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Abstract

Background

Acceptance and commitment therapy has shown to be effective in chronic pain rehabilitation, and acceptance has been shown to be a key process of change. The influence of treatment dose on acceptance is not clear, and in particular, the effectiveness of a non-intensive treatment (<20 h) in a tertiary pain clinic is required.

Purpose

The purpose of the study was to assess the effectiveness of a low-intensity, acceptance and commitment therapy (ACT) group program for chronic pain. The study sought to compare, at both groups and individual patient levels, changes in acceptance with changes observed in previous ACT studies. Methods Seventy-one individuals with chronic pain commenced a 9-week ACT-based group program at an outpatient chronic pain service. In addition to acceptance, outcomes included the following: pain catastrophizing, depression, anxiety, quality of life, and pain-related anxiety. To compare the current findings with previous research, effect sizes from seven studies were aggregated using the random-effects model to calculate benchmarks. Reliable change indices (RCIs) were applied to assess change on an individual patient-level.

Results

The ACT intervention achieved a statistically significant increase in acceptance and medium effect size (d=0.54) at a group level. Change in acceptance was of a similar magnitude to that found in previous ACT studies that examined interventions with similar treatment hours (<20 h). Results across other outcome measures demonstrated small to medium effect sizes (d=0.01 to 0.48, mean=0.26). Reliable improvement in acceptance occurred in approximately one- third (37.2, 90 % CI) of patients. Approximately three- quarters (74.3, 90 % CI) demonstrated reliable change in at least one of the outcome measures.

Conclusions

The low-intensity, group-based ACT intervention was effective at a group level and showed a similar magnitude of change in acceptance to previous ACT studies employing low-intensity interventions. Three-quarters of patients reported reliable change on at least one outcome measure.

Introduction

Acceptance and commitment therapy (ACT) has emerged as an efficacious treatment for chronic pain [1, 2] and has recently been recognized by the American Psychological Association as having strong research efficacy [3]. The effectiveness of ACT for chronic pain has been demonstrated in a number of interdisciplinary group-based studies (e.g., McCracken et al. [4]; McCracken et al. [5]) and in studies with specific populations, such as older adults with persistent pain [6]. Further, the results obtained using ACT for chronic pain are comparable to those achieved via traditional cognitive-behavioral therapy (CBT) interventions [1, 2].

ACT interventions for chronic pain involve identifying helpful ways to respond to thoughts and feelings, exploring values and developing skills in mindfulness and acceptance. The focus of ACT is on

increasing functioning despite aversive internal experiences (e.g., sensations, thoughts, and feelings) and without attempts to alter or control those experiences. This particular focus distinguishes ACT from traditional CBT, which targets challenging maladaptive cognitions in order to change emotional responses and behavior [7]. ACT is based on the psychological flexibility model, which contains six core components (acceptance, cognitive defusion, present moment awareness, self-as-context, values, and committed action) [6, 8]. Of these, acceptance has by far the most research support as a process variable or mechanism of change (i.e., the underlying change process that accounts for the effectiveness of the intervention). This, together with its central role in the theoretical underpinnings of the ACT model, means that acceptance is ideally placed to be an indicator of treatment effectiveness and thereby provide a basis for comparison across ACT studies.

Although research has demonstrated that ACT is an efficacious therapeutic approach for individuals with chronic pain and highlighted acceptance as a key change mechanism, the degree to which these findings are influenced by treatment dose is currently unclear. Although the majority of programs explored by early ACT studies were conducted intensively (i.e., 5 days a week for 3 to 4 weeks) and face-to-face in tertiary pain settings, recent studies have employed less intensive approaches in other settings (i.e., an 8-week program delivered weekly in a clinical trial setting [2] and a four-session, 4 h per session intervention conducted in general practice [9]). Overall, the least intensive interventions have tended to report smaller effect sizes for key processes and outcomes, compared to more intensive interventions [2]. Further investigation of the impact of program intensity on patient outcomes is therefore required. Moreover, specific investigation of non-intensive group treatment (<20 h) in a tertiary pain clinic setting is needed as there have been no effectiveness studies that evaluate such programs in this setting.

Given that the Chronic Pain Acceptance Questionnaire (CPAQ), with its strong psychometric properties, is arguably the most widely used measure of pain acceptance, it is a logical measure to use for between-program comparison [10]. A shortened form of the CPAQ—CPAQ-8—has been developed, and early validation studies suggest it holds similar psychometric properties to the original measure [11–13]. In busy clinical practice, the CPAQ-8 may reduce response burden and provide an efficient way to assess program effectiveness. Currently, there is preliminary evidence to support the use of the CPAQ- 8 to assess change in acceptance following treatment at a group level and no previous research investigating its use at the individual level [14]. Therefore, while not the primary focus, it is hoped this study will also provide further information about the CPAQ-8 in comparison to its longer counterpart, the CPAQ.

In this study, we compared the effectiveness of a low- intensity, group-based ACT intervention with benchmarks based on changes in acceptance calculated from past ACT studies. We additionally applied reliable change indices to assess program change at an individual patient level. A theory-consistent measure of acceptance was used to assess the focal construct and both the CPAQ and the shorter CPAQ-8 were calculated.

Methods

Participants

Participants were consecutive patients referred to attend a 9- week, ACT focused, outpatient group program at the pain management unit of a major tertiary teaching hospital in Australia. To be included in the program, patients were required to have chronic non-palliative pain, be open to alternative (non-medical) approaches to pain management, be motivated to participate in the program, have exhausted current options for physical and/or medical treatments for pain, and have identifiable areas for improvement in functioning. Exclusion criteria included severe depression (where acute medical intervention was required), substance misuse, or intellectual impairment; an uncontrolled psychiatric disorder; and communication difficulties (literacy/ speech/English language comprehension/vision). Patients who had participated in a pain management group program within the last 2 years were similarly excluded.

Of the 71 (29.6 % male) patients who were referred to the program and completed questionnaires prior to the initial session, 46 (27.7 % male) also completed the questionnaire at the conclusion of the 9-week program. Within the final sample (n=46), 54.3 % indicated that they had experienced severe pain in the last week, 25.7 % indicated moderate pain, and 12.9 % very severe pain; the remainder of the patients reported their pain experience as mild (2.9 %). The majority of patients were married (41.8 %; never married, 22.9 %; separated or divorced, 22.9 %; living with partner but not married, 7.1 %; widowed, 2.9 %). A total of 15.7 % undertook part-time work, while the remaining patients were divided into full-time work (2.9 %), voluntary work (7.1 %), home-duties (9 %), student (5.7 %), and retired/unemployed/other (59.4 %). A majority of patients were born in Australia (75.4 %); 17.1 % were born in either the UK or Ireland; 1.4 % were from Germany; 1.4 % from North America; and 4.3 % listed “other.” The highest level of education completed ranged from university (17.1 %), technical college (26.9 %), to high school (34.2 %). For 64.3 % of patients, the duration of pain was greater than 5 years, 30 % had experienced pain for between 1 and 5 years, and 4.3 % had experienced pain for less than 12 months.

Measures

A battery of standardized measures was administered at program commencement and again at the end of the program. The treatment process measures assessed pain catastrophizing and pain acceptance, and the treatment outcome measures assessed depression, anxiety, quality of life, and pain-related anxiety.

Pain Catastrophizing

Pain catastrophizing was measured using the Coping Strategies Questionnaire (CSQ; [15]). The CSQ was developed for use in chronic pain populations, and the catastrophizing sub- scale was used in this study to assess catastrophic thoughts (e.g., “It’s terrible and I feel it’s never going to get any better”). Each question is rated on a 7-point scale from 0 (never do that) to 6 (always do that). Cronbach’s alpha for the catastrophizing subscale has been reported as 0.84 [16]. In regression analysis, the CSQ-CAT has been shown to contribute unique variance to the prediction of pain after

controlling for negative mood [17]. The test-retest reliability of the catastrophizing scale for a 1-week interval was 0.77 [18].

Acceptance of Chronic Pain

The CPAQ [19] is a 20-item measure that consists of two subscales: activity engagement (e.g., "I am getting on with the business of living no matter what the level of pain is) and pain willingness (e.g., Keeping my pain level under control takes first priority whenever I am doing something"), which is reversed scored. Each question is rated on a scale from 0 (never true) to 6 (always true). The 8-item measure was also calculated from the CPAQ. Cronbach's alpha for the CPAQ-8 has been reported as 0.77 to 0.89 [11]. The CPAQ-8 correlated with a number of measures of patient functioning [13, 11]: it predicted depression and disability, even after accounting for catastrophizing and kinesiophobia [13]. The test- retest reliability of the CPAQ over 2 weeks has been reported as 0.83 [20], and the test-retest reliability of the CPAQ-8 over 6 weeks has been reported as 0.81 [14].

Depression and Anxiety

The Hospital Anxiety and Depression Scale (HADS; [21]) is a 14-item measure of depression and anxiety in a medical out- patient population. The items were selected to exclude physical symptoms such as dizziness [22]. Both scales were shown to have good internal reliability. An example of a question assessing anxiety is "I get a sort of frightened feeling as if something awful is about to happen," and an example of a question assessing depression is "I feel as if I am slowed down." The measure has been shown to have a two-factor structure, and the test-retest reliability over a period greater than 6 weeks was 0.70 for both the anxiety and depression scales [23].

Health-Related Quality of Life

The Short Form-36 (SF-36) is a 36-item measure that assesses eight domains of health-related quality of life. Two composites can be calculated by summing the four domains that relate to physical functioning and the four domains that relate to emotional/mental functioning. An example of a question assessing physical functioning is "During the past week, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?" An example of a question assessing emotional/ mental functioning is "During the past week, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?" The measure has acceptable internal reliability [24] and adequate test-retest reliability [25]. The measure has demonstrated convergent and divergent validity and has shown discriminate power [26]. The test-retest reliability of the SF-36 has been reported as 0.92 for the physical component and 0.91 for the emotional/mental functioning component [27].

Pain-Related Anxiety

The Pain Anxiety Symptoms Scale-20 (PASS-20; [28]) assesses pain-related fear and avoidance. Items are assessed on a scale ranging from 0 (never) to 5 (always). Although participants completed the 40-item scale [29], only the 20 items of the PASS-20 were used in the analysis. The PASS-20 has good internal consistency and construct validity [30]. The test-retest reliability of the PASS-20 has been reported as 0.86 [30].

Procedure

A hospital research ethics committee and a university research ethics committee provided ethical approval for the study.

Group Intervention Program

Patients participated in an ACT-based group treatment program for chronic pain. The intervention was based on a manual for the treatment of chronic pain previously reported by Vowles et al. [1] and Wetherell et al. [2]. Sessions were co- facilitated by a psychologist and a physiotherapist and were run in groups of varying sizes (two to seven participants) on a weekly basis across 9 weeks, for 2 h each session. Aside from specific pain and life management strategies, the program covered aspects of mindfulness, clarification of values, defusion techniques, committed action, and self-as-context components. These core elements relate to the six ACT processes, which together represent psychological flexibility [31]. Homework exercises based on the protocol used in Vowles et al. [1] were set for patients to complete between sessions.

Previous Research Results

A review of the literature was performed to compare the results of this study with those of previous ACT-based interventions for chronic pain. The PsycINFO and PubMed databases were searched using the following terms: “acceptance and commitment therapy,” “contextual cognitive-behavioral therapy,” “cognitive-behavioral therapy” and “chronic pain.”

Studies published up to and including December 2013 were considered. Studies were included in the analysis if they were based on the theoretical model of ACT or contextual- behavioral science, treated patients with chronic pain, used the CPAQ or CPAQ-8 as a measure of acceptance, had a sample size greater than 20, and had data reported in a way that enabled an effect size to be calculated for the acceptance measure. The database search identified seven papers published between January 2005 and December 2013 that met all the criteria. Two studies reported in Vowles et al. [1] did not meet sample size criteria for this analysis.

Data Analytic Strategy

Data analysis was undertaken using SPSS version 21. We used t tests to evaluate whether there were significant differences between individuals who completed the program and those who did not. The primary goal was to assess the effectiveness of the program at both the group and individual level.

At the group level, paired t tests were conducted to assess the effectiveness of the intervention. To reduce the risk of a Type I statistical error, a Bonferroni correction was used. According to Cohen [32], greater than 0.2 is a small effect, greater than 1.5 is a medium effect, and a large effect is greater than 0.8.

To compare the results of the present study to an industry benchmark, we sought to identify studies that utilized a similar group-based treatment program and measured acceptance via the CPAQ or CPAQ-8. Given that the low-intensity nature of this intervention (18 h) was a novel feature, we sought to separate out a subgroup from the selected studies that consisted of only low-intensity interventions (i.e., those with <20 h of treatment). Consequently, two overlapping groups were created. The first group comprised seven studies, four of which were of high treatment intensity (>90 h) and three studies of low treatment intensity (<20 h). There was some methodological heterogeneity among the seven studies: two RCTs and five observational studies. There was also some clinical heterogeneity (e.g., several studies included tertiary care patients and one study included primary care patients). Within the group of three studies of low treatment intensity, there was again some clinical and methodological heterogeneity. Given the heterogeneous set of studies, a random-effects model was considered appropriate to aggregate effect sizes.

To compare the present findings with previous results, effect sizes were calculated for all studies included in the review using pre- and post-treatment means divided by the pooled standard deviation to yield the Hedge's g statistic. Hedge's g was selected because it provides a correction for smaller sample sizes [33]. If the correlation between pre- and post- treatment scores was not available, r=0.7 was used as a substitute value [34]. Next, an aggregate for Hedge's g was calculated within comprehensive meta-analysis (CMA) 2.0 for the random-effects model for both the group of seven studies and the subgroup of three low-intensity studies. In accordance with Borenstein et al. [35], the heterogeneity of the within- group effect sizes was assessed using Cochrane's Q and

Higgins' I2 statistics [36, 37]. To calculate the number of additional studies with a null result that would be required to bring the mean effect size to a negligible value (i.e., d<0.2), a fail-safe N (Nfs) was calculated in accordance with the formula of Orwin [37].

The mean and the 90 and 95 % confidence intervals were calculated for each measure (pre- and post-treatment). To assess the effectiveness of the intervention at the individual level, a reliable change index for each measure (i.e., CSQ, CPAQ-8, HADS, SF-36, PASS-20) was calculated in accordance with the formula of Jacobson and Truax [38]. To compare with previous studies (e.g., Han et al. [39]; Vowles & McCracken [40]), reliable change indices were calculated at both 90 % and 95 % confidence.

Results

Preliminary Analyses

No outliers or multi-collinearity was identified in the preliminary data analysis. At time 1 (pre-intervention), there were no statistically significant differences between patients who completed the

program (n=46) and those who did not (n=25) on key demographic variables and pre-treatment measures (all ts [69]<1.74, all ps>0.09).

Change and Effect Sizes

The results of the paired t tests from pre- to post-treatment are reported in Table 1. Table 1 also contains the effect sizes that were calculated from pre- to post-treatment data points. The effect size for the theory-consistent acceptance process (CPAQ) was d=0.54. The average effect size for the outcome measures across the treatment period was d =0.26 (with a range of 0.01 to 0.48).

Reliable Change Analyses

The percentage of patients who demonstrated some improvement, as well as those who showed reliable improvement, no change and reliable deterioration were calculated for process and outcome measures and are presented in Table 2. In accordance with Jacobson and Truax [38], 95 % (α=0.05) and 90 % (α=0.10) confidence intervals were used to determine cut-off points for patients who were deemed to have undergone reliable change. To compare changes across variables and with previous studies, improvement was defined as change in the direction associated with increased adjustment and function; reliable improvement was defined as change greater than the minimum difference calculated for the 90 % and 95 % confidence intervals. A total of 74.3 % (90 % CI) of patients demonstrated reliable change in at least one of the outcome measures, while 32.6 % (90 % CI) of patients showed reliable change in two of the outcome measures. Consequently, for one person to see reliable change in one outcome measure, 1.3 patients would need to go through treatment and 3.1 patients would need to go through treatment for one person to see a reliable change on two outcome measures. Reliable improvement in pain acceptance, as measured by the CPAQ, was seen in 37.2 % (90 % CI) of patients and, in all but one case, change in acceptance was accompanied by a reliable change in an outcome. Therefore, 34.9 % (90 % CI) of patients reliably improved on pain acceptance and at least one outcome measure.

Comparison with Previous Studies

Table 3 contains a summary of the seven studies that met the inclusion criteria: one study was a randomized controlled trial comparing ACT with traditional CBT, one was a wait-list control, and five were pre- and post-treatment studies without a control or comparison group. In total, there were 1885 participants across the seven studies.

The results of the Hedge's g calculations for the pre- to post-treatment within-group effect sizes are summarized in Table 3. Effect sizes for all seven studies were combined using the random-effects model producing an effect size for acceptance of 0.99 (95 % CI (0.68, 1.32), p<0.001). Cochrane's Q statistic was significant (Q=55, p<0.001), indicating that the variability in effect sizes across studies was greater than that which could be attributed to sampling error. Further, the I2 statistic (I2 =89.1) indicated the percentage of the variance that was due to differences between studies (89.1 %).

Based on Higgins et al. [35], low between-study variability is <25 %, moderate is <50 %, and high is <75 %. The fail-safe N (to reduce the effect size to a small effect) was approximately four times the number of studies included in the analysis (Nfs= 27.7). When the three low-intensity studies were combined using the random-effects model, an effect size of 0.65 (95 % CI, 0.43, 0.86) was obtained. Cochrane's Q statistic was not significant (Q=0.54, p=0.76), indicating that the variability in effect sizes across the three studies was not greater than that which could be attributed to sampling error. Therefore, the subgroup of three low-intensity studies showed less statistical heterogeneity than when the seven studies were combined.

Discussion

The 9-week (18 h) group-based ACT intervention for chronic pain showed a statistically significant increase and medium effect size for acceptance. As in previous studies (e.g., Vowles et al.[41]), the intervention also yielded a statistically significant decrease in catastrophizing. Although the treatment did not specifically target catastrophic cognitions, the intervention did contain cognitive components that may have assisted with lessening the influence of catastrophic thinking patterns. The effect sizes for outcome measures were small to medium.

When the current findings were compared to a clinical benchmark, the effect size for acceptance was comparable to other low-intensity (<20 h) programs but lower than the benchmark that included high intensity studies. The frequency of the program delivery (i.e., once a week) may have resulted in smaller effect sizes when compared to more intensive programs (i.e., daily intervention). Nevertheless, given that the total "dose" of therapy was also modest (i.e., 18 h compared to approximately 100 h for more intensive programs), statistically significant changes across process and outcome variables represent an important finding, particularly for translation to busy and resource-scarce clinical services.

At an individual level, the majority of patients showed some improvement in at least one measure. To compare results to previous studies (e.g., Han et al. [39] and Vowles & McCracken [40]), a reliable change analysis based on a 90 % confidence interval was conducted. In keeping with previous research (i.e., Vowles & McCracken [40]), approximately three-quarters of patients showed reliable improvement on at least one outcome measure, indicating a statistically significant change that can be distinguished from measurement error [38]. More than a third of patients (37.2, 90 % CI) showed a reliable change in acceptance. Further, in all but one case, a reliable change in acceptance (90 % CI) was accompanied by a reliable change in at least one outcome measure. Therefore, in support of previous findings (e.g., Vowles & McCracken [40]; Vowles et al., [41]), changes in acceptance were associated with overall improvements in functioning within other clinical domains.

More than a dozen studies have now assessed the efficacy and effectiveness of ACT for chronic pain in group-based interventions, the majority of which have employed the CPAQ. In this study, at a group level, the CPAQ-8 yielded an effect size similar in magnitude to that for the CPAQ. In addition, reliable change results for the CPAQ-8 with 90 % confidence interval were equivalent to CPAQ results. Although the results at the group level of analysis were similar irrespective of whether the CPAQ or CPAQ-8 was calculated, when a stringent change criterion (95 % CI) was applied at the individual level, some divergence in the rates of reliable change between the CPAQ and CPAQ-8 was observed. Consequently, caution is advised in assuming measurement equivalence when assessing

individual-level change, particularly when using a stringent change criterion and/or an intervention likely to have a modest effect on acceptance.

This study has theoretical and practical implications for clinical practice. From a contextual-behavioral perspective, pain acceptance, a clinically relevant process variable, can be targeted and modified through intervention. This study shows that following a low-intensity, group-based intervention, in addition to significant group level changes, reliable change in acceptance at an individual level was associated with reliable changes in other measures typically considered in pain rehabilitation: namely, catastrophizing, disability, and depression. Currently, insurers and other third-party payers often want treatment effects expressed in terms of improvements in symptoms of psychopathology, with the reasons for this focus being historical and multi-faceted. Shifting the focus to patterns of behavior such as engagement in activities of meaning and disengagement from struggling with pain would likely be more efficient and potentially less stigmatizing for the individual. Numerous cross-sectional studies have shown that lower acceptance of pain is associated with higher depression and greater disability at a group level (e.g., McCracken et al. [19]). Change in pain acceptance has also been shown to correlate negatively with changes in depression and disability at a group level [4, 5]. This study used acceptance as both a target of treatment and marker of treatment success at the individual and group levels. Further education and dissemination of information regarding the measurement of processes such as pain acceptance is likely required for these approaches to be clearly understood in the broader health community.

This study has some limitations: health care utilization and work status were not assessed, and consequently, the cost effectiveness of the intervention cannot be measured in economic terms. Nevertheless, the program was run with minimal staff (presenter and co-presenter) for 120 min each week, over 9 weeks. Comparatively, the delivery of intensive interdisciplinary programs can total over 100 h. This study also did not have a control group; however, change in acceptance was compared to similar ACT interventions and to the control arms of randomized controlled trials where available. Finally, the sample size of this study was small, and considerable attrition was observed as can be common in effectiveness studies. The generalizability of the findings is likely to be affected by the sample size and high rate of attrition.

In summary, the ACT intervention was shown to be effective on the basis of a statistically significant increase in pain acceptance at the group level. Despite significant group level change, the medium effect size for pain acceptance was of similar magnitude to an aggregate of studies (n=3) of approximately equivalent treatment intensity but not of an aggregate of seven studies that included high intensity interventions. Analysis at an individual level revealed considerable variability among individuals. Nevertheless, the majority (94 %) of patients who demonstrated reliable change in acceptance also showed reliable change in other measures of clinical importance. Finally, findings based on analyses using the CPAQ and CPAQ-8 were similar in most instances, providing further support for the use of the CPAQ-8 to measure change following acceptance-based interventions, particularly when response burden is a consideration.

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Contributors Anne Burke provided clinical management of the pain program. The statistical analysis was conducted by Dr John Baranoff, under the guidance of Dr Jason Connor. An initial draft of the manuscript was written by Dr John Baranoff. All authors contributed to and approved the final draft.

Ethical Standards All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

The authors declare that they have no competing interests.

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