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## Internet-based treatment for eating disorders: bridging the treatment gap

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## Chapter 3

# Effectiveness of an online self-help program, expert-patient support and their combination for eating disorders: results from a randomized controlled trial

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### Abstract

**Objective:** Many individuals with an eating disorder do not receive appropriate care. Low-threshold interventions could help bridge this treatment gap. The study aim was to evaluate the effectiveness of Featback, a fully automated online self-help intervention, online expert-patient support and their combination.

**Method:** A randomized controlled trial with a 12-month follow-up period was conducted. Participants aged 16 or older with at least mild eating disorder symptoms were randomized to four conditions: (1) Featback, a fully automated online self-help intervention, (2) chat or email support from a recovered expert patient, (3) Featback with expert-patient support and (4) a waiting list control condition. The intervention period was 8 weeks and there was a total of six online assessments. The main outcome constituted reduction of eating disorder symptoms over time.

**Results:** Three hundred fifty five participants, of whom 43% had never received eating disorder treatment, were randomized. The three active interventions were superior to a waitlist in reducing eating disorder symptoms ( $d = -0.38$ ), with no significant difference in effectiveness between the three interventions. Participants in conditions with expert-patient support were more satisfied with the intervention.

**Discussion:** Internet-based self-help, expert-patient support and their combination were effective in reducing eating disorder symptoms compared to a waiting list control condition. Guidance improved satisfaction with the internet intervention but not its effectiveness. Low-threshold interventions such as Featback and expert-patient support can reduce eating disorder symptoms and reach the large group of underserved individuals, complementing existing forms of eating disorder treatment.

## Public significance statement

Individuals with eating-related problems who received (1) a fully automated internet-based intervention, (2) chat and e-mail support by a recovered individual or (3) their combination, experienced stronger reductions in eating disorder symptoms than those who received (4) usual care. Such brief and easy-access interventions play an important role in reaching individuals who are currently not reached by other forms of treatment.

## Introduction

On average, it takes people with an eating disorder several years before they receive help specifically for their eating disorder (Austin et al., 2021). While individuals with an eating disorder generally utilize more health care services than those without, only a minority seeks targeted treatment (Hart et al., 2011; Weissman & Rosselli, 2017), indicating that many do not receive the care they need. This is worrying, since a longer duration of untreated eating disorder seems to be indicative of poorer outcome (Andrés-Pepiñá et al., 2020). The evident treatment gap (i.e., the discrepancy between people in need of help for their eating disorder and those actually receiving it) underscores the need to reach this underserved group, for example by using scalable, easily accessible, low-threshold interventions (Aardoom, Dingemans, & Van Furth, 2016; Kazdin et al., 2017; Moessner & Bauer, 2017). Two possible ways of making interventions more accessible for a large audience are internet interventions and support from an expert (recovered) patient.

## Internet interventions for eating disorders

As captured in multiple systematic reviews and meta-analyses over the past decade (Aardoom et al., 2013b; Beintner et al., 2012; Dölemeyer et al., 2013; Linardon et al., 2020; Loucas et al., 2014; Melioli et al., 2016; Pittock et al., 2018; Schlegl et al., 2015; Wade & Wilksch, 2018; Zeiler et al., 2021b), internet interventions for eating disorders appear to have a beneficial effect on eating disorder symptoms and related complaints such as drive for thinness and weight and shape concerns compared to care as usual. Technological advancements have allowed internet-based interventions to be increasingly personalized towards users. The internet intervention 'Featback' is one such application that aims to provide low-threshold and easily accessible care for people with (symptoms of) an eating disorder, through personalized feedback. It is a brief online self-help program that works with an automated monitoring and feedback system. The main goal of Featback is to reduce eating disorder symptoms, by making users aware of their eating disorder symptoms, providing support and stimulating help-seeking behaviors, both towards their direct environment and professional facilities. An earlier randomized controlled trial showed Featback to be (cost-)effective in reducing symptoms of bulimia nervosa, depression and anxiety compared to a waiting list control condition (Aardoom, Dingemans, Spinhoven, et al., 2016; Aardoom, Dingemans, van Ginkel, et al., 2016). Interestingly, adding psychologist support once or three times a week increased satisfaction with the intervention, but not its (cost-)effectiveness.

The impression is that personal guidance adds to the effectiveness of, adherence to and



satisfaction with an online intervention, but this is mostly based on what we know from other disorders (Baumeister et al., 2014). Often, guidance is provided by therapists, but expert patients are increasingly involved in research and delivering support. Theoretically, expert-patient support can be especially valuable in providing low-threshold interventions, because a shared background and natural credibility enables them to establish a rapport, effectively model healthy behaviors and enhance self-efficacy (Dennis, 2003; Simoni et al., 2011). They might also be easier to approach and confide in than health professionals. Only few studies have involved expert-patient supporters (Fogarty et al., 2016; Lewis & Foye, 2022). Findings cautiously indicate that expert-patient support can enhance quality of life, relationships, and adherence to an intervention (Cardi et al., 2019; McCarroll, 2012; Perez et al., 2014; Ramjan et al., 2017). Concordantly, guidance from an expert patient might be a strategic alternative to support from health professionals. However, its added value and effective ways of implementation are not yet established.

## Aims

The aim of the study was to investigate the effectiveness of Featback, expert-patient support and their combination. First, it was hypothesized that the three active interventions were more effective than a waiting list control condition. Secondly, the combination of Featback and expert-patient support was expected to be more effective than the two interventions separately. Lastly, no differences in effectiveness were anticipated between separately receiving Featback or expert-patient support.

## Methods

This study was preregistered at the Dutch Trial Register ([trialregister.nl/trials](http://trialregister.nl/trials); identifier NL7065) and a study protocol with elaborate descriptions of the hypotheses and methods has been published (Rohrbach et al., 2019). The described repeated measures ANOVAs in the study protocol were altered to mixed model analyses, since they were more versatile. Additionally, a sensitivity analysis controlling for all relevant prognostic variables was performed rather than only with variables that differed significantly at baseline, as this is statistically preferable (De Boer et al., 2015). No other changes to the analysis plan per protocol were made. An economic evaluation concerning this trial has been published elsewhere (Rohrbach, Dingemans, Van Furth, et al., 2022). Results on prediction, moderation, and mediation will not be addressed here.

## Design

A randomized controlled trial with a two-by-two factorial design with planned contrasts was used, creating four conditions: (1) Featback only, (2) Featback plus weekly expert-patient support, (3) weekly expert-patient support only, and (4) a waiting list control condition. Participants were assessed at baseline (T0), post intervention (eight weeks after baseline; T1) and 3 (T2), 6 (T3), 9 (T4) and 12 (T5) months after post intervention. All assessments consisted of online self-report questionnaires.

## Participants and procedure

The majority of participants were recruited via Proud2Bme, a Dutch e-community for people with eating related problems. Other sources were also used, such as the Featback website, a blog on a fashion and health website aimed at (female) teenagers, social media, Google Ads and the Dutch eating disorder patient organization. Eligible participants were aged 16 years or older and had at least mild self-reported symptoms of an eating disorder; 52 or higher on the Weight Concerns Scale (Killen et al., 1993) or, as reported on the Short Evaluation of Eating Disorders (Bauer et al., 2005), a BMI of 18.5 or lower or at least weekly binge eating episodes or compensatory behaviors in the past four weeks. In the case of severe eating disorders, participants received the advice to seek professional help, but could still participate in the study as they may benefit from the offered interventions too. After expressing interest and filling out the screening questions, all eligible participants were asked to complete an online informed consent form and the baseline assessment (T0).

Participants were randomly allocated to one of the four conditions. An independent researcher created the allocation sequence using the SPSS function to produce random numbers. Hence, the randomization sequence, using blocks of 40 participants, was concealed from the principal investigator. The current design made it impossible to mask participants and expert patients to allocation. During the trial the principal investigator was not masked to the allocation, in order to send the appropriate information to participants. However, the content and timing of mails and reminders were standardized in order to avoid performance bias.

## Interventions

Participants in all four conditions were allowed to seek help from any source for their eating disorder symptoms or other complaints. In this sense, the waiting list control condition can be regarded as treatment as usual for the current sample.

## Featback

Participants in this condition received an account for the weekly monitoring and feedback system. During eight weeks participants received a weekly email with a link to a questionnaire with four questions on eating disorder related symptoms. On a 4-point scale, participants rated how often the behavior or symptom occurred this week, ranging from 'not at all', '1-3 days', '4-6 days' to '7 days'. The weekly feedback message was also dependent on whether participants indicated to have improved, deteriorated or stayed the same compared to previous week regarding the four monitoring questions. After completing the monitoring questionnaire, participants received a supportive feedback message that matched the participant's answers from a database with over 1250 different messages, written in collaboration with expert patients, scientists and psychologists. The supportive messages (on average 384 words) contain a summary of self-reported eating problems and changes compared to the previous week, psychoeducation, and guidance on how to counter eating disorder related symptoms. Additionally, participants could access the Featback website with psycho-educative material on eating disorders at their own convenience.

### **Expert-patient support**

Expert patients ( $N = 5$ ) received an intervention protocol and one day of training on how to use their own experience to help others with eating disorder symptoms via chat and email. During the trial, expert patients received monthly supervision from an experienced expert patient and clinical psychologist (EvF). Expert patients scheduled 20-minute slots flexibly across the week to give participants ample choice to access support. They worked 4 to 6 hours a week, could maximally support 12 participants at any one time and received monthly payment.

Participants in this condition were assigned to one of the expert patients for eight weeks and received an account to schedule appointments. For each of the eight sessions, participants were able to choose between email and chat support. Chat sessions closed automatically after 20 minutes. For email sessions participants were asked to send an email to their expert patient before the scheduled appointment, so that the expert patient could respond during the 20-minute appointment.

### **Feedback with expert-patient support**

Participants in this condition were able to make use of both Feedback and weekly 20-minute chat or email support from an expert patient.

### **Waiting list control**

Participants in this condition were placed on a waiting list for 14 months. The timing of the assessments was equal to that in the other conditions. After the waiting period, participants were offered eight weeks of Feedback with weekly expert-patient support.

### **Intervention check**

An intervention check, based on a checklist constructed before the trial started (Rohrbach et al., 2019), was performed to investigate whether and how sessions from expert patients were distinguishable from sessions by psychologists, as performed in the previous Feedback trial by Aardoom, Dingemans, Spinhoven, et al. (2016). Two masked master-level psychology students rated the structure, intervention content and methods of delivery of 30 chat and email sessions from expert patients and 30 chat and email sessions from psychologists.

## **Outcomes**

The primary outcome measure was eating disorder symptomatology as assessed by the Eating Disorder Examination Questionnaire (EDE-Q 6.0) (Fairburn & Beglin, 2008). A total score of eating disorder pathology was computed by taking the average of 22 items presented as 7-point Likert scale questions. Secondary outcomes measures included symptoms of anxiety and depression measured with the 4-item Patient Health Questionnaire (PHQ-4) (Kroenke et al., 2009), general self-efficacy measured with the General Self-Efficacy Scale (GSES) (Schwarzer & Jerusalem, 1995) and experienced social support measured with the 12-item Social Support List (SSL-12-I) (van Eijk et al., 1994). Additionally, motivation to

change, user satisfaction with the automated messages and expert-patient support, and help seeking intentions and behaviors were assessed with self-developed questionnaires. At baseline, self-esteem measured with the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965) was obtained, as well as demographic information including gender, age, educational level, country of origin, work situation, internet access, self-reported severity of eating problems and eating disorder treatment history. Lastly, the Inclusion of Other in the Self scale (IOS scale) (Aron et al., 1992) was used to assess, at week 3 of the intervention, the extent to which participants allocated to a condition with expert-patient support perceived themselves to be similar to the expert patient they were paired with. Psychometric properties of all questionnaires were adequate and can be found in the published protocol (Rohrbach et al., 2019).

## Statistical procedures

All participants who underwent randomization were included in the analyses, following the intention-to-treat approach. An a priori sample size calculation, finding the optimal sample size for the main research question with a power of 80% to detect a small effect ( $d = 0.30$ ), indicated 88 participants per condition ( $N = 352$ ) were needed.

Main analyses were conducted in R version 4.0.2 (R Core Team, 2018) using linear mixed models (lmer function from the lme4 package) including random intercepts. To analyze the effect of the intervention type, three condition contrast were created. Specifically, to investigate the main hypothesis that the active interventions (i.e., Featback, expert-patient support and Featback plus expert-patient support) were more effective than a waiting list in decreasing eating disorder symptomatology, the three active conditions (pooled) were contrasted against the waiting list (CC1). This contrast allowed to investigate whether offering one of the active interventions, on average, resulted in greater symptoms reductions compared to the waiting list. The second contrast (CC2) distinguished the expert-patient support only and Featback only conditions (pooled) from the combination condition (i.e., Featback plus expert-patient support) to examine whether the combination condition was superior in reducing eating disorder symptoms. The third contrast (CC3) consisted of the Featback only versus expert-patient support only condition and informed on the relative effectiveness of offering only Featback and only expert-patient support. Moreover, five time contrasts were included, being baseline versus post intervention (TC1), and post intervention versus 3 (TC2), 6 (TC3), 9 (TC4) and 12 (TC5) month follow-up. Changes from baseline to post intervention (TC1) were of primary interest. The other time contrasts were used to inspect whether effects were maintained over time. All condition and time contrast combinations (15 in total) were tested separately to avoid noise in the models and improve interpretation. In other words, conditions or time points that were irrelevant for the effect of interest were removed from the model, as they may have introduced error variance, making the model less parsimonious. As recommended by (Cheng et al., 2010) when testing pre-specified models, Bonferroni adjustment of the p-values ( $\alpha = .05/15$ ) was applied to account for multiple testing and reduce type I errors. In summary, CC1\*TC1 was the interaction of primary interest. CC2\*TC1 and CC3\*TC1 were used to test our second and third hypotheses. To see the long-term effects of the interventions, TC5 (1-year follow-up) was deemed most informative. An overview of all statistical models can be found in Appendix B.1. These

main analyses were repeated for symptoms of anxiety and depression, general self-efficacy and experienced social support.

Additionally, six linear regression analyses were conducted to investigate both the short (T1) and the long term (T5) relationship between perceived similarity ratings, and (1) eating disorder symptomatology, (2) self-efficacy and (3) experienced social support. Multiple testing was accounted for using Holm's method (Holm, 1979).

### **Missing data**

Missing data were multiply imputed (Rubin, 1987) using R. Logistic regression (multinomial) was used for imputing categorical variables, while predictive mean matching was used for most of the numerical variables (Rubin, 1986; Van Buuren, 2012). Variables constructed from other variables (e.g., BMI was determined by weight and length) were imputed using passive imputation (Van Buuren & Groothuis-Oudshoorn, 2011).

The number of predictors for each variable with missing data was determined by using a rule of thumb of 15 cases per predictor (Stevens, 2001). For a specific variable with missing data, the other variables that were most strongly related to this variable were chosen as predictors for the missing data. If the variable with missing data and a potential predictor were both numerical, then their absolute correlation was used as a measure of association. Partial  $\eta^2$  was used as a measure of association if the variable with missing data was numerical and the potential predictor was categorical. Finally, if both the variable with missing data and a potential predictor were categorical, then Cramér's V was used. Missing data were imputed 100 times, creating 100 complete versions of the incomplete dataset.

### **Sensitivity analyses**

The main analysis (CC1 and TC1) was repeated for participants with an adequate dose only. To be considered an adequate-dose participant, a participant in the Feedback only, expert-patient support only and combination condition should have completed at least five out of eight monitoring assessments, five out of eight support sessions or both respectively. Secondly, the main analysis was repeated including covariates that were assumed to be prognostic for treatment outcome (i.e., age, baseline eating disorder symptoms, eating disorder duration, eating disorder treatment history, psychological health care visits, baseline self-esteem, baseline motivation to recover from the eating disorder, baseline anxiety and depression symptoms, baseline self-efficacy, baseline experienced social support and baseline BMI).

## **Results**

### **Participants**

Participant flow throughout the study is presented in Figure 1 and baseline characteristics are summarized in Table 1. Recruitment went as planned and lasted from October 2018 until October 2019 with the last follow-up measurement completed in December 2020. The baseline distributions of eating disorder symptoms across the sample are displayed in Figure



2. Study drop-out rates did not differ between conditions at post intervention,  $\chi^2(3) = 3.99$ ,  $p = .26$ , or other assessments. Most mentioned reasons for dropping out, based on 26 responses, were lost interest in the intervention or research, the feeling that participating took too much time and the feeling that the intervention or research was not helpful.

**Table 1.** Baseline characteristics of participants ( $N = 355$ )

Characteristics	Featback ( $N = 88$ )	Featback + Expert- patient support ( $N = 90$ )	Expert- patient support ( $N = 87$ )	Waiting list ( $N = 90$ )	Total sample ( $N = 355$ )
<b>Gender</b>					
Female (%)	82 (93.2)	89 (98.9)	84 (96.6)	88 (97.8)	343 (96.7)
Male (%)	5 (5.7)	1 (1.1)	1 (1.1)	2 (2.2)	9 (2.5)
Other (%)	1 (1.1)	0 (0.0)	2 (2.3)	0 (0.0)	3 (0.8)
<b>Nationality</b>					
Dutch (%)	78 (88.6)	80 (88.9)	80 (92.0)	81 (90.0)	319 (89.9)
Belgian (%)	9 (10.2)	9 (10.0)	6 (6.9)	8 (8.9)	32 (9.0)
Other (%)	1 (1.1)	1 (1.1)	1 (1.1)	1 (1.1)	4 (1.1)
<b>Education</b>					
Low (%)	5 (5.6)	12 (13.3)	12 (13.7)	18 (20.5)	47 (13.3)
Middle (%)	33 (37.5)	31 (34.4)	34 (39.0)	35 (39.3)	133 (37.6)
High (%)	50 (56.8)	47 (52.2)	41 (47.1)	36 (40.4)	174 (49.2)
<b>Marital status</b>					
Married/living together (%)	20 (22.7)	22 (24.4)	26 (29.9)	30 (33.3)	98 (27.6)
Living alone (%)	68 (77.3)	66 (73.3)	58 (66.7)	58 (64.4)	250 (70.4)
Divorced (%)	0 (0.0)	1 (1.1)	3 (3.4)	2 (2.2)	6 (1.6)
Widow (%)	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)	1 (0.2)
<b>Treatment history for ED</b>					
Yes (%)	46 (52.3)	54 (54.0)	53 (60.9)	49 (54.4)	202 (56.9)
No (%)	42 (47.7)	36 (40.0)	34 (39.1)	41 (45.6)	153 (43.1)
<b>Self-reported diagnosis status</b>					
Officially diagnosed with ED	52 (59.1)	60 (66.7)	52 (59.8)	58 (64.4)	222 (62.5)
No diagnosis, but assumed to have ED	24 (27.3)	22 (24.4)	23 (26.4)	22 (24.4)	91 (25.6)
Eating problems, but likely no ED diagnosis	12 (13.6)	8 (8.9)	12 (13.7)	10 (11.1)	42 (11.8)
Age [Years]	28.0 (1.7)	28.3 (10.4)	26.8 (9.4)	28.1 (12.4)	27.8 (10.8)
Weight [kg]	64.0 (21.0)	62.2 (18.3)	63.6 (22.0)	64.7 (23.4)	63.6 (21.2)
Height [cm]	169.9 (7.2)	168.5 (6.9)	169.7 (7.1)	169.5 (6.9)	169.4 (7.0)
Duration of eating problems [years]	10.1 (9.1)	10.3 (8.8)	8.6 (8.2)	11.4 (12.0)	10.1 (9.7)

EDE-Q	3.9 (1.1)	4.1 (1.1)	4.3 (1.0)	4.3 (1.0)	4.1 (1.0)
PHQ-4	7.6 (3.4)	7.5 (3.3)	8.2 (2.9)	7.9 (3.3)	7.8 (3.2)
GSES	25.9 (5.8)	27.4 (5.2)	24.4 (5.4)	26.7 (5.8)	26.1 (5.6)
SSL-12	29.4 (6.7)	30.4 (7.5)	30.0 (6.7)	30.1 (7.0)	30.0 (7.0)
RSES	20.8 (5.5)	21.6 (5.8)	19.0 (4.5)	20.6 (4.9)	20.5 (5.3)
Motivation to change	21.4 (4.5)	22.6 (4.5)	22.2 (4.5)	22.0 (4.2)	22.0 (4.5)
Internet usage [hours per day]	4.2 (2.6)	3.7 (2.2)	3.9 (2.3)	3.4 (2.8)	3.8 (2.5)

Note. Data are presented as means (SD) unless indicated otherwise.

ED = Eating Disorder; EDE-Q = Eating Disorder Examination Questionnaire; GSES = General Self-Efficacy Scale; PHQ-4 = 4-item Patient Health Questionnaire; RSES = Rosenberg Self-Esteem Scale; SD = standard deviation; SSL-12 = 12-item Social Support List.

## Eating disorder psychopathology

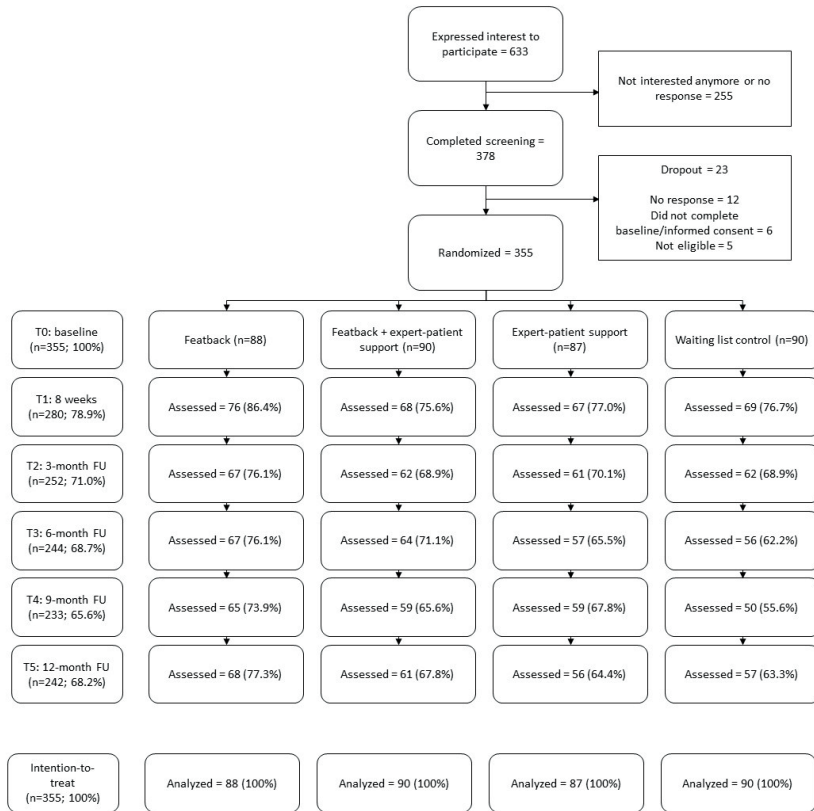
Main results can be found in Table 2 and all mixed model results can be found in Appendix B.2. First, the three active interventions were compared with the waiting list control condition (CC1\*TC1). A statistically significant medium effect of condition on changes in EDE-Q total scores between baseline and post intervention was found, favoring the active interventions. There were no significant condition-by-time interaction terms for the other time contrasts, indicating that there were no differences in longer-term eating disorder symptom changes between the three active interventions and the waitlist. No other significant results were found regarding eating disorder symptomatology. Specifically, the combination condition did not outperform the Feedback only and expert-patient support only conditions pooled together in the short term (CC2\*TC1) or any other time contrast. Similarly, no difference in effectiveness between the Feedback only and expert-patient support only conditions were found in the short term (CC3\*TC1) or any other time contrast.

To further explore change in participants on EDE-Q scores between baseline and post intervention, the reliable change index (RCI) was calculated (Jacobson & Truax, 1992). Based on the EDE-Q reliability in the current sample (Cronbach's  $\alpha = .90$ ) and the standard deviation of baseline EDE-Q total scores (1.04), the RCI was 0.89. Derived from the RCI, the number of participants (averaged across 100 imputed datasets) showing reliable deterioration, no change and reliable improvement was 14, 261 and 80 respectively. No significant difference in these frequencies between conditions was found,  $\chi^2(6) = 11.14, p = .08$ . Details can be found in Appendix B.3.

## Secondary outcomes

For symptoms of anxiety and depression, social support and self-efficacy, no time by condition interaction effects were found, indicating that for these variables trajectories over time were similar across conditions. Between baseline and post intervention, participants improved regarding symptoms of anxiety and depression. Between post intervention and 12-month follow-up participants improved regarding self-efficacy. Results were non-significant across other condition and time contrasts.

**Figure 1.** Participant flow during the study.

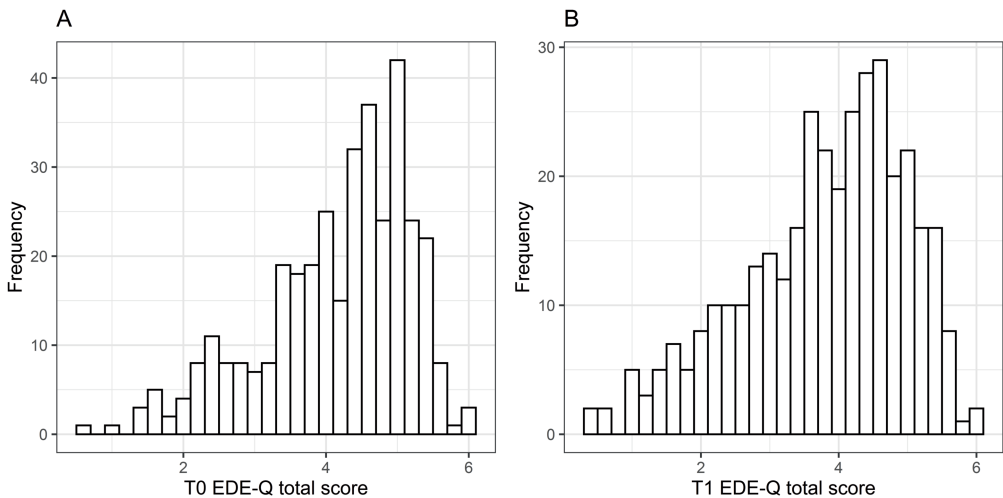


**Table 2.** Pooled results of linear mixed models analyses over 100 multiple imputed datasets

Measure	CC	TC	Time effects		Time-condition interaction effects		
			$\beta$ (95% CI)	$t$ ( $p$ )	$\beta$ (95% CI)	$t$ ( $p$ )	Cohen's $d$
Eating disorder symptoms (EDE-Q global)	CC1	TC1	-0.18 (-0.22; -0.14)	-8.12 (< .001)	-0.15 (-0.22; -0.07)	-3.66 (< .001)	0.38
	CC1	TC5	-0.27 (-0.35; -0.19)	-6.67 (< .001)	0.16 (0.02; 0.29)	2.26 (.02)	0.25
	CC2	TC1	-0.23 (-0.28; -0.18)	-8.81 (< .001)	-0.04 (-0.12; 0.03)	-1.17 (.24)	-0.12
	CC2	TC5	-0.22 (-0.31; -0.13)	-4.87 (< .001)	-0.04 (-0.18; 0.09)	-0.64 (.52)	-0.09
	CC3	TC1	-0.21 (-0.26; -0.15)	-6.73 (< .001)	0.01 (-0.06; 0.07)	0.17 (.87)	0.02
	CC3	TC5	-0.2 (-0.31; -0.09)	-3.66 (< .001)	0.01 (-0.09; 0.12)	0.25 (.80)	0.04
Depression and anxiety symptoms (PHQ-4)	CC1	TC1	-0.41 (-0.58; -0.23)	-4.61 (< .001)	-0.22 (-0.52; 0.08)	-1.43 (.15)	-0.12
	CC1	TC5	-0.42 (-0.63; -0.20)	-3.85 (< .001)	0.16 (0.02; 0.29)	2.26 (.02)	0.25
General self-efficacy (GSES)	CC1	TC1	0.09 (-0.18; 0.35)	0.65 (.52)	0.09 (-0.4; 0.59)	0.37 (.71)	0.04
	CC1	TC5	0.38 (0.07; 0.69)	2.40 (.02)	-0.15 (-0.73; 0.43)	-0.50 (.62)	-0.06
Experienced social support (SSL-12)	CC1	TC1	-0.04 (-0.35; 0.26)	-0.28 (.78)	-0.19 (-0.72; 0.35)	-0.69 (.49)	-0.07
	CC1	TC5	0.35 (-0.1; 0.80)	1.52 (.13)	0.20 (-0.58; 0.97)	0.50 (.62)	0.06

CC = Condition contrast, CI = confidence interval, TC = Time contrast  
 CC1 = Three active interventions (Feedback only, expert-patient support only and Feedback plus expert-patient support) versus waiting list control condition  
 CC2 = Feedback plus expert-patient support condition versus Feedback only and expert-patient support only  
 CC3 = Feedback only versus expert-patient support only  
 TC1 = baseline versus post intervention  
 TC5 = post intervention versus 12-month follow-up

**Figure 2.** Distribution of eating disorder examination questionnaire (EDE-Q) total scores at baseline (A) and post intervention (B)



## Intervention check

Raters could distinguish sessions correctly in 94% of the cases (agreement between the two raters was 95%), confirming the expectation that differences exist between the psychologist sessions of the previous trial (Aardoom, Dingemans, Spinhoven, et al., 2016) and expert-patient sessions of the current trial. Details on the intervention check can be found in Appendix B.4.

## Similarity ratings

Of the 177 participants who had the option to receive expert-patient support, 144 (81.4%) completed the IOS-scale. Answers on the IOS-scale were not imputed, since only participants in the two expert-patient support conditions received this questionnaire. Perceived similarity ratings were low with a median of 2 and mean of 2.7 ( $SD = 1.5$ ). Perceived similarity was not predictive of eating disorder symptoms at post intervention,  $\beta = 0.002$ ,  $F(1, 126) < 0.001$ ,  $p = .98$ , and, after correcting for multiple testing, at 12-month follow-up,  $\beta = -0.19$ ,  $F(1, 107) = 4.05$ ,  $p = .05$ . Similar non-significant results were found for the predictive value of perceived similarity ratings on experienced social support and self-efficacy.

## Per protocol analyses

The number of adequate-dose participants was 74 (84.1%) in the Feedback, 34 (37.8%) in the combination and 48 (55.2%) in the expert-patient support condition. The main analysis,



concerning the comparison of the effect of the three active interventions and the waitlist condition on eating disorder symptoms for the period between baseline and post intervention, was repeated with adequate-dose participants ( $N = 156$ ). The result was similar to the main analysis and favoring the three active interventions,  $t(323) = -3.23, p = .001$ . The number of intervention sessions was not prognostic of eating disorder symptoms at post intervention,  $\beta = -0.02, t(665) = -1.10, p = .27$ . Furthermore, adding covariates to the model yielded similar results to the main analysis, with a significant time-by-condition interaction favoring the three active interventions,  $t(405) = -3.57, p < .001$ . Lastly, severity of eating disorder symptoms was explored as a moderator, by entering it as a fixed effect in the CC1\*TC1 model. Based on (Mond et al., 2006), severity was considered high or low depending on whether a participant's baseline EDE-Q score was higher or lower than 4.0. No evidence for moderation of eating disorder symptom severity was found,  $t(447) = 0.80, p = .42$ .

Table 3 presents information on intervention usage, satisfaction and initiation of professional help. Further details can be found in Appendix B.5. On average, participants made more use of Featback sessions than expert-patient support sessions. Intervention satisfaction was significantly higher in conditions with expert-patient support compared to the Featback only condition. Furthermore, of the 150 participants seeking help at post intervention, 33 (22%) indicated that the 8-week intervention stimulated them to request professional help. However, there was no difference between the four conditions in initiating professional help for eating-related problems (e.g., with general practitioner or psychologist). Lastly, of the 90 participants randomized to the waiting list, 38 (42%) made use of the option to use Featback and expert-patient support after study completion.

**Table 3.** Intervention usage, satisfaction and help initiation of participants per condition

Category	Feedback ( <i>N</i> = 88)	Feedback + Expert- patient support ( <i>N</i> = 90)	Expert- patient support ( <i>N</i> = 87)	Waitlist ( <i>N</i> = 90)	Total sample ( <i>N</i> = 265; excludes waitlist)	Statistics
Adequate-dose participants (%)	74 (84.1)	34 (37.8)	48 (55.2)	NA	156 (58.9)	$\chi^2(2) = 40.00,$ $p < .001$
Indicated to stop with the intervention (%)	4 (4.6)	3 (3.3)	6 (6.9)	NA	13 (4.9)	$\chi^2(2) = 1.24,$ $p = .54$
Mean number of sessions (SD; median)	6.5 (2.1; 7.0)	9.2 (5.2; 10.0)	4.4 (3.1; 5.0)	NA	6.7 (4.2)	$F(2, 262) =$ $37.67, p < .001$
Feedback		5.6 (2.7; 7.0)		NA	6.0 (3.0)	$t(176) = 2.28,$ $p = .024$
Feedback		3.6 (2.9; 3.0)		NA	4.0 (3.0)	$t(175) = 1.86,$ $p = .066$
Proportion of possible sessions used (SD)	80.7% (26.1)	57.4% (32.2)	54.9% (38.3)	NA	64.3% (34.5)	$F(2, 262) =$ $16.80, p < .001$
0 sessions (%)	2 (2.3)	6 (6.7)	17 (19.5)	NA		$\chi^2(2) = 16.43,$ $p < .001$
Feedback		6 (6.7)		NA		
Support		23 (25.6)		NA		
1 session (%)	4 (4.5)	4 (4.4)	7 (8.0)	NA		$\chi^2(2) = 1.38,$ $p = .50$
Feedback		6 (6.7)		NA		
Support		5 (5.6)		NA		
All sessions (%)	40 (45.5)	11 (12.2)	14 (16.1)	NA		$\chi^2(2) = 16.43,$ $p < .001$
Feedback		34 (37.8)		NA		
Support		12 (13.3)		NA		
Intervention satisfaction <sup>a</sup> (SD)	5.8 (1.8)	7.1 (1.7)	7.4 (1.6)	NA	6.7 (1.8)	$F(2, 192) =$ $15.98, p < .001$
Initiated professional help <sup>b</sup> (%)	22 (25.0)	17 (18.9)	15 (17.2)	20 (22.2)	74 (20.8)	$F(3, 351) =$ $0.64, p = .59$

Exp = expert-patient support; FB = Feedback SD = standard deviation; WLC = waiting list control condition  
<sup>a</sup> On a scale from 1 (completely unsatisfied) to 10 (completely satisfied); based on 70, 63, and 62 (195 total) responses in the Feedback, Feedback + expert-patient support and expert-patient support conditions respectively.

<sup>b</sup> Indicates the number of participants who had never received eating disorder related treatment at baseline, but sought professional help (e.g., with a general practitioner, psychologist or psychiatrist) on at least one of the follow-up measures (T1-T5); total based on 355 participants.

## Discussion

The main aim of the current study was to investigate the effectiveness of Feedback, expert-patient support and the combination of both compared to care as usual (waitlist) for eating

disorders. Of the 355 participants, 22.5% (25.3% in the three active conditions and 13.3% in the waitlist) experienced reliable improvement in eating disorder symptoms. Results showed that participants in the three active conditions had larger improvements in eating disorder symptoms over the 8-week intervention period than participants in the waitlist condition. Contrary to expectations, the three active interventions were equally effective. The conditions with support from an expert patient were rated as more satisfactory than Featback alone. The results are similar to a previous randomized controlled trial on the effectiveness of Featback (Aardoom, Dingemans, Spinhoven, et al., 2016), where active interventions outperformed a waiting list control condition and adding support from a psychologist to the automated monitoring system enhanced intervention satisfaction, but not its effectiveness. Results are also in line with other research that found internet-based interventions to be effective in reducing eating disorder symptoms (Linardon et al., 2020; Melioli et al., 2016). The interventions in the current trial did not lead to more professional treatment initiation compared to the waitlist condition, but over 30 participants indicated the intervention had stimulated them to seek professional help. That a brief intervention such as Featback and expert-patient support can improve eating disorder symptoms and might stimulate help-seeking behaviors is promising, especially when considering its potential reach. Featback is free to use and easily accessible 24 hours a day. Therefore, it can exist next to and complement current treatment options for eating disorders, by reaching underserved individuals (Bauer & Goldschmidt, 2019). This is supported by the fact that 43% of the current study sample had, at baseline, never received treatment while having a very long average duration of eating disorder problems. This suggests that others in similar positions might also profit from Featback or expert-patient support, even if they do not (yet) receive other forms of treatment. Apart from individuals not currently reached by regular treatment, Featback could also be used in the period between intake and commencement of treatment. Waiting times for eating disorder treatment in the Netherlands have increased to an average of 11 weeks (Nederlandse Zorgautoriteit, 2021). Although further research is necessary, offering self-help interventions in this period might keep individuals motivated for recovery and prepare them for future care (Vollert et al., 2019). In general, based on findings from this and other studies, low-threshold and innovative interventions like Featback and expert-patient support are not only likely to reduce the burden for individuals with eating disorders, but also to bridge the treatment gap by reaching underserved people.

### **Expert-patient guidance**

It was expected that individuals with an eating disorder would bond quickly with expert patients, making them receptive to interventions aimed at changing destructive behavior and increasing self-efficacy and experienced social support (Dennis, 2003; Simoni et al., 2011). Contradictorily, adding expert-patient support to Featback did not increase effectiveness. This is not in line with a meta-analysis, covering multiple disorders, suggesting a small beneficial effect of guidance (Baumeister et al., 2014). Guidance in the pooled studies varied considerably and mostly covered support by therapists. An explanation of the discrepancy might thus be that expert patients are less effective in reducing symptoms through online support than health professionals. However, even though expert-patient and psychologist support appear to be distinct interventions, a previous Featback trial found no increased ef-

fectiveness of adding online psychologist support (Aardoom, Dingemans, Spinhoven, et al., 2016). Alternatively, results on the effectiveness of online guidance of Baumeister et al. (2014) may not generalize to eating disorder interventions, where evidence seems mixed (Yim & Schmidt, 2019b). Accordingly, in a meta-analysis studying the effect of individual components on effectiveness of e-health interventions for eating disorders, guidance did not moderate intervention effectiveness (Barakat et al., 2019). Regardless of effectiveness, individuals with eating disorders are repeatedly found to value support in the context of internet interventions highly (Linardon et al., 2021; Yim & Schmidt, 2019a). It suggests that intervention effectiveness does not require satisfaction. Surprisingly, despite the higher satisfaction, there were relatively fewer adequate-dose participants in conditions with expert-patient support. For the combination condition, this may partly be explained by the fact that an adequate dose required 10 completed sessions instead of 5 in the other conditions. Nonetheless, many participants in the current study did not make (full) use of the option to receive weekly support, indicating they still experienced barriers to engage with the online support. These barriers were thought to be lower when guidance was offered by expert patients compared to health professionals. Specifically, perceived similarity between the participant and expert patient was proposed to be an important ingredient for the effectiveness of expert-patient support, but no proof for this was found. Possibly, the perceived similarity was too low and little varied to detect any effect or three weeks were too few to build a rapport.

## Future directions

Considering the ambiguity around guidance for internet-based eating disorder interventions, more research specifically devoted to how it works and under which circumstances is warranted. Additionally, investigating predictors and moderators of internet-based interventions like Feedback and expert-patient support might clarify who benefits from what kind of intervention, leading to more personalized treatment. Lastly, an interesting next step might be to see if Feedback and expert-patient support can be improved by incorporating more innovative technologies, as there is still much ground to cover (Burger et al., 2020). For example, gamification, videos or Virtual Agents in addition to text alone show potential in improving mental health and engagement (Abd-Alrazaq et al., 2020; Fleming et al., 2017). This is in line with evidence indicating that using multiple features that address different modalities has a positive influence on the effectiveness of technology-enhanced eating disorder treatments (Barakat et al., 2019). Lastly, to better understand the effect of intervention usage on effectiveness, it might be valuable to investigate different durations of Feedback and expert-patient support.

## Strengths and limitations

Strengths of the study are recruitment of a large sample size, the design including randomized allocation of participants, obtaining 12-month follow-up measures in all conditions with adequate retention of participants, and maintaining an intent-to-treat approach making use of multiple imputations of the data. A limitation is the sole use of self-report measures, which are subject to socially acceptable answers, misinterpretation, and recall bias. Nevertheless,

using self-report allowed for maintaining the low-threshold character of the intervention and participating in the study. Similarly, broad inclusion criteria were used to ensure the sample represented intended end users, improving generalization to real-world settings. However, it is difficult to generalize the results to individuals with specific diagnoses, as rates of improvement may differ across diagnostic groups. A last consideration pertains to the number of planned contrasts. While they were conform the hypotheses as stated in the protocol, performing several tests increased the family-wise error rate, which was mitigated by a Bonferroni correction of the p-values. Nevertheless, a different statistical approach (e.g., factorial design with main and interaction effects of treatment) might have involved fitting fewer models, while still informing on the (relative) effectiveness of the internet interventions.

## **Conclusion**

A fully automated low-threshold internet-based self-help program for eating disorders (Featback), weekly chat or email support from an expert patient and the combination of both were effective in reducing eating disorder symptoms compared to a waiting list control condition. Although expert-patient support improved satisfaction ratings, it did not improve the effectiveness. Now that beneficial effects of Featback have been confirmed in two randomized controlled trials, a next step is to implement the program and make it widely available. The current study highlights the potential of internet interventions such as Featback and expert-patient support to reach the large group of undetected and underserved individuals with an eating disorder and help them address their problems, complementing the existing pallet of treatment options that currently exists for eating disorders.





