Title: The First Episode Rapid Early Intervention for Eating Disorders – Upscaled (FREED-Up) study: Clinical outcomes.

Running title: The FREED-Up study clinical outcomes

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Abstract:

Background: FREED (First Episode Rapid Early Intervention for Eating Disorders) is a service model and care pathway for emerging adults aged 16 to 25-years with a recent onset eating disorder (ED) of <3 years. A previous single-site study suggests that FREED significantly improves clinical outcomes compared to treatment-as-usual (TAU). The present study (FREED-Up) assessed the scalability of FREED. A multi-centre quasi-experimental pre-post design was used, comparing patient outcomes before and after implementation of FREED in participating services.

Methods: FREED patients (n=278) were consecutive, prospectively ascertained referrals to four specialist ED services in England, assessed at four time points over 12 months on ED symptoms, mood, service utilisation and cost. FREED patients were compared to a TAU cohort (n=224) of similar patients, identified retrospectively from electronic patient records in participating services. All were emerging adults aged 16-25 experiencing a first episode ED of < 3 years duration.

Results: Overall, FREED patients made significant and rapid clinical improvements over time. 53.2% of FREED patients with anorexia nervosa reached a healthy weight at the 12-month timepoint, compared to only 17.9% of TAU patients (X^2 [1, N = 107]=10.46, p<0.001). Significantly fewer FREED patients required intensive (i.e., in-patient or day-patient) treatment (6.6%) compared to TAU patients (12.4%) across the follow-up period (X^2 [1, N=40]=4.36, p=0.037). This contributed to a trend in cost savings in FREED compared to TAU (-£4472, p=0.06, CI -£9168, £233).

Discussion: FREED is robust and scalable and is associated with substantial improvements in clinical outcomes, reduction in inpatient or day-patient admissions, and cost-savings.

Introduction

Eating disorders (EDs), including anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), other specified feeding and eating disorder (OSFED) and related subclinical syndromes affect up to 15% of young women (Hay, Girosi, & Mond, 2015) and up to 5.5% of men (Lipson & Sonneville, 2017), with peak onset from adolescence into emerging adulthood

(Javaras et al., 2015; Silén et al., 2020). Across all EDs, levels of disability and mortality are high, with AN having the highest mortality of any psychiatric disorder (Treasure, Duarte, & Schmidt, 2020). Some clinical studies indicate that response to treatment may be greater in the early stages of the illness and may diminish the longer the disorder persists (Ambwani et al., 2020; Treasure, Stein, & Maguire, 2015). In line with this, there is a growing body of evidence suggesting that over time EDs become more entrenched through functional deterioration, neuroadaptation, and the development of habitual behaviour patterns (Berner & Marsh, 2014; O'Hara, Campbell, & Schmidt, 2015; Steinglass & Walsh, 2016). Together, such findings provide a compelling case for establishing early intervention services for EDs that match the developmental needs and symptom profiles of individuals with recent-onset disorders, analogous to developments in psychosis (McGorry & Mei, 2018; McGorry, Ratheesh, & O'Donoghue, 2018) and other psychiatric disorders (Richards, Austin, Allen, & Schmidt, 2019). Finally, it is necessary to prevent unnecessary suffering due to prolonged illness.

An important concept in the early intervention literature is the duration of untreated illness, i.e. the time between falling ill and first specialist, evidence-based treatment (e.g. Oliver et al., 2018; Penttilä, Jääskeläinen, Hirvonen, Isohanni, & Miettunen, 2014). In EDs, a recent systematic review found that, internationally, average duration of untreated ED (DUED) ranges from about 2.5 years for AN to nearly 6 years for BED (Austin et al., 2020). DUED can be divided into patient- and healthcare-related components. While patient driven delays relate to a lack of problem recognition and help seeking, healthcare-related delays are caused by systemic barriers to accessing treatment for eating related concerns. In England, the wait from general practitioner (GP) referral to start of ED treatment has historically been an average of about 6 months (Beat, 2017). While ED services for children and young people implemented a 4-week waiting time target in 2015 (NHS England), no comparable change has been seen in adult services. This time period is important considering that ED patients on a waitlist tend to drop out more often (Carter et al., 2012) and those who wait for treatment have poorer outcomes than those treated immediately (Sánchez-Ortiz et al., 2011).

To the best of our knowledge, only two evidence-based ED early intervention service models exist. One is the Psychenet model, which aimed to facilitate early illness detection and help

seeking, and reduce DUED in adolescents and adults with AN by implementing a public health intervention into the education/health care systems in Hamburg, Germany (Gumz et al., 2014; Gumz, Weigel, Wegscheider, Romer, & Löwe, 2018). However, following the implementation of this complex intervention, neither DUED nor time to first specialist assessment were reduced.

The second is the First Episode Rapid Early Intervention for Eating Disorders (FREED) which was developed for emerging adults aged 18-25 with any ED and a DUED < 3 years (Schmidt, Brown, McClelland, Glennon, & Mountford, 2016). FREED criteria have been broadened since, to cover the age range of 16 to 25 years. FREED is a service model and care pathway which aims to deliver well-coordinated, person-centred, and evidence-based care which is tailored to illness- and developmental stage. Reduction in the service-related component of DUED is accomplished by encouraging early referral from primary care and reducing waiting times within specialist services. Pilot data from a single-site quasi-experimental study using a pre-post design found that FREED reduced DUED, improved treatment uptake, and significantly improved clinical outcomes in the targeted population (Brown et al., 2018; McClelland et al., 2018). Comparison between patients receiving FREED (n=56) and a treatment as usual (TAU) comparison group at a comparable stage of illness (n=86) revealed that for those with AN, 59% of FREED versus 17% of TAU returned to a healthy weight within 12 months of starting treatment. Hospital admissions (in/day-patient) were also reduced for FREED (9%) compared to TAU (14%) within the same 12 months (McClelland et al., 2018). These marked group differences in weight recovery and service utilisation persisted up to 24 months (Fukutomi et al., 2020).

FREED-Up aimed to assess the scalability of FREED in a multi-centre study using a similar pre-post design. Baseline data (i.e., waiting times, DUED, and treatment uptake) indicate successful replication of pilot study findings, and have been reported elsewhere (Flynn et al., 2020; Schmidt et al., 2020). FREED-Up is a real-world implementation study with imperfect and limited TAU data. Therefore we had three pragmatic objectives: (1) to assess ED and other clinical outcomes over time within the FREED group and within clinical subgroups, (2) to compare change in body mass index (BMI) for FREED and TAU patients with AN, and 3) to compare service use between FREED and TAU patients.

Methods

Details on study design, participants, and research procedures are reported in Flynn et al. (2020) and included in Supplementary Materials. In brief, a pre-post design comparing patients before and after FREED implementation was used to determine how FREED compared with TAU in relation to DUED, waiting times, treatment uptake, clinical outcomes, and service utilisation. All relevant regulatory (including ethical) approvals were obtained prior to recruitment.

Participants

Participants in the FREED cohort were patients aged 16-25 with a primary diagnosis of any DSM-5 ED and illness duration < 3 years recruited prospectively from consecutive referrals to four specialist outpatient ED services in England. Recruitment occurred from January 2017 to September 2018. The TAU cohort were patients, comparable in age and illness duration, identified through a retrospective audit of electronic patient records from the same four sites in the two years before FREED was implemented.

Procedure

Clinical procedures

The FREED service model/care pathway and its implementation are described in Supplementary Materials and in Allen et al. (2020). In brief, services aimed to offer potentially FREED eligible patients (i.e., within age range and with referral indicating suitable DUED) screening by phone within 48 hours of referral, assessment within two weeks, and NICE recommended, evidence based treatment (e.g., ED focused cognitive behavioural [CBT-ED] or Maudsley Anorexia Nervosa Treatment for Adults [MANTRA]) within another two weeks (NICE, 2017). The treatment is tailored to the developmental needs of emerging adults (e.g., social media use, focus on life transitions) and early stage illness.

Research procedures

Patients eligible for treatment via the FREED service were invited to take part in the study at their clinical assessment. All participants gave written, informed consent. Following this, they

completed a semi-structured interview with a researcher (face-to-face or by phone) which explored illness onset and duration (see Flynn et al., 2020). Patients then completed a baseline questionnaire pack which included demographic questions and widely used outcome measures. Questionnaires were repeated 3, 6, and 12 months after baseline. Participants were followed-up regardless of whether they engaged with treatment or not. Information on service usage (e.g., number of treatment sessions) was obtained from clinicians via a specially designed case record form and supplemented with data from electronic case notes.

Data for the TAU cohort were extracted from electronic clinical records. This included information on demographics, diagnosis, referral, assessment, service usage, and body mass index (BMI) within 30 days of each of the four FREED timepoints. No questionnaire data comparable to those collected for the FREED cohort were available for the TAU group.

Clinical Outcome Measures

All measures used are well-validated and reliable questionnaires.

Eating Disorder Examination Questionnaire (EDE-Q)

The EDE-Q assesses ED related cognitions and behaviours over the past 28 days (Fairburn & Beglin, 2008). A global score $\geq$ 2.8 is indicative of clinically concerning ED symptoms (Mond et al., 2008).

Clinical Outcomes in Routine Evaluation (CORE-10)

The CORE-10 is a ten-item measure assessing global distress and functioning (Barkham et al., 2013). Scores above 10 indicate a clinical level of distress.

Clinical Impairment Assessment (CIA)

The 16-item CIA measures psychosocial impairment due to an ED, with scores 16 and above indicating clinical levels of impairment (Bohn & Fairburn, 2008).

Depression, Anxiety, and Stress Scale (DASS-21)

The DASS-21 assesses mood over the past seven days (Lovibond & Lovibond, 1995). A total score of 13 or greater has been proposed as a cut-off for a clinical level of pathology (Crawford & Henry, 2003)

Work and Social Adjustment Scale (WSAS)

The WSAS is a five-item measure assessing functional impairment due to illness, in this case, an ED (Marks, 1986). Scores 10 and above are deemed a clinical level of functional impairment.

Levels of Expressed Emotion Scale (LEE)

The LEE measures the patient's rating of the level of expressed emotion of a close caregiver or partner (Cole & Kazarian, 1988). The 60-item true/false questionnaire includes subscales for attitude toward illness, emotional response, intrusiveness, and tolerance/expectations (Cole & Kazarian, 1988).

Psychological Outcome Profiles (PSYCHLOPS)

The PSYCHLOPS is an individualised outcome measure used to evaluate function and wellbeing (Ashworth et al., 2004). Examples of a patient generated outcomes in this cohort include "commit to my studies," "get a good night's sleep," and "take care of my son." The PSYCHLOPS has been validated for use in ED care (Austin et al., 2021).

Body Mass Index (BMI)

BMI was calculated using height and weight measurements (kilograms/metres^2). For the FREED cohort, this was measured at each timepoint via questionnaire. When missing, clinical notes were consulted. For the TAU cohort, this information was extracted from clinical notes.

Analyses

Statistical analyses followed from our study aims. Firstly, there was a within-group evaluation of the clinical outcomes both for the FREED group as a whole and for the clinical subgroup of those with BN, BED, or OSFED. For these within-group analyses, linear mixed modelling was used. Logistic regression was used to examine predictors of missingness (diagnosis, age at onset, treatment completion, gender, ethnicity, BMI at assessment). The only predictor of

missingness was treatment completion and this was therefore included in the model as a covariate. For the analysis of bingeing and compensatory behaviours, only those who reported the presence of a behaviour at assessment were entered into the model.

For the between-group analysis (i.e. FREED vs. TAU) of BMI in patients with AN, linear mixed modelling was used. Again, logistic regression was employed to examine predictors of missingness. Treatment completion, study site, BMI at assessment, and age of onset were all predictive of missingness and therefore included as covariates in the model. Timepoint and group were investigated as main effects and timepoint*group as an interaction effect.

Thirdly, economic outcomes (service utilisation and costs) were compared between groups using generalised linear modelling (gamma family, identity link) as recommended to account for the highly skewed nature of cost data (Mihaylova, Briggs, O'Hagan, & Thompson, 2011). Predictors of missingness identified in the clinical analyses were included as covariates in the cost model.

Analyses were conducted in SPSS version 26 and Stata version 15.

Results

Participant Characteristics

For participant flow through the study see Supplementary Figure1 (reproduced from Flynn et al., 2020) . Demographic and clinical baseline characteristics are presented in Table 1.

Within group analyses

These analyses were done for questionnaire data available for FREED participants only.

Clinical outcomes for all FREED participants

Estimated mean EDE-Q global scores for the full FREED cohort from baseline to 12 months are shown in Figure 1.

Table 2 shows the linear mixed model results for the ED symptoms, other clinical outcomes, and BMI for the FREED cohort, with contrasts between follow-up timepoints. Raw data for these measures at each timepoint can be found in Supplementary Table 2.

Rate of recovery was calculated at each follow-up timepoint. Recovery was defined as in Mond et al. (2008) as an EDE-Q score < 2.8, with the additional criterion of a BMI > 18.5 kg/m^2 for those with AN, as used in previous trials (e.g. Schmidt et al., 2015). In the FREED sample, recovery figures for AN were T1: 1/117 (0.9%), T2: 5/103 (4.9%), T3: 10/87 (11.5%), T4: 29/79 (36.7%) and for BN/BED/OSFED were T1: 13/161 (8.1%), T2: 21/59 (35.6%), T3: 29/51 (56.9%), T4: 30/46 (65.2%).

Clinical outcomes for FREED subgroup with bulimic symptoms

160 FREED patients who entered treatment had a diagnosis of BN, BED, or OSFED. They reported binge eating (n=125), vomiting (n=98), laxative use (n=39), and excessive exercise (n=112) at baseline. Between T1 and T4, FREED patients with BN/BED/OSFED who reported bingeing at baseline reduced the monthly frequency of the behaviour by an estimated average of 8.29 episodes (95% CI [-10.09, -6.48]). Monthly vomiting reduced by an estimated average of 10.13 episodes (95% CI [-13.23, -7.03]), laxative use reduced by an average of 9.26 episodes (95% CI [-12.40, -6.12]) and excessive exercise by 8.95 episodes (95% CI [-11.04, -6.86]).

Table 3 and Supplementary Figure 2 show that the estimated mean occurrence of bingeing and compensatory behaviours reduced between each time point, but that the magnitude of change for all behaviours was greatest in the first three months (T1-T2).

Between group analyses

FREED vs TAU AN patients

117 FREED patients and 78 TAU patients who entered treatment had a diagnosis of AN. Figure 2 shows estimated mean BMI by group (FREED and TAU) and the estimated difference between cohorts at each timepoint, with T1 representing the start of treatment for both groups. There was a main effect for group ($F(1,205)=13.17$; $p<0.001$), but no group by time interaction

(F(1,410)=1.96, *p*=0.12), i.e., FREED AN patients started treatment at a higher BMI and continued to have a higher BMI at all timepoints.

By 12 months, the estimated mean BMI of AN patients was 18.65 kg/m^2 in FREED (95% CI [18.27, 19.03]) and 17.33 kg/m^2 in TAU (95% CI [16.75, 17.90]), giving a mean difference of 1.32 BMI points (95% CI [0.63, 2.02]). Between T1 and T4 (i.e. treatment start to 12 months) FREED AN participants gained an estimated 2.09 BMI points (95% CI [1.66, 2.53]) whereas TAU patients gained an estimated 1.22 BMI points (95% CI [0.59, 1.86]).

We also calculated proportions of patients who were weight recovered (defined as BMI > 18.5 kg/m^2) at each time point. For the FREED group these figures were T1: 5/117 (4.35%), T2: 18/105 (17.1%), T3: 31/92 (33.7%), T4: 42/79 (53.2%). For the TAU group figures were T1: 5/78 (6.4%), T2: 8/59 (13.6%), T3 8/55 (14.5%), T4: 5/28 (17.9%). At T3 and T4 the differences between the two groups are significant (T3: X^2 [1, N=147]=6.48, *p*=0.011; T4 X^2 [1, N = 107]=10.46, *p*<0.001).

Service utilisation in FREED versus TAU patients

For those who entered treatment, there was no significant difference in the rate of treatment completion between the FREED and TAU cohorts (FREED: 189/270, 70.0%; TAU: 103/157, 65.6%; X^2 [1, N=427]=0.89, *p*=0.35). There was also no significant difference between the average number of treatment sessions attended by the FREED cohort (*m*=18.64, *SD*=12.64) than the TAU cohort (*m*=16.67, *SD*=15.01) across the 12 month follow-up period (*t*[413]=-0.4088, *p*=0.16).

The proportion of patients requiring additional intensive treatment (day- or in-patient) for their ED was significantly lower for the FREED cohort (18/272, 6.6%) than the TAU cohort (21/169, 12.4%), across the 12-month follow-up period (X^2 [1, N=40]=4.36, *p*=0.037). There was also a significant difference in the number of days spent in intensive treatment (FREED *M*=7.03 days, *SD*=34.55; TAU *M*= 17.93 days, *SD*=58.39; [*t*(422)=-2.4154, *p*=0.02]).

Service use was valued using NHS national average 2018/2019 unit costs (NHS England, 2020) for outpatient attendances (£206) and inpatient admissions (£787) for child and adolescent

EDs. Day care attendance unit cost was based on an NHS England contract daily tariff of £412 for Step UP day care (South London and Maudsley NHS Foundation Trust, 2020). The non-clinical time cost for FREED champions (including training) was estimated at £17,172 per year based on the NHS Agenda for Change Band 7 (e.g., newly qualified psychologist). The total cost of the four FREED champions over two years (£137,376) was divided by the number of FREED patients (n=278) and apportioned equally to all patients in the FREED cohort (£494). There was a trend to lower total costs in the FREED cohort (FREED M=£8781, SD=£21976; TAU M=£13604, SD=£32997, adjusted difference -£4472 [p=0.06] CI -£9168, £233).

Discussion

This study is a large-scale evaluation of the FREED service for emerging adults with an early stage ED. Overall, the findings indicate that FREED achieves swift and significant improvements in clinical outcomes, and that when compared with TAU for patients of comparable age and DUED, FREED appears to be superior. Across the whole transdiagnostic cohort there were significant and large reductions in ED and related symptoms over the 12-month follow up period, with the magnitude of change being greatest in the first three months. With regards to AN, our reported recovery rates (53.2% weight recovered, 36.7% both weight and ED psychopathology recovered) were comparable or better than those in recent large scale treatment trials in adults (13-42.9% recovered, by various definitions) (Brockmeyer, Friederich, & Schmidt, 2018).

Our findings replicate the results of the pilot study (McClelland et al., 2018). In FREED-Up, AN patients gained an estimated average of 2.09 BMI points over the 12 month study period, with 53.2% reaching a healthy BMI (> 18.5 kg/m^2), while in the pilot study patients gained an average of 2.26 BMI points and 58.8% reached a healthy BMI. In comparison, 17.9% of those receiving TAU in FREED- Up reached a healthy BMI within the same timeframe, similarly to the pilot study's 16.7%. Importantly, while BMI is not sufficient for achieving full AN recovery, weight gain in outpatient treatment that is patient driven (rather than externally imposed as in inpatient care) generally parallels improvements in ED symptoms and quality of life (e.g. Byrne et al., 2017; Schmidt et al., 2015). Finally, in FREED, utilisation of intensive treatment was

substantially reduced (6.6% in FREED versus 12.4% in TAU), contributing to an average cost saving of £4472 per patient. It is possible that earlier referral in FREED meant slightly milder cases at specialist presentation and therefore a more treatable illness.

These findings, coupled with the knowledge that FREED significantly reduces both DUED and waiting times when delivered as intended (Flynn et al., 2020), make a compelling case for scaling FREED further. Through our replication of both clinical and process related pilot outcomes, we demonstrate that FREED can be successfully scaled to specialist ED services with differing contexts, resources, and challenges.

However, the study is not without limitations. As the TAU control population was identified retrospectively from clinical records, systematic differences between control patients and FREED-Up patients, which are unrelated to the intervention, are possible. Further, as BMI was the only measure routinely available we were unable make meaningful comparison related to clinical outcomes for FREED patients with BN/BED/OSFED relative to TAU. Second, the effective components of the FREED service model/care pathway need to be evaluated to determine the key mechanisms of clinical change (Richards et al., under review).

Overall, FREED-Up demonstrates that the clinically significant improvements seen in the FREED pilot study are maintained when FREED is scaled to additional services. Further, where comparisons can be made with TAU, our findings indicate that FREED produces superior clinical outcomes at a reduced cost.

References

Allen, K. L., Mountford, V., Brown, A., Richards, K., Grant, N., Austin, A., … Schmidt, U. (2020). First episode rapid early intervention for eating disorders (FREED): From research to routine clinical practice. *Early Intervention in Psychiatry, 14,*(5) 625-630. https://doi.org/10.1111/eip.12941

Ambwani, S., Cardi, V., Albano, G., Cao, L., Crosby, R. D., Macdonald, P., … Treasure, J. (2020). A multicenter audit of outpatient care for adult anorexia nervosa: Symptom trajectory, service use, and evidence in support of "early stage" versus "severe and enduring" classification. *International Journal of Eating Disorders*. Advanced online publication. https://doi.org/10.1002/eat.23246

Ashworth, M., Shepherd, M., Christey, J., Matthews, V., Wright, K., Parmentier, H., … Godfrey, E. (2004). A client-generated psychometric instrument: The development of 'PSYCHLOPS.' *Counselling and Psychotherapy Research*, *4*(2), 27–31. https://doi.org/10.1080/14733140412331383913

Austin, A., Flynn, M., Richards, K., Hodsoll, J., Duarte, T., …, Schmidt, U. (2020). Duration of untreated eating disorder and relationship to outcomes: A systematic review of the literature. *European Eating Disorders Review*. Advanced online publication. https://doi.org/10.1002/erv.2745

Austin, A., Potterton, R., Flynn, M., Richards, K., Allen, K., Glennon, D., …, Schmidt, U. Exploring the use of the individualized patient reported outcome measures in eating disorders: Validation of the Psychological Outcome Profiles. *European Eating Disorders Review, 29* (2), 281-291. https://doi.org/10.1002/erv.2819

Barkham, M., Bewick, B., Mullin, T., Gilbody, S., Connell, J., Cahill, J., … Evans, C. (2013). The CORE-10: A short measure of psychological distress for routine use in the psychological therapies. *Counselling and Psychotherapy Research, 13*(1), 3-13. https://doi.org/10.1080/14733145.2012.729069

Beat. (2017). Delayed for years, denied for months.

https://www.beateatingdisorders.org.uk/uploads/documents/2017/11/delaying-for-years-denied-for-months.pdf

Berner, L. A., & Marsh, R. (2014). Frontostriatal circuits and the development of bulimia nervosa. *Frontiers in Behavioral Neuroscience, 8*, 395. https://doi.org/10.3389/fnbeh.2014.00395

Bohn, K., & Fairburn, C. G. (2008). The Clinical Impairment Assessment Questionnaire (CIA 3.0). In Fairburn, C. G. (Ed.), *Cognitive Behavior Therapy and Eating Disorders*. New York, Guilford Press.

Brockmeyer, T., Friederich, H. C., & Schmidt, U. (2018). Advances in the treatment of anorexia nervosa: A review of established and emerging interventions. *Psychological Medicine*, *48*, 1228–1256. https://doi.org/10.1017/S0033291717002604

Brown, A., McClelland, J., Boysen, E., Mountford, V., Glennon, D., & Schmidt, U. (2018). The FREED Project (first episode and rapid early intervention in eating disorders): service model, feasibility and acceptability. *Early Intervention in Psychiatry*, *12*(2), 250–257. https://doi.org/10.1111/eip.12382

Byrne, S., Wade, T., Hay, P., Touyz, S., Fairburn, C. G., Treasure, J., … Crosby, R. D. (2017). A randomised controlled trial of three psychological treatments for anorexia nervosa. *Psychological Medicine, 47*(16), 2823-2833. https://doi.org/10.1017/S0033291717001349

Carter, O., Pannekoek, L., Fursland, A., Allen, K. L., Lampard, A. M., & Byrne, S. M. (2012). Increased wait-list time predicts dropout from outpatient enhanced cognitive behaviour therapy (CBT-E) for eating disorders. *Behaviour Research and Therayp, 50*(7-8), 487-492. https://doi.org/10.1016/j.brat.2012.03.003

Cole, J. D., & Kazarian, S. S. (1988). The level of expressed emotion scale: A new measure of expressed emotion. *Journal of Clinical Psychology, 44*(3), 392-397. https://doi.org/10.1002/1097-4679(198805)44:3<392::AID-JCLP2270440313>3.0.CO;2-3

Crawford, J. R., & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): Normative

data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology, 42*(2), 111-131. https://doi.org/10.1348/014466503321903544

Flynn, M., Austin, A., Lang, K., Allen, K., Bassi, R., Brady, G., …, & Schmidt, U. (2020). Assessing the impact of First Episode Rapid Early Intervention in Eating Disorders (FREED) on duration of untreated eating disorder: A multi-centre quasi-experimental study. *European Eating Disorders Review.* Advanced online publication. https://doi.org/10.1002/erv.2797

Fukutomi, A., Austin, A., McClelland, J., Brown, A., Glennon, D., Mountford, V., … Schmidt, U. (2020). First episode rapid early intervention for eating disorders: A two-year follow-up. *Early Intervention in Psychiatry, 14*(1), 137-140. https://doi.org/10.1111/eip.12881

Gumz, A., Uhlenbusch, N., Weigel, A., Wegscheider, K., Romer, G., & Löwe, B. (2014). Decreasing the duration of untreated illness for individuals with anorexia nervosa: Study protocol of the evaluation of a systemic public health intervention at community level. *BMC Psychiatry, 18*(14), 300. https://doi.org/10.1186/s12888-014-0300-1

Gumz, A., Weigel, A., Wegscheider, K., Romer, G., & Löwe, B. (2018). The psychenet public health intervention for anorexia nervosa: A pre-post-evaluation study in a female patient sample. *Primary Health Care Research and Development*, *19*(1), 42–52. https://doi.org/10.1017/S1463423617000524

Hay, P., Girosi, F., & Mond, J. (2015). Prevalence and sociodemographic correlates of DSM-5 eating disorders in the Australian population. *Journal of Eating Disorders*, *3*(1). https://doi.org/10.1186/s40337-015-0056-0

Javaras, K. N., Runfola, C. D., Thornton, L. M., Agerbo, E., Birgegård, A., Norring, C., … Bulik, C. M. (2015). Sex- and age-specific incidence of healthcare-register-recorded eating disorders in the complete swedish 1979-2001 birth cohort. *International Journal of Eating Disorders, 48(8),* 1070-1081. https://doi.org/10.1002/eat.22467

Lipson, S. K., & Sonneville, K. R. (2017). Eating disorder symptoms among undergraduate and graduate students at 12 U.S. colleges and universities. *Eating Behaviors, 24,* 81-88. https://doi.org/10.1016/j.eatbeh.2016.12.003

Lovibond, S. H., & Lovibond, P. F. (1995). Manual for the Depression Anxiety Stress Scales. In *Psychology Foundation of Australia*. https://doi.org/DOI: 10.1016/0005-7967(94)00075-U

Marks, I. M. (1986). *Behavioural psychotherapy: Maudsley pocket Book of clinical management.* Wright/IOP Publishing.

McClelland, J., Hodsoll, J., Brown, A., Lang, K., Boysen, E., Flynn, M., … Schmidt, U. (2018). A pilot evaluation of a novel First Episode and Rapid Early Intervention service for Eating Disorders (FREED). *European Eating Disorders Review, 26*(2), 129-140. https://doi.org/10.1002/erv.2579

McGorry, P. D., & Mei, C. (2018). Early intervention in youth mental health: Progress and future directions. *Evidence-Based Mental Health, 21*(4). https://doi.org/10.1136/ebmental-2018-300060

McGorry, P. D., Ratheesh, A., & O'Donoghue, B. (2018). Early intervention—an implementation challenge for 21st century mental health care. *JAMA Psychiatyr, 75*(6), 545-546. https://doi.org/10.1001/jamapsychiatry.2018.0621

Mihaylova, B., Briggs, A., O'Hagan, A., & Thompson, S. G. (2011). Review of statistical methods for analysing healthcare resources and costs. *Health Economics, 20*(8), 897-916. https://doi.org/10.1002/hec.1653

Mond, J. M., Myers, T. C., Crosby, R. D., Hay, P. J., Rodgers, B., Morgan, J. F., … Mitchell, J. E. (2008). Screening for eating disorders in primary care: EDE-Q versus SCOFF. *Behaviour Research and Therapy, 46*(5), 612-622. https://doi.org/10.1016/j.brat.2008.02.003

National Institute for Health and Care Excellence (NICE). (2017). *Eating disorders: recognition and treatment*. Retrieved from https://www.nice.org.uk/guidance/ng69

NHS England. (2020). National Cost Collection 2019. Retrieved from https://www.england.nhs.uk/wp-content/uploads/2020/08/1_-_NCC_Report_FINAL_002.pdf

NHS England. (2015). Access and waiting time standard for children and young people with an

eating disorder: Commissioning guide. Retrieved from https://www.england.nhs.uk/wp-content/uploads/2015/07/cyp-eating-disorders-access-waiting-time-standard-comm-guid.pdf

O'Hara, C. B., Campbell, I. C., & Schmidt, U. (2015). A reward-centred model of anorexia nervosa: A focussed narrative review of the neurological and psychophysiological literature. *Neuroscience and Biobehavioral Reviews, 52,* 131-152. https://doi.org/10.1016/j.neubiorev.2015.02.012

Oliver, D., Davies, C., Crossland, G., Lim, S., Gifford, G., McGuire, P., & Fusar-Poli, P. (2018). Can we reduce the duration of untreated psychosis? A systematic review and meta-analysis of controlled interventional studies. *Schizophrenia Bulletin, 44*(6), 1362-1372. https://doi.org/10.1093/schbul/sbx166

Penttilä, M., Jääskeläinen, E., Hirvonen, N., Isohanni, M., & Miettunen, J. (2014). Duration of untreated psychosis as predictor of long-term outcome in schizophrenia: Systematic review and meta-analysis. *British Journal of Psychiatry, 2,* 88-94. https://doi.org/10.1192/bjp.bp.113.127753

Richards, K., Austin, A., Allen, K., & Schmidt, U. (2019). Early intervention services for non-psychotic mental health disorders: A scoping review protocol. *BMJ Open*, *9*(12). https://doi.org/10.1136/bmjopen-2019-033656

Richards, K., Flynn, M., Austin, A., Lang, K., Allen, K.L., Bassi, R., …, Schmidt, U. *Assessing Implementation fidelity in First Episode Rapid Early Intervention for Eating Disorders (FREED).* Manuscript under review.

Sánchez-Ortiz, V. C., Munro, C., Stahl, D., House, J., Startup, H., Treasure, J., … Schmidt, U. (2011). A randomized controlled trial of internet-based cognitive-behavioural therapy for bulimia nervosa or related disorders in a student population. *Psychological Medicine, 41*(2), 407-417. https://doi.org/10.1017/S0033291710000711

Schmidt, U., Brown, A., McClelland, J., Glennon, D., & Mountford, V. A. (2016). Will a comprehensive, person-centered, team-based early intervention approach to first episode

illness improve outcomes in eating disorders? *International Journal of Eating Disorders, 49*(4), 374-377. https://doi.org/10.1002/eat.22519

Schmidt, U., Flynn, M., Lang, K., Austin, A., Allen, K., Brady, G., …, & Serpell, L. (2020). The FREED-Up study (First Episode Rapid Early Intervention for Eating Disorders - Upscaled): Final evaluation report.

Schmidt, U., Magill, N., Renwick, B., Keyes, A., Kenyon, M., DeJong, H., … Landau, S. (2015). The Maudsley Outpatient Study of Treatments for Anorexia Nervosa and Related Conditions (MOSAIC): Comparison of the Maudsley Model of Anorexia Nervosa Treatment for Adults (MANTRA) with specialist supportive clinical management (SSCM) in outpatients with . *Journal of Consulting and Clinical Psychology, 83*(4), 796-807. https://doi.org/10.1037/ccp0000019

Silén, Y., Sipilä, P. N., Raevuori, A., Mustelin, L., Marttunen, M., Kaprio, J., & Keski-Rahkonen, A. (2020). DSM-5 eating disorders among adolescents and young adults in Finland: A public health concern. *International Journal of Eating Disorders, 53*(5), 520-531. https://doi.org/10.1002/eat.23236

Steinglass, J. E., & Walsh, B. T. (2016). Neurobiological model of the persistence of anorexia nervosa. *Journal of Eating Disorders, 4*(19). https://doi.org/10.1186/s40337-016-0106-2

Treasure, J., Duarte, T. A., & Schmidt, U. (2020). Eating disorders. *The Lancet, 395*(10227), 899-911. https://doi.org/10.1016/S0140-6736(20)30059-3

Treasure, J., Stein, D., & Maguire, S. (2015). Has the time come for a staging model to map the course of eating disorders from high risk to severe enduring illness? An examination of the evidence. *Early Intervention in Psychiatry, 9*(3), 173-184. https://doi.org/10.1111/eip.12170

Table 1. Demographic and baseline characteristics.

	FREED (*n*=278)	**TAU (*n*=224)**	***t*-test or *z*-test**
Age (M ± SD)	20.19 ± 2.39	20.28 ± 2.43	-0.41, p = 0.68
Sex (F:M)	259:19	216:8	1.6, p = 0.11
Diagnosis			
AN (n, %)	117 (42.1)	116 (51.8)	2.23, p < 0.05
BMI (kg/m^2; M ± SD)	16.62 ± 1.27	16.18 ± 1.37	-1.30, p = 0.20
BN (n, %)	71 (25.9)	59 (26.3)	0.1, p = 0.91
BMI (kg/m^2; M ± SD)	23.71 ± 4.60	22.78 ± 3.89	-1.25, p = 0.21
BED (n, %)	3 (1.1)	6 (2.7)	1.34, p = 0.18
BMI (kg/m^2; M ± SD)	28.27 ± 8.34	27.12 ± 3.58	0.19, p = 0.87
OSFED (n, %)	86 (30.9)	43 (19.2)	2.99, p < 0.05
BMI (kg/m^2; M ± SD)	21.52 ± 3.21	22.04 ± 3.48	-0.02, p = 0.99
Ethnicity (n, %)			
White	181 (65.1)	174 (77.7)	3.08, p < 0.05
Asian	27 (9.7)	21 (9.4)	0.14, p = 0.99
Black	11 (4.0)	5 (2.2)	1.10, p = 0.27
Mixed	20 (7.2)	7 (3.1)	2.01, p < 0.05
Other/Unknown	39 (14.1)	17 (7.6)	2.29, p < 0.05
Occupation (n, %) [a]			
School	18 (6.5)	-	
University/College	156 (56.1)	-	
Employed	72 (25.9)	-	
Unemployed	25 (9.0)	-	

a - Occupation data unavailable for TAU

Table 2. Linear mixed model of psychological outcomes in the FREED cohort, with contrasts between timepoints.

	T1-T2		**T2-T3**		**T3-T4**		**T1-T4**	
	Mean Difference	**SE p**	**Mean Difference**	SE P	**Mean Difference**	SE P	**Mean Difference**	SE P
EDE-Q	-0.92, 95% CI (-1.07, -0.78)	0.074 <0.001	-0.34, 95% CI (-0.50, -0.18)	0.080 <0.001	-0.49, 95% CI (-0.66, -0.32)	0.11 <0.001	-1.75, 95% CI (-1.97, -1.54)	0.11 <0.001
CORE-10	-2.59, 95% CI (-3.42, -1.77)	0.42 <0.001	-2.49, 95% CI (-3.39, -1.58)	0.46 <0.001	-0.94, 95% CI (-1.8, 0.02)	0.49 0.054	-6.02, 95% CI (-7.08, -4.95)	0.54 <0.001
CIA	-5.25, 95% CI (-6.59, -3.90)	0.67 <0.001	-3.85, 95% CI (-5.31, -2.38)	0.75 <0.001	-4.26, 95% CI (-5.82, -2.69)	0.80 <0.001	-13.35, 95% CI (-15.31, -11.38)	1.00 <0.001
DASS	-5.06, 95% CI (-6.54, -3.57)	0.76 <0.001	-3.54, 95% CI (-5.16, -1.92)	0.83 <0.001	-3.10, 95% CI (-4.82, -1.38)	0.88 <0.001	-11.70, 95% CI (-13.77, -9.62)	1.05 <0.001
WSAS	-3.14, 95% CI (-4.19, -2.09)	0.54 <0.001	-2.94, 95% CI (-4.09, -1.79)	0.58 <0.001	-2.07, 95% CI (-3.29, -0.86)	0.62 0.001	-8.15, 95% CI (-9.67, -6.62)	0.77 <0.001

	T1-T2		**T2-T3**		**T3-T4**		**T1-T4**	
	Mean Difference	**SE p**	**Mean Difference**	**SE** P	**Mean Difference**	**SE** P	**Mean Difference**	**SE** P
LEE	-2.38, 95% CI (-3.65, -1.11)	0.65 <0.001	-0.77, 95% CI (-2.16, 0.63)	0.71 0.28	-0.87, 95% CI (-2.34, 0.61)	0.75 0.25	-4.02, 95% CI (-5.64, -2.39)	0.82 <0.001
Psychlops	-3.79, 95% CI (-4.35, -3.24)	0.28 <0.001	-1.42, 95% CI (-2.03, -0.81)	0.31 <0.001	-1.71, 95% CI (-2.35, -1.07)	0.33 <0.001	-6.92, 95% CI (-7.67, -6.17)	0.38 <0.001

Table 3. Linear mixed model of symptoms in the FREED cohort (BN/BED/OSFED), with contrasts between timepoints.

	T1-T2		**T2-T3**		**T3-T4**		**T1-T4**	
	Mean Difference	**SE p**	**Mean Difference**	**SE** P	**Mean Difference**	**SE** P	**Mean Difference**	**SE** P
Binge	-5.53, 95% CI (-7.28, -3.79)	0.88 <0.001	-0.19, 95% CI (-1.72, 2.10)	0.97 0.84	-2.56, 95% CI (-4.58, -0.55)	1.02 0.013	-8.29, 95% CI (-10.09, -6.48)	0.92 <0.001
Vomit	-6.51, 95% CI (-8.42, -4.61)	0.97 <0.001	-0.76, 95% CI (-2.84, 1.31)	1.05 0.47	-2.86, 95% CI (-5.14, -0.58)	1.16 0.014	-10.13, 95% CI (-13.23, -7.03)	1.58 <0.001
Laxatives	-5.66, 95% CI (-8.50, -2.82)	1.42 <0.001	-1.05, 95% CI (-4.16, 2.06)	1.56 0.50	-2.55, 95% CI (-5.80, -0.70)	1.00 0.12	-9.26, 95% CI (-12.40, -6.12)	1.56 <0.001
Excessive exercise	-6.10, 95% CI (-7.56, -4.64)	0.74 <0.001	-2.22, 95% CI (-3.82, -0.62)	0.81 0.007	-0.63, 95% CI (-2.38, 1,13)	0.89 0.48	-8.95, 95% CI (-11.04, -6.86)	1.06 <0.001

Figure 1. Estimated means and 95% confidence intervals for EDE-Q scores from start of treatment (0 months) to final follow up (12 months) for FREED patients (n=278, n=175).

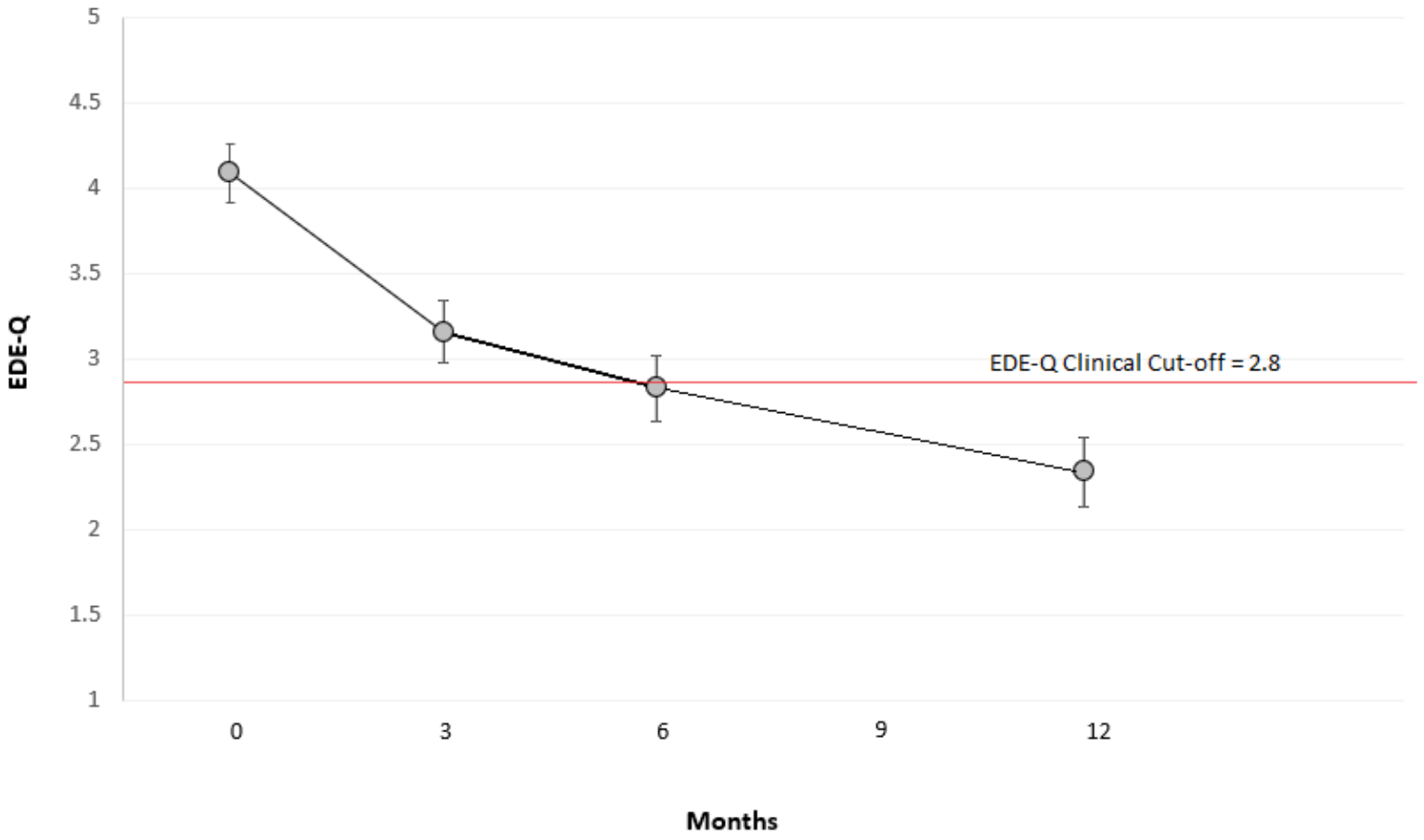

Figure 2. Estimated means and 95% confidence intervals for BMI from start of treatment (0 months) to final follow up (12 months) for FREED (n=117, n=79) and TAU (n=78, n=28) patients with AN.