

Adaptive actions and treatment outcomes in transdiagnostic internet-delivered cognitive behaviour therapy for chronic health conditions

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ARTICLE INFO

Keywords:

Chronic health conditions
Internet-delivered cognitive behaviour therapy
Adaptive actions
Depression
Anxiety

ABSTRACT

Transdiagnostic internet-delivered cognitive behavioural therapy (ICBT) has demonstrated effectiveness for improving a range of outcomes for individuals living with diverse chronic health conditions. However, the behavioural processes that contribute to these outcomes remain unclear. This study examined whether participation in a 5-lesson transdiagnostic ICBT program for chronic health conditions was associated with changes in adaptive actions (i.e., Healthy Thinking, Meaningful Activities, Goals and Plans, Healthy Habits, and Social Connections) and whether these changes were maintained at follow-up. We also explored whether changes in adaptive actions were associated with changes on measures of depression, anxiety, pain intensity, and pain interference. Adults ($N = 121$) received a transdiagnostic ICBT program for chronic health conditions in a routine online care setting. Adaptive actions were assessed with the Things You Do Questionnaire-15 Item (TYDQ-15). GEE analyses indicated that the TYDQ-15 total and domain scores improved significantly from pre- to post-treatment and were maintained at follow-up. Effect sizes were small to moderate. Hierarchical linear regression models indicated a significant association between adaptive behaviours and clinical outcomes on the PHQ-9, GAD-7, and BPI-Interference. The findings highlight the potential value of encouraging adaptive actions early in treatment and underscore the need for further research to identify actions that may contribute to improvements in depression, anxiety, and related outcomes.

1. Introduction

Chronic health conditions are a broad category of diseases and functional medical disabilities that are highly prevalent (Dai et al., 2020) and can have a debilitating impact on quality of life (GBD 2021 Causes of Death Collaborators, 2024). They pose a significant risk for the development of comorbid mental health concerns (Huang et al., 2023) as individuals adjust to a new level of functioning, often disrupting previous life roles and relationships and leading to mood disorders, anxiety, and increased suicidality (Dai et al., 2020; Scott et al., 2023). Therefore, effective care should ideally address the psychosocial impacts of chronic health conditions. Unfortunately, there are numerous barriers to accessing psychological treatment, including limited physical

mobility and geographical distance, as well as wait times, cost, and stigma (Moroz et al., 2020).

Internet-delivered cognitive behavioural therapy (ICBT) is an effective alternative to face-to-face therapy (Hedman-Lagerlöf et al., 2023) that overcomes many barriers and improves access to evidence-based care through structured online therapy modules delivered through a secure online platform (Andersson, 2016). ICBT often features asynchronous therapist support to further support patients while they complete treatment. It has proven efficacious in treating numerous mental and somatic health conditions (Käll et al., 2024).

ICBT programs can be either disorder-specific or transdiagnostic, with disorder-specific programs focusing on the treatment of a single diagnosis (e.g., generalized anxiety disorder) and transdiagnostic

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programs targeting multiple conditions within the same intervention (Andersson, 2016). Transdiagnostic ICBT programs offer an advantage over disorder-specific treatments in routine practice because they can be offered to patients with diverse chronic health conditions (Dear et al., 2022; Picariello et al., 2024), and they streamline service delivery by reducing the need for multiple parallel treatment streams. Interventions for chronic disease can target a range of outcomes including anxiety and depression, as well as the functional impacts of chronic conditions (e.g., disability, quality of life) and some of the symptoms of the conditions themselves (e.g., pain, gastrointestinal symptoms).

Emerging evidence for ICBT for individuals with chronic conditions has been encouraging. A relatively recent meta-analysis of 25 studies, the majority of which involved guidance (72%), found small overall between-group effects for anxiety and depression, with moderator analyses indicating that guided interventions produced moderate effects, whereas self-guided programs tended to show smaller effects (Mehta et al., 2019). Another systematic review of 44 randomized controlled trials of internet-based and mobile-based cognitive behavioural therapy for chronic conditions reported small-to-moderate improvements in symptoms of depression, anxiety and general psychological distress at post-treatment and follow-up as well as benefits for physical distress and functional impairment at post-intervention (Tao et al., 2023; this study did not directly compare self-guided and therapist-guided interventions, although 72% of the studies involved guidance). Finally, a further meta-analysis of ICBT for adults with chronic pain (with 64% of the studies involved guidance) found small between-group effect sizes for disability and pain intensity, alongside improvements in depression and anxiety, consistent with traditional face-to-face psychological interventions (Gandy et al., 2022). Moderator analysis indicated that interventions involving guidance were associated with larger effects on most outcomes. Taken together, these findings suggest that ICBT, particularly when offered with guidance, is a viable treatment option for managing the mental health and functional impacts of chronic conditions as well as some condition-specific symptoms of the conditions.

The Chronic Conditions Course is a 5-lesson transdiagnostic ICBT program for supporting psychological adjustment to chronic health conditions, including improving mental health and functional abilities. A recent randomized controlled trial comparing ICBT to a control condition demonstrated significant improvements in disability ($d = 0.17$; % improvement = 16%), depression ($d = 0.47$; % improvement = 29%), anxiety ($d = 0.32$; % improvement = 27%), which were maintained at 3- and 12-months follow-up (Dear et al., 2022). Another recent randomized controlled trial compared the intervention when offered in a self-guided versus team-guided format (Mehta et al., 2022), finding significant large within groups effects sizes for depression and anxiety, moderate improvements on self-efficacy, and small improvements on pain interference. Of note, these effects are comparable to improvements reported in meta-analyses of face-to-face CBT for patients with chronic health conditions (Scott et al., 2023; Williams et al., 2020).

While these results are very encouraging, the mechanisms underlying improvement are not yet well understood, and few clear or dominant predictors of response to such treatments have been observed to date (Scott et al., 2025). One promising candidate mechanism is engagement in adaptive actions or coping behaviours – that is, behaviours that support psychological wellbeing and functioning in daily life. Titov et al. (2022) identified five adaptive actions – Healthy Thinking, Meaningful Activities, Goals and Plans, Healthy Habits, and Social Connections – collectively referred to as the Things You Do (TYD) or Big Five, that are associated with lower depression and anxiety and increased satisfaction with life. In ICBT for anxiety and depression in people without chronic health conditions, patients who engaged in these behaviours at least half the week had greater reductions in symptoms of depression and anxiety at post-treatment (Bisby et al., 2023a). This pattern has been replicated in large uncontrolled trials in Canada (Bisby et al., 2022; $N = 1114$) and Australia (Bisby et al., 2023b; $N = 409$) where it was found that, as depression and anxiety decreased from pre- to post-treatment, there was

a concomitant increase in adaptive actions. Moreover, in one study, Healthy Thinking, Meaningful Activities, and Goals and Plans had a small but significant mediating effect on changes in depression (Bisby et al., 2022). In another recent study, mid-treatment TYD scores more consistently predicted outcomes (i.e., symptoms of depression, anxiety, post-traumatic stress disorder, panic disorder, social anxiety, insomnia, as well as work and social adjustment and wellbeing) than homework engagement (Hadjistavropoulos et al., 2025). Experimental trials have also demonstrated that increasing the frequency of these adaptive actions reduces symptoms of depression and anxiety (Bisby et al., 2024a).

Chronic health conditions introduce persistent physical symptoms (e.g., pain, fatigue), functional limitations, fluctuating health status, and ongoing medical demands that may alter both the feasibility and impact of engaging in adaptive behaviours. For example, meaningful activities and healthy habits may be constrained by physical limitations, and goal setting may require greater flexibility and adjustment in the context of unpredictable symptoms. In addition, pain and illness-related distress may compete with or moderate engagement in adaptive actions, potentially changing their relationship with depression and anxiety outcomes. Chronic disease is also associated with higher rates of comorbid mental health symptoms (Huang et al., 2023), social role disruption, and reduced quality of life (Dai et al., 2020; Scott et al., 2023), which may influence how adaptive behaviours function as mechanisms of change. Accordingly, it is essential to examine whether adaptive actions operate similarly, differently, or more selectively in ICBT interventions tailored to individuals with chronic health conditions rather than extrapolating from findings in general anxiety and depression samples. To date, however, adaptive actions have not been examined in the context of ICBT for chronic conditions, or how changes in these actions relate to treatment outcomes.

The current study therefore examines the relationships between adaptive behaviours and changes in symptoms in an ICBT intervention for adults with chronic disease receiving treatment in routine care. Specifically, we examined (1) whether participation in the course was associated with improvements in adaptive actions that were maintained over time; and (2) whether changes in adaptive actions were associated with changes in symptoms of depression and anxiety, as well changes in pain intensity and interference. Pain is one of the most common symptoms in various chronic health conditions and is strongly related to mental health, function and quality of life (Bair et al., 2003; Fayaz et al., 2016; Reyes-Gibby et al., 2002). We were interested in whether changes occurred across all adaptive action domains or were more pronounced in some areas, and whether all outcomes were similarly impacted by overall changes in adaptive actions. We hypothesized that adaptive behaviours would increase from pre- to post-treatment and be maintained at follow-up. We further hypothesized that changes in adaptive actions over treatment would predict depression and anxiety, as has been found in other samples, but no hypotheses were made regarding pain intensity and interference. Understanding these patterns is important for clarifying potential mechanisms of change and may help inform strategies to optimize the effectiveness of ICBT and other interventions for people with chronic conditions in real-world practice.

2. Methods

2.1. Design, ethics, and recruitment

This observational trial was conducted through the Online Therapy Unit (OTU), which offers ICBT to residents of Saskatchewan funded through the provincial government. This unit offers ICBT programs for depression, anxiety, alcohol misuse, and chronic health conditions as part of routine care; it does not deliver other forms of psychological treatment within the unit, although patients may access additional services in the community (Hadjistavropoulos and Peynenburg, 2025). Ethics approval was received from the University of Regina Ethics Board (file # 2018-045). Recruitment occurred between September 15, 2023,

and November 12, 2024, and prospective patients learned about the course through a variety of means (e.g., family doctors, community mental health clinics, word of mouth, and various advertisements). Patients provided informed consent for their participation in the trial.

2.2. Procedure, inclusion criteria and exclusion criteria

Prospective patients first completed an online screening questionnaire to determine eligibility, followed by a brief telephone interview. To be included in the current trial, patients had to meet the following criteria: 18 years of age or older, resident of Saskatchewan, self-reported diagnosis with a chronic physical condition lasting at least three months, at least mild symptoms of depression or anxiety (operationalized as a score of 5 or less on either the Patient Health Questionnaire 9-item (PHQ-9; Kroenke et al., 2001) or the Generalized Anxiety Disorder 7-item (GAD-7; Spitzer et al., 2006) access to and comfortable using the Internet, and time to work on the course. Prospective patients were excluded if they did not meet the above inclusion criteria or if they reported any of the following: severe mental health condition receiving or requiring treatment (e.g., high suicide risk, bipolar/mania, schizophrenia, psychosis, severe alcohol or drug use, hospitalization for mental health in the last six months), wanting help with another condition, or concerns about online therapy. Patients were excluded if they scored below 5 on both measures of depression and anxiety. An exception was made for one patient who only recently experienced an improvement in symptoms of depression or anxiety.

2.3. Intervention – the Chronic Conditions Course

All patients received access to a transdiagnostic ICBT program called the Chronic Conditions Course, developed at Macquarie University in Australia (Gandy et al., 2016; Dear et al., 2018, 2022) and licensed for free by the Online Therapy Unit (Mehta et al., 2020, 2022). The Chronic Conditions Course consists of five lessons that are released over an 8-week period. The primary targets of the intervention are improving mental health (e.g., anxiety, depression) and functional abilities (i.e., disability) in the context of significant physical disease. Lessons focus on introducing common skills from cognitive behaviour therapy, including symptom identification, thought challenging, pleasant activity scheduling, de-arousal strategies, graded exposure, activity planning and pacing, and relapse prevention. Each lesson includes case stories about how patients with chronic conditions can apply the skills, as well as downloadable “Do-It-Yourself” guides that include lesson summaries and homework activities. Throughout the course, patients can also access a range of additional resources (e.g., sleep, working with health professionals). Further details about the course can be found in Dear et al. (2022).

2.4. Therapist support

Patients were assigned a therapist for the 8-week duration of the course. At the start of the course, the therapist informed each patient which day they would be contacted each week. Once per week, when patients logged into the platform, they completed the PHQ-9 and GAD-7, followed by brief questions about their experiences with the previous week's lesson (Hadjistavropoulos et al., 2020a). These items assessed which lesson they focused on, the effort they invested, how understandable and helpful they found the material, the extent to which they completed course activities, their intention to make changes in the coming week, and any successes or challenges encountered. Patients could send their therapist a message at any time during the week using the platform's secure messaging system. Then, on a designated day, therapists reviewed these symptom measures, the patient's course progress, and any messages sent by the patient, to guide the provision of individualized support. Therapist support was limited to once per week.

Phone calls were only made if the patient had not logged on in a

week, demonstrated an increased risk, or requested a phone call. Therapists were all registered clinicians ($n = 9$; 7 registered social workers; 2 registered psychologists) who had received training in ICBT and then received ongoing auditing and feedback on their messages on a quarterly basis (see Hadjistavropoulos et al., 2018 and Hadjistavropoulos et al., 2020b for additional details). Three clinicians were part of the Online Therapy Unit clinical team, and six clinicians were part of a community-based mental health clinic.

2.5. Demographic and clinical characteristics

Patients responded to questions about their demographics (e.g., age, gender, marital status, education, employment status, ethnicity, and location) and clinical characteristics (e.g., chronic health conditions, duration of symptoms, use of prescription medications, and use of mental health services).

2.6. Outcome measures

Measures of adaptive actions, depression, and anxiety were administered at baseline, mid-treatment (Week 4), post-treatment (Week 8), and 20-week follow-up. Measures of pain intensity and interference were assessed at the same time points, excluding Week 4. As noted above, the PHQ-9 and GAD-7 were also administered weekly to enable therapists to monitor symptom progression. Several additional measures were administered for clinical purposes but are not the focus of analyses in this study.¹ For this study, the following outcome measures were analysed:

2.6.1. Things You Do Questionnaire-15 (TYDQ-15; Bisby et al., 2024b; Titov et al., 2022)

This questionnaire measures the frequency of adaptive behaviours across five domains: Healthy Thinking, Meaningful Activities, Goals and Plans, Healthy Habits, and Social Connections. Each item is rated on a 5-point scale ranging from 0 (“Not at all”) to 4 (“Every day”), based on how often patients engaged in each action during the previous week. While the 21-item TYDQ was administered, 15 items were used for scoring as recommended by Bisby et al. (2024b) based on the psychometric properties. This resulted in a score ranging from 0 to 60 for the entire scale, and 0 to 12 for each domain. In the current sample, Cronbach's alpha at baseline was 0.94.

2.6.2. PHQ-9 (Kroenke et al., 2001)

The PHQ-9 includes 9 self-report items designed to assess depressive symptoms in the most recent 2-week period. Total scores range between 0 and 27 and a score of 10 or higher has been used to identify probable cases of major depressive disorder (Manea et al., 2012). Cronbach's alpha at baseline was 0.86.

2.6.3. GAD-7 (Spitzer et al., 2006)

The GAD-7 consists of 7 items to assess symptoms of generalized anxiety in the past 2 weeks. Scores range from 0 to 21, with scores of 10 or higher often used to identify clinical levels of anxiety (Spitzer et al., 2006). Cronbach's alpha at baseline was 0.89.

¹ Self-Efficacy to Manage Chronic Disease Scale (SEM-CD; Lorig et al., 2001); Chronic Health Conditions Course Homework Reflection, Mental Health Continuum Short Form (MHC-SF; Keyes et al., 2008), Lubben Social Network Scale (Lubben et al., 2006), UCLA Loneliness Scale 3-item (Hughes et al., 2004), Work and Social Adjustment Scale (WSAS; Mundt et al., 2002), Insomnia Severity Index (ISI; Morin et al., 2011), Mini-Social Phobia Inventory (Mini-SPIN; Connor et al., 2001), Panic Disorder Severity Scale (PDSS-SR 2-item; Forsell et al., 2019), PTSD Checklist for DSM-5 4-item (PCL-5 4-item; Price et al., 2016); Alcohol Disorder Identification Test (AUDIT; Saunders et al., 1993), Drug Use Disorder Identification Test (DUDIT; Berman et al., 2002).

2.6.4. Brief Pain Inventory (BPI; Cleeland and Ryan, 1994)

The BPI consists of two factors: pain intensity (4 items assessing average pain, worst pain, least pain, and pain at the point of completion) and pain interference (7 items), with total scores ranging from 0 to 10 on each factor. Higher scores indicate greater pain intensity or interference. In the current study, consistent with previous research (Bisby et al., 2023a), BPI-intensity was calculated using a single item measuring average pain since this is typically of greatest interest (from 0 to 10) and BPI-interference was calculated using the total score on the seven interference items (total score ranging from 0 to 70). Cronbach's alpha for BPI-interference at baseline was 0.92.

2.7. Statistical analyses

All analyses were conducted using IBM SPSS version 29. A *p*-value of 0.05 was used for all tests. Patients who enrolled in the Chronic Conditions Course and accessed Lesson 1 were included in the primary analyses. Because patients accessed this observational trial as part of routine care, there was no pre-determined sample size, and an a-priori power analysis was not conducted.

The primary analysis used Generalized Estimating Equation (GEE) models to assess the statistical significance of changes over time on the TYDQ-15, PHQ-9, GAD-7, BPI-intensity, and BPI-interference. A gamma distribution with log link was used to account for skewness in the dependent variables (Karin et al., 2018), and an unstructured working correlation matrix was applied to account for differing trajectories of

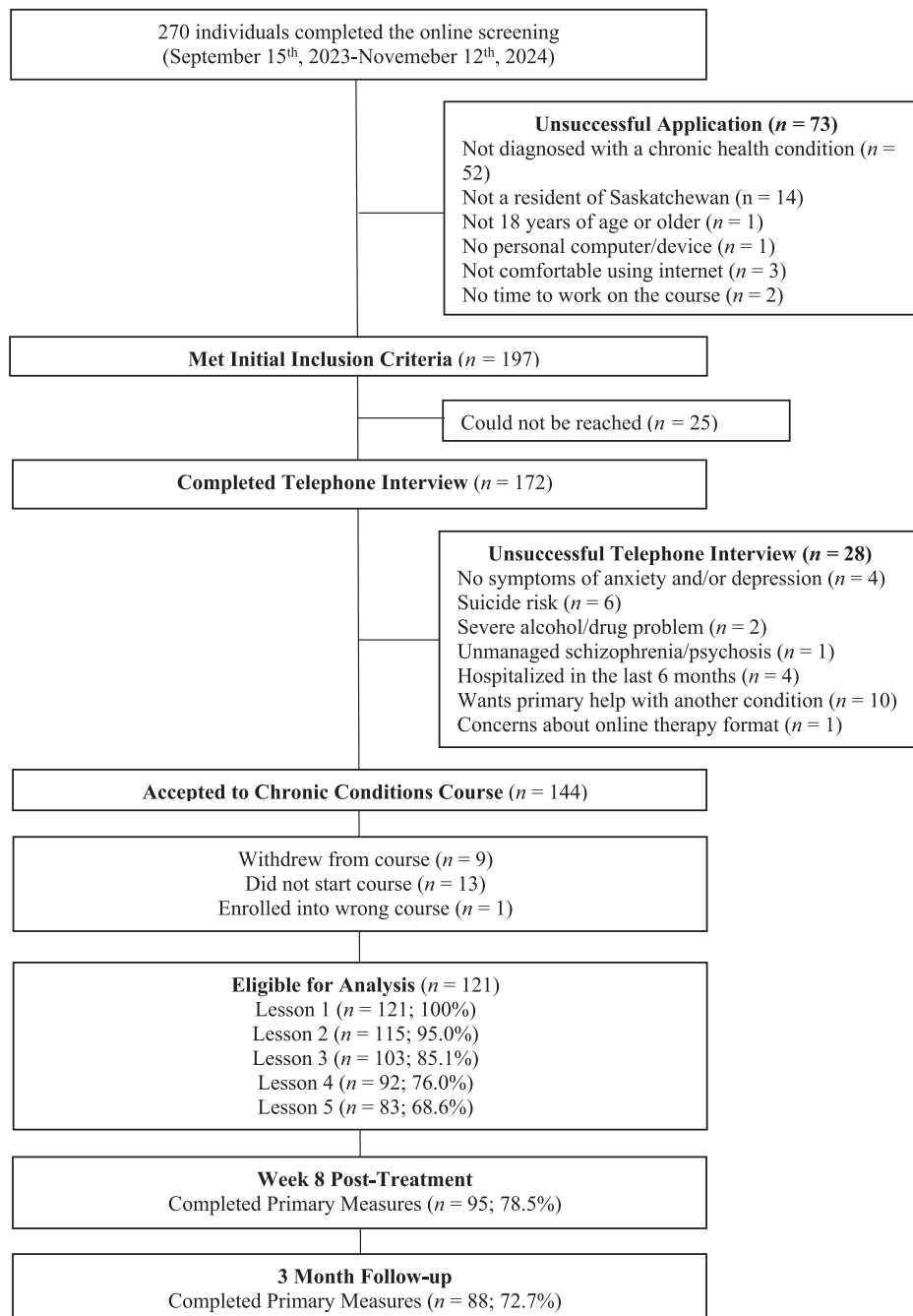


Fig. 1. Patient flow diagram.

change. The primary analyses followed intention to treatment principles, and missing data at post-treatment and follow-up were handled using multiple imputation. Baseline symptom severity for each measure and lesson completion, were included in the imputation models, consistent with previous research showing that these factors predict outcomes in ICBT data that is assumed missing at random and obtained during routine care (Karin et al., 2018, 2021). Multiple imputation was performed using fully conditional specification, and five imputations were generated, after which the imputation model demonstrated stable convergence. The imputed datasets and parameter estimates, standard errors, and confidence intervals were pooled in SPSS's multiple imputation module.

To assess the clinical significance of changes, Cohen's *d* effect sizes and 95% confidence intervals were calculated using estimated marginal means (Cohen, 1988). GEE models were also used to examine changes over time in each domain of the TYDQ-15.

A secondary analysis was conducted for the subset of patients who completed post-treatment ($n = 95$). A series of hierarchical linear regressions were conducted to explore whether changes on the TYDQ-15 were associated with changes on the PHQ-9, GAD-7, BPI-intensity, and BPI-interference. In each model, the baseline outcome score was entered at Step 1, and the TYDQ-15 change score (difference between pre- and post-treatment scores) was entered at Step 2.

3. Results

3.1. Participant characteristics

Participant flow is shown in Fig. 1. A total of 121 participants were accepted to the Chronic Conditions Course and were eligible for analysis. Of these, 95 (78.5%) completed the post-treatment assessment (primary endpoint) and 88 (72.7%) completed the 3-month follow-up (secondary endpoint). Demographic characteristics are shown in Table 1. Mean age was 45.7 years ($SD = 12.7$) and 72.7% (88/121) were female. Reported ethnicity of most participants was White (90.9%, 110/121), and most resided in a large city (60.3%, 73/121). Over two-thirds of the participants were married (69.4%, 84/121) and most had a post-high school qualification (53.7%, 65/121) or a university education (29.8%, 36/121). Approximately one-third of the sample was employed full or part-time (34.7%, 42/121), and an equal number reported being disabled (34.7%, 42/121). Over half the sample reported taking psychotropic medication (57.9%, 70/121), and less than half reported receiving mental health treatment at the time they enrolled in ICBT (45.5%, 55/121). Additional details about mental health service use in the previous 3 months are included in Table 1.

3.2. Change over time

The GEE models showed significant changes over time on all measures: TYDQ-15 (Wald's $\chi^2 = 34.83$, $p < .001$), PHQ-9 (Wald's $\chi^2 = 61.42$, $p < .001$), GAD-7 (Wald's $\chi^2 = 47.08$, $p < .001$), BPI-intensity (Wald's $\chi^2 = 35.02$, $p < .001$), and BPI-interference (Wald's $\chi^2 = 12.64$, $p < .002$). Compared to baseline (week 1), mean scores on the TYDQ-15 were significantly higher at post-treatment and follow-up ($ps < 0.001$). For all other measures, mean scores were significantly lower at post-treatment and follow-up compared to baseline ($ps < 0.001$). The only exception to this pattern was BPI-interference, which was significantly lower at post-treatment but not at follow-up ($p = .073$).

Significant changes over time were also observed on each subscale of the TYDQ-15: Healthy Thinking (Wald's $\chi^2 = 37.51$, $p < .001$), Meaningful Activities (Wald's $\chi^2 = 33.27$, $p < .001$), Goals and Plans (Wald's $\chi^2 = 34.82$, $p < .001$), Healthy Routines (Wald's $\chi^2 = 15.27$, $p = .002$), and Social Connections (Wald's $\chi^2 = 13.15$, $p = .004$). Pairwise comparisons from baseline to each timepoint revealed different rates of change for each subscale (Fig. 2). Improvements in the Healthy Thinking domain reached significance by follow-up ($p < .001$). Increases were

Table 1

Pre-treatment demographic and clinical characteristics of patients ($n = 121$).

	<i>n</i>	%
Age		
Mean (<i>SD</i>)	45.7 (12.7)	
Range	20–83	
Gender		
Woman	88	72.7
Man	27	22.3
Transgender/non-binary individuals	4	3.3
Prefer not to disclose	2	1.7
Ethnicity		
White	110	90.9
Indigenous (First Nations, Inuit, Metis)	3	2.5
Black	1	0.8
East/Southeast Asian	1	0.8
South Asian	1	0.8
Middle Eastern	1	0.8
Prefer not to disclose	4	3.3
Marital status		
Single/never married/dating	20	16.5
Married/common law	84	69.4
Separated/divorced/widowed	17	14.0
Education		
High school diploma or less	20	16.5
Post high school certificate or diploma/ Some post-secondary	65	53.7
University degree	36	29.8
Employment status		
Employed part-time/full-time	42	34.7
Homemaker	9	7.4
Retired	16	13.2
Student	1	0.8
Disability	42	34.7
Unemployed	11	9.1
Location		
Small rural location	24	19.8
Small to medium city (7000–100,000)	24	19.8
Large city (over 100,000)	73	60.3
Mental health characteristics		
Taking psychotropic medications	70	57.9
Currently receiving mental health treatment		
No	66	54.5
Yes	55	45.5
Mental health service use in the past 3 months		
Family doctor	58	47.9
Psychiatrist	19	15.7
Psychologist	8	6.6
Social worker	13	10.7
Counsellor	20	16.5
Nurse/community nurse/psychiatric nurse	3	2.5
Occupational therapist	2	1.7
Medical specialist	14	11.6
Other health professional	10	8.3
I have not consulted with any providers	23	19.0

significant by mid-treatment for Meaningful Activities ($p = .001$), and Goals and Plans ($p = .043$), and remained significant at post-treatment and follow-up ($ps < 0.001$). Healthy Routines and Social Connections were significant by post-treatment ($p = 0.027$ and $p = .047$ respectively) and remained significant at follow-up ($p = .001$ for Healthy Routines and $p = .003$ for Social Connections).

The estimated marginal means and effect sizes for each measure, and each subscale of the TYDQ-15 are shown in Table 2. Moderate effect sizes were observed from baseline to post-treatment for all measures except BPI-interference, which showed a small effect size ($d = 0.37$). Moderate effect sizes were maintained at follow-up for the TYDQ-15, PHQ-9, and GAD-7.

3.3. Associations between frequency of adaptive behaviours and clinical outcomes

Results of the hierarchical regressions are shown in Table 3. Changes on the TYDQ-15 were associated with changes on the PHQ-9 ($\Delta R^2 = 0.08$, $p < .001$), GAD-7 ($\Delta R^2 = 0.11$, $p < .001$), and BPI-interference ($\Delta R^2 =$

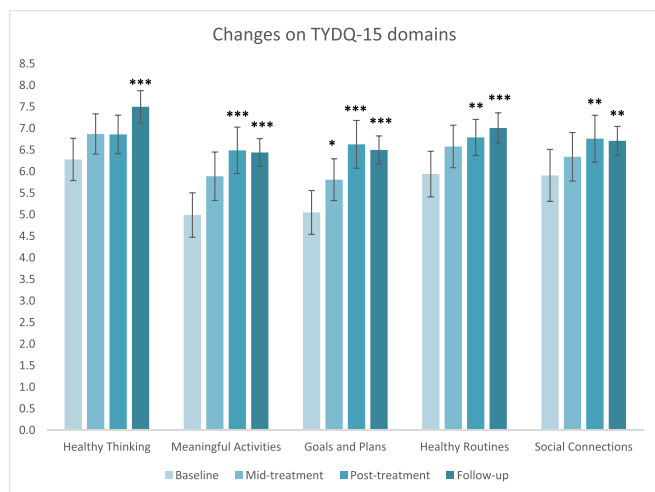


Fig. 2. Changes over time for each TYDQ-15 domain.

TYDQ-15 = Things You Do Questionnaire-15.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2

Estimated marginal means and within-group effect sizes from baseline to post-treatment and baseline to follow-up (N = 121).

	Estimated marginal means (SD)			Cohen's <i>d</i> within-group effect sizes [95% CIs]	
	Baseline	Post-treatment	Follow-up	Baseline to post-treatment	Baseline to follow-up
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		
TYDQ-15	28.17 (11.94)	33.59 (10.94)	34.29 (10.92)	-0.47 [-0.73, -0.22]	-0.53 [-0.79, -0.28]
PHQ-9	11.03 (5.73)	6.97 (5.06)	7.69 (4.88)	0.75 [0.49, 1.01]	0.63 [0.37, 0.88]
GAD-7	9.41 (5.58)	6.22 (5.00)	6.08 (4.74)	0.60 [0.34, 0.86]	0.64 [0.38, 0.90]
BPI-intensity	5.51 (2.26)	4.20 (2.10)	4.72 (1.98)	0.60 [0.34, 0.86]	0.37 [0.12, 0.62]
BPI-interference	35.79 (16.37)	29.70 (16.87)	32.60 (15.72)	0.37 [0.11, 0.62]	0.20 [-0.05, 0.45]
TYDQ-15 subscales:					
Healthy thinking	6.23 (2.78)	6.87 (2.46)	7.53 (2.34)	-0.24 [-0.50, -0.01]	-0.51 [-0.76, -0.25]
Meaningful activities	4.99 (2.91)	6.50 (2.56)	6.47 (2.87)	-0.55 [-0.81, -0.29]	-0.51 [-0.77, -0.25]
Goals and plans	5.05 (2.86)	6.64 (2.75)	6.52 (2.93)	-0.57 [-0.82, -0.31]	-0.51 [-0.76, -0.25]
Healthy routines	5.94 (2.99)	6.80 (2.49)	7.04 (2.26)	-0.31 [-0.57, -0.06]	-0.42 [-0.67, -0.16]
Social connections	5.91 (3.38)	6.78 (2.43)	6.73 (2.97)	-0.30 [-0.55, -0.04]	-0.26 [-0.51, -0.00]

Note. *M* = Mean; *SD* = standard deviation; *CI* = confidence interval; TYDQ-15 = Things You Do Questionnaire – 15 Item; PHQ-9 = Patient Health Questionnaire – 9 Item; GAD-7 = Generalized Anxiety Disorder – 7 Item; BPI-intensity = Brief Pain Inventory (single item measuring average pain severity); BPI-interference = Brief Pain Inventory (total score of interference items).

= 0.05, $p < .01$). BPI-intensity was not significant ($\Delta R^2 = 0.01, p = .13$).

Table 3

Summary of hierarchical regression models examining whether change in TYDQ-15 predicts change in other outcome measures (n = 95).

Outcome	R^2	ΔR^2	β	<i>p</i>
PHQ-9				
Step 1	0.28			
Step 2	0.36	0.08	-0.29	<0.001
GAD-7				
Step 1	0.29			
Step 2	0.40	0.11	-0.34	< 0.001
BPI-intensity				
Step 1	0.50			
Step 2	0.51	0.01	-0.11	0.13
BPI-interference				
Step 1	0.16			
Step 2	0.21	0.05	-0.23	0.01

Note. TYDQ-15 = Things You Do Questionnaire – 15 Item; PHQ-9 = Patient Health Questionnaire – 9 Item; GAD-7 = Generalized Anxiety Disorder – 7 Item; BPI-intensity = Brief Pain Inventory (single item measuring average pain severity); BPI-interference = Brief Pain Inventory (total score of interference items).

Step 1: constant = baseline outcome score;

Step 2: constant = TYDQ-15 change (post-treatment 1 pre-treatment).

4. Discussion

Transdiagnostic ICBT is an emerging treatment that appears to improve mental health and functional outcomes for people with a broad range of chronic health conditions (Dear et al., 2022). To optimize treatment outcomes, it is important to understand why and how treatment works. This study began to address this question by examining whether transdiagnostic ICBT for chronic health conditions was associated with changes on the TYDQ-15, which measures actions across five domains: Healthy Thinking, Meaningful Activities, Goals and Plans, Healthy Routines, and Social Connections. As a secondary aim, we examined whether overall change on the TYDQ-15 from pre-treatment to post-treatment was associated with changes in depression, anxiety, pain intensity, and pain interference, across treatment.

The sample reflected substantial psychosocial burden, with roughly one-third reporting being off work due to disability and more than half taking psychotropic medication. Engagement in treatment was strong, with 76% completing four of the five treatment lessons. Consistent with prior research (Dear et al., 2022; Mehta et al., 2022), treatment was associated with significant symptom improvements for depression, anxiety, pain intensity, and pain interference. Effects were largest for depressive symptoms and more modest for pain-related outcomes, aligning with meta-analytic findings on ICBT for chronic health conditions (Gandy et al., 2022; Tao et al., 2023). As anticipated, within-group effect sizes in the current study were larger than between-group effects reported in prior randomized trials comparing the Chronic Conditions Course to a control condition (Dear et al., 2022). Improvements were largely maintained at 3-month follow-up, although gains in pain interference attenuated somewhat over time.

In terms of the primary focus of this study, consistent with our hypotheses, we found that all adaptive actions improved over time and were maintained at the 3-month follow-up. Of interest, improvements emerged earliest on Meaningful Activities and Goals and Plans, followed by Healthy Routines and Social Connections, and Healthy Thinking improving more gradually, reaching significance by follow-up. This temporal pattern may indicate that practical behaviour change precedes shifts in thinking and social connections and may catalyze subsequent cognitive and interpersonal improvements. This is particularly interesting since cognitive restructuring is taught earlier in the course than behavioural strategies.

The present findings are broadly consistent with previous research identifying adaptive actions as mechanisms of change in ICBT, although some differences likely reflect variations in sample size and analytic

approaches (e.g., Bisby et al., 2022; Hadjistavropoulos et al., 2025). Bisby et al. (2022) found that increases in adaptive actions partially mediated reductions in depression symptoms, while associations with anxiety were weaker and not significant when controlling for comorbid change. More recently, Hadjistavropoulos et al. (2025) demonstrated that mid-treatment adaptive actions predicted outcomes across multiple domains. The current study extends this work by demonstrating similar patterns among individuals with chronic health conditions. Together, these findings add to growing evidence that engagement in adaptive actions may represent a common behavioural process underlying improvement across diverse ICBT interventions for different clinical populations. These findings are particularly meaningful for individuals with chronic health conditions, for whom engagement in adaptive actions may be both more difficult and more consequential due to persistent symptoms such as pain and fatigue. Demonstrating that adaptive behaviours increased during ICBT and were associated not only with reduced depression and anxiety but also pain interference suggests that these behaviours may represent a modifiable process supporting both psychological and functional outcomes in this population. Importantly, changes occurred despite ongoing medical symptoms, indicating that adaptive actions remain clinically relevant targets even when the underlying condition persists. Future research using more sophisticated research designs and analytic methods, exploring the relationships between different adaptive actions and symptom changes, is worthwhile.

4.1. Strengths and limitations

The study had some limitations. The sample size constrained the analyses of associations between TYDQ-15 scores and the other symptom measures. However, the regression analyses provided some preliminary evidence for the relationships between adaptive actions and symptoms related to mental health and chronic conditions. The TYDQ-15 was only administered at pre-treatment, mid-treatment, post-treatment, and 3-month follow-up, so the current study cannot answer questions related to the trajectory of change during ICBT or how the increase in adaptive actions might relate to the timing of specific skills introduced in the lessons (e.g., cognitive restructuring, behavioural activation). A further limitation of the study is that there was no control group, which limits the scope of the conclusions about the effects of the intervention. However, a strength of the study is the use of data from a routine care clinic where patients often have complex and multimorbid concerns, which increases the generalizability of the study's findings. Another strength is the high response rate for a routine care service, which provides confidence in the pattern of findings. Overall, the findings contribute to the literature on the role of adaptive actions in symptom improvement for patients experiencing chronic conditions.

4.2. Future directions

Further research using a larger sample would be better powered to detect small differences in the associations between TYDQ-15 scores and other outcome measures. A larger sample size would also allow us to look at the associations with individual domains (i.e., Healthy Thinking, Meaningful Activities, Goals and Plans, Healthy Habits, and Social Connections) rather than total scores. Including weekly TYDQ-15 measurements would allow for mediation analysis, and the TYDQ-15 could be examined alongside established therapeutic factors that predict or moderate treatment outcome, such as treatment credibility, adherence, and working alliance (Haller et al., 2023). Further, it could be valuable to investigate TYDQ-15 in relation to variables that may mediate anxiety, pain, and pain interference, such as reduced catastrophizing or decreased avoidance (Benito et al., 2024; Salkovskis et al., 2023).

Future studies could involve refining treatment content or therapist support to strengthen their impact on adaptive actions, and in turn, on symptom improvement. If patients complete weekly TYDQ-15 measures, then therapists could determine which adaptive behaviours clients are

struggling with. There may be utility in routinely monitoring adaptive actions, with weekly therapist messages tailored to prompt the patient to engage in these behaviours more frequently.

4.3. Conclusions

The current findings contribute to our understanding of how engagement in adaptive actions may change in treatment and be associated with symptom improvements for adults with chronic health conditions. Consistent with prior research, adaptive actions increased over the course of treatment and were maintained at follow-up. Moreover, increases in adaptive actions were associated with reductions in depression, anxiety, and pain interference. Findings suggest that adaptive behavioural engagement could have broader implications and future work with larger samples, utilising more sophisticated designs and statistical analyses, would be beneficial. These results have the potential to inform how treatment is provided to people with chronic health conditions.

Ethics statement

The study was approved by the Research Ethics Board of the University of Regina (2018-045), and all participants provided informed consent.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work HDH used ChatGPT-5 solely to improve grammar and phrasing. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Funding

The Online Therapy Unit is funded by the Saskatchewan Ministry of Health. N.T. and B.F.D. are funded by the Australian Government to operate the national MindSpot Clinic. Funders had no involvement in the study design, collection, analysis, or interpretation of the data.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors wish to acknowledge the patients, screeners, therapists, research staff, research associates, students, and web developers associated with the Online Therapy Unit at the University of Regina.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.invent.2026.100930>.

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