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Psychological flexibility and catastrophizing as associated change mechanisms during online Acceptance & Commitment Therapy for chronic pain

Hester R. Trompetter [a, *], Ernst T. Bohlmeijer [a], Jean-Paul Fox [b], Karlein M.G. Schreurs [a, c]

[a] University of Twente, Department of Psychology, Health and Technology, Postbox 217, 7500 AE, Enschede, The Netherlands
[b] University of Twente, Department of Research Methodology, Measurement and Data Analysis, Postbox 217, 7500 AE, Enschede, The Netherlands
[c] Roessingh Research and Development, Postbox 310, 7500 AH, Enschede, The Netherlands

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ABSTRACT

The underlying mechanisms of the effectiveness of cognitive behavioural interventions for chronic pain need further clarification. The role of, and associations between, pain-related psychological flexibility (PF) and pain catastrophizing (PC) were examined during a randomized controlled trial on internet-based Acceptance & Commitment Therapy (ACT) for chronic pain. We assessed (1) the unique and combined indirect effects of PF and PC on outcomes, and (2) the causality of relations between PF, PC and the primary outcome pain interference in daily life (MPI) *during ACT*. A total of 238 pain sufferers were allocated to either ACT, a control condition on Expressive Writing, or a waiting list condition. Non-parametric cross-product of coefficients mediational analyses and cross-lagged panel designs were applied. Compared to control conditions, both baseline to post-intervention changes in PF and PC seemed to uniquely mediate baseline to three-month follow-up changes in pain interference and psychological distress. Only PF mediated changes in pain intensity. Indirect effects were twice as large for PF (κ^2 = .09–.19) than for PC (κ^2 PCS = .05–.10). Further assessment of changes during ACT showed, however, that only PF, and not PC, predicted *subsequent* changes in MPI, while early and late changes in both PF and PC predicted later changes in each other. In conclusion, only PF functioned as a direct, causal working mechanism during ACT, with larger indirect effects that occurred earlier than changes in PC. Additionally, PC may function as an indirect mechanism of change during ACT for chronic pain via its direct influence on PF.

1. Introduction

Various psychosocial models for chronic pain exist, and each underlie different treatment options, such as: Cognitive Behavioural Therapy (CBT) (Turner & Romano, 2001), Graded Exposure (Boersma et al., 2004; Leeuw et al., 2008) and Acceptance & Commitment Therapy (ACT) (Hayes, Strosahl, & Wilson, 2012). Recent summaries show that chronic pain treatment, in general, is modestly effective (Turk, Wilson, & Cahana, 2011; Williams, Eccleston, & Morley, 2013). One possible way to improve psychosocial treatment for chronic pain is to test proposed treatment mechanisms (i.e. 'process variables') of different treatment modalities. This approach can clarify how and why changes in individual functioning occur during each treatment model, which can further enhance clinical procedures and guide more successful allocation of patients to treatment (Kazdin, 2009; Kraemer, Wilson, Fairburn, & Agras, 2002). The aim of this study was, therefore, to examine the treatment mechanisms of change during a recently performed randomized controlled trial of web-based.

ACT for chronic pain (Trompetter, Bohlmeijer, Veehof, & Schreurs, 2014). In particular, our study focused on the treatment mechanisms of psychological flexibility and pain catastrophizing. ACT is a relatively new psychosocial treatment that is effective in reducing psychological and physical disability related to chronic pain (Buhrman et al., 2013; Thorsell et al., 2011; Veehof, Oskam, Schreurs, & Bohlmeijer, 2011; Wetherell et al., 2011). The central, overarching therapeutic mechanism in the framework of ACT is *psychological flexibility* (S. C. Hayes, Luoma, Bond, Masuda, & Lillis, 2006, 2012). Psychological flexibility results when six interrelated

* Corresponding author.
E-mail addresses: h.r.trompetter@utwente.nl (H.R. Trompetter), e.t.bohlmeijer@utwente.nl (E.T. Bohlmeijer), g.j.a.fox@utwente.nl (J.-P. Fox), k.m.g.schreurs@utwente.nl (K.M.G. Schreurs).

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therapeutic processes are worked through, which can be paired intro three response styles. The first response style that is fostered within ACT, the 'open' response style, includes both *acceptance* and the process of *cognitive defusion*. Acceptance refers to the ability to assume an open stance towards the pain experience and is offered as an alternative to fruitless attempts to control or avoid pain. Cognitive defusion reflects the ability to distance oneself from thoughts and learn to recognize these thoughts as separate from the experiences they refer to, thereby facilitating the individual's choice to not react to the thought content. Acquiring an open response style enables one to actively choose and engage in valued life activities, even in the presence of pain. This second response style of the ACT model, termed the 'engaged' response style, includes the processes of *values* and *committed action*. The interrelated processes *self-as-context* and *present-moment awareness* are represented in the third, 'grounded' response style, and associated with mindfulness. These two processes enable individuals to assume an unbiased stance in the here-and-now from where they can become open to and actively engage with their lives (Hayes et al., 2012). As the combined result of attaining these response styles, psychological flexibility is the capacity to act effectively in accordance with intrinsically motivating values and goals in the presence of pain and associated cognitions and emotions.

Observational studies have shown that aspects of psychological flexibility specifically contribute to predicting patient improvement during ACT-based treatment for chronic pain (McCracken & Gutiérrez-Martínez, 2011; McCracken & Vowles, 2008; Vowles & McCracken, 2008). Furthermore, one randomized controlled trial on ACT showed that psychological flexibility is an actual mediator of improvement in individuals experiencing whiplash associated disorder (Wicksell, Olsson, & Hayes, 2010). In Wicksell et al.'s study, psychological flexibility functioned as a mediator beyond other process variables such a kinesophobia and self-efficacy. Unfortunately, knowledge from other randomized controlled trials on mediating mechanisms of change during ACT for chronic pain is lacking.

In addition to a focus on psychological flexibility, we specifically examined possible changes in pain catastrophizing during web-based ACT for chronic pain. Pain catastrophizing refers to the degree to which a patient employs overly negative, exaggerated cognitive appraisals of the pain experience (Sullivan et al., 2001) and is an established key process in the fear avoidance model of pain (Crombez, Viane, Eccleston, Devulder, & Goubert, 2013; Vlaeyen & Linton, 2000) and CBT-based psychosocial interventions (Turner & Romano, 2001). Outcomes of a large array of randomized controlled trials show that reduction of pain catastrophizing is an important process variable of patient improvement during CBT-based treatment for chronic pain (Smeets, Vlaeyen, Kester, & Knottnerus, 2006; Spinhoven et al., 2004; Turner, Holtzman, & Mancl, 2007).

Theoretical considerations on the nature of the relationship between aspects of psychological flexibility and pain catastrophizing take different forms. ACT-models have been developed without pain catastrophizing as an explicitly proposed or central mechanism. Instead, ACT explicitly targets the function of potentially catastrophic thoughts without trying to change their specific content or frequency as done in CBT (S. C. Hayes et al., 2012). Contrastingly, in CBT pain catastrophizing is theoretically and clinically associated with general avoidance behaviour (Vlaeyen & Linton, 2000), and it is assumed that the content of catastrophic thoughts have to be changed to be able to give up avoidance behaviour. Interestingly, a handful of recent studies have shown that both CBT- and ACT-based treatments for chronic pain are able to simultaneously affect pain catastrophizing and acceptance as a central aspect of psychological flexibility. Although not targeted directly, acceptance improved during CBT-based treatment for chronic pain (Vowles, Wetherell, & Sorrell, 2009; Wetherell et al., 2011), and similarly, pain catastrophizing decreased significantly during ACT-based chronic pain treatment (Buhrman et al., 2013; Vowles, McCracken, & Eccleston, 2007).

Given these initial general findings and the need to further refine, improve and integrate different existing psychological models to understand chronic pain (e.g. Pincus & McCracken, 2013), we must further examine the specific contributions of both these central processes in explaining changes in patient outcomes during psychosocial interventions. Up until now, only two uncontrolled observational studies, one in CBT and one in ACT, explored aspects of psychological flexibility and pain catastrophizing simultaneously as possible mediating mechanisms (Baranoff, Hanrahan, Kapur, & Connor, 2013; Vowles et al., 2007). Both studies suggest that changes in both acceptance and pain catastrophizing are uniquely related to changes in outcomes beyond one or the other process. Unfortunately, nothing is known about the level and course of change in both process variables in relation to each other during and after either CBT- and ACT-treatment for chronic pain. One cross-sectional study indicated that pain acceptance mediates changes in pain catastrophizing (Vowles, McCracken, & Eccleston, 2008). However, such research questions have not been investigated in controlled trials, and especially, have not been investigated *during* the course of chronic pain treatment. These issues have all been addressed in this study.

Our data derives from a recently performed, three-armed randomized controlled trial on the efficacy of an internet-based guided self-help ACT-intervention for chronic pain (Trompetter, Bohlmeijer, Veehof, et al., 2014). During the trial, several patients' outcomes improved to a greater extent in ACT than in both control conditions, and, in addition, both psychological flexibility and pain catastrophizing improved. To follow-up on these findings, we first examined the unique and combined indirect effects of both process variables in changing pain interference, psychological distress and pain intensity in ACT as compared to the control conditions. Following these general mediational analyses, using within-group data assessed only during the ACT intervention we addressed causality of changes in processes and outcomes. We first examined if changes in psychological flexibility and pain catastrophizing predicted *subsequent* changes in pain interference in daily life as the primary outcome variable on several time-intervals during and after ACT. Finally, we specifically assessed the causality of temporal associations between psychological flexibility and pain catastrophizing.

2. Method

2.1. Participants and procedure

Participants were a heterogeneous group of individuals experiencing chronic pain, who were recruited through advertisements in Dutch national newspapers and web-based patient platforms. Participants were not paid, neither paid a fee themselves, to participate in the intervention**.** People included (a) were older than 18 years, (b) had a momentary pain intensity score ≥ 4 on an 11-point Numeric Rating Scale, (c) experienced pain at least 3 days per week, (d) and experienced pain during at least the past 6 months. People were excluded if they (a) experienced very low levels of psychological inflexibility, i.e. a score < 24 on the Psychological Inflexibility in Pain Scale, (Wicksell, Lekander, Sorjonen, & Olsson, 2010), and (b) experienced very high levels of psychological distress, i.e. a score > 24 on the Hospital Anxiety and Depression Scale, (Zigmond & Snaith, 1983). These cut-off scores were based one standard deviation above (HADS) or below (PIPS)