The effectiveness of internet-delivered cognitive behavioural therapy for health anxiety in routine care

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PII: S0165-0327(19)31648-9
DOI: https://doi.org/10.1016/j.jad.2019.11.087
Reference: JAD 11334

To appear in: Journal of Affective Disorders

Received date: 24 June 2019
Revised date: 17 September 2019
Accepted date: 12 November 2019


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Highlights

- Health anxiety is prevalent and disabling.
- RCTs show internet CBT (iCBT) is effective for treating health anxiety.
- First study to evaluate effectiveness of iCBT for health anxiety in routine care.
- Large reductions in health anxiety, depression, and distress ($g’s > 1.1$).
- Higher completion for clinician-supervised (46%) than unsupervised iCBT (33%).
Title:

The effectiveness of internet-delivered cognitive behavioural therapy for health anxiety in routine care

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Keywords: cognitive behaviour therapy; health anxiety; illness anxiety disorder, somatic symptom disorder, internet; effectiveness

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Abstract
Introduction: Randomised controlled trials have shown that internet-delivered cognitive behavioural treatment (iCBT) is an effective treatment for health anxiety, but the effectiveness of these programs in routine care has not been investigated. This study examined the effectiveness of iCBT for health anxiety symptoms in routine care settings in the community. Methods: Using an open-trial design, we investigated adherence to, and effectiveness of a 6-lesson iCBT program for health anxiety symptoms amongst individuals (n= 391, mean age 41 years, 64% female) who enrolled in the program either self-guided (n=312) or under the supervision of community clinicians (general practitioners, psychologists and other allied health professionals) (n=79). Primary outcome was health anxiety severity on the Short Health Anxiety Inventory (SHAI), and secondary outcomes were depression severity on the Patient Health Questionnaire 9-item (PHQ-9) (depression) and distress (Kessler-10: K-10). Results: Adherence to the iCBT program was inadequate (45.6% in the clinician-supervised group, 33.0% in the unguided group), but within-subjects effect sizes were large (SHAI: g=1.66, 95%CI: 1.45-1.88; PHQ-9: g=1.12, 95%CI: 0.92-1.32; K-10: g=1.35, 95%CI: 1.15-1.56). Limitations: No control group, lack of follow-up data. Conclusions: iCBT is an effective treatment for health anxiety symptoms in routine care, but methods to increase adherence are needed to optimise benefits to participants. Randomised controlled effectiveness trials with long-term follow-up are needed.
One in twenty individuals experience excessive and disabling anxiety about their health during their lifetime (Sunderland, Newby, & Andrews, 2013), but despite the high prevalence rates, it often goes undetected and untreated (Tyrer, Eilenberg, Fink, Hedman, & Tyrer, 2016). In the DSM-5, health anxiety is a core component of Illness Anxiety Disorder and Somatic Symptom Disorder (American Psychiatric Association, 2013). Several randomised controlled trials (RCTs) have shown that internet-delivered CBT (iCBT) is an efficacious treatment for health anxiety, superior to a range of control groups including waiting list; psychoeducation and clinical support; behavioural stress management; and online forums (Hedman et al., 2013; Hedman et al., 2011; Hedman, Axelsson, Andersson, Lekander, & Ljótsson, 2016; Hedman et al., 2014; Newby et al., 2018). In RCT settings, iCBT is equally effective in treating health anxiety in therapist guided and self-guided format (Hedman et al., 2016). Although the efficacy of iCBT for health anxiety has been established, the effectiveness of iCBT for health anxiety is unknown. It is not clear whether the positive effects of iCBT for health anxiety observed in developer-led RCTs generalise to routine care or community settings. To our knowledge, this is the first study internationally to examine the effectiveness of, and adherence to iCBT for health anxiety symptoms in a routine care setting.

We present the results of a cohort of 391 patients who were prescribed an iCBT course for health anxiety (Health Anxiety program (see Newby et al., 2016; Newby et al., 2018) by their clinician in the community between June 2016 and February 2019 or opted to start the program without any clinical guidance during the same time period. This study aimed to examine the impact of the iCBT program on health anxiety symptom severity, general distress and depression severity, explore adherence rates, and compare the adherence and outcomes of those who took part in the program with and without clinician supervision. We hypothesised that adherence to the program would be consistent with previous effectiveness research into iCBT (40-50%) (e.g., Newby, Mewton, & Andrews, 2017;
Newby, Mewton, Williams, & Andrews, 2014) for those who were prescribed the program by their clinician but less so for those completing the program independent of a clinician (approximately 15%). However, given that the content of the program was constant irrespective of whether or not participants received clinical guidance, we expected that both delivery models would yield large effect size reductions in health anxiety symptom severity and psychological distress (Hedges $g > 1.0$).

**Methods**

**Participant Sample**

The sample comprised 391 participants who enrolled in the Health Anxiety program on THIS WAY UP website (www.thiswayup.org.au) - an online treatment service for depression and anxiety provided by St Vincent's Hospital Sydney and the University of New South Wales - between 8 June 2016 and 28 February 2019. The study is an open trial design, and is reported in line with the STROBE guidelines for observational studies (Elm et al., 2007).

**Description of THIS WAY UP Health Anxiety Program**

The Health Anxiety program includes six online lessons. Lesson content is presented in the form of an illustrated comic-style story about a male character who experiences health anxiety, and gains mastery over his symptoms with the help of a clinician, through the use of CBT techniques (e.g., thought challenging, behavioural experiments, graded exposure¹) (see Table 1 for lesson content). At the end of each illustrated lesson, participants download a lesson summary (a homework document), which includes practical exercises, such as graded

¹ To view a demonstration of the lesson content of this program, contact the corresponding author
exposure, to complete before their next lesson. A lesson is deemed to be complete once the individual has downloaded the homework document. This document only becomes available once the entire illustrated story has been displayed. The participant can then book in a date on which they will commence the following lesson, with a minimum 5 days wait-period between lessons. Reminder emails are sent if they miss a date. Automatic emails are sent congratulating the participant when they complete a lesson. Participants also have access to frequently asked questions following each lesson, and extra resources on key information including: good sleep, boosting motivation, activity monitoring and planning, assertive communication, information for family and friends, advice about ‘how to help your doctor help you’, attention shifting, managing mental imagery, and relaxation skills. Participants had 90 days to complete the entire program, at a cost of $59AUD.

**Enrolment options for the Health Anxiety Program**

There are two different enrolment options to access the Health Anxiety iCBT program on the THIS WAY UP website. The first option is for participants to self-refer to the program, and guide themselves through the modules, without receiving any guidance from a clinician. We use the term ‘unguided’ program in the rest of the paper to refer to this option, and this option is only available for people living in Australia. The second option is for a clinician to recommend and prescribe the iCBT course to their patient. We call this the clinician-supervised enrolment option. In order for the clinician to supervise their patient through the iCBT course, they must be registered with a free clinician account on the THIS WAY UP website. The clinician emails the patient a prescription for the course from the website (see below for further details). The participant then enrolls in the program under the supervision of their clinician.
Clinicians registered with the THIS WAY UP service are told that individuals are unlikely to benefit if they are actively suicidal, dependent on drugs or alcohol, have schizophrenia or bipolar disorder, or are taking regular antipsychotic or benzodiazepine medications. Ethics approval was not required, as this study was conducted as part of the routine Quality Assurance activities of THIS WAY UP and all self-report measures examined herein were required for the safe conduct of THIS WAY UP iCBT for Health Anxiety program. Prior to enrolment in treatment, all participants provided their electronic informed consent that their pooled de-identified data could be collected, collated, analysed and published for quality assurance purposes.

**Clinician-supervised iCBT: iCBT for Health Anxiety with Clinical Guidance**

Participants were prescribed the *Health Anxiety* program by their general practitioner, allied health practitioner, psychologist or medical practitioner (together, referred to as ‘clinicians’). Clinicians maintained clinical responsibility for their participant while they underwent the iCBT program. For a clinician to prescribe the program to their patient, they needed to log in to their clinician account on THIS WAY UP, and type up an electronic ‘script’ which includes the first name, and email address of their patient, along with the name of the specific iCBT program they recommend (in this case the Health Anxiety course). The ‘script’ is then sent to their patient via email. The patient then follows the web link and instructions within the email to register for the program on the website.

Participants complete a K-10, a diagnosis-independent measure of psychological distress (detailed further below) (Kessler et al., 2002), prior to the commencement of each lesson. Automated emails are sent to the participant’s supervising clinician once a) the participant has completed a lesson (the email includes a lesson-by-lesson summary of the K-10 scores) or b) if their K-10 score rises to or above 30 (severe range). The automatic email
to the patient (if K10 is 30 or above) advises that their distress score is elevated and if they are worried by how they feel, they should talk to their supports and contact their health professional. Crisis support numbers and ‘In Case of Emergency’ resources are provided as well in the automated email. Clinicians can also login to their account on the website to view their participant’s progress, which can be viewed on a clinician dashboard. The clinician dashboard enables them to view their participant’s progress through the course including login details, questionnaire results, and lesson completion results.

**Unguided iCBT: iCBT for Health Anxiety without Clinical Guidance**

Participants also had the option to complete the Health Anxiety iCBT program without any clinical guidance. Similar to the clinician-supervised group, this group also completed the K-10 prior to each lesson. Automated emails were sent to the participant (i) if their K-10 rose to above 30 (severe range), and (ii) to remind them to complete their lesson. The same automatic email was sent as in the clinician-supervised group.

**Procedure**

To participate in the THIS WAY UP Health Anxiety program, the individual first needed to create an account on the website (https://thiswayup.org.au/). To sign up for an account, they needed to provide their first name, email address, provide a password to create an account, and provide electronic consent by agreeing to the Terms of Use and Privacy Policy. Next, we ask for age, gender, and postcode (optional), and mobile number (optional if interested in SMS reminders). SMS reminders were introduced in August 2017 as an opt-in service (19/48 (39.6%) who enrolled in this period opted in for SMS reminders.)
After selecting their course, the final step in the registration process is to pay $59AUD for the course. Without payment, the person could not access or start the course. Only the clinician-supervised option is available outside of Australia.

**Outcome Measures**

*The Short Health Anxiety Inventory* (SHAI, Salkovskis, Rimes, Warwick, & Clark, 2002). The SHAI is a validated 18-item self-report measure of health anxiety symptom severity experienced during the past week. The inventory has sound psychometric properties including good internal consistency, test-retest reliability and construct validity, and is sensitive to change across treatment (Abramowitz, Deacon, & Valentiner, 2007; Alberts, Hadjistavropoulos, Jones, & Sharpe, 2013). Participants are asked to rate the frequency of their health anxiety symptoms on a four point scale, ranging from 0-3. For example, the first item is: 0 = I do not worry about my health, 1 = I occasionally worry about my health, 2 = I spend much of my time worrying about my health, and 3 = I spend most of my time worrying about my health. We used a cut-off score of 18 (or higher) as an indicator of clinically significant health anxiety (according to Alberts et al., 2013). In the current sample, internal consistency was $\alpha = .90$ at baseline and $\alpha = .92$ at lesson 6.

*The Kessler 10-item Psychological Distress scale* (K-10; Kessler et al., 2002) is a 10-item measure of psychological distress. Items (e.g., About how often did you feel nervous?) are assessed on a 5-point scale over the past two weeks with greater total scores indicating higher distress. Total scores range from 0 to 50, with a total score of 20 (or more) indicative of clinical distress (Andrews & Slade, 2001). The K-10 has excellent psychometric properties (Furukawa, Kessler, Slade, & Andrews, 2003), which are stable across the adult lifespan (Sunderland, Hobbs, Anderson, & Andrews, 2012). In the current sample, internal consistency was $\alpha = .89$ at baseline and $\alpha = .87$ at lesson 6.
The Participant Health Questionnaire-9 (PHQ-9, Kroenke, Spitzer, & Williams, 2001) is a 9-item self-report scale that assesses DSM-IV criteria for major depressive disorder (MDD). Participants rate the frequency of symptoms (e.g., “Feeling down, depressed, or hopeless”) over the past two weeks on a scale ranging from 0 (not at all) to 3 (nearly every day), where 1 = several days, 2 = more than half of the days. Total scores range from 0 to 27, with a score 10 (or more) indicative of a probable MDD diagnosis (Zuithoff et al., 2010). The PHQ-9 has good sensitivity and specificity (Wittkampf, Naeije, Schene, Huyser, & van Weert, 2007), and excellent reliability and validity (α = .86; Kroenke et al., 2001). In the current sample, internal consistency was α = .85 at baseline and 0.82 at lesson 6.

Participant Feedback Questionnaire. After lessons 4 and 6, participants were invited to complete an optional brief anonymous feedback survey, specifically designed for THIS WAY UP courses. They were asked how likely it is that they would recommend THIS WAY UP courses to a friend or colleague (from 0 to 10, where 0 = not at all likely, and 10 = extremely likely)².

Outcome Measurement

Participants completed the K-10 prior to each lesson to measure progress, and the SHAI and PHQ-9 prior to commencing lesson 1, lesson 4 (mid-point) and lesson 6.

Statistical Analyses

All analyses were implemented in SPSS v. 24.

Comparison of Demographic and Clinical Variables Between Those Accessing iCBT With and Without Clinical Guidance:

² This questionnaire also included open-ended questions to obtain qualitative feedback about the course, and suggested improvements for future iterations.
We compared demographic and clinical characteristics of the groups who enrolled in the iCBT program with versus without clinical guidance using independent samples t tests and chi square analyses.

Adherence and Treatment Effects

Univariate analyses were conducted to investigate the baseline demographic and clinical variables associated with adherence. Next, a linear mixed model for each of the outcome measures was implemented using the MIXED procedure with a random intercept for subject were estimated to investigate reductions in each of the outcome measures between pre- and post-assessments. Mixed models estimate parameters in repeated measures studies with unbalanced data using maximum likelihood estimation. This makes use of the incomplete data in a way that does not bias the parameter estimates (West, Welch, & Galecki, 2006). For each outcome, measurement occasion was treated as a categorical variable, and an identity covariance structure was specified to model the covariance structure of the random intercept. Initial model building focused on the selection of the most appropriate covariance structure for the residual correlation matrix. Model fit indices and inspection of the variance-covariance matrix supported the selection of the unstructured covariance structure for SHAI, PHQ-9, and K-10 outcome measures.

The fixed effects of iCBT type (clinician-supervised/unguided), age, sex, rurality and their interactions with time, were then added to each of the models. The fixed effect corresponding to the iCBT type (clinician-supervised/unguided) by time interaction enabled us to examine whether there was a difference in improvements on the SHAI, PHQ-9 and K-10 variables in the unguided versus clinician-supervised groups.

Reliable Change
We sought to examine the proportion of participants who showed clinically reliable change (both improvements and deterioration) on the SHAI in each sample between pre- and post-treatment. We used the values from Jacobson and Truax (1991) to calculate this previously in our RCT, and a score of 8 points or more reflected a statistically reliable change. We used test-retest reliability estimates from Olatunji et al. (Olatunji, Etzel, Tomarken, Ciesielski, & Deacon, 2011) and SD of 7.21 (Newby et al., 2018) to calculate these values.

**Normalisation of Health Anxiety**

There is a lack of consensus regarding whether a cut-point of 18 or 20 on the 18-item SHAI is the most psychometrically robust method to determine normal levels of health anxiety versus cases of clinical health anxiety (Alberts et al., 2013). Therefore, to examine whether participants experienced normal health anxiety symptoms, we counted the number of participants with post-treatment data who scored below 18 on the SHAI at the final lesson of the program, as well as the number who scored below 20 on the SHAI.

**Results**

**Participants**

There were 782 individuals who started the registration process for the *Health Anxiety* course during the evaluation period from 8 June 2016 to 28 February 2019. See Figure 1 for the participant flow chart. Of the 782 participants, 365 (46.7%) did not complete their enrolment because they stopped at the payment step of registration. Independent samples *t* tests compared those who completed their enrolment (n=417) and those who did not complete their enrolment (n=365). Applicants who did not complete their enrolment were younger (M=39.12, SD=12.14), than participants who completed their enrolment (M=41.08,
SD=12.90; $t(779)=1.86, p =0.04$); and were more likely to have chosen an unsupervised rather than a supervised course ($\chi^2=20.64, df=1, p <.001$). There were no significant differences in sex ($\chi^2= 4.73, df = 2, p = 0.094$), or rural status ($\chi^2= 1.65, df = 1, p = 0.20$).

There was a difference in the number who were living in Australia or New Zealand, with more applicants who did not complete their enrolment reported they were living outside of Australia/NZ ($\chi^2= 17.14, df = 1, p <.001$).

On average, participants were 41.08 years of age ($SD=12.90, range=18-87$), 64.3% were female ($n=268$), 32.1% were male ($n=134$) and 15 were of unspecified gender (3.6%). See Table 2 for demographic characteristics. Of the 327 participants who provided their postcode (this was optional), 21.3% ($n=89$) were living in rural or remote regions of Australia. The majority accessed the program without clinical supervision ($n=332, 79.6\%$). Prescribers for the remaining participants included: general practitioners ($n=30, 7.2\%$), allied health including psychologists ($n=40, 9.6\%$), and other specialist health providers ($n=15, 9.6\%$).

On average, participants reported total scores on the health anxiety measure (the SHAI) of 34.71 ($SD=8.79, range=7-54$). Only 15 participants reported symptom severity below 18 on the SHAI, a conservative threshold for clinically significant health anxiety (Alberts et al., 2013). In contrast, participants’ experienced variable levels of depression symptom severity, ($range= 0 to 27$, i.e., the highest score possible on the PHQ-9). Mean levels of 9.12, indicating that the sample was characterised, on average, by mild depression severity ($SD=5.62, IQR = 7$), with 41.3% ($n=170$) meeting criteria for a probable diagnosis of MDD, with total PHQ-9 score $\geq 10$. The sample also experienced variable levels of psychological distress ($M(SD) = 25.62(SD=7.00); range= 11-50, IQR=9$), with 328 (79.4\%) reporting a score of 20 or higher, indicating clinical distress.
For clinician-supervised versus unguided groups, there were no differences in baseline SHAI scores, PHQ-9 scores, K-10 scores, age, sex, or rural status (all $p$s > .05) see Table 2 for results and statistics.

**Adherence**

There were 26 participants (6.2%, 20 in the unguided course, and 6 in the supervised course) who enrolled, and paid for their course but did not start. Participants completed on average, 3.88 lessons ($SD=1.92$, range = 1-6) (see Table 3 for lesson-by-lesson completion rates). On average, the unguided group completed 3.79 lessons ($SD=1.93$), whereas the clinician-supervised group completed 4.23 lessons ($SD=1.89$). Independent samples t tests were used to compare the average number of lessons completed in the unguided versus supervised groups; this difference did not reach significance ($t(389)=1.79, p=.074$).

Of those who were undergoing the program without clinical supervision, 33.0% completed all six lessons. In comparison, 45.6% of those receiving clinical supervision completed all six lessons of treatment. Participants prescribed the program by a health care professional were more likely to complete all components of the program compared to those who enrolled in the program without guidance from a health professional/clinician ($\chi^2(1) = 4.34, p < .05$). Sex, rurality and baseline scores on the SHAI, were not associated with completing the program (all $p$s> .05). However, participants who completed all six lessons were *older* than those who did not complete the program [$t(389) = 3.24, p < .01$; completers vs non-completers: $M(SD)_{age}= 43.91 (13.45) \text{ vs.} 39.45 (12.34)$], had *lower baseline distress* (K-10 scores, $t(389) = -2.56, p < .05$; completers vs non-completers: $M(SD)_{K-10}= 24.39 (6.45) \text{ vs.} 26.27 (7.18)$), and *lower depression severity* (PHQ-9 scores, $t(388) = -2.01, p < .05$; completers vs non-completers: $M(SD)_{PHQ-9}= 8.31 (4.67) \text{ vs.} 9.51 (6.12)$).

**Effectiveness of the Health Anxiety Program**
For the SHAI outcomes, the fixed effects of sex and age were statistically significant, and were retained in the model. For both the K-10 and PHQ-9, the fixed effect of age was statistically significant, and was retained in the final models. All remaining fixed effects which were not statistically significant were removed from each model. Therefore the time by group (iCBT type: clinician-supervised versus the unguided groups) effects were not statistically significant in all of the models, indicating that the groups did not differ in the degree of improvement across the programs in symptoms of health anxiety, depression, or general distress. Chi-square difference testing of the -2 log-likelihoods indicated that the removal of the non-significant fixed effects did not decrease model fit for any of the outcome variables, and they were excluded from further analyses.

Table 4 includes the estimated marginal means at pre- and post-treatment, the linear mixed model results, and within-group effect sizes for each of the outcome measures. Effect sizes (Hedges g adjusted for the correlation between time-points) were calculated from the model with measurement occasion, and significant fixed effects entered in the model. For all outcome measures, the program significantly improved participants’ symptom severity at the \( p < 0.001 \) level. Treatment produced large effect-size reductions for all outcome measures (Hedges’ \( g = 1.12 \) [95%CI: 0.92-1.32] for PHQ-9 to 1.66 [95%CI: 1.45-1.88] for SHAI scores).

**Reliable Clinical Change (Completer sample)**

We then calculated the proportion of the sample that completed treatment that experienced reliable improvements on the SHAI (a change of 8 points or more was considered reliable change). While 43 participants (29.5% of completers) experienced no change, 103 experienced reliable improvement (70.5% of completers). No participant
experienced reliable deterioration, although it is possible that people who dropped out experienced deterioration before they discontinued the intervention.

**Normalisation of health anxiety at post-treatment (completer sample)**

Finally, we estimated the proportion of participants whose symptom severity normalised (i.e., achieved scores below validated clinical cut-off scores) on the SHAI following treatment. Out of 146 completers, 49 (33.6% of completers) reported scores below 18 on the SHAI at post-treatment. Using a cut-off score of 20 on the SHAI at post-treatment, we found that 102/146 (69.9% of completers) reported scores below 20.

**Participant Feedback**

Fifty one participants completed the optional patient feedback survey (28 participants at lesson 4, and 23 at lesson 6). Participants provided high ratings regarding the likelihood of recommending the course to others (M=8.54, SD=1.80, range 5-10).

**Discussion**

This study was the first to investigate the adherence and effectiveness of an iCBT program for health anxiety symptoms (the *Health Anxiety* program) accessed by those without clinical guidance (*n* = 312) and those who were supervised through the course by a health practitioner (*n* = 79). On average, participants demonstrated large and significant reductions on all outcome measures of health anxiety symptoms, comorbid depression symptoms, and general distress from baseline to the end of the program (Hedge’s *g*’s > 1.1). These effect sizes are consistent with the large improvements in health anxiety and comorbid symptoms observed between pre and post-treatment in our previous RCT of the same program (Hedges *g* = 2.82, 95%CI: 2.18-3.46 for health anxiety, 1.21 [95%CI: 0.73-1.68] for depression) (Newby et al., 2016; Newby et al., 2018), and the findings of RCTs conducted by...
Hedman and colleagues (Hedman et al., 2016). Participant feedback indicated positive ratings of the program, including high ratings of their likelihood of recommending the course to a friend, with an average score over 8 on a 0-10 scale.

The proportion of participants achieving clinically reliable change of 8 or more points on the Short Health Anxiety Inventory was also similar for people who completed the program (70.5% in this study versus 84% in the RCT). Because the most appropriate cut-off score to detect clinically significant health anxiety on the SHAI is unclear at present, we used two different values to assess normalisation of health anxiety levels at the end of treatment. For completers, 33% achieved health anxiety levels below 18, and 70% scored below 20 on the SHAI. To our knowledge, this is the first study to demonstrate that the positive effects of iCBT for health anxiety symptoms generalise beyond randomised trial settings to routine care community samples. These findings add to the growing body of evidence in support of the efficacy of CBT to treat health anxiety symptoms delivered in the traditional face-to-face format (Cooper, Gregory, Walker, Lambe, & Salkovskis, 2017), and the utility of low-intensity internet and bibliotherapy-delivered CBT interventions to increase access to CBT for health anxiety in routine care settings in the community, in clinician-supervised and self-guided format (Hedman et al., 2016).

Effectiveness studies are critical to understand whether empirically supported therapies such as iCBT are as effective, and achieve the same completion rates when delivered in routine care settings. Effectiveness studies can also help to reveal the limitations of delivering these treatments in routine care settings. Our results add to a growing literature showing that iCBT achieves large improvements in anxiety outside of controlled clinical trial settings, but that adherence to clinician-supervised and unguided iCBT is lower in routine care (Mewton, Wong, & Andrews, 2012; Morgan et al., 2017; Newby et al., 2014).
In this study, we found that more than 70% of participants enrolled in the unguided iCBT course without supervision from a primary care clinician or therapist. Those who did unguided iCBT were less likely to complete their program, with 33% completing the entire six lessons of the program, versus 46% completion rates in those who were supervised by a clinician. While the completion rates in the clinician-supervised iCBT group replicate past findings (e.g., 47%, see Newby et al., 2013), the completion rates for unguided iCBT group were higher than the 15% completion rates reported by a previous study (Morgan et al., 2017).

Because participants were not randomly allocated to clinician-supervised versus unguided iCBT, these results need to be interpreted with caution. While it is likely the higher adherence in the clinician-supervised group may be due to clinician support, it is also possible that other factors such as differences in sample characteristics, personality factors, concurrent treatments or comorbidities may have influenced this finding. Interestingly, Hedman and colleagues have previously found relatively high adherence rates in self-guided iCBT and bibliotherapy-delivered CBT for health anxiety (Hedman et al., 2016), although their study was a RCT, and not an effectiveness study, and they used comprehensive diagnostic assessments prior to entry into the study which improve adherence to iCBT (Boettcher, Berger, & Renneberg, 2012).

Because the current sample’s health anxiety symptom severity (mean SHAI score of 34) was very similar to our past research trials of iCBT for health anxiety (e.g., mean SHAI score of 35.77, Newby et al., 2018) where we found 85% completion rates in our pilot trial (Newby et al., 2016) and 60% completion rates in our RCT (Newby et al., 2018), severity is therefore unlikely to fully explain the lower completion rates in this study. The lower completion rates may be explained by the high proportion of individuals doing the course without clinician supervision, sample characteristics, and/or the context in which it was delivered. Consistent
with past effectiveness studies by our research team (Hobbs, Joubert, Mahoney, & Andrews, 2018; Hobbs, Mahoney, & Andrews, 2017; Mewton et al., 2012; Williams & Andrews, 2013), older adults were more likely to complete the program than their younger counterparts. In addition, people who completed the course had lower levels of distress and depression symptom severity at baseline. There was no effect of clinician’s profession, rural status, or sex on adherence or completion rates, or on health anxiety or distress outcomes.

It is also important to note that despite differences in the completion rates, the average number of lessons completed did not differ, and there were no significant differences in outcomes on the health anxiety, depression or distress measures between the clinician-supervised and unguided groups. We also know from previous studies that there is likely a dose response relationship between number of lessons completed and treatment outcome, and this is true for drop-outs and completers (Hilvert-Bruce, Rossouw, Wong, Sunderland, & Andrews, 2012; Mewton & Andrews, 2015; Sunderland, Wong, Hilvert-Bruce, & Andrews, 2012). Even those who complete a few lessons of iCBT can reduce their symptom severity. This suggests that a partial dose of iCBT may be helpful for symptom improvement, and that completion of the entire 6 lessons of the program may not be required to obtain full benefit.

Over half of participants in this sample completed at least four of the six lessons, and were therefore introduced to the core psychoeducation about health anxiety and CBT skills (e.g., thought challenging, behavioural experiments, graded exposure). However, our findings also highlight that there is room for improvement in encouraging ongoing engagement with iCBT. Only half were introduced to graded exposure, thought to be a key skill to reduce excessive and unhelpful safety behaviours (e.g., body checking, reassurance-seeking) and avoidance of feared situations, emotions, thoughts and sensations, that are theorised to maintain and worsen health anxiety (Warwick & Salkovskis, 1990), and the majority were not exposed to relapse prevention, which is thought to be critical for anticipating and
responding to future lapses and maintaining gains beyond the completion of treatment. Given that most participants do not complete the entire 6 lessons of the iCBT program in this setting, we need to do further research to discover helpful methods to improve engagement. This may include either changing content, or re-design of the program (including format, and order of modules).

It also highlights the need to educate clinicians in the community how and when to contact their participants throughout this iCBT program, to encourage them to continue with iCBT. One unique aspect of THIS WAY UP iCBT courses is that participants follow a character who experiences health anxiety, to learn how they use CBT skills to recover from health anxiety. While this can help normalise symptoms of health anxiety and common concerns experienced by people who worry about their health, the feared illnesses in health anxiety are diverse, including fears of developing cancer, neurological conditions, mental illness, other brain disorders (e.g., Alzheimer’s Disease) or being convinced one is already seriously ill. It is possible that the inclusion of only one character, who primarily feared cancer and neurological illnesses, was not relatable to other individuals who differed in their experience of health anxiety, or engaging enough for people who experienced health anxiety in the context of diagnosed chronic health conditions or other medical illnesses.

To date, most iCBT programs for anxiety and depression follow a similar format and structure, starting with psychoeducation in the first module and ending with relapse prevention in the final module, with emotion regulation skills and cognitive therapy components taught before exposure (although Hedman et al.’s program is an exposure-based iCBT program). To improve adherence rates for this iCBT program in routine care, modular approaches may be useful, where the participant can choose which module to complete first depending on their needs; this approach has been demonstrated effective in mixed anxiety disorder samples (Nordgren et al., 2014). If we determine the most effective iCBT
skills/treatment components and deliver them first in iCBT, this may improve treatment efficiency and therefore, outcomes. Given the participant feedback suggested that finding the time to do the course was a common challenge, discovering new ways of increasing the efficiency of iCBT, whilst improving the on-boarding process at enrolment to ensure the participants plan when, where, and how they will work on the course and practical exercise, may be important areas for future improvements. Although participants can benefit substantially prior to discontinuing treatment, future research is needed to understand the reasons for the lower adherence in unguided iCBT in routine care (e.g., lack of intake interviews, nature of the referral process, participant complexity and comorbidity, motivation levels) compared to RCT research to identify effective interventions that encourage program completion. At present, clinicians are encouraged to contact their participants to maximise benefit, in line with evidence showing that clinician guidance and contact is important for promoting positive outcomes in iCBT (Spek et al., 2007). The reality is that most participants are choosing to do their programs without clinician guidance, so future efforts should be focusing on improving unguided iCBT programs.

**Study Limitations**

Because this study did not have a control group, we cannot rule out the effects of other factors or concurrent treatments. We had very limited information about the nature of the sample and participants, or their treatment history, and it is unknown whether the participants did in fact have illnesses that they were anxious about, or had comorbid physical health issues. The findings are reliant on self-report symptom severity data, and no diagnostic interview data is available; therefore we do not know if the participant met criteria for Illness Anxiety Disorder and/or Somatic Symptom Disorder, or another diagnosis (e.g., panic disorder). In addition, the data were collected before each lesson. We did not follow-up participants beyond the completion of treatment; therefore the maintenance of gains beyond
the final lesson is not known. It is very important that future research examines whether iCBT for health anxiety delivered in community settings leads to long-lasting improvements in health anxiety symptom severity, and other important outcomes such as reductions in excessive health service utilisation and functional impairment. There was substantial loss of data, due to attrition of the participants from the program. We do have any information about why participants dropped out, or how satisfied they were with the treatment program before they dropped out. The use of linear mixed models assisted in modelling the outcomes, but relied on mid-treatment data (for SHAI and PHQ-9 outcomes), for which there was also missing data. Therefore the high rates of attrition and missing data are a significant limitation, but speak to the importance of increasing adherence and engagement in future.

Conclusions

Internet-delivered CBT for health anxiety symptoms is effective for people who enrol in the program either self-guided and under the supervision of health care practitioners in the community. While these interventions are likely to be highly scalable, future research efforts are needed to explore the factors which help health anxious individuals to remain engaged in iCBT so that they can experience the benefit these programs can offer.
Table 1. Content and Homework Tasks for each of the six lessons of the THIS WAY UP Health Anxiety program

<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Content</th>
<th>Homework Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Psychoeducation about health anxiety, the fight or flight response, goal setting, and health anxiety cycles</td>
<td>Set treatment goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complete health anxiety cycle</td>
</tr>
<tr>
<td>2</td>
<td>Psychoeducation about the noisy body, and false alarms, strategies to manage worry and attentional hypervigilance</td>
<td>Activity planning, mindfulness exercises, checking prevention plan</td>
</tr>
<tr>
<td>3</td>
<td>Psychoeducation about thoughts and thinking errors, alternative explanations for physical symptoms</td>
<td>Thought monitoring, alternative explanations for physical symptoms</td>
</tr>
<tr>
<td>4</td>
<td>Thought challenging, behavioural experiments</td>
<td>Thought challenging, behavioural experiments</td>
</tr>
<tr>
<td>5</td>
<td>Education about avoidance and safety behaviours; graded exposure and tolerating uncertainty and doubt</td>
<td>Graded exposure</td>
</tr>
<tr>
<td>6</td>
<td>Relapse prevention</td>
<td>Relapse prevention plan</td>
</tr>
</tbody>
</table>

Table 2. Baseline sample and demographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Unguided (n=328) M (SD)</th>
<th>Clinician-supervised (n=85) M (SD)</th>
<th>Total sample (N=412) M (SD)</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAI scores</td>
<td>35.13 (8.77)</td>
<td>33.11 (8.92)</td>
<td>34.71 (8.79)</td>
<td>( t(411)=1.90, p =0.059 )</td>
</tr>
<tr>
<td>PHQ-9 scores</td>
<td>9.00 (5.74)</td>
<td>9.62 (5.12)</td>
<td>9.13 (5.62)</td>
<td>( t(410)=-0.92, p &gt; .05 )</td>
</tr>
<tr>
<td>K-10 scores</td>
<td>25.40 (7.10)</td>
<td>26.46 (6.61)</td>
<td>25.60 (7.00)</td>
<td>( t(411)=-1.24, p &gt; .05 )</td>
</tr>
<tr>
<td>Age</td>
<td>40.64 (12.42)</td>
<td>42.81 (14.56)</td>
<td>41.16 (12.93)</td>
<td>( t(415)=-1.39, p &gt; .05 )</td>
</tr>
<tr>
<td></td>
<td>n(%)</td>
<td>n(%)</td>
<td>SHAI score ≥18</td>
<td>K-10 score ≥20</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>218 (65.7%)</td>
<td>50 (58.8%)</td>
<td>316 (95.2%)</td>
<td>255 (76.8)</td>
</tr>
<tr>
<td>Male</td>
<td>100 (30.1%)</td>
<td>34 (40.0%)</td>
<td>81 (95.3%)</td>
<td>73 (98.9)</td>
</tr>
<tr>
<td>Unspecified</td>
<td>14 (4.2%)</td>
<td>1 (1.2%)</td>
<td>397 (96.4%)</td>
<td>327 (79.4%)</td>
</tr>
<tr>
<td><strong>Rural status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional/remote</td>
<td>77 (23.2%)</td>
<td>12 (14.1%)</td>
<td>88 (21.4)</td>
<td></td>
</tr>
<tr>
<td>Major cities</td>
<td>193 (58.1%)</td>
<td>45 (52.9%)</td>
<td>234 (56.8%)</td>
<td></td>
</tr>
<tr>
<td>Missing/Not</td>
<td>62 (18.7%)</td>
<td>28 (32.9%)</td>
<td>90 (21.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>Clinician</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allied health</td>
<td>30 (35.3%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (medical)</td>
<td>40 (47.1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 (17.6%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Country</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>n/a</td>
<td>66 (77.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North America</td>
<td></td>
<td>7 (8.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>1 (1.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. GP = general practitioner, K-10 = Kessler Distress Scale – 10 item; M = mean, PHQ-9 = Participant Health Questionnaire – 9 item; SD = standard deviation, SHAI = Short Health Anxiety Inventory.
Table 3. Lesson-by-lesson completion rates for participants undergoing the internet cognitive behavioural therapy program for health anxiety with or without clinician guidance

<table>
<thead>
<tr>
<th></th>
<th>iCBT for Health Anxiety without clinical guidance (n=312)</th>
<th>iCBT for Health Anxiety with clinical guidance (n=79)</th>
<th>Total sample (n=391)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 lesson</td>
<td>51 16.3</td>
<td>8 10.1</td>
<td>59 15.1</td>
</tr>
<tr>
<td>2 lessons</td>
<td>56 17.9</td>
<td>13 16.5</td>
<td>69 17.6</td>
</tr>
<tr>
<td>3 lessons</td>
<td>39 12.5</td>
<td>9 11.4</td>
<td>48 12.3</td>
</tr>
<tr>
<td>4 lessons</td>
<td>29 9.3</td>
<td>8 10.1</td>
<td>37 9.5</td>
</tr>
<tr>
<td>5 lessons</td>
<td>34 10.9</td>
<td>5 6.3</td>
<td>39 10.0</td>
</tr>
<tr>
<td>6 lessons</td>
<td>103 33.0</td>
<td>36 45.6</td>
<td>139 35.5</td>
</tr>
</tbody>
</table>
Table 4. Estimated marginal means and linear mixed model results for health anxiety, depression and distress

<table>
<thead>
<tr>
<th></th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
<th>Mean difference</th>
<th>(df) for the time effect</th>
<th>F</th>
<th>r</th>
<th>Effect size (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAI&lt;sup&gt;a&lt;/sup&gt;</td>
<td>34.32 (8.69)</td>
<td>22.14 (7.66)</td>
<td>12.18</td>
<td>(2, 438.00)</td>
<td>243.31*</td>
<td>0.49</td>
<td>1.66 (1.45-1.88)</td>
</tr>
<tr>
<td>PHQ-9&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.06 (5.13)</td>
<td>4.85 (3.77)</td>
<td>4.21</td>
<td>(2, 369.99)</td>
<td>122.91</td>
<td>0.50</td>
<td>1.12 (0.92-1.32)</td>
</tr>
<tr>
<td>K-10&lt;sup&gt;b&lt;/sup&gt;</td>
<td>25.51(6.32)</td>
<td>18.04 (5.47)</td>
<td>7.47</td>
<td>(2, 407.33)</td>
<td>217.63*</td>
<td>0.55</td>
<td>1.35 (1.15-1.56)</td>
</tr>
</tbody>
</table>

Note. K-10 = Kessler Distress Scale – 10 item; PHQ-9 = Participant Health Questionnaire -9 item; SHAI = Short Health Anxiety Inventory; <sup>a</sup>r = Pearson correlation between Lesson 1 & Lesson 6 scores for calculation of within-group effect sizes; EMM = estimated marginal mean, <sup>b</sup>SD = standard deviation, *p < .001; a = Adjusted model with measurement occasion (time), age, and sex as fixed effects in the model. b = Adjusted model with measurement occasion (time), and age, as fixed effects in the model.
Author Statement

Role of the Funding Source

This work was supported by the Australian National Health and Medical Research Council (NHMRC) and Medical Research Future Fund (APP1145382). The NHMRC/MRFF had no involvement in any aspect of the study, nor the preparation of this manuscript.

Contributors

All authors conceptualised the study, and wrote the manuscript. Dr Newby performed the statistical analyses. All authors have contributed to and approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Acknowledgments

N/A

References


doi:10.1017/s1041610211001852 
Started registration for the THIS WAY UP Health Anxiety Course from 8 June 2016 - 28 Feb 2019

Excluded (n=365)
- Did not complete their enrolment, because they stopped at the payment step of registration process.

Completed registration and enrolment and paid for the course (n=417)

Unguided course (n=328)
- 1 lesson completed, n =51
- 2 lessons completed, n=56
- 3 lessons completed, n=39
- 4 lessons completed, n=29
- 5 lessons completed, n=34
- 6 lessons completed, n=103

Clinician-supervised course (n=85)
- 1 lesson completed, n =8
- 2 lessons completed, n=13
- 3 lessons completed, n=9
- 4 lessons completed, n=8
- 5 lessons completed, n=5
- 6 lessons completed, n=36