germany showed that there were no significant differences in effect sizes between the two countries. In addition, we found that changes in weight and shape concerns across cultures were larger in high-risk groups than in non-risk groups, a finding consistent with Stice, Shaw, and Marti's (2007) meta-analytic review of eating disorders that found that selected eating disorder prevention programs are more effective than universal ones.

Several controlled (Fernandez-Aranda et al., 2009; Myers, Swan-Kremeier, Wonderlich, Lancaster, & Mitchell, 2004) and uncontrolled trials (Murray et al., 2007; Pretorius et al., 2009) have shown evidence that Internet-, computer-based interventions or interventions using new technologies can be effective for patients with full-syndrome EDs or symptoms of EDs. Given both the results of prevention trials for high-risk groups and those of interventions for clinical populations, our intention was to expand the existing program Student Bodies™ to women with clinical symptoms of EDs or subthreshold EDs. In order to do so, the existing Student Bodies™ program had to be adapted to specifically address these symptoms.

Accordingly, the main objectives of the current study were to examine whether the adapted version of Student Bodies™ (referred to as Student Bodies™+) would: 1) improve relevant knowledge (on EDs, healthy eating & exercise), 2) reduce attitudes of disordered eating, 3) reduce the frequency and/or intensity of ED symptoms or behaviors, and 4) reduce general psychopathological burden in women with ED symptoms or subthreshold EDs.

## Method

### Participants and procedures

Study participants were recruited from four different German universities and through announcements in seminars, advertisements on campus, the university e-mail system, and through flyers in fitness-studios, private practices of physicians, and pharmacies.

In the announcements, women were invited to participate in the program if they wanted to improve their body image, to learn more about healthy eating and exercise, and to maintain a healthy eating pattern in the face of negative emotions and stress. In a first step, interested participants were screened for eligibility by a short

screening questionnaire provided either in person or via e-mail. Screen positive participants were subsequently invited to complete more detailed assessments in person (see below).

After a complete description of the study to the participants, written informed consent was obtained. Following screening and pre-assessments, eligible participants were randomized to one of two conditions: the SB+ intervention condition or a wait-list control group condition. Randomization was performed in blocks of 20 subjects to ensure large enough discussion groups for participants in the intervention.

Participants were assessed before the intervention (at baseline), at post-intervention (after 8 weeks), and 6 months later at follow-up. The study was approved by the local human subjects committee.

Women aged 18–35 years,  $17.5 < \text{BMI} < 33$ , with high weight and shape concerns as indicated by scoring  $>42$  on the Weight and Shape Concerns Scale (WCS; Grund, 2003; Jacobi, Abascal, & Taylor, 2004) were potentially eligible for the study. In addition, participants were required to have behavioral symptoms of an ED, such as recurrent binge eating and/or compensatory behaviors below the diagnostic threshold, and/or chronic restrictive eating assessed by a modified version of the ED diagnostic section (H) of the Structured Clinical Interview for DSM IV Axis I Disorders (SCID; Wittchen, Zaudig, & Fydrich, 1997). Exclusion criteria were a full-syndrome ED in the past 6 months and any other severe current psychopathology (e.g., current major depression, use of psychotropic medication, or current alcohol or drug abuse). Participants fulfilling criteria for clinical EDs were referred by the research team for ED treatment.

Participants were classified as subthreshold AN if they meet all other criteria but their BMI was between 17.5 and 20, and/or they did not have amenorrhea and/or not endorse fear of gaining weight. They were classified as subthreshold BN if their binge eating and inappropriate compensatory behaviors occurred at a frequency of less than twice a week, or for a duration of less than 3 months, or if binges were not objectively large. Participants with binges occurring only once per week, but who met all other criteria for BED, were classified as subthreshold BED.

Initially, 126 women fulfilling inclusion criteria were randomized. At 6-month follow-up, data from 103 participants were available (see Fig. 1 for CONSORT participant flow). Previous studies with high-risk samples had been able to detect moderate effect sizes ( $d = 0.50$ ) for core outcome measures (Beintner et al., 2011). The sample size was, therefore, based on having sufficient power to detect group differences of moderate effect sizes and a drop-out rate between pre-intervention and 6-month follow-up of 30%.

Mean age of the women at baseline was 22.3 years ( $SD = 2.9$ ), mean BMI was 23.6 ( $SD = 2.7$ ). 6.3% of them ( $N = 8$ ) had had past ED treatment (4 for AN, 4 for BN); 21.4% ( $N = 27$ ) fulfilled criteria for a lifetime diagnosis of an ED (17 AN, 8 BN, 2 BED). Most of them (98.4%) had completed high school and were currently university students (95.2%), and 34.4% were single. At baseline, 17 (26.6%) of the participants in the intervention group and 12 (19.4%) of the participants in the control group fulfilled criteria for any subthreshold ED as defined above. All others endorsed ED symptoms at lower levels. Specifically, 7 participants in the intervention group were classified as subthreshold BN, 5 as subthreshold AN, and 5 as subthreshold BED. In the control group, 3 participants were classified as subthreshold BN, 4 fulfilled criteria for subthreshold AN, and 5 for subthreshold BED. In addition, 26 endorsed subjective or objective binges, 1 endorsed any kind of purging behavior (misuse of diuretics and/or laxatives and/or vomiting), 29 endorsed chronic restrictive eating, 1 endorsed binge eating and purging (below threshold and without overconcern of weight and shape), and 40 participants endorsed binge eating and chronic restrictive eating in the past two months.

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