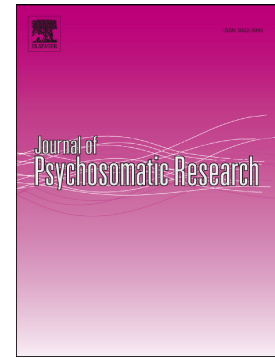


## Accepted Manuscript

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PII: S0022-3999(17)31173-X  
DOI: doi:[10.1016/j.jpsychores.2018.02.015](https://doi.org/10.1016/j.jpsychores.2018.02.015)  
Reference: PSR 9493

To appear in: *Journal of Psychosomatic Research*

Received date: 28 November 2017  
Revised date: 26 February 2018  
Accepted date: 26 February 2018

Please cite this article as: B.F. Dear, V.J. Fogliati, R. Fogliati, M. Gandy, S. McDonald, N. Talley, G. Holtmann, N. Titov, M. Jones , Transdiagnostic internet-delivered cognitive-behaviour therapy (CBT) for adults with functional gastrointestinal disorders (FGID): A feasibility open trial. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Psr*(2017), doi:[10.1016/j.jpsychores.2018.02.015](https://doi.org/10.1016/j.jpsychores.2018.02.015)

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Transdiagnostic internet-delivered cognitive-behaviour therapy (CBT) for adults with functional gastrointestinal disorders (FGID): A feasibility open trial

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**ABSTRACT**

Many people with functional gastrointestinal disorders (FGIDs) face significant barriers in accessing psychological treatments that are known to reduce symptoms and their psychological sequelae. This study examined the feasibility and initial outcomes of a transdiagnostic and internet-delivered cognitive behaviour therapy (iCBT) intervention, the *Chronic Conditions Course*, for adults with functional gastrointestinal disorders (FGIDs). A single-group feasibility open trial design was employed and administered to twenty seven participants. The course ran for 8 weeks and was provided with weekly contact from a Clinical Psychologist. Seventy percent of participants completed the course within the 8 weeks and 81.5% provided data at post-treatment. High levels of satisfaction were observed and relatively little clinician time ( $M = 42.70$  minutes per participant;  $SD = 46.25$  minutes) was required. Evidence of clinical improvements in FGID symptoms ( $ds \geq 0.46$ ; avg. improvement  $\geq 21\%$ ), anxiety symptoms ( $ds \geq 0.99$ ; avg. improvement  $\geq 42\%$ ), and depression symptoms ( $ds \geq 0.75$ ; avg. improvement  $\geq 35\%$ ) were observed, which either maintained or continued to improve to 3-month follow-up. Evidence of improvement was also observed in pain catastrophising and mental-health related quality of life, but not physical-health related quality of life. These findings highlight the potential value of transdiagnostic internet-delivered programs for adults with FGIDs and support for the conduct of larger-scale controlled studies.

## 1. INTRODUCTION

Functional gastrointestinal disorders (FGIDs) are characterised by gastrointestinal symptoms such as pain, discomfort, bloating or altered bowel habit that are not explained by identifiable biochemical or structural abnormalities that are identified in the routine clinical settings (Jones et al, 2007). Common FGIDs include irritable bowel syndrome (IBS), functional constipation, and functional dyspepsia. FGIDs are prevalent, with community estimates of prevalence of between 10 to 20% commonly reported (Drossman et al., 1993). FGIDs are associated with significant personal, societal, and economic cost. These include higher rates of work absenteeism and health care use (Drossman et al., 1993), significantly lower quality of life (Halder et al., 2004; Koloski, et al., 2000), lower social functioning (Halder et al., 2004), and higher rates of psychological disorders such as depression and anxiety (Halder et al., 2004; Locke III, et al., 2004). Current models of FGID pathology suggest that there is a bi-directional association between FGIDs and poorer psychological wellbeing (Jones et al., 2007; Mayer, et al., 2001). This bidirectional relationship highlights the potential role of psychological treatments.

A range of psychological treatments have demonstrated efficacy in reducing the physical symptoms and psychological sequelae of FGIDs (Palsson & Whitehead, 2013), especially those based on the principles of cognitive behaviour therapy (CBT) (Drossman et al., 2003; Lackner et al., 2004; Li et al, 2014). However, there are numerous barriers to psychological treatment for people with FGIDs, including the costs, stigma, distance from specialist services and a lack of availability of trained health practitioners (Hunt et al., 2009; Lackner et al., 2008; Palsson & Whitehead, 2013). One strategy for increasing access to CBT for FGIDs is the delivery of CBT treatment via the internet (iCBT) (Knowles et al., 2014; Beaty et al., 2013). For example, Hunt and colleagues (2009) developed an iCBT treatment that led to reduced IBS symptoms and

improved quality of life, with outcomes being maintained for up to 3 months after treatment. Ljótsson and colleagues have since demonstrated the significant potential of iCBT for IBS in a concerted series of studies. These studies demonstrated that an iCBT program with mindfulness components helped reduce IBS symptoms, anxiety and depression, and increased quality of life (Ljótsson et al., 2010) and compared favourably to a stress-management treatment (Ljótsson et al., 2011a). Furthermore, these improvements were maintained at up to 18 months post treatment (Ljótsson et al., 2011b), and the treatment was shown to be cost-effective compared to treatment-as-usual, requiring only 165 minutes of clinician time per patient over the course of treatment (Ljótsson et al., 2011c). This work has now been replicated in adolescents with FGIDs with similarly encouraging outcomes (Bonnert et al., 2017; Labouni et al., 2017).

One important feature of the available iCBT literature is that it employed treatments specifically designed for patients with FGIDs, particularly IBS. Consequently, it is unclear whether the methodology associated with transdiagnostic treatment approaches, which have been demonstrated as effective for treating anxiety and depression (Newby et al., 2015; Norton et al., 2016; Mansell et al., 2009), might have potential for adults with FGIDs. Transdiagnostic iCBT treatments are carefully designed to provide therapeutic information and teach psychological skills that are suitable for a broad range of psychological disorders and difficulties, rather than one specific disorder or difficulty. Potential advantages of transdiagnostic approaches include their utility in patients groups with comorbidity and the greater ease with which they can be disseminated relative to treatments that target one disorder (McHugh et al., 2009). While most of the published literature concerns transdiagnostic treatment approaches for anxiety and depression in physically healthy populations, several preliminary trials have explored the potential of transdiagnostic iCBT for improving symptoms in adults with physical health conditions, including various pain conditions (Dear et al., 2015; Dear et al., 2017;

Friesen et al., 2017), chronic kidney disease (Chan et al., 2016), recent cancer (Alberts et al., 2017) and epilepsy (Gandy et al., 2016). For example, one recent feasibility trial (n = 27) examined the potential of a transdiagnostic iCBT intervention, the Chronic Conditions Course, at reducing a range of symptoms in adults with epilepsy (Gandy et al., 2016). This study found very high levels of engagement and acceptability, and evidence of clinically significant changes in depression, anxiety and disability. Importantly, the iCBT intervention was not specifically designed for adults with epilepsy and did not focus on one particular mental health disorder, such as depression; instead it was designed for adults with a broad range of chronic health conditions and mental health difficulties. These findings indicate the potential of transdiagnostic iCBT for adults with chronic physical health conditions, including adults with FGIDs.

The present study aimed to examine the feasibility of a transdiagnostic iCBT intervention, the Chronic Conditions Course, for adults with FGIDs. This course teaches core cognitive and behavioural skills for assisting adults with chronic health conditions to manage their mental health and functional abilities. The course comprises five core lessons delivered over 8 weeks and is provided with brief weekly contact from a clinical psychologist, which is provided via e-mail and telephone. The current study employed a single-group open-trial design to gain preliminary data about the feasibility, acceptability, and efficacy of the course to inform future randomised controlled trials. It was hypothesized that: (1) participants would rate the intervention as acceptable; (2) improvements on the primary outcomes of gastrointestinal symptoms, anxiety and depression would be observed at post-treatment and 3-month follow-up; and (3) evidence of improvements on the secondary outcomes of pain catastrophising and functional disability would also be observed.

## 2. METHOD

### 2.1 Participants

Participants read about the trial and applied to participate via the eCentreClinic website ([www.ecentreclinic.org](http://www.ecentreclinic.org)). The eCentreClinic is a specialist research unit that provides information about common mental health and chronic health conditions and offers free psychological interventions via participation in clinical trials. The eCentreClinic website can be located via online searches and is promoted by various health professionals and websites within Australia. The present trial was also promoted via Facebook.

The trial was approved by the Macquarie University Human Research Ethics Committee and was registered on the Australian and New Zealand Clinical Trials Registry: ACTRN12615001020572. Inclusion criteria were: (a) Having experienced FGID symptoms for longer than 6 months; (b) having consulted with a GP or specialist about FGID symptoms and being diagnosed with a FGID; (c) Self-reported difficulties with anxiety and depression; (d) being 18 years or older; and (e) living in Australia at the time of the trial. Exclusion criteria were: (a) reporting very severe symptoms of depression (total PHQ-9 score  $\geq 23$ ) or suicidal ideation (a score of 3 on question 9 of the PHQ-9); (b) recent history (within the last 12 months) of attempted suicide or self-harm; and (c) a diagnosis of a non-functional bowel disease (e.g. Crohn's disease, ulcerative colitis, gastrointestinal cancer). Interested participants completed an online screening questionnaire to ensure they met the inclusion and exclusion criteria, which were then subsequently confirmed in a telephone assessment.

A total of 54 people started an online application to participate in the trial. Of these, 28 met all of the inclusion and exclusion criteria upon telephone assessment, and were allocated to the study. Participant flow throughout the study is shown in Figure 1. Participant characteristics are shown in Table 1.

## ***2.2 Measures***

The primary and secondary endpoints of the trial were immediately post-treatment and 3-months post-treatment, respectively. The acceptability and satisfaction questions were administered at post-treatment only. All primary and secondary outcome measures were administered online at pre-treatment, post-treatment and 3-month follow-up. The primary outcomes were also administered at mid-treatment. The pre-treatment measures were administered immediately prior to the start of the Course and the post-treatment measures were completed following the completion of the 8-week Course. The measures of anxiety and depression symptoms were also administered weekly during the course in order to monitor patient symptoms and safety. All questionnaires were administered online. To maximise questionnaire completion, up to 5 emails were sent encouraging participants to complete post-treatment and 3-month follow-up questionnaires. Non-responding participants were also followed-up with up to 3 telephone calls.

### ***2.2.1 Primary Outcomes***

*Gastrointestinal Symptoms Rating Scale (GSRS; Svedlund, Sjödin, & Dotevall, 1988)*

The GSRS is a 15-item scale assessing common symptoms of gastrointestinal disorders, covering: abdominal pain, acid reflux, constipation, diarrhoea and indigestion. Higher scores indicate greater severity of symptoms. The GSRS has been used across multiple studies



investigating various gastrointestinal disorders and has been found to have acceptable reliability and validity (Kulich et al., 2008). Cronbach's alpha in the current study was .75.

*Patient Health Questionnaire-9 Item (PHQ-9; Kroenke, Spitzer, & Williams, 2001)*

The PHQ-9 is a 9-item measure of symptoms of depression over the past two weeks based on the DSM-IV diagnostic criteria for major depressive disorder. The PHQ-9 has good internal consistency and is sensitive to change (Kroenke, Spitzer, & Williams, 2001; Titov et al., 2011). Cronbach's  $\alpha$  in the current study was .83.

*Generalized Anxiety Disorder 7-Item (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006)*

The GAD-7 is a 7-item scale measuring the occurrence of general anxiety symptoms over the past two weeks. The GAD-7 is sensitive to DSM-IV-congruent GAD, social phobia, and panic disorder, and has good psychometric properties (Dear et al., 2011; Lowe et al., 2008). Cronbach's alpha in the current study was .88.

*2.2.1 Secondary Outcomes*

*Pain Catastrophising Scale (PCS; Sullivan, Bishop, & Pivik, 1995).*

The PCS is a 13-item scale measuring the degree of cognitive catastrophising about pain. Higher PCS scores are associated with greater pain and distress in relation to pain experiences (Sullivan et al., 1995). Cronbach's alpha in the current study was .94.

*Short Form 12 v2 (SF-12; Ware, Kosinski, & Keller, 1996)*

The SF-12 is a 12-item measure that assesses physical (SF-12-PCS) and mental (SF-12-MCS) related quality of life. The SF-12 has demonstrated good reliability and validity generally (Ware et al., 1996).

### *Treatment Satisfaction*

Treatment satisfaction and acceptability were assessed at post-treatment via 7 questions: (1) 'Overall, how satisfied were you with the Course?'; (2) 'How satisfied were you with the quality of the materials?'; (3) 'Would you feel confident in recommending this Course to a friend?'; (4) 'Was it worth your time doing the Course?'; (5) 'How has participating in this Course affected your confidence that you can manage day-to-day activities, despite FGID symptoms?'; (6) 'How has participating in this Course affected your confidence that you can manage symptoms of stress and anxiety?'; and (7) 'How has participating in this Course affected your confidence that you can manage symptoms of low mood and depression?'. Participants responded to the first two questions using a 5-point Likert scale, which ranged from 'Very Satisfied' to 'Very Dissatisfied', and the second two questions with a 'Yes' or 'No' response, and the last three questions with a 5-point Likert scale, 'Greatly increased' to 'Greatly reduced', with an option to indicate they never had difficulties managing that area. These questions have

been used in numerous previous research trials examining the acceptability of other internet-delivered treatments (e.g., Dear et al., 2015; Chan et al., 2016; Alberts et al., 2017; Gandy et al., 2016).

### ***2.3 Treatment and procedure***

The Chronic Conditions Course is a new Internet-delivered intervention based on the principles of CBT and on validated transdiagnostic programs for adults with chronic pain (Dear et al., 2015; Dear et al., 2017; Friesen et al., 2017). Several clinical trials using the course are ongoing and one feasibility trial has recently been published examining the course for adults with epilepsy (Gandy et al., 2016). The course is based on a pragmatic model of psychological intervention that aims to: (1) provide information that helps people to understand and deconstruct their symptoms and difficulties; (2) teach a range of simple CBT skills to help participants manage a range of symptoms and difficulties; and (3) reduce the impact of their condition on their day-to-day activities and mental health by the gradual practice and integration of the skills taught into peoples' routines. Being based on the principles of transdiagnostic intervention, the course is designed to provide therapeutic information and teaches cognitive and behavioural self-management skills suitable for people with a broad range of chronic health conditions; rather than for people with FGIDs, specifically. The Chronic Conditions Course is being systematically developed and evaluated as a part of a broader program of research, which aims to increase access to psychological treatment for adults with chronic physical health conditions. It is notable that there is no tailoring of content or materials for individual participants; all participants receive the same materials.

An overview of the structure, content, and skills taught within the Course is provided in Table 2. The Course consists of five online lessons and five downloadable PDF lesson summaries, which provide homework assignments to help participants learn the core skills. Each lesson is presented in the form of a slide show, comprising approximately 70 slides and each slide containing 100 to 200 words. Each lesson takes approximately 10 to 20 minutes to read, and is designed to be easily read by someone with reading proficiency equivalent to a 12 year old. The lesson materials are presented in a didactic format with images and diagrams, and include realistic examples of skills practice and symptom management throughout, which are designed to aid learning. Each lesson begins with a summary of the previous lesson, and ends with a summary of key concepts and skills introduced in the lesson. Each downloadable lesson summary is between 8 to 12 pages long, comprising 200 to 400 words per page alongside images and diagrams.

Participants are strongly encouraged to practice the course skills on a daily basis and to gradually adopt them into their everyday lives. Additional resources are provided to introduce topics and skills that are relevant for many participants, including materials on managing sleep, working with health professionals and managing chronic health conditions, problem solving, and assertive communication. Case stories are provided that describe how people with a range of different chronic health conditions, including people with FGIDs, apply the course information and skills. In the current trial the course was supplemented with a basic 4-page (approximately 1,200 words) FGID-specific resource, which included information about the different types of FGID, their prevalence, treatments, the 'brain-gut' connection, and the importance of people with FGID learning to manage their emotional wellbeing.

Participants were also sent regular automated emails throughout the course. Some emails were triggered based on participant behaviour. Some emails were triggered when participants completed a lesson and some when participants had not completed a lesson within 7 days of it becoming available. Emails were also triggered to let participants know when new materials were available and some were sent at set times when participants are known to experience difficulties (e.g., during the early weeks of the course and again towards the end when activity pacing and graded exposure are introduced). Each email was brief and was comprised of 2 to 3 paragraphs containing 3 or 4 concise sentences. Each email used the participant's first name and was written to convey a warm and supportive tone.

#### ***2.4 Clinician Support***

The course was offered with brief weekly support from a clinical psychologist (VJF), which was provided via telephone and a secure messaging system. Clinical contact was primarily used to encourage and support participants to work through the course and to apply the skills in the context of their symptoms and circumstances. The clinician was instructed to: (i) answer participants' questions; (ii) summarise content; (iii) encourage skills practice and reinforce progress; (iv) enquire about participants' experiences with the course and use of the skills; and (v) normalise challenges in the learning and use of the core skills. The clinician aimed to limit contact to approximately 10 to 15 minutes per participant per week.

#### ***2.5 Analytic Plan***

All analyses were conducted using SPSS version 21. Binary logistic regressions were employed to examine for baseline differences between participants completing and not completing post-treatment questionnaires. Consistent with other trials and recommendations (Hubbarb et al., 2010), generalised estimating equations (GEE) were employed to examine changes in outcome measures from pre-treatment to post-treatment and from pre-treatment to the 3-month follow-up period. GEE emphasizes the modelling of change in an average group effect over time, while accounting for within-subject variance with the specification of a working correlation structure. GEE analyses provide model coefficients that represent multiplicative change in the dependent variable and these coefficients form a change factor (i.e.,  $\exp(\beta)$ ), which can be used to calculate the average percentage change from baseline to any time point for each group. An unstructured working correlation structure was selected, coupled with a robust error estimation, for all GEE analyses. All GEE models also specified a gamma distribution with a log link response scale to address skewness in the dependent variable distributions. Average percentage change across time was calculated from the GEE analyses for each of the outcome variables with 95% confidence intervals. Cohen's *d* effect sizes and 95% confidence intervals were also calculated for within-group effects based on the estimated marginal means derived from the GEE models. **The alpha significance level was set at 0.05, and no adjustment was made for multiple statistical comparisons.**

Consistent with intention-to-treat principles, missing values at post-treatment and 3-month follow-up were imputed by carrying forward a participant's last observed score (i.e., the LOCF approach) on the given outcome measure. Two additional approaches for handling missing data were also employed as a part of a sensitivity analysis to examine whether the approach for handling missing data affected the findings. In one of these approaches, the most conservative approach, missing data was handled by carrying forward the participant's data from baseline (i.e., the

BOCF approach). In the other approach, consistent with expert recommendations (Little and Rubin, 2014), adjusted longitudinal GEE models were used to impute the data of missing cases (i.e., the Modelled Outcomes approach). These adjusted GEE models accounted for participants' symptom levels at baseline as well as the number of treatment modules completed; both of which have been identified as important nonignorable missing data mechanisms in similar trials (e.g., Dear et al., 2015).

### **3. RESULTS**

#### ***3.1 Adherence and Attrition***

At post-treatment, 19 participants (70.4%) had read all five lessons, two (7.4%) four lessons only, one (3.7%) three lessons only, two (7.4%) two lessons only, and three (11.1%) one lesson only. Twenty participants (70%) provided mid-treatment data, 22 (81.5%) participants provided post-treatment data and 21 (77.8%) provided 3-month follow-up data. Participants who did not complete questionnaires at post-treatment were more likely not to have received a FGID diagnosis (Wald's  $\chi^2 = 6.38, = .012$ ). However, no other baseline differences were found between those who did and did not complete post-treatment questionnaires, and caution is needed given the small sample size.

#### ***3.2 Treatment Acceptability and Satisfaction***

Of the participants completing the post-treatment questionnaires, 17 (77.3%) reported being 'very satisfied' with the course, three (13.6%) were 'mostly satisfied', and two (9.1%) were 'neutral'. No participants reported being dissatisfied. Twenty-one (95.5%) reported that the course was worth their time and 22 (100%) reported that they would recommend the course.

Eighteen participants (81.8%) reported an 'increased' or 'greatly increased' ability to manage FGID symptoms, and four participants (18.2%) reported 'no change'. Twenty participants (90.9%) reported an 'increased' or 'greatly increased' ability to manage depression symptoms, one (4.5%) reported 'no change', and one (4.5%) reported not having prior difficulties with depression. Twenty participants (90.9%) reported an 'increased' or 'greatly increased' ability to manage anxiety symptoms and two participants (9.1%) reported no change. No participants reported that the course reduced their ability to manage any of these symptoms.

### ***3.3 Time Spent and Summary of Contacts***

Over the eight weeks of the course, the clinical psychologist made an average of 8.44 telephone calls ( $SD = 3.45$ ), and spent an average of 42.70 mins ( $SD = 46.25$ ; median = 27) in total per participant. The psychologist also sent an average of 7.15 ( $SD = 2.63$ ) manual emails, taking an average of 18.93 mins ( $SD = 16.09$ ) per participant.

### ***3.4 Primary and Secondary Outcomes***



See Table 3 for estimated marginal means and standard deviations of outcome measures. GEE models showed significant time effects for FGID symptoms (GSRS; Wald's  $\chi^2 = 41.61$ ,  $p < .001$ ), depression (PHQ-9; Wald's  $\chi^2 = 31.42$ ,  $p < .001$ ) and anxiety (GAD-7; Wald's  $\chi^2 = 45.40$ ,  $p < .001$ ). Pairwise comparisons revealed significantly lower symptoms scores across the outcome domains at post-treatment compared to pre-treatment ( $ps \leq .002$ ). Anxiety and depression scores were maintained between post-treatment and 3-month follow-up ( $ps \geq .163$ ), but FGID symptoms improved further to 3-month follow-up ( $p = .010$ ).

GEE models showed significant time effects for pain catastrophising (PCS; Wald's  $\chi^2 = 38.79$ ,  $p < .001$ ) and mental health-related quality of life (SF-12-MCS; Wald's  $\chi^2 = 22.54$ ,  $p < .001$ ). GEE models showed a marginally significant effect for physical health-related quality of life (SF-12-PCS; Wald's  $\chi^2 = 7.81$ ,  $p = .050$ ). Pairwise comparisons revealed significant improvements in pain catastrophising and mental health-related quality of life at post-treatment compared to pre-treatment ( $ps < .001$ ), but not the physical health-related component of quality of life ( $p = .936$ ). The physical health-related component of quality of life improved marginally between post-treatment and 3-month follow-up, but failed to reach statistical significance ( $p = .057$ ). Pain catastrophising and the mental health-related component of quality of life remained stable between post-treatment and 3-month follow-up ( $p \geq .136$ ).

### ***3.5 Sensitivity Analysis Using Other Methods for Handling Missing Data.***

The sensitivity analysis employing the same GEE models using the two other approaches for handling missing data revealed the same overall patterns (see Table 4). Specifically, using the BOCF approach, significant time effects were found for FGID symptoms (GSRS; Wald's

$\chi^2 = 39.62, p < .001$ ), depression (PHQ-9; Wald's  $\chi^2 = 26.68, p < .001$ ), anxiety (GAD-7; Wald's  $\chi^2 = 38.41, p < .001$ ), pain catastrophising (PCS; Wald's  $\chi^2 = 32.27, p < .001$ ) and mental health-related quality of life (SF-12-MCS; Wald's  $\chi^2 = 24.42, p < .001$ ), with a marginally significant effect for physical health-related quality of life (SF-12-PCS; Wald's  $\chi^2 = 7.78, p = .051$ ). Similarly, using the Modelled Outcomes approach, significant time effects were found for FGID symptoms (GSRs; Wald's  $\chi^2 = 57.47, p < .001$ ), depression (PHQ-9; Wald's  $\chi^2 = 50.71, p < .001$ ), anxiety (GAD-7; Wald's  $\chi^2 = 127.75, p < .001$ ), pain catastrophising (PCS; Wald's  $\chi^2 = 30.71, p < .001$ ) and mental health-related quality of life (SF-12-MCS; Wald's  $\chi^2 = 43.18, p < .001$ ). However, with this approach there was also statistically significant time effects for physical health-related quality of life (SF-12-PCS; Wald's  $\chi^2 = 24.34, p < .001$ ). Thus, the approach to handling missing data did not significantly affect the overall pattern of findings.

#### 4. DISCUSSION

The present study explored the feasibility and preliminary efficacy of a new transdiagnostic iCBT course designed for a broad range of chronic physical health conditions. It was hypothesized that participants would find the course acceptable and that improvements in FGID, anxiety and depressive symptoms would be observed. These hypotheses were largely supported. The course was acceptable with high treatment completion rates and levels of satisfaction. These results were obtained with relatively little clinician time ( $M = 42.70$  minutes per participant;  $SD = 46.25$ ). Clinically significant improvements in FGID symptoms ( $ds \geq 0.46$ ; avg. improvement  $\geq 21\%$ ), anxiety symptoms ( $ds \geq 0.99$ ; avg. improvement  $\geq 42\%$ ), and depression symptoms ( $ds \geq 0.75$ ; avg. improvement  $\geq 35\%$ ) were observed at post-treatment, with FGID symptoms

further improving to 3-month follow-up ( $ds \geq 1.01$ ; avg. improvement  $\geq 38\%$ ). Clinically significant improvements were also observed in pain catastrophising ( $ds \geq 0.80$ ; avg. improvement  $\geq 49\%$ ) and mental-health related quality of life ( $ds \geq -0.75$ ; avg. improvement  $\geq -22\%$ ), but not physical health related quality of life.

Detailed comparison of outcomes with existing studies is complicated by the small number of studies conducted to date, and the different outcomes employed across studies. However, the findings of the current trial are encouraging and compare favourably with the outcomes of previous trials of face-to-face CBT (Palsson et al., 2013) and iCBT for FGIDs (e.g., Ljotsson et al., 2010; Ljotsson et al., 2011a; Ljotsson et al., 2011c). The findings of the current study are interesting in light of the fact that the course materials were focussed broadly on managing emotional wellbeing and physical functioning in the face of a comprehensive range chronic physical health conditions (chronic pain, diabetes, kidney disease, multiple sclerosis, epilepsy, cancer, FGIDs, etc). This is encouraging given the potential of transdiagnostic treatments, especially delivered via the internet, for improving access to care. The value of having treatment programs that are suitable for a broad range of patients with different physical health and mental health conditions is significant, particularly given the prevalence of physical and mental multimorbidity (Read et al., 2017).

The current findings are broadly consistent with the existing literature of transdiagnostic iCBT for anxiety and depression in physically healthy populations (Newby et al., 2015). Within the anxiety and depression literature, large trials have compared traditional disorder-specific approaches with newer transdiagnostic approaches (Newby et al., 2015; Dear et al., 2016; Fogliati et al., 2016; Dear et al., 2015; Titov et al., 2015). Early evidence suggests that both approaches to treatment may be similarly acceptable and effective for anxiety and depression, but that

the transdiagnostic approach may confer pragmatic advantages. These advantages include reducing the need for clinicians to be trained in multiple treatment protocols by having one treatment that meets the varied needs of a large portion of patients (e.g., McHugh et al., 2009). Comparatively few trials have examined transdiagnostic iCBT for adults with chronic health conditions, with most trials focussing on specific chronic health conditions (Beaty et al., 2013). However, encouraging data from preliminary trials of transdiagnostic iCBT programs are emerging and the current study adds to this literature (Dear et al., 2015; Friesen et al., 2017; Chan et al., 2016; Alberts et al., 2017; Gandy et al., 2016). Randomised controlled trials with larger sample sizes are now needed, particularly starting to examine the potential of transdiagnostic iCBT for more diverse clinical populations.

It is important to note that no major difficulties were encountered in the current study that would need to be addressed before conducting a larger randomised controlled trials. One reason for the absence of major difficulties is likely that the treatment program was heavily informed by previous research ( $n > 1500$ ) examining transdiagnostic programs for chronic pain (Dear et al., 2015; Dear et al., 2017; Friesen et al., 2017) and other chronic health conditions (Chan et al., 2016; Gandy et al., 2016; Alberts et al., 2017). The intervention also included a brief resource providing basic background information on FGIDs based on experience in previous research (e.g., Chan et al., 2016; Gandy et al., 2016), which may have increased credibility and engagement for participants with FGIDs.

There are a number of important limitations that should be considered alongside the results of the current trial. Firstly, the absence of a control group means that it is not possible to determine the effects of treatment beyond that of spontaneous remission. Second, the current study employed only one self-report measure of gastrointestinal symptoms and did not include a detailed symptom diary as have some previous studies

(e.g., Ljotsson et al., 2010). Third, the current treatment program was supplemented with a very brief FGID-specific resource that meant it was not entirely transdiagnostic. Fourth, while the majority of patients had seen a GP or medical specialist and been diagnosed with an FGID, confirmation of these diagnoses was not required and some participants (25%) had not received a firm diagnosis at the time of participation. Fifth, as with other trials of iCBT for FGIDs, a large proportion of the sample was comprised of participants with IBS rather than some of the other common FGIDs. Sixth, the current study employed a treatment seeking sample who were interested in participating in a psychologically-based iCBT intervention. It is unclear whether similar levels of acceptability or clinical outcomes would be obtained if patients were referred into the program by their GP or gastroenterologist, although there is already some encouraging evidence to suggest that similar outcomes would be obtained (Ljotsson et al., 2011c). It would be beneficial for future research to examine iCBT as a routine referral pathway from gastroenterologists and general practitioners following FGID diagnosis. Seventh, this study did not collect data on health service use or workforce participation, which is important for understanding the economic value of such interventions. Eighth, the current study employed a relatively small sample. Ninth, despite multiple attempts at contact, no clear reasons for non-response or feedback about the course was obtained from participants who did not complete the questionnaires.

Despite its limitations, the current study has a number of strengths and extends the available literature. It is the first study to examine the potential of transdiagnostic iCBT for adults with FGIDs. The current study found high levels of satisfaction and evidence of good clinical outcomes, providing the necessary data to support larger scale trials of transdiagnostic iCBT for adults with FGIDs. The current study also provides a good preliminary test of transdiagnostic iCBT for FGIDs in that strict inclusion criteria were not employed and a heterogeneous group

of participants were recruited, which more closely reflects routine clinical service. The current study suggests that the transdiagnostic iCBT approach warrants further evaluation in large-scale clinical trials.

### **Conflicts of Interest**

B Dear and N Titov are authors and developers of the Chronic Conditions Course, but derive no personal or financial benefit from it. N Titov and B Dear are funded by the Australian Government to develop and provide a free national online assessment and treatment service, the MindSpot Clinic ([www.mindspot.org.au](http://www.mindspot.org.au)), for people with anxiety and depression.

### **Acknowledgements**

The authors gratefully acknowledge all of the participants for their involvement and helpful feedback throughout the research. The authors also gratefully acknowledge the reviewers for their helpful feedback on earlier versions of this manuscript. This research was enabled by funding from the National Health and Medical Research Council (NHMRC) to BFD via an Australian Public Health Fellowship.

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**Table 1.** Demographic and clinical characteristics of the sample

Variables	n	%
<b>Gender</b>		
Male	2	7.4%
Female	25	92.6%
<b>Age</b>		
Mean	41.26 (12.92)	
Range	23 to 74	
<b>Marital Status</b>		
Single/Never Married	4	14.8%
Married/ De Facto	17	63%
Separated/Divorced/Widowed	6	22.2%
<b>Education</b>		
High School or less	6	22.2%
Certificate/ Diploma / Other <sup>a</sup>	16	59.3%
University	5	15.5%
<b>Employment Status<sup>b</sup></b>		
Employed full-time	9	66.7%
Employed part-time	4	14.8%
Unemployed	2	7.4%
Disability pension	2	7.4%
Retired	3	11.1%
<b>FGID diagnosis<sup>b</sup></b>		
Irritable Bowel Syndrome	18	66.6%
Functional Dyspepsia	2	7%

Gastrointestinal Reflex Disease	1	3.7%
No clear diagnosis	7	25%
<b>Years with FGID Symptoms</b>		
Mean		13.55 (10.13)
<b>Health Professionals Seen regarding FGID symptoms</b>		
General Practitioner	10	37%
Gastroenterologist	17	63%
<b>Mental health treatment (previous 12 months)</b>		
Seen a mental health professional	14	51.9%
Taking medications for anxiety or depression	7	25.9%

*Note.* Standard deviations are shown in parentheses. All data were self-reported.

<sup>a</sup> These are qualifications obtained outside of high school in Australia but are less academically demanding than a university degree.

<sup>b</sup> Categories are not mutually exclusive; participants could select more than one to best describe their circumstances.

**Table 2.** Timetable and Content of the Chronic Conditions Course

Lesson	Time Before Next Lesson	Lesson Content	Primary Skill Taught	Additional Resources
1	1 week	Education about the prevalence of chronic health conditions and symptoms of anxiety and depression. Introduction of a CBT model and explanation of the functional relationship between physical, thought and behavioural symptoms. Instructions for identifying their own symptoms and how their symptoms interact.	<ul style="list-style-type: none"> <li>- Symptom identification</li> <li>- Symptom formulation</li> </ul>	<ul style="list-style-type: none"> <li>- About FGIDs <sup>a</sup></li> <li>- Managing chronic health conditions</li> <li>- Sleep management</li> <li>- What to do in a mental health emergency</li> </ul>
2	2 weeks	Introduction to the basic principles of cognitive therapy and importance of managing thoughts in the management of chronic health conditions but also anxiety and depression. Instructions for monitoring and challenging thoughts.	<ul style="list-style-type: none"> <li>- Thought monitoring</li> <li>- Thought challenging</li> </ul>	<ul style="list-style-type: none"> <li>- Structured problem solving and Worry Time</li> <li>- Challenging beliefs</li> </ul>
3	1 week	Introduction to the physical symptoms of depression (i.e., hypo-arousal) and anxiety (i.e. hyper-arousal) and their relationship to emotional wellbeing and managing the impact of symptoms of chronic health conditions. Instructions about controlling physical symptoms via scheduling pleasant activities and using de-arousal strategies such as controlled breathing.	<ul style="list-style-type: none"> <li>- Pleasant activity scheduling</li> <li>- Controlled relaxation</li> </ul>	<ul style="list-style-type: none"> <li>- Attention and physical symptoms</li> <li>- Acute and Chronic Pain</li> </ul>
4	2 weeks	Introduction to the behavioural symptoms of anxiety, depression and chronic health conditions. Explanation of the overdoing-underdoing cycle of activity levels and issues around the fear and the avoidance of social and physical activities. Instructions for pacing and gradually tackling avoidance.	<ul style="list-style-type: none"> <li>- Activity pacing</li> <li>- Graded exposure</li> </ul>	<ul style="list-style-type: none"> <li>- Assertive communication</li> </ul>
5	2 weeks	Information about the occurrence of lapses in depression, anxiety and chronic health-related symptoms. Information about the signs of relapse and the importance of goal-setting into the future. Instructions for creating a relapse prevention plan and goal-setting.	<ul style="list-style-type: none"> <li>- Relapse prevention</li> <li>- Goal setting</li> </ul>	—

<sup>a</sup> Trial-specific resource.



**Table 3** Means, standard deviations, percentage change and effect sizes.

	n	Estimated Marginal Means				Percentage Change from Pre-treatment <sup>a</sup>		Within Group Cohen's <i>d</i> Effect Sizes <sup>b</sup>	
		Pre-Treatment	Mid-Treatment	Post-Treatment	3-Month Follow-up	Post-treatment	3-Month Follow-up	Post-treatment	3-Month Follow-up
<b>PRIMARY OUTCOMES</b>									
FGID symptoms (GSRS) <sup>c</sup>	27	43.37 (10.61)	41.26 (11.88)	37.48 (14.71)	32.55 (10.61)	21% (0%, 39%)	38% (23%, 51%)	0.46 (-0.09, 0.99)	1.01 (0.44, 1.57)
Depression (PHQ-9)	27	10.07 (4.69)	8.26 (4.69)	6.55 (4.75)	5.85 (4.15)	35% (14%, 50%)	42% (24%, 56%)	0.75 (0.18, 1.29)	0.95 (0.38, 1.50)
Anxiety (GAD-7)	27	10.29 (4.90)	8.40 (4.72)	5.92 (3.83)	5.59 (3.34)	42% (27%, 55%)	46% (32%, 57%)	0.99 (0.41, 1.54)	1.10 (0.53, 1.68)
<b>SECONDARY OUTCOMES</b>									
Pain Catastrophizing (PCS)	27	19.37 (12.21)	14.96 (11.48)	9.92 (11.28)	7.55 (7.78)	49% (21%, 67%)	61% (42%, 74%)	0.80 (0.24, 1.35)	1.15 (0.56, 1.71)
Physical quality of life (SF12: PCS) <sup>d</sup>	27	42.27 (12.49)	43.35 (12.51)	42.39 (12.74)	45.00 (11.34)	0% (10%, -12%)	-6% (3%, -17%)	-0.01 (0.52, -0.54)	-0.23 (0.31, -0.76)
Mental quality of life (SF12: MCS) <sup>d</sup>	27	33.27 (8.70)	35.17 (9.21)	40.61 (10.74)	40.82 (9.13)	-22% (-10%, -35%)	-23% (-13%, -33%)	-0.75 (-0.19, -1.29)	-0.85 (-0.28, -1.39)

*Note.* Standard deviations are shown in parentheses for the means and 95% confidence intervals are shown in parentheses for effect size and percentage change statistics

<sup>a</sup> The percentage change from pre-treatment statistics are estimates of relative change derived from the GEE models conducted separately for each outcome.

<sup>b</sup> The within group Cohen's *d* effect sizes are estimated in comparison to pre-treatment.

<sup>c</sup> To accurately reflect percentage change, a constant of 15 was subtracted from GSRS scores when calculating percentage change scores.

<sup>d</sup> Negative percentage change estimates and Cohen's *d* effect sizes indicate positive improvement on this measure.

**Table 4** Means, standard deviations, percentage change and effect sizes using alternative approaches for handling missing data.

	n	Estimated Marginal Means				Percentage Change from Pre-treatment <sup>a</sup>		Within Group Cohen's <i>d</i> Effect Sizes <sup>b</sup>	
		Pre-Treatment	Mid-Treatment	Post-Treatment	3-Month Follow-up	Post-treatment	3-Month Follow-up	Post-treatment	3-Month Follow-up
Baseline Observation Carried Forward Approach (BOCF)									
<b>PRIMARY OUTCOMES</b>									
FGID symptoms (GSRS) <sup>c</sup>	27	43.37 (10.61)	41.26 (11.88)	36.14 (13.85)	31.40 (11.14)	25% (6%, 43%)	35% (19%, 49%)	0.58 (0.03, 1.12)	1.10 (0.51, 1.66)
Depression (PHQ-9)	27	10.07 (4.69)	8.26 (4.69)	6.70 (5.09)	6.14 (4.05)	33% (11%, 50%)	39% (22%, 52%)	0.69 (0.13, 1.23)	0.90 (0.33, 1.44)
Anxiety (GAD-7)	27	10.29 (4.90)	8.40 (4.72)	6.14 (4.32)	6.07 (3.92)	40% (22%, 54%)	41% (25%, 54%)	0.90 (0.33, 1.44)	0.95 (0.38, 1.50)
<b>SECONDARY OUTCOMES</b>									
Pain Catastrophizing (PCS)	27	19.37 (12.21)	14.96 (11.48)	9.96 (11.40)	8.40 (9.62)	49% (21%, 67%)	57% (33%, 72%)	0.80 (0.23, 1.34)	1.00 (0.42, 1.55)
Physical quality of life (SF12: PCS) <sup>d</sup>	27	42.27 (12.49)	43.35 (12.51)	42.36 (12.78)	44.95 (11.37)	0% (11%, -12%)	-6% (3%, -17%)	-0.01 (0.53, -0.54)	-0.22 (0.31, -0.76)
Mental quality of life (SF12: MCS) <sup>d</sup>	27	33.27 (8.70)	35.17 (9.21)	40.34 (11.24)	40.07 (9.67)	-21% (-9%, -25%)	-20% (-10%, -32%)	-0.70 (-0.14, -1.24)	-0.74 (-0.18, -1.28)
Modelled Outcomes Approach									
<b>PRIMARY OUTCOMES</b>									
FGID symptoms (GSRS) <sup>c</sup>	27	43.37 (10.61)	41.61 (11.29)	36.22 (13.71)	31.33 (10.44)	25% (6%, 42%)	42% (28%, 55%)	0.58 (0.03, 1.12)	1.14 (0.55, 1.70)
Depression (PHQ-9)	27	10.07 (4.69)	6.96 (4.98)	6.29 (5.65)	4.87 (3.85)	37% (12%, 55%)	52% (35%, 64%)	0.64 (0.09, 1.18)	1.21 (0.62, 1.77)
Anxiety (GAD-7)	27	10.29 (4.90)	6.88 (3.71)	4.82 (3.07)	4.72 (2.61)	53% (40%, 63%)	54% (43%, 63%)	1.34 (0.73, 1.91)	1.42 (0.80, 1.99)
<b>SECONDARY OUTCOMES</b>									
Pain Catastrophizing (PCS)	27	19.37 (12.21)	13.55 (13.24)	8.76 (11.51)	7.05 (11.01)	55% (26%, 72%)	64% (34%, 80%)	0.89 (0.32, 1.44)	1.06 (0.48, 1.61)
Physical quality of life (SF12: PCS) <sup>d</sup>	27	42.27 (12.49)	45.00 (15.07)	42.02 (12.80)	46.50 (13.22)	1% (11%, -12%)	-10% (1%, -22%)	0.02 (0.55, -0.51)	-0.33 (0.21, -0.86)
Mental quality of life (SF12: MCS) <sup>d</sup>	27	33.27 (8.70)	37.73 (9.06)	42.57 (9.76)	42.60 (8.61)	-28% (-17%, -39%)	-28% (-19%, -38%)	-1.01 (-0.43, -1.56)	-1.08 (-0.49, -1.63)

Note. Standard deviations are shown in parentheses for the means and 95% confidence intervals are shown in parentheses for effect size and percentage change statistics

<sup>a</sup> The percentage change from pre-treatment statistics are estimates of relative change derived from the GEE models conducted separately for each outcome.

<sup>b</sup> The within group Cohen's *d* effect sizes are estimated in comparison to pre-treatment.

<sup>c</sup> To accurately reflect percentage change, a constant of 15 was subtracted from GSRS scores when calculating percentage change scores.

<sup>d</sup> Negative percentage change estimates and Cohen's *d* effect sizes indicate positive improvement on this measure.

ACCEPTED MANUSCRIPT

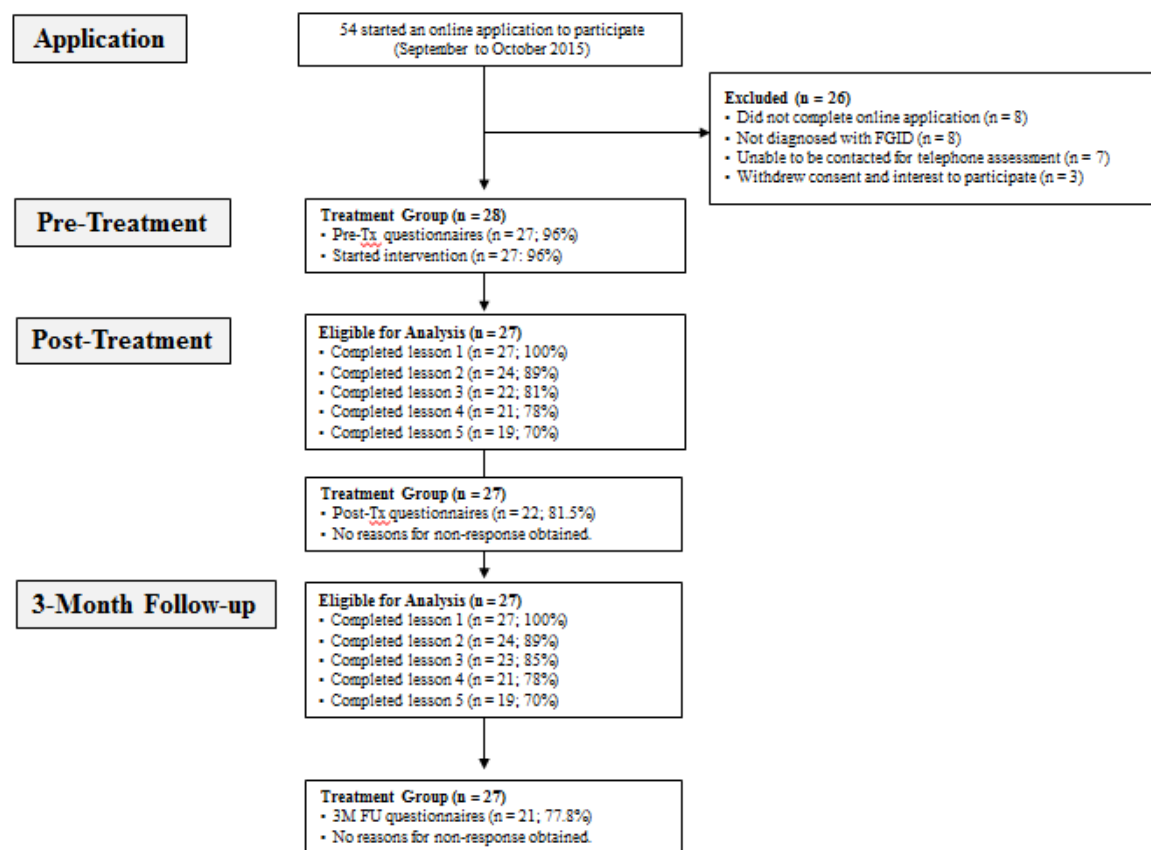


Figure 1. Participant Flow from Application to 3-month Follow-up

**Highlights**

- Study is a feasibility open trial of a transdiagnostic Internet-delivered CBT program for people with functional gastrointestinal disorders (FGID)
- Transdiagnostic iCBT program is designed to simultaneously treat anxiety, depression, and disability in people with a broad range of chronic health conditions
- High treatment completion rates and levels of satisfaction were observed with only modest clinician time required per participant
- Clinical improvements were observed in FGID, anxiety and depression symptoms, which remained or further improved at 3-month follow-up
- Results are encouraging and indicate large-scale controlled trials are warranted