Transdiagnostic, internet-delivered cognitive behavior therapy for depression and anxiety: Exploring impact on health anxiety

Victoria A.M. Owens[a], Heather D. Hadjistavropoulos[a,*], Luke H. Schneider[a], Kirsten M. Gullickson[a], Eyal Karin[b], Nickolai Titov[b], Blake F. Dear[b]

[a] Department of Psychology, University of Regina, Regina, Canada
[b] eCentreClinic, Department of Psychology, Macquarie University, Sydney, Australia

ABSTRACT

Health anxiety is associated with significant personal distress and economic cost; as such, widely available and effective treatment options are crucial. Several studies suggest that Internet-delivered cognitive behavior therapy (ICBT) programs that specifically target health anxiety are efficacious for this condition. However, no known studies have examined the impact of transdiagnostic ICBT, which emphasizes the acquisition of broad coping skills applicable to a variety of mental health concerns, on symptoms of health anxiety. The current study sought to explore changes in health anxiety symptoms by utilizing data available from a previously published study of 8-week transdiagnostic ICBT. Specifically, changes in symptoms of health anxiety in response to a transdiagnostic ICBT program that targeted broad symptoms of depression and anxiety, were examined in a subsample of individuals who endorsed elevated symptom scores on the Short Health Anxiety Inventory at pre-treatment ($n = 72$). Following treatment, large reductions in health anxiety symptoms (Cohen's $d = 0.91$; 20% improvement), depression (Cohen's $d = 0.85$; reduction = 38%), generalized anxiety (Cohen's $d = 1.21$; reduction = 42%), and disability (Cohen's $d = 0.90$; reduction = 35%) were reported. Furthermore, results showed that transdiagnostic ICBT was rated as acceptable to people with high health anxiety symptoms. Despite elevated pre-treatment health anxiety scores, email correspondence between clients and their therapist revealed very few mentions of health anxiety. These findings provide preliminary evidence for transdiagnostic ICBT for symptoms of health anxiety and suggest further research is warranted.

1. Introduction

Being aware of physical sensations can be adaptive and serve to alert an individual to the presence of illness (Taylor and Asmundson, 2004). That same awareness, however, can become maladaptive if the individual becomes health anxious or preoccupied and hyperaware of bodily sensations, convinced that benign sensations may be a sign of significant physical health problem (Abramowitz et al., 2007). Health anxiety is estimated to impact 6% of individuals at some point in their life (Bobevski et al., 2016) and can affect individuals with or without medical conditions (Abramowitz et al., 2007; Jones et al., 2014; Kehler and Hadjistavropoulos, 2009). It is associated with high levels of psychological distress (Abramowitz et al., 2007; Warwick and Salkovskis, 2001), as well as significant economic costs that result from frequent medical consultations and often unnecessary tests (e.g., Barsky et al., 2001; Bobevski et al., 2016). The consequences of health anxiety accentuate the importance of developing efficacious psychological

treatment options to remediate the condition. Psychological treatments, delivered in-person or delivered through the Internet, may be disorder-specific or transdiagnostic in nature. Interventions are considered to be disorder-specific when one disorder in particular is targeted (e.g., depression), although of note, these interventions do commonly result in reduced comorbid mental health symptoms that may not be directly targeted in the intervention (e.g., Newby et al., 2017). Interventions are considered transdiagnostic when they simultaneously address symptoms of more than one disorder and focus on cognitive and behavioral skills that are broadly applicable to various diagnostic categories (Kazdin, 2014; McEvoy et al., 2009).

Disorder-specific, cognitive behavior therapy (CBT) protocols has been researched extensively in the treatment of health anxiety (e.g., Bobevski et al., 2016; Clark et al., 1998; Olatunji et al., 2014; Warwick et al., 1996); protocols emphasize developing strategies to manage the cognitive (e.g., attentional bias towards bodily sensations), behavioral (e.g., frequent medical consultations), and physical (e.g., headaches)

---

symptoms associated with health anxiety (Hedman and Axelsson, 2017). Randomized control trials have consistently demonstrated the efficacy of CBT in the treatment of health anxiety (Olatunji et al., 2014; Taylor and Asmundson, 2004). Unfortunately, barriers to accessing in-person services (e.g., geographical restrictions, mobility restraints, stigma) greatly contribute to the undertreatment of mental health disorders, including health anxiety (Andersson and Titov, 2014; Collins et al., 2004).

Internet-delivered CBT (ICBT) is a relatively new method of delivering psychological treatment and has been shown to produce comparable effect sizes to face-to-face CBT in the treatment of a variety of mental health concerns (e.g., Andersson et al., 2014; Andrews et al., 2018; Carlbring et al., 2018). During an ICBT program, individuals are provided with structured psychoeducational materials, delivered in an online format (Andersson and Titov, 2014). ICBT is advantageous in that barriers associated with accessing in-person services may be mitigated (Andersson and Titov, 2014). Taking into account the advantages associated with ICBT, Hedman et al. (2011) pioneered the first known ICBT program for health anxiety. Individuals that met diagnostic criteria for hypochondriasis were presented with strategies for managing health anxiety (e.g., mindfulness as a means of attending to physical sensations in the body) in an online format and had access to an online therapist. At post-treatment, symptoms of health anxiety, as measured by the Health Anxiety Inventory (HAI; Salkovskis et al., 2002), showed large and significant reductions ($d = 1.94$; Hedman et al., 2011); symptoms of depression, general anxiety, anxiety sensitivity, and quality of life were also found to significantly improve following treatment, despite not being directly targeted. Subsequently, Hedman et al. (2014) compared the effects of an exposure-based ICBT program and an Internet-delivered behavioral stress management program in individuals that met diagnostic criteria for hypochondriasis. While participants in both groups demonstrated large reductions in health anxiety symptoms, as measured by the HAI ($d = 1.22–1.78$), participants that received exposure-based ICBT showed significantly greater improvements (Hedman et al., 2014). This trend was also observed across symptoms of comorbid depression and anxiety in that medium to large reductions were observed in both groups, with more favorable reductions reported in the exposure-based ICBT condition. Of note, large reductions in health anxiety symptoms are still observed when exposure-based ICBT is provided without the guidance of a therapist, as well as when psychoeducational materials are provided as a hardcopy as opposed to over the Internet (Hedman et al., 2016).

Other researchers have also explored Internet-delivered treatments specifically for health anxiety in individuals that met diagnostic criteria for either illness anxiety disorder or somatic symptom disorder. For example, Newby et al. (2016) developed the Health Anxiety Program which consists of several online lessons containing information about understanding health anxiety, reducing worry about personal health, becoming aware of anxious thinking, thought challenging, education about avoidance and safety behaviors, and relapse prevention. Individuals partaking in this program had access to an online therapist; therapeutic support was largely based on the individual's need. Promisingly, large reduction in health anxiety as measured by the Short Heath Anxiety Inventory (SHAI; Salkovskis et al., 2002), as well as secondary measures of depression and anxiety symptoms were reported at post-treatment (Hedges $gs > 1.00$; Newby et al., 2016). More recently, Newby et al. (2018) compared an ICBT program for health anxiety with an active control group, wherein individuals in the active control group received psychoeducation regarding anxiety as well as therapist contact. Significant reduction in health anxiety as measured by the SHAI was reported in both the ICBT and active control group, representing a large (Hedges $g = 2.82$) and medium (Hedges $g = 0.69$) sized reduction respectively; significant reductions in secondary measures of depression and anxiety symptoms were reported in both groups (Hedges $gs > 0.67$), with more favorable reductions observed in the ICBT condition (Newby et al., 2018). In summary, several studies have

demonstrated the effectiveness of ICBT in the treatment of health anxiety, when health anxiety is directly targeted; however, these disorder-specific interventions have also led to reductions in symptoms of secondary depression and anxiety. This suggests that similarities exist between health anxiety, depression, and anxiety, providing the rationale for studying the use of transdiagnostic interventions in this population.

As more becomes known about the commonalities between mental health concerns, transdiagnostic interventions have been increasingly researched (Kazdin, 2014; McEvoy et al., 2009). Previous research has shown transdiagnostic ICBT is effective for reducing symptoms across a variety of disorders (e.g., panic, social anxiety) without targeting these concerns specifically (Titov et al., 2015). Moreover, studies reveal that transdiagnostic ICBT results in comparable effect sizes to disorder-specific ICBT for depression, generalized anxiety, social anxiety, and panic (e.g., Dear et al., 2015; Newby et al., 2017). Transdiagnostic ICBT provides some pragmatic advantages over disorder-specific ICBT in routine practice; for example, transdiagnostic interventions simplify treatment dissemination by requiring a clinician to learn and deliver a singular treatment protocol (Meidlinger and Hope, 2017). Furthermore, transdiagnostic ICBT is beneficial from a client perspective, because it allows individuals with comorbid conditions to concurrently learn to manage multiple disorders (Titov et al., 2011). Transdiagnostic ICBT has shown excellent results related to generalized anxiety and depression outcomes, yet it remains unclear whether similar results will be found as it relates to the treatment of health anxiety symptoms. Given the overlapping features between health anxiety, depression, and anxiety, coupled with the results from previous disorder-specific ICBT for health anxiety, transdiagnostic treatments appear to be an appropriate avenue to explore in this population. The purpose of the current investigation was to examine the extent to which health anxiety symptoms improve with transdiagnostic ICBT by making use of data from clients with elevated health anxiety who participated in a previous trial of ICBT for generalized anxiety and depression. The study also aimed to qualitatively analyze the content of clients' communication with their therapist to look for any mention of health anxiety, which might indicate health anxiety was a primary concern for some participants. Given previous research has shown transdiagnostic Internet interventions effectively reduce symptoms across a variety of disorders (Johnston et al., 2011), it was hypothesized that in a sample of individuals with elevated health anxiety, the intervention would result in significant reductions in symptoms of health anxiety, generalized anxiety, depression, and disability. No hypotheses were made regarding the extent to which messages would show evidence of discussion of health anxiety with the therapist.

2. Methods

2.1. Participants

Participant data for this study was obtained from a previously published registered trial of transdiagnostic ICBT to treat depression and generalized anxiety (ISRCTN14230906; Hadjistavropoulos et al., 2017); participant data was included in the current study if the individual had high pre-treatment levels of health anxiety. All participants applied to the trial through the Online Therapy Unit (www.onlinetherapyuser.ca), a government-funded clinic that offers ICBT to residents of Saskatchewan, Canada. To be eligible for the intervention, participants were required to be: over the age of 18; live in Saskatchewan, Canada; provide a medical contact for emergency purposes; and have access to a computer and Internet. Further, individuals were excluded if they reported high suicide risk, mania, psychosis, or primary problems with alcohol or drugs. Following admission to the course, participants were enrolled in a transdiagnostic ICBT program (the Wellbeing Course) and as per the study protocol were randomly assigned to receive varying levels of therapist support (i.e., standard

support [weekly messages from therapist] or optional support [message received from therapist only when participant initiates communication]). Data was available for 174 individuals that participated in the larger trial (Hadjistavropoulos et al., 2017); however, the current study sought only to assess change of symptoms in individuals that reported elevated levels of health anxiety at pre-treatment (i.e., 18 or greater on the SHAI). This cutoff score is based on a discriminant function analysis conducted by Rode et al. (2006) wherein a score of 18 or higher identified individuals that met diagnostic criteria for the previous diagnosis of hypochondriasis and represented clinically significant levels of health anxiety (Seivewright et al., 2004); as such, numerous researchers use 18 as a cut-off score when seeking to identify individuals with diagnostically relevant health anxiety symptoms (e.g., Hayter et al., 2016; Patel et al., 2016). Of the 174 participants randomized to the larger ICBT trial, 72 participants met criteria for the current study (i.e., SHAI ≥ 18); 39 received standard support and 33 received optional support.

2.2. Intervention

Participants involved in the current study received access to the Wellbeing Course, an 8-week transdiagnostic ICBT program (Titov et al., 2011) that was licensed from Macquarie University for use by the Online Therapy Unit. The Wellbeing Course is comprised of five lessons including: 1) introduction to the cognitive behavior model of depression and anxiety; 2) information regarding cognitive symptoms and thought challenging; 3) information regarding physical symptoms, de-arousal strategies, and pleasant activity scheduling; 4) information regarding behavioral symptoms and graded exposure; and 5) relapse prevention. The Wellbeing Course has been described in detail in previous studies (i.e., Dear et al., 2011; Hadjistavropoulos et al., 2016). In combination with five lessons, all participants had access to additional Resources (e.g., sleep, assertiveness) and were encouraged to complete Do-It-Yourself guides that break down central concepts taught in each lesson. Case Stories based on previous clients were provided.

2.3. Therapist support

Automated messages were sent to all participants and contained information about upcoming lesson availability. Participants were able to message their therapists via a secure online messaging system hosted on the Online Therapy Unit's website. Therapists were supervised graduate students in clinical psychology ($n = 2$) and registered social workers ($n = 3$). The majority of contact between therapists and participants was via an online messaging system; however, telephone calls were occasionally made. For example, regardless of the level of therapist support received, if a participant had not logged into the website for a week, the therapist may have called them in an attempt to engage the participant in treatment. The therapist may have also called a participant if safety was a concern, indicated by an increase of five of more points on a depression measure, or if a participant endorsed thoughts of being better off dead or hurting themselves more than half the days or nearly every day. In the standard support condition, participants were contacted on a weekly basis by their therapists, regardless of whether they had replied. In the optional support condition, participants were only messaged by therapists if the participant had initiated contact.

2.4. Measures

2.4.1. Outcome measure

The SHAI (Salkovskis et al., 2002) is a brief measure of health anxiety symptoms and is comprised of a subset of items contained in a longer 64-item questionnaire, the HAI (Salkovskis et al., 2002). The SHAI has been used by clinicians and researchers as a tool for assessing an individual's level of health concern, ranging from normal levels to

severe health anxiety (Alberts et al., 2013; Lovas and Barsky, 2010). Individuals read four possible statements that may apply to them and respond by choosing the statement that best represents how they feel (e.g., I usually feel at [very low]/[fairly low]/[moderate]/[high] risk for developing a serious illness.). Each statement is scored on a 0 to 3 scale; all scores are summed to produce a total score. Scores can range from 0 to 42, wherein a higher score represents greater health anxiety severity. The 14-item SHAI has comparable psychometric properties to the full 64-item version (Salkovskis et al., 2002) and appears to have good internal consistency and convergent and divergent validity (Alberts et al., 2013; Salkovskis et al., 2002). Cronbach's α in the current study ranged from 0.77 to 0.94.

2.4.2. Background and clinical information

Participants provided demographic information during an online questionnaire prior to beginning treatment. Information obtained included: age, sex, ethnicity, employment status, education, relationship status, size of community where participant resided (e.g., reserve, town, large city). Participants also completed generalized anxiety and depression measures.

2.4.2.1. The Generalized Anxiety Disorder Scale 7-item (GAD-7; Spitzer et al., 2006). The GAD-7 is designed to measure symptoms of generalized anxiety disorder. Individuals are asked to indicate how often, over the past two weeks, seven statements have applied to them (e.g., feeling nervous, anxious, or on edge; trouble relaxing). Each of the seven statements are rated on a 0 (not at all) to 3 (nearly every day) scale. Scores can range from 0 to 21, wherein a higher score represents greater severity of generalized anxiety. The GAD-7 has been shown to have strong psychometric properties, including good internal consistency and construct validity (Mills et al., 2014; Spitzer et al., 2006). Cronbach's α in the current study ranged from 0.83 to 0.88.

2.4.2.2. The Patient Health Questionnaire 9-item (PHQ-9; Kroenke et al., 2001). The PHQ-9 is a measure of depression symptom severity. Individuals are asked to indicate how often, over the past two weeks, nine statements have applied to them (e.g., little interest or please in doing things; feeling down, depressed or hopeless). Each of the nine statements are rated on a 0 (not at all) to 3 (nearly every day) scale. Scores can range from 0 to 27, wherein a higher score represents greater severity of depression. The PHQ-9 has been shown to have strong psychometric properties, including good internal consistency, reliability, and construct validity (Cameron et al., 2008; Kroenke et al., 2001). Cronbach's α in the current study ranged from 0.89 to 0.92.

2.4.2.3. Sheehan Disability Scale (SDS; Sheehan, 1983). The SDS is a measure of general impairment in psychosocial functioning. The SDS is comprised of three statements, asking individuals to rate on a 1 to 10 scale how their symptoms have disrupted: work/school work, social life, and family/home responsibilities. Scores on the SDS can range from 0 to 30, wherein higher scores indicate greater impairment. The SDS has been found to have strong psychometric properties, including internal consistency and reliability (Leon et al., 1997). Cronbach's α in the current study ranged from 0.84 to 0.96.

2.4.3. Treatment satisfaction

Following previous ICBT research (e.g., Titov et al., 2015), at post-treatment, participants were asked to indicate whether they believed the course was worth their time and whether they would recommend the course to a friend (yes/no).

2.5. Analytic strategy

SPSS version 23 was used to conduct all statistical analyses. The SHAI, GAD-7, PHQ-9, and SDS were administered to participants at pre-treatment, post-treatment, and 3-month follow-up. Individuals

participating in the Wellbeing Course were randomized to receive varying levels of therapist contact (standard weekly vs. optional weekly). Analyses for the current study, however, did not separate based on level of therapist contact received, as such analyses have already been undertaken and published in a non-inferiority trial; differences in outcomes were not identified between standard and optional weekly support (Hadjistavropoulos et al., 2017). Additionally, as the current study is the first known to examine the impact of transdiagnostic ICBT on symptoms of health anxiety, participant data was combined to facilitate generalizability of results. Consistent with previous research (Dear et al., 2015; Hadjistavropoulos et al., 2016; Hadjistavropoulos et al., 2017), generalized estimation equation (GEE) models were used to examine changes in symptoms over time. GEE analyses use longitudinal models to statistically examine within-group change in dependent variables over time, while also accounting for within-subject variance though a working correlation model (Hubbard et al., 2010). For the GEE analyses, an unstructured working correlation was used, along with robust error estimation. Additionally, a gamma distribution with a log-link response scale was chosen to address skewness and kurtosis observed within the data (Karin et al., 2018b).

To address missing values (36.1% post-treatment and 70.8% follow-up) and consistent with intention-to-treat principles (Hollis and Campbell, 1999) and previous research (Karin et al., 2018a), model-based imputation was used to generate replacement values for all dependent variables at post-treatment and 3-month follow-up. To determine the suitability of replacing missing cases under the missing at random assumption (MAR), an exploration of demographic and symptom variables predicting missing values was conducted (Karin et al., 2018a; Little et al., 2012). From the range of available predictors, the variable of lesson completion was identified as the single largest predictor of missing data at post-treatment; in line with previous missing cases research (Fernandez et al., 2015). This outcome implied that the estimation of replacement outcomes for missing cases must account for the lower rate of treatment adherence, and the higher likely higher rate of symptoms in those individuals who do not complete much of the treatment and become missing cases. To account for any possible bias associated with missing cases, the replacement of missing cases outcomes was taken from longitudinal models that adjusted (stratified) each of the outcomes by time, group, and the individual's lesson completion. Estimated marginal means from the GEE analysis were used to calculate the average percentage change across time on the SHAI, GAD-7, PHQ-9, and SDS while effect sizes and their associated 95% confidence intervals were also calculated based on the GEE to aid in the interpretation of results.

2.5.1. Qualitative analysis of participant messages

Messages sent by participants to their therapists were examined to assess whether individuals who endorse high levels of health anxiety symptoms were explicitly mentioning these concerns to their therapist. One of the authors (V. Owens) reviewed 226 messages sent by participants for instances in which health anxiety was specifically mentioned. Messages were reviewed for both frequency of mentioning health anxiety and for the content of those messages.

3. Results

3.1. Background, clinical, and treatment satisfaction information

As presented in Table 1, participants ranged in age from 20 to 68 years with an average age of 37.69 (SD = 11.84). Most participants were female (n = 58; 80.6%), identified as Caucasian (n = 60; 83.3%), and reported living in a large city (n = 35; 48.6%). Over three quarters of the sample reported post-secondary education (n = 55; 77.7%; ranging from some college to university graduate degrees), and indicated they were currently employed (n = 47; 65.3%). Most participants reported being married or living with a partner (n = 43; 59.7%), followed

Table 1
Participant characteristics.

	All participants (N = 72)	
	n	%
Age		
Mean (SD)	37.69 (11.84)	–
Range	20–68	–
Gender		
Female	58	80.6
Male	14	19.4
Relationship status		
Single/dating	18	25.0
Living with partner	11	15.3
Married	32	44.4
Divorced/separated	9	12.5
Widowed	1	1.4
Missing data	1	1.4
Education		
Less than grade 12	1	1.4
High school diploma	15	20.8
College/some university	36	51.3
University undergraduate degree	9	12.5
University professional degree (e.g., MD)	1	1.4
University graduate degree (e.g., MA, PhD)	9	12.5
Employment status		
Employed part-time/full-time	47	65.3
Unemployed	2	2.8
Homemaker	5	6.9
Retired, student, or disability	17	25.0
Ethnicity		
Caucasian	60	83.3
Indigenous	7	9.8
Other	5	7.0
Location		
Large city (> 200,000)	35	48.6
Small city (10,000-200,000)	21	29.2
Town/village/farm	16	22.3
Clinical symptoms		
Pre-treatment GAD-7 ≥ 10	58	80.6
Pre-treatment PHQ-9 ≥ 10	50	69.4
Treatment engagement		
Mean furthest lesson visited (SD)	4.14 (1.35)	–
Mean written messages sent to therapists (SD)	3.14 (3.47)	–
Mean written messages received by therapist (SD)	6.08 (2.98)	–

Note. GAD-7 = Generalized Anxiety Disorder 7-item; PHQ-9 = Patient Health Questionnaire.

by being single (n = 18; 25.0%), with the remainder being separated, divorced, or widowed.

In terms of clinical information, consistent with the larger trial (Hadjistavropoulos et al., 2017), at pre-treatment, 69% (n = 50) of participants reported PHQ-9 scores ≥10 suggestive of a depressive disorder and 81% (n = 58) reported GAD-7 scores ≥10, suggestive of generalized anxiety disorder. On average, participants visited 4.14 (SD = 1.35) of five lessons and sent 3.14 (SD = 3.47) messages to their therapists. See Table 1 for additional information regarding participant demographic and clinical information. In terms of treatment satisfaction, the majority of participants reported that the course was worth their time (89%; n = 49) and reported they would recommend the course to a friend (87%; n = 48).

3.2. Primary analysis

The means, standard deviations, percentage reductions, and Cohen's d effect sizes for the SHAI, GAD-7, PHQ-9, and SDS are presented in Table 2 and suggest clinically significant symptom change occurred. The GEE revealed statistically significant Time effects for the SHAI (Wald's χ^2 = 237.35, $p < 0.001$) and the GAD-7 (Wald's χ^2 = 95.68, $p < 0.001$); for both of these measures, pairwise comparisons showed significant differences between pre-treatment and post-treatment

Table 2
Means, standard deviations, and effect sizes (Cohen's d) for outcome and clinical measures.

	Estimated marginal means			Percentage change from pre-treatment		Within-group effect size from pre-treatment	
	Pre-treatment	Post-treatment	3-Month follow-up	To post-treatment	To 3-month follow-up	To post-treatment	To 3-month follow-up
Measure							
SHAI	23.97 (4.72)	19.09 (5.92)	15.60 (4.74)	20 [14–26]	35 [30–39]	0.91 [0.57–1.25]	1.77 [1.38–2.15]
GAD-7	13.01 (4.50)	7.53 (4.59)	6.25 (3.86)	42 [33–50]	52 [45–58]	1.21 [0.84–1.55]	1.61 [1.23–1.98]
PHQ-9	13.26 (6.06)	8.16 (5.92)	7.48 (6.06)	38 [27–48]	44 [32–53]	0.85 [0.51–1.19]	0.96 [0.61–1.3]
SDS	19.54 (6.64)	12.62 (8.59)	11.43 (8.06)	35 [24–45]	42 [31–50]	0.90 [0.56–1.24]	1.10 [0.74–1.44]

Note. SHAI = Short Health Anxiety Inventory; GAD-7 = Generalized Anxiety Disorder-7; PHQ-9 = Patient Health Questionnaire-9; SDS = Sheehan Disability Scale. Standard deviations are shown in rounded parentheses for the estimated means; 95% confidence intervals are shown in square parentheses for the percentage changes and effect sizes.

scores, pre-treatment and 3-month follow-up scores, as well as between post-treatment and 3-month follow-up scores (all $ps \leq 0.001$). The GEE revealed statistically significant Time effects for the PHQ-9 (Wald's $\chi^2 = 42.40$, $p < 0.001$) and the SDS (Wald's $\chi^2 = 46.60$, $p < 0.001$); pairwise comparisons for both these measures showed significant differences between pre-treatment and post-treatment scores, as well as pre-treatment and 3-month follow-up scores (all $ps < 0.001$), however, there was no significant difference between post-treatment and 3-month follow-up scores (all $ps > 0.14$).

3.2.1. Qualitative analysis of participant messages

Of the 226 messages sent by participants, eight messages contained information directly pertaining to health anxiety. Within the eight messages, four participants mentioned health anxiety once, and two participants mentioned health anxiety twice. Instances in which health anxiety was mentioned were often brief and were not typically elaborated upon. For example, one participant discussed an upcoming mammogram, and her anxiety pertaining to her health and the results from the mammogram. Another participant reported "*My thoughts range from thinking I have a health condition to having some other form of illness*".

4. Discussion

The current study is the first to explore whether a transdiagnostic ICBT program targeting generalized anxiety and depression would also result in notable improvements in health anxiety symptoms among a subsample of participants who endorsed clinical levels of health anxiety at pre-treatment. As hypothesized, large and significant improvements were reported for symptoms of health anxiety (Cohen's $d = 0.91$; reduction = 20%), as well as generalized anxiety (Cohen's $d = 1.21$; reduction = 42%), depression (Cohen's $d = 0.85$; reduction = 38%), and disability (Cohen's $d = 0.90$; reduction = 35%). These findings not only suggest that an 8-week transdiagnostic ICBT is associated with clinically significant improvements in health anxiety symptoms, as evidenced by large effect sizes and notable percentage of symptom reduction, but also improvements in other important outcomes among individuals with high health anxiety (i.e., generalized anxiety, depression, disability). With regard to treatment satisfaction, the vast majority of participants indicated that the course was worth their time (89%) and that they would recommend the course to a friend (87%). These findings suggest that transdiagnostic ICBT is rated as acceptable to people with elevated symptoms of health anxiety.

The findings of the present study extend on the existing literature by providing preliminary evidence for the efficacy of transdiagnostic ICBT in the treatment of health anxiety symptoms. Although it is tempting to directly compare the effect sizes found in the current study to those reported by health anxiety-specific ICBT trials (e.g., Hedman et al., 2011, 2014, 2016; Newby et al., 2016, 2018), we believe such a comparison is inappropriate, given the notable differences between studies with regard to study design, recruitment method, inclusion/exclusion criteria, pre-treatment health anxiety severity, and so on. Specially

designed RCTs that compare transdiagnostic and disorder-specific ICBT programs for health anxiety are needed to allow for judgements of superiority. However, the findings of the current study suggest that transdiagnostic ICBT may assist in reducing health anxiety symptoms and that clinical trials examining transdiagnostic ICBT for health anxiety are worthwhile, particularly studies comparing transdiagnostic and disorder-specific ICBT for health anxiety with appropriate control. Such trials are worthwhile given the broader ICBT literature suggests transdiagnostic ICBT may have several pragmatic benefits over disorder-specific ICBT (e.g., clinicians learn and deliver a singular treatment protocol, clients with comorbid conditions can learn to concurrently manage multiple disorders; Meidlinger and Hope, 2017; Titov et al., 2011). Nevertheless, transdiagnostic interventions need to be at least as acceptable and effective as established disorder-specific treatments for their pragmatic benefits to be considered.

Qualitative analysis of clients' correspondence with their therapist revealed that only 6 clients out of 72 mentioned health anxiety in their communications. Furthermore, when health anxiety was mentioned, clients rarely elaborated upon their worries about their health or related the skills to their health anxiety, and therapists did not encourage clients to do so. This suggests that although all the participants included in this study reported elevated health anxiety scores at pre-treatment, concerns about health were not the primary focus of most clients. Given that diagnostic assessments were not completed in the current study as in previous studies (e.g., Hedman et al., 2011, 2014, 2016; Newby et al., 2016, 2018), it is unclear whether clients had clinical difficulties with health anxiety (e.g., anxiety in the absence of health problems) or were experiencing anxiety related to their actual health (e.g., anxiety in the presence of real health problems). The latter is a real possibility given the well-established links between anxiety and depression and real physical health morbidity (e.g., Read et al., 2017). Thus, the low incidence of health anxiety discussion in clients' emails may be a product of the recruitment method of the RCT from which the current data is drawn. Specifically, the Wellbeing Course was advertised as helping clients manage depression and anxiety, so it is likely that participants included in the current study were not seeking treatment specifically for health anxiety and may not have been aware that this ICBT program could help reduce their health anxiety symptoms. If recruitment materials mentioned health anxiety and therapists were to encourage clients to apply the skills to their health anxiety symptoms, it is possible that health anxiety may have been a more prominent topic in client-therapist correspondence. Nevertheless, the current findings highlight the potential of transdiagnostic ICBT for adults experiencing symptoms of health anxiety.

This brief report is the first known to examine the impact of transdiagnostic ICBT on health anxiety symptoms. There were several strengths of the study, including use of an established transdiagnostic ICBT program (e.g., Dear et al., 2015; Hadjistavropoulos et al., 2016, 2017; Titov et al., 2011, 2015) and a psychometrically sound measure of health anxiety with an empirically supported cut off score (Alberts et al., 2013; Rode et al., 2006; Salkovskis et al., 2002; Seivewright et al.,

2004). Furthermore, as the inclusion criteria for the current study was based on a cutoff score as opposed to meeting diagnostic criteria, the subsequent less stringent inclusion criteria than past health anxiety-specific ICBT trials (Hedman et al., 2011, 2014, 2016; Newby et al., 2016, 2018) may make this sample more comparable to clients seen in routine care that would not necessarily meet diagnostic criteria and as such may improve the generalizability of the findings. There were also several limitations to the current study that warrant discussion. First, the vast majority of the sample consisted of female participants (i.e., 80.6%); while this is not an uncommon demographic trend in the ICBT literature (e.g., Hadjistavropoulos et al., 2017; Hedman et al., 2014), it perhaps limits the generalizability of our results. Future research may wish to specifically recruit males in order for potential comparisons to be made between females and males and to ascertain a better understanding into effective treatment options for health anxiety symptoms in men. Second the sample consisted of clients who were randomized to two different treatment conditions (i.e., standard support or optional support); however, it is unclear what influence the level of support had on the current findings. It is possible that the different levels of therapist support may have been associated with health anxiety outcomes or treatment engagement, but the sample size was too small to allow for group comparisons. Third, no information about participants' health status or conditions was available and, while individuals can experience clinical health anxiety even when they have a health condition (Kehler and Hadjistavropoulos, 2009; Jones et al., 2014), previous health anxiety-specific ICBT trials have excluded individuals with health conditions. This complicates direct comparisons of the current findings with existing studies of disorder-specific ICBT for health anxiety symptoms. Fourth, the qualitative analysis of clients' communications was limited by the paucity of relevant examples; therefore, it was not possible to identify meaningful themes within the content. Fifth, some caution is needed in interpreting the 3-month follow-up data, given relatively low numbers of participants provided data about their health anxiety symptoms at follow-up (36.1%) compared with symptoms of general anxiety and depression (70.3%). Finally, although the current study administered measures at 3-month follow-up, this is a relatively short follow-up period. Given that individuals with health anxiety are vulnerable to symptom relapse (e.g., Salkovskis et al., 2003), future research may benefit from assessing measures at a longer follow-up period to determine whether symptom improvement is maintained for extended periods of time. Despite noted limitations, these promising preliminary findings suggest future research exploring transdiagnostic ICBT for health anxiety is worthwhile. Specifically, randomized controlled trial of transdiagnostic ICBT for the treatment of health anxiety would allow for comparisons between groups (e.g., waitlist control, health anxiety-specific ICBT); this would make it possible to conduct a more detailed exploration of the efficacy of transdiagnostic ICBT for individuals with health anxiety and produce more generalizable results.

5. Conclusion

Results from the current study provide preliminary support for the use of transdiagnostic ICBT in the treatment of health anxiety symptoms. Significant and large reductions in health anxiety, generalized anxiety, and depression symptoms were observed at post-treatment and appeared to be maintained at follow-up. In general, participants reported overall satisfaction with the transdiagnostic ICBT program. Comparing the results of the current study with health anxiety-specific ICBT trials is not recommended however, because of several notable differences between the studies. Nevertheless, the findings of the current study provide the necessary support for more rigorous randomized controlled trials examining the potential of transdiagnostic versus disorder-specific ICBT for symptoms of health anxiety.

References

Abramowitz, J.S., Olatunji, B.O., Deacon, B.J., 2007. Health anxiety, hypochondriasis, and the anxiety disorders. Behav. Ther. 38, 86–94. https://doi.org/10.1016/j.beth.2006.05.001.

Alberts, N.M., Hadjistavropoulos, H.D., Jones, S.L., Sharpe, D., 2013. The short health anxiety inventory: a systematic review and meta-analysis. J. Anxiety Disord. 27, 68–78. https://doi.org/10.1016/j.janxdis.2012.10.009.

Andersson, G., Titov, N., 2014. Advantages and limitations of internet-based interventions for common mental disorders. World Psychiatry 13, 4–11. https://doi.org/10.1002/wps.20083.

Andersson, G., Cuijpers, P., Carlbring, P., Riper, H., Hedman, E., 2014. Guided internet based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: a systematic review and meta-analysis. World Psychiatry 13, 288–295. https://doi.org/10.1002/wps.20151.

Andrews, G., Basu, A., Cuijpers, P., Craske, M.G., McEvoy, P., English, C.L., Newby, J.M., 2018. Computer therapy for the anxiety and depression disorders is effective, acceptable and practical health care: an updated meta-analysis. J. Anxiety Disord. 55, 70–78. https://doi.org/10.1016/j.janxdis.2018.01.001.

Barsky, A.J., Ettner, S.L., Horsky, J., Bates, D.W., 2001. Resource utilization of patients with hypochondriacal health anxiety and somatization. Med. Care 39, 705–715. https://doi.org/10.1097/00005650-200107000-00007.

Bobevski, I., Clarke, D.M., Meadows, G., 2016. Health anxiety and its relationship to disability and service use: findings from a large epidemiological survey. Psychosom. Med. 78, 13–25. https://doi.org/10.1097/psy.0000000000000252.

Cameron, I.M., Crawford, J.R., Lawton, K., Reid, I.C., 2008. Psychometric comparison of PHQ-9 and HADS for measuring depression severity in primary care. Br. J. Gen. Pract. 58, 32–36. https://doi.org/10.3399/bjgp08x263794.

Carlbring, P., Andersson, G., Cuijpers, P., Riper, H., Hedman-Lagerlöf, E., 2018. Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: an updated systematic review and meta-analysis. Cogn. Behav. Ther. 47, 1–18. https://doi.org/10.1080/16506073.2017.1401115.

Clark, D.M., Salkovskis, P.M., Hackmann, A., Wells, A., Fennell, M., Ludgate, J., ... Gelder, M., 1998. Two psychological treatments for hypochondriasis: a randomised controlled trial. Br. J. Psychiatry J. Ment. Sci. 173, 218–225. https://doi.org/10.1192/bjp.173.3.218.

Collins, K.A., Westra, H.A., Dozois, D.J., Burns, D.D., 2004. Gaps in accessing treatment for anxiety and depression: challenges for the delivery of care. Clin. Psychol. Rev. 24, 583–616. https://doi.org/10.1016/j.cpr.2004.06.001.

Dear, B.F., Titov, N., Schwencke, G., Andrews, G., Johnston, L., Craske, M.G., McEvoy, P., 2011. An open trial of a brief transdiagnostic internet treatment for anxiety and depression. Behav. Res. Ther. 49 (12), 830–837.

Dear, B.F., Staples, L.G., Terides, M.D., Karin, E., Zou, J., Johnston, L., ... Titov, N., 2015. Transdiagnostic versus disorder-specific and clinician-guided versus self-guided internet delivered treatment for generalized anxiety disorder and comorbid disorders: a randomized controlled trial. J. Anxiety Disord. 36, 63–77. https://doi.org/10.1016/j.janxdis.2015.09.003.

Fernandez, E., Salem, D., Swift, J.K., Ramtahal, N., 2015. Meta-analysis of dropout from cognitive behavioral therapy: magnitude, timing, and moderators. J. Consult. Clin. Psychol. 83 (6), 1108–1122. https://doi.org/10.1037/ccp0000044.

Hadjistavropoulos, H.D., Nugent, M., Alberts, N., Staples, L., Dear, B., Titov, N., 2016. Transdiagnostic internet-delivered cognitive behaviour therapy in Canada: an open trial comparing results of a specialized online clinic and nonspecialized community clinics. J. Anxiety Disord. 42, 19–29. https://doi.org/10.1016/j.janxdis.2016.05.006.

Hadjistavropoulos, H.D., Schneider, L.H., Edmonds, Karin E.M., Nugent, M.N., Dirkse, D., Dear, B.F., Titov, N., 2017. Randomized controlled trial of Internet-delivered cognitive behaviour therapy comparing standard weekly versus optional weekly therapist support. J. Anxiety Disord. 52, 15–24. https://doi.org/10.1016/j.janxdis.2017.09.006.

Hayter, A.L., Salkovskis, P.M., Silber, E., Morris, R.G., 2016. The impact of health anxiety in patients with relapsing remitting multiple sclerosis: misperception, misattribution and quality of life. Br. J. Clin. Psychol. 55, 371–386. https://doi.org/10.1111/bjc.12106.

Hedman, E., Axelsson, E., 2017. Severe health anxiety in the somatic symptom and related disorders. In: McKay, D., Abramowitz, J.S., Storch, E.A. (Eds.), Treatments for Psychological Problems and Syndromes. John Wiley & Sons, Inc., Hoboken, NJ, pp. 345–359.

Hedman, E., Andersson, G., Andersson, E., Ljotsson, B., Ruck, C., Asmundson, G.J., Lindefors, N., 2011. Internet-based cognitive-behavioural therapy for severe health anxiety: randomised controlled trial. Br. J. Psychiatry 198, 230–236. https://doi.org/10.1192/bjp.bp.113.140913.

Hedman, E., Axelsson, E., Görling, A., Ritzman, C., Ronnheden, M., El Alaoui, S., ... Ljótsson, B., 2014. Internet-delivered exposure-based cognitive–behavioural therapy and behavioural stress management for severe health anxiety: randomised controlled trial. Br. J. Psychiatry 205 (4), 307–314. https://doi.org/10.1192/bjp.bp.113. 140913.

Hedman, E., Axelsson, E., Andersson, E., Lekander, M., Ljótsson, B., 2016. Exposure-based cognitive–behavioural therapy via the internet and as bibliotherapy for somatic symptom disorder and illness anxiety disorder: randomised controlled trial. Br. J. Psychiatry 209, 407–413. https://doi.org/10.1192/bjp.bp.116.181396.

Hollis, S., Campbell, F., 1999. What is meant by intention to treat analysis? Survey of published randomised controlled trials. BMJ 319 (7211), 670–674.

Hubbard, A.E., Ahern, J., Fleischer, N.L., Van der Laan, M., Lippman, S.A., Jewell, N., ... Satariano, W.A., 2010. To GEE or not to GEE: comparing population average and mixed models for estimating the associations between neighborhood risk factors and health. Epidemiology 21, 467–474. https://doi.org/10.1097/EDE. 0b013e3181caeb90.

Johnston, L., Titov, N., Andrews, G., Spence, J., Dear, B.F., 2011. A RCT of a transdiagnostic internet-delivered treatment for three anxiety disorders: examination of support roles and disorder-specific outcomes. PLoS One 6, e28079. https://doi.org/10. 1371/journal.pone.0028079.

Jones, S.L., Hadjistavropoulos, H.D., Gullickson, K.M., 2014. Understanding health anxiety following breast cancer diagnosis. Psychol. Health Med. 19 (5), 525–535. https://doi.org/10.1080/13548506.2013.845300.

Karin, E., Dear, B.F., Heller, G.Z., Crane, M.F., Titov, N., 2018a. "Wish You Were Here": examining characteristics, outcomes, and statistical solutions for missing cases in web-based psychotherapeutic trials. JMIR Mental Health 5 (2). https://doi.org/10. 2196/mental.8363.

Karin, E., Dear, B.F., Heller, G.Z., Gandy, M., Titov, N., 2018b. Measurement of symptom change following web based psychotherapy: statistical characteristics and analytical methods for measuring and interpreting change. J. Med. Internet Res. 5, e10200. https://doi.org/10.2196/10200.

Kazdin, A.E., 2014. Evidence-based psychotherapies II: changes in models of treatment and treatment delivery. S. Afr. J. Psychol. 45, 3–21. https://doi.org/10.1177/ 0081246314538733.

Kehler, M.D., Hadjistavropoulos, H.D., 2009. Is health anxiety a significant problem for individuals with multiple sclerosis? J. Behav. Med. 32, 10–161. https://doi.org/10. 1007/s10865-008-9186-z.

Kroenke, K., Spitzer, R., Williams, J., 2001. The PHQ-9: validity of a brief depression severity measure. J. Gen. Intern. Med. 16, 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x.

Leon, A.C., Olfson, M., Portera, L., Farber, L., Sheehan, D.V., 1997. Assessing psychiatric impairment in primary care with the Sheehan Disability Scale. Int. J. Psychiatry Med. 27 (2), 93–105.

Little, R.J., D'agostino, R., Cohen, M.L., Dickersin, K., Emerson, S.S., Farrar, J.T., ... Neaton, J.D., 2012. The prevention and treatment of missing data in clinical trials. N. Engl. J. Med. 367 (14), 1355–1360.

Lovas, D.A., Barsky, A.J., 2010. Mindfulness-based cognitive therapy for hypochondriasis, or severe health anxiety: a pilot study. J. Anxiety Disord. 24, 931–935. https://doi. org/10.1016/j.janxdis.2010.06.019.

McEvoy, P.M., Nathan, P., Norton, P.J., 2009. Efficacy of transdiagnostic treatments: a review of published outcome studies and future research directions. J. Cogn. Psychother. 23, 20–33. https://doi.org/10.1891/0889-8391.23.1.20.

Meidlinger, P.C., Hope, D.A., 2017. The new transdiagnostic cognitive behavioral treatments: commentary for clinicians and clinical researchers. J. Anxiety Disord. 46, 101–109. https://doi.org/10.1016/j.janxdis.2016.11.002.

Mills, S.D., Fox, R.S., Malcarne, V.L., Roesch, S.C., Champagne, B.R., Sadler, G.R., 2014. The psychometric properties of the generalized anxiety disorder-7 scale in Hispanic Americans with English or Spanish language preference. Cult. Divers. Ethn. Minor. Psychol. 20, 463–468. https://doi.org/10.1037/a0036523.

Newby, J.M., Mahoney, A.E., Mason, E.C., Smith, J., Uppal, S., Andrews, G., 2016. Pilot trial of a therapist-supported internet-delivered cognitive behavioural therapy program for health anxiety. Internet Interv. 6, 71–79. https://doi.org/10.1016/j.invent. 2016.09.007.

Newby, J.M., Mewton, L., Andrews, G., 2017. Transdiagnostic versus disorder-specific internet-delivered cognitive behaviour therapy for anxiety and depression in primary care. J. Anxiety Disord. 46, 25–34. https://doi.org/10.1016/j.janxdis.2016.06.002.

Newby, J.M., Smith, J., Uppal, S., Mason, E., Mahoney, A.E.J., Andrews, G., 2018. Internet-based cognitive behavioral therapy versus psychoeducation control for illness anxiety disorder and somatic symptom disorder: a randomized controlled trial. J. Consult. Clin. Psychol. 86, 89–98. https://doi.org/10.1037/ccp0000248.

Olatunji, B.O., Kauffman, B.Y., Meltzer, S., Davis, M.L., Smits, J.A., Powers, M.B., 2014. Cognitive-behavioral therapy for hypochondriasis/health anxiety: a meta-analysis of treatment outcome and moderators. Behav. Res. Ther. 58, 65–74. https://doi.org/10. 1016/j.brat.2014.05.002.

Patel, S., Malins, S., Guo, B., James, M., Kai, J., Kaylor-Hughes, C., ... Tyrer, H., 2016. Protocol investigating the clinical outcomes and cost-effectiveness of cognitive–behavioural therapy delivered remotely for unscheduled care users with health anxiety: randomised controlled trial. BJPsych Open 2, 81–87. https://doi.org/10.1192/bjpo. bp.115.002220.

Read, J., Sharpe, L., Modini, M., Dear, B.F., 2017. Multimorbidity and depression: a systematic review and meta-analysis. J. Affect. Disord. 221, 36–46. https://doi.org/ 10.1016/j.jad.2017.06.009.

Rode, S., Salkovskis, P., Dowd, H., Hanna, M., 2006. Health anxiety levels in chronic pain clinic attenders. J. Psychosom. Res. 60, 155–161. https://doi.org/10.1016/j. jpsychores.2005.07.005.

Salkovskis, P.M., Rimes, K.A., Warwick, H., Clark, D., 2002. The health anxiety inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. Psychol. Med. 32, 843–853. https://doi.org/10.1017/ s0033291702005822.

Salkovskis, P.M., Warwick, H., Deale, A.C., 2003. Cognitive-behavioral treatment for severe and persistent health anxiety (hypochondriasis). Brief Treat. Crisis Interv. 3 (3), 353–367.

Seivewright, H., Salkovskis, P., Green, J., Mullan, N., Behr, G., Carlin, E., ... Tyrer, P., 2004. Prevalence and service implications of health anxiety in genitourinary medicine clinics. Int. J. STD AIDS 15, 519–522. https://doi.org/10.1258/ 0956462041558122.

Sheehan, D.V., 1983. The Anxiety Disease. Scribner, New York, NY.

Spitzer, R.L., Kroenke, K., Williams, J.B.W., Löwe, B., 2006. A brief measure for assessing generalized anxiety disorder. Arch. Intern. Med. 166, 1092–1097. https://doi.org/10. 1001/archinte.166.10.1092.

Taylor, S., Asmundson, G.J.G., 2004. Treating Health Anxiety: A Cognitive-Behavioural Approach. The Guilford Press, New York, NY.

Titov, N., Dear, B.F., Schwencke, G., Andrews, G., Johnston, L., Craske, M.G., McEvoy, P., 2011. Transdiagnostic internet treatment for anxiety and depression: a randomised controlled trial. Behav. Res. Ther. 49, 441–452. https://doi.org/10.1016/j.brat.2011. 03.007.

Titov, N., Dear, B., Staples, L., Terides, M., Karin, E., Sheehan, J., ... McEvoy, P.M., 2015. Disorder-specific versus transdiagnostic and clinician-guided versus self-guided treatment for major depressive disorder and comorbid anxiety disorders: a randomized controlled trial. J. Anxiety Disord. 35, 88–102. https://doi.org/10.1016/j. janxdis.2015.08.002.

Warwick, H.M., Salkovskis, P.M., 2001. Cognitive-behavioral treatment of hypochondriasis. In: Starcevic, V., Lipsitt, D.R. (Eds.), Hypochondriasis: Modern Perspectives on an Ancient Malady. Oxford University Press, New York, NY, pp. 314–328.

Warwick, H.M., Clark, D.M., Cobb, A.M., Salkovskis, P.M., 1996. A controlled trial of cognitive-behavioural treatment of hypochondriasis. Br. J. Psychiatry J. Ment. Sci. 169, 189–195. https://doi.org/10.1192/bjp.169.2.189.