



Both early and late changes in psychological variables relate to treatment outcome for musculoskeletal pain patients at risk for disability

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ABSTRACT

We know little about why some people get better after psychological treatments for pain disability, whereas other people do not. In order to understand differences in treatment response, we need to explore processes of change during treatment. It has been suggested that people with pain complaints who change early in treatment have better outcomes. Therefore, we aimed to investigate whether changes in psychological variables at different time points are related to outcome, and whether early or late changes are better predictors of outcome. We used the fear avoidance model as a theoretical framework. We followed 64 patients weekly over 6–7 weeks and then determined outcome. Our findings indicate that people who decrease in catastrophizing and function early in treatment as well as in depressive symptoms, worry, fear avoidance beliefs and function late in treatment have better outcomes. Early decreases in function, and late decreases in depressive symptoms and worry uniquely predict improvements in disability. While early and late changes covaried concurrently, there were no significant sequential relationships between early and late changes. Changes in the proposed process variables in the fear avoidance model, early as well as late in treatment, thus add valuable information to the explanation of outcome.

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Although behavioral and cognitive-behavioral treatment approaches for pain problems seem to be helpful for many patients with pain problems (e.g. Eccleston, Williams, & Morley, 2009; Morley, Eccleston, & Williams, 1999), people respond differently to treatment and we do not know why (Vlaeyen & Morley, 2005). Even among patients who respond well to treatment, effect sizes of around .50 suggest that treatment effects are modest (Vlaeyen & Morley, 2005). In order to understand individual differences in response to treatment, there is a need to thoroughly explore in which ways people change during treatment, and how this is related to outcome.

When participating in treatment for pain-related disability, people in general improve on psychological variables. These improvements are correlated with improvements in pain and disability. For example, two studies show that pre to post changes as well as pre-treatment to follow up changes in dysfunctional beliefs about pain, cognitive coping strategies and catastrophic thinking about pain were associated with better outcome (Jensen, Turner, & Romano, 1994, 2001). Another study showed the same pattern for cognitive coping and negative thinking (Tota-Faucette,

Gil, Williams, Keefe, & Goli, 1993). In some cases, researchers have found that pre to post changes in psychological variables, such as catastrophic thinking about pain and perceived control over pain, can function as mediators of treatment outcome (Smeets, Vlaeyen, Kester, & Knottnerus, 2006; Spinhoven et al., 2004). Thus, those who improve on psychological variables from pre- to post-treatment also typically improve on outcome variables.

The exact patterns of change in terms of *when* changes occur remain largely unexplored. Although many clinical researchers have attempted to change psychological variables (e.g. Leeuw et al., 2007; Main, Sullivan, & Watson, 2007), few studies have explored change processes during treatment as a factor that can help explain variation in treatment outcome in the pain area (Morley & Keefe, 2007). Consequently, we still know little about *when* changes in psychological variables occur and *how* changes during treatment might be related to outcome.

Findings from psychotherapy research suggest that the timing of change might be an important marker for making clinical decisions. When investigating psychotherapy outcome for other areas than pain, findings suggest that early responses to treatment as opposed to late responses make an important contribution to the explanation of variation in outcome for depressed patients (Fennell & Teasdale, 1987; Ilardi & Craighead, 1994) as well as patients with

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mixed psychological complaints (Haas, Hill, Lambert, & Morrell, 2002). Thus, people who show rapid responses to treatment are generally better off in terms of outcome than people who do not respond rapidly. These findings are clinically valuable since they put forward which patterns of change should be indicative of continuing according to treatment planning, and which patterns of change indicate the need for another approach. Hence, it might be valuable to insert the timing of change in key variables into the analysis of outcome of psychological treatment also for pain.

In the pain area, findings are not yet clear when it comes to the timing of change in psychological variables as predictors of outcome. Only a few studies have been performed, using different methodologies. In two articles exploring change in CBT-based multidisciplinary pain treatment programs (Burns, Glenn, Bruehl, Harden, & Lofland, 2003; Burns, Kubitius, Bruehl, Harden, & Lofland, 2003), the authors sought to investigate the relationship between timing of changes in process variables as well as outcome variables during treatment. They could demonstrate that early changes in pain catastrophizing and depression were associated with late changes in pain severity and general activity in chronically disabled patients. The authors concluded that reductions in catastrophic thinking about pain and pain helplessness may influence improvements in outcome variables. A study from a Canadian research group used another approach to investigate the timing of change and its relationship with outcome (Sullivan, Adams, Thibault, Corbière, & Stanish, 2006). They aimed to predict outcome in terms of depression as it had shown to be indicative of return to work at follow up. Their findings showed that for a group of mildly depressed individuals, early changes in pain, catastrophic thinking about pain, fear of movement, and disability predicted total change in depression level during treatment. For moderately to severely depressed individuals, late treatment changes were more strongly related to total change in depression. Finally, a recent study showed that, in line with findings in other areas of psychotherapy research, people with a rapid response to cognitive behavior therapy for irritable bowel syndrome had a larger symptom reduction than people who did not respond rapidly (Lackner et al., 2010).

In addition to mere empirically driven approaches, theoretical models are important to guide studies that investigate the processes of change involved in the treatment of pain related disability. The fear avoidance model is a prominent example of a theoretical model that has guided empirical studies in understanding the development of, as well as the recovery from, disability (Vlaeyen & Linton, 2000). In short, the fear avoidance model posits that some individuals react to their pain experience with catastrophic cognitions about the pain. These catastrophic cognitions then elicit fear of pain and avoidance, which in the long run, gives rise to depression and disability. Implicitly, the model suggests that recovery from disability could involve a reversed series of sequential changes where decreases in catastrophizing precede changes in fear of pain, depression and disability. The sequential order of this series of events has recently been investigated empirically. Wideman, Adams, and Sullivan (2009) investigated the relationship between early and late treatment changes in catastrophizing, fear of pain, depression and disability in relation to return to work for a group of patients with subacute or chronic musculoskeletal pain problems undergoing a community based disability management intervention. Even though the results generally supported the validity of the variables in the fear avoidance model as key processes of change, no support was found for the hypothesized sequential relationship between early treatment changes in catastrophizing and late treatment changes in fear of pain, depression and disability. Moreover, both early and late changes were related to outcome (Wideman et al., 2009). While

there may be several explanations for a lack of temporal relationship between changes in these psychological variables such as timing of measurement of early and late change, overlapping constructs and specific characteristics of population under study, these results may also raise questions regarding the validity of the exact sequence of change in psychological variables in the fear avoidance model during treatment. For example, it could be that the sequential relationships among catastrophizing fear and disability differ for the *development* of pain-related disability and the *recovery* from disability (Wideman et al., 2009).

In summary, the empirical studies give an indication that change, and not least the *timing of change*, in key variables during psychological pain treatment is related to outcome. However, findings are far from conclusive and methodological as well as theoretical questions remain. It is for example not clear if timing of treatment response is of differential importance for people from different populations. For example, common to existing studies is that they focus on chronic populations. Moreover, findings are inconsistent about whether only early or both early and late changes during treatment can act as predictors for outcome. Before findings from other areas of psychotherapy are generalized to the pain area, more studies are needed that can replicate and extend findings with varying methodologies and in different samples. There is a need to study the relationship between timing of change in key psychological variables and outcome of pain treatment that can extend the results to a different context. Preferably, the selected variables have their basis in established theoretical models.

Our aim in this study is to explore treatment changes in psychological variables in a population of patients at risk for development of long-term pain-related disability. Moreover, we aim to investigate *when* changes occur during treatment, early versus late, and these changes' importance for outcome. We have selected pain catastrophizing, back pain worry, fear and avoidance beliefs and depressive symptoms, as representatives for key psychological variables that have a documented association with outcome (Nicholas, Linton, Watson, & Main, 2011), and followed them throughout treatment. The variables are theoretically relevant, and suggested by the fear avoidance model to be of importance for pain related disability (Vlaeyen & Linton, 2000). Specifically, we will explore to what extent these psychological variables change during treatment. Thereafter, the analyses will focus on whether early or late changes in these variables are better predictors of outcome in terms of a primary outcome variable; disability, along with two secondary outcome variables; perception of health status and pain intensity. In order to test possible sequential relationships in the timing of change among the variables in the fear avoidance model, disability will also be investigated as a process variable in the analysis.

Method

Procedure and design

This study is part of a randomized controlled trial investigating the effects of psychological treatments developed to prevent long-term pain related disability. Participants were recruited through the occupational health care department of Örebro County Council, Örebro, Sweden. Participants were employees of Örebro County Council or Örebro Municipality, currently experiencing a musculoskeletal pain problem. If they fulfilled inclusion criteria and accepted participation, they were randomized to one out of three treatment arms. They met individually with a psychologist or a physical therapist once or twice a week during six to seven weeks. Starting two weeks before treatment and going on until two weeks after treatment, participants filled out a weekly battery of

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