**Psychological factors & treatment opportunities in low back pain**

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Word count: 6680 with references

A large body of evidence suggests that psychological factors, including emotions, beliefs and avoidant behaviours, are linked to poor outcomes in low back pain. At the same time, the evidence from trials of psychological interventions suggests that they improve outcomes mostly in the short term and against passive controls only. These sub-optimal results may be due to low competency or fidelity in delivery, or inadequate matching of treatment methods with specific patient problems. Most importantly, there is insufficient theoretical guidance and integration in the design, selection, and delivery of methods that precisely target known process of pathology. We identify several new directions for research, opportunities to improve the impact of psychological interventions, and to change clinical practice. These include better ways to conceptualize and deliver reassurance at early stages of back pain; utilizing models such as the psychological flexibility model to guide treatment development, and essentially extend the fear-avoidance model.

Key words: Low back pain, psychological predictors, moderators, mediators, psychological interventions.

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The past few decades have seen a flurry of research into psychological aspects of low back pain (LBP). While some areas of research have yielded consistent and convincing evidence for the role of psychological factors in LBP, others have produced only modest evidence at best. Even where there has been significant success this has not yet changed the facts on the ground: LBP remains one of the most prevalent and costly health problems, and has been estimated to affect 632 million people worldwide, placing it as the leading cause of daily disability (see chapter 1 in this issue).

The continuing study of psychological factors associated with back pain may offer unique opportunities to develop and deliver new treatments. Such goals are perhaps best served by a focus on factors that are modifiable and appear most important. So far, we know that ignoring the psychological aspects of the pain experience, including unhelpful beliefs and emotional responses, can impede recovery. It is therefore timely to examine which psychological aspects should be addressed in consultations for back pain, how they should be addressed, and who should do it. A sound starting point for a synthesis of diverse data sets is to consider our working models. We therefore start off with a short review of current models as a way to organise the specific psychological factors examined later.

The aims of this review are to:

1. Summarize key models of psychological interventions
2. Review key psychological processes in LBP outcomes
3. Present the evidence on the effectiveness of current psychological treatment approaches
4. Identify promising new approaches and speculate on future directions, including research priorities and practical implications for clinicians and patients.

Models

The cognitive behavioural model and the cognitive behaviour therapy (CBT) approach are clearly the dominant current psychological framework and treatment approach to chronic pain. The general cognitive behavioural model is very broad and in some ways very flexible [[1](#_ENREF_1)]. In fact all of the other models we present are each more or less specific versions of this broader model. The essence of the cognitive behavioural model of chronic pain is rather simple. A key concept is that human emotions and behaviour are determined largely by how one views the world, including common errors and biases [[2](#_ENREF_2)]. Beyond that, the model proposes that (a) thoughts, beliefs, and behaviour patterns are important in understanding adjustment to chronic pain, (b) thoughts, beliefs, emotions, and behaviours interact with each other and with the situations where they occur, (c) thoughts, beliefs, and behaviour patterns can be targeted for change by specific methods of skills-training and learning,

The fear-avoidance model [[3](#_ENREF_3)], again, is in many ways a more specific version of the CBT model. It was designed with a focus on catastrophizing and fear and meant to explain not all disabling chronic pain but only some, those cases showing a pattern of phobia-like avoidance. According to this model two routes are available when one has an acute painful injury. One includes normal activity re-engagement and recovery. The other includes catastrophizing about pain, fear, avoidance, inactivity, possible physical deconditioning, possible depression, persisting pain, and becoming stuck in a fear and avoidance cycle.

An alternative or perhaps companion to the fear-avoidance model is what is called the avoidance-endurance model [[4](#_ENREF_4)]. This proposed that in addition to the fear avoidance pathway to disability there is an opposite pathway, an endurance-related responses and subsequent physical overuse. The endurance component in particular seems to include two key psychological components: the suppression of pain-related thoughts; and pain persistence behaviour [[5](#_ENREF_5)].

Acceptance of pain and acceptance-based approaches to chronic pain are increasingly recognized in chronic pain research and treatment development [[1](#_ENREF_1),[6](#_ENREF_6),[7](#_ENREF_7)]. There is, however, a wider model behind acceptance, called the psychological flexibility model [[8](#_ENREF_8),[9](#_ENREF_9)]. Psychological flexibility is defined as the capacity to persist with behaviour or change it in a way that is guided by one’s goals, in touch with what the situation at hand allows, and occurring in a context where cognitive-based influences on behaviour interact with direct experiences [[10](#_ENREF_10)]. It can also be described as behaviour that is open to experience, connected to the present moment, and engaged in actions linked to goals and values.

Summary of models

As recent attempts to organise and summarize the range of psychological approaches to chronic pain attest, these are indeed wide and varied [[1](#_ENREF_1)]. As there is no one unifying model, this must mean that practice is also not unified, and perhaps clinicians’ choices for treatment methods are left under the influences of their preferred model. This non-uniformity and the role of clinician preference may mean that at least some patients are not being matched with the methods and approach that will best meet their needs [[6](#_ENREF_6)]. Greater uniformity probably requires greater consensus on what are effective treatments and then a more consistent high level of competency in the delivery of these effective treatments. Also, matching interventions to patients needs depends on understanding their needs. This in turn leads research to attempt to identify sub-groups of patients with specific needs by identifying predictors of poor outcomes, moderators of treatment response, and mediating processes during interventions that impact on outcomes.

Key Psychological Processes

Psychological factors can relate to patients’ outcome in three ways, all of which have specific implications for clinical decisions: Prognostic indicators (predictors) predict patients’ outcomes independent of interventions; effect modifiers (moderators) are characteristics that influences the direction or strength of patients’ responses to a specific treatment; and treatment mediators are intervening variables that appear to account for the effect of treatment on patients’ outcomes [[11](#_ENREF_11)]. This section will focus on predictors of poor outcome, which are often conceptualised as obstacles to recovery. Non-physiological predictors of poor outcomes in back pain have often been described as ‘yellow flags’, and early conceptualisation included psychological, social and environmental factors (see also chapter 6 in this issue) [[12](#_ENREF_12)]. This review focuses only on psychological processes. The original idea of identifying yellow flags was to reduce the burden of disability, based on the notion that screening for known predictors, and including them in the clinical decision process should improve care. Sensitivity to these factors could also improve the therapeutic alliance between practitioners and patients, and improve adherence to advice and treatment. In the long term, addressing predictors of poor outcomes at early stages of back pain could improve outcomes and reduce costs, by matching interventions to patients’ needs. The concept of flags has developed over time to include three broad groups: normal, but unhelpful factors; reaction to symptoms; and abnormal symptoms [[13](#_ENREF_13)]. The latter, described as ‘orange flags’, include co-morbid psychiatric disorders, which usually require referral to specialists, while the former can potentially be addressed by general practitioners, physiotherapist and other practitioners commonly consulted for back pain [[12](#_ENREF_12)].

Much of the evidence for predictors comes from epidemiological observational studies, in which suspected factors were measured at early stages of back pain (typically in the first 4 weeks) and participants were followed up (typically for 12 months) (e.g. [[14](#_ENREF_14)]). Selection and measurement of outcomes has been varied, but the strongest evidence is based on outcomes that include disability, pain interference and intensity, mood state, and absenteeism from work due to back pain. There are several systematic reviews that have attempted to synthesise the evidence from prospective cohorts to identify predictors [[12](#_ENREF_12),[15-18](#_ENREF_15)]. Although there is some contradictory evidence, there is now sufficient evidence to support a link between several specific psychological factors and poor outcomes. These include the following:

Depression

There is robust evidence that low mood, often described as depression, predicts the transition to persistent pain status [[15](#_ENREF_15),[18-21](#_ENREF_18)]. A systematic review of prospective cohorts that included psychological predictors found depression to be the strongest predictor of long term disability [[15](#_ENREF_15)]. Another systematic review coded the components of nine compound screening tools to identify predictors of three dependent variables: work status, functional status and pain [[21](#_ENREF_21)]. Depression predicted all three outcomes. This fits well within the growing evidence for the impact of depression on prognosis in other groups with pain [[22](#_ENREF_22)]. Despite the abundant evidence for the impact of depression on outcomes, there is considerably less clarity about interventions that target depression in pain patients [[23](#_ENREF_23)]. Better understanding of different behaviour patterns within depression in patients with back pain could help develop more targeted interventions.

Fear Avoidance

The fear-avoidance model of [[3](#_ENREF_3)] was described in a previous section. This model differentiates between aspects of catastrophic fear, which combine fear with beliefs about threat and damage, and subsequent avoidant behaviours. However, the majority of questionnaires measure beliefs rather than behaviours; and several measures focus on exercise specifically, rather than daily activities [[24](#_ENREF_24),[25](#_ENREF_25)]. The concept of avoidance ranges from narrow interpretations of avoidance of specific movement, to generalised disengagement with life activities. Possibly because of this lack of clarity, the directional link between avoidance and catastrophic thinking has not been clearly demonstrated, although the two are clearly associated. Other possible factors leading to avoidant behaviour have been proposed, including modelling, misinformation, and depression [[25](#_ENREF_25),[26](#_ENREF_26)]. Further development of theory about broader conceptualisation of fear and avoidance is needed [[27](#_ENREF_27),[28](#_ENREF_28)].

Fearful beliefs about movement, exercise and activity have been linked to poor outcomes in several prospective observational studies (e.g. [[29](#_ENREF_29)]) and to changes in performance in experimental studies (e.g. [[30](#_ENREF_30)]). Patterns of avoidance behaviour also have been shown to correlate with measures of catastrophizing and with psychosocial and physical disability in cross-sectional data [[31](#_ENREF_31),[32](#_ENREF_32)]. Furthermore, among complex patterns of activity, avoidance appears to be the “overriding” feature associated with greater disability in general chronic pain and perhaps more so in back pain [[33](#_ENREF_33)]. In systematic reviews of prospective cohorts, measures of fear-avoidance have been shown to predict function (e.g. [[18](#_ENREF_18),[21](#_ENREF_21)]) most consistently when the beliefs and the outcomes measured are work-related [[24](#_ENREF_24),[34](#_ENREF_34)].

Catastrophic cognitions and anxiety

Catastrophizing is defined as a maladaptive cognitive style which focuses on irrational forecasting of future events [[35](#_ENREF_35)]. In relation to pain, a recent review of concepts and measurements, concluded that pain catastrophizing is characterized by the tendency to magnify the threat value of pain stimulus and to feel helpless in the context of pain, and by a relative inability to inhibit pain-related thoughts in anticipation of, during or following a painful encounter [[36](#_ENREF_36)].

Catastrophizing is a key aspect of the fear-avoidance model, but catastrophic thinking has been shown to be related to depression and disability independently of fear, as well as having an influence on outcome via fear [[37](#_ENREF_37)]. Sieben and colleagues [[38](#_ENREF_38)] used a time series analysis to test the relationships across time between fear avoidance beliefs, catastrophizing, and pain intensity in 44 patients. Their results indicate that peaks on all three measures occur together, but no causal relationships could be ascertained. One problem is distinguishing between over-lapping constructs and subtle variations in conceptualization and measurement of fearful cognitions. Catastrophizing is related to anxiety, fear, avoidance and depression. While the overlap between constructs and measurements needs untangling, catastrophic thinking is evidently an important predictor of patient outcomes [[36](#_ENREF_36)].

Acceptance

There are more than 45 studies, including several prospective cohorts, showing that acceptance of pain and related constructs, such as values, flexible present-focused attention, cognitive defusion, and committed action are correlated with reduced distress and disability, with less health care use, with better general functioning, and better work status, in groups with chronic pain [[39](#_ENREF_39),[40](#_ENREF_40)]. Although carried out with heterogeneous groups with different sites of pain, back pain was the largest subgroup in each study. These studies have shown that the predictive role of acceptance of pain is independent of, and larger than the role of pain intensity.

Pain perceptions and expectations

There is a growing body of evidence suggesting that patients’ perceptions and expectations are related to their recovery from back pain [[20](#_ENREF_20),[34](#_ENREF_34),[41](#_ENREF_41),[42](#_ENREF_42)]. There is also evidence that such expectations predict response to treatment [[43](#_ENREF_43)]. Perceptions about back pain having serious consequences, being difficult to control, and lasting a long time have been shown to predict more disability in a large cohort of UK primary care consultants [[14](#_ENREF_14)]. Similar beliefs have been found to predict longer work absence [[44](#_ENREF_44)]. Patients’ perception of their own ability to cope, and impact on their outcomes, also called pain self-efficacy, has been shown to relate to disability even after controlling for pain intensity and distress [[45](#_ENREF_45)]. It is also related to physical performance in patients with back pain [[46](#_ENREF_46)].

However, the role of patient perceptions and expectations about their back pain is potentially complex. Patients who hold negative expectations for recovery may be less likely to recover, but causality cannot be implied. Patient negative expectations may reflect a host of unmeasured obstacles to recovery and the “cause” of poor recovery may reside with these obstacles, rather than with the negative expectation per se. Attempting to change expectations in this scenario would not result in improved outcomes. In fact, giving out the message that most people recover quickly and that the patient can expect to do the same could constitute false reassurance.

Recent years have seen a growing interest not only in patients’ beliefs and expectations about back pain, but also in those of health care providers [[47](#_ENREF_47)]. Underlying this interest is the assumption that practitioners’ beliefs will affect their clinical decisions, and that these beliefs, combined with explicit messages about treatment, work absence, monitoring of pain, and the threat of back pain will transmit to patients, impacting on their beliefs and behaviours and ultimately on outcomes.

Because of the difficulties in measuring clinical decisions and subsequent patient behaviours, the majority of the evidence stems from self-report of behaviour by practitioners, or reported putative clinical behaviour in response to vignettes of patients. A systematic review of the relationship between practitioners’ beliefs and behaviours concluded that there is moderate evidence that practitioners’ fear avoidance beliefs are associated with reported sick leave prescription, thus directly influencing patients’ behaviour [[48](#_ENREF_48)].

Summary of predictors

There is good evidence for an association between a specific set of psychological predictors, including emotional and cognitive factors, and poorer patient outcomes. However, there is also contradictory evidence about the exact factors involved [[49](#_ENREF_49)]. Better prediction might depend on more individualised and complex models rather than univariate approaches.

A large observational study of 20 suspected psychosocial factors found that only a handful of them were unique, independent, prognostic indicators, but all of them were significant predictors of outcomes when considered alone [[14](#_ENREF_14)]. This suggests overlapping variance between predictors. This, in turn, suggests a need to identify important psychological dimensions than can help to integrate current findings, and this requires better models and theory.

The utility of the evidence on predictors depends on our ability to develop interventions that target and modify the specific prognostic indicators. Arguably, except for one or two trials, this has not been done. This topic is discussed further in chapter 7 of this issue.

The effectiveness of psychological interventions for back pain

There are now many published randomised control trials (RCTs) of psychological therapies for chronic pain in general and back pain specifically and several systematic reviews of these. The most recent review of 35 trials of psychological interventions for chronic pain in general, of which 11 were studies with back pain or back and neck pain, concluded that CBT produces weak effects in improving pain immediately following treatment, small effects on disability with some maintenance six months following treatment, and small to moderate effects in decreasing catastrophizing and improving mood immediately following treatment [[50](#_ENREF_50)]. A systematic review of intensive, multidisciplinary, biopsychosocial rehabilitation for chronic LBP concluded that it improves pain and functioning [[51](#_ENREF_51)], but only at high doses of more than 100 hours of treatment. Another review looked at specific types of psychological treatments including operant, relaxation, biofeedback, cognitive, cognitive-behavioural, and combinations of these [[52](#_ENREF_52)]. The main conclusion was that particular combinations of relaxation and cognitive therapy were superior to waiting list control conditions with regard to short term pain relief, but the authors caution that only few of the studies (7/21) were of sufficiently good methodology. Another review concluded, that cognitive behavioural and multidisciplinary treatments appear to produce short term pain relief and improvements in functioning for back pain but that there is no evidence that they can do so in the long run [[53](#_ENREF_53)].

A more positive result from a systematic review and meta-analysis was produced by Hoffman and colleagues [[54](#_ENREF_54)]. They extracted 205 effects sizes from 22 identified RCTs of psychological treatment for chronic LBP and found positive effects for CBT on pain-related interference, health-related quality of life, and depression. On average the effects of psychological treatments were small and there was little evidence that psychological treatment were superior to other active treatment comparison conditions. The one exception to this was multidisciplinary treatments including psychological methods, which were superior to other active treatments in improving work-related outcomes, both in the short term and long term [[54](#_ENREF_54)]. Another review identified 35 trials of psychological treatment and 11 trials of interdisciplinary treatment and found good quality evidence for moderate benefits defined as an effect size of greater than SMD = 0.5 on pain or disability [[55](#_ENREF_55)].

Explaining findings from trials

The emerging picture is that psychological interventions deliver small to moderate effects, which are mostly short term, and that these effects are demonstrated clearly only against passive controls. Why have psychological treatments failed to deliver against active controls? There are several explanations that may account for this and these could assist in the design of future interventions and trials. The majority of trials target heterogeneous groups, including patients low on risk [[56](#_ENREF_56)]. Inclusion of patients without psychological needs to receive treatment that includes psychology not only results in reducing effect size, by including patients for whom the treatment is not effective [[57](#_ENREF_57)], but is also irrational and, arguably, unethical. In addition, there is evidence that some trials were plagued by inadequate delivery (e.g. [[58](#_ENREF_58)]), and other trials may have been compromised by low dose and inadequate training. The limitations associated with training, dose and delivery by non-psychologists remain primary constraints for research. Psychologists are not commonly employed in primary care settings, and access to them is limited. It seems reasonable therefore to develop and test interventions delivered by practitioners that regularly see patients with LBP. Arguably, considerations about ease of implementation have led researchers to focus on delivering easily ‘packaged’ interventions, with minimum training and sub-optimal content. These approaches may have diluted the effects of interventions.

A recent review of interventions that included psychological approaches noted that all of the trials that failed to show benefit included delivery of the intervention by non-psychologists. In contrast, in the majority of trials that showed a benefit, the intervention was delivered by a psychologist [[12](#_ENREF_12)]. The few contrasts to this in which delivery by non-psychologists have shown benefit include substantial effort in selecting, training, supervising and assessing the competence of the practitioners delivering the treatment [[59](#_ENREF_59)]. Using the evidence on prognostic indicators, and conceptualising them in a pragmatic approach to divide patients into low, medium and high risk is the basis for the Start Back trial [[59](#_ENREF_59)]. A simple screening tool was developed from large datasets, in which a single screening question represented each of a set of constructs. The constructs represent predictors that were considered modifiable through primary care interventions [[60](#_ENREF_60)]. The high-risk group included questions on fear, anxiety, catastrophizing, depression and bothersomeness, thus capturing many of the predictors identified above. Although the trial showed that screening and matching for risk improved outcomes overall against physiotherapy, there was no difference in the outcomes of the high-risk group alone. Further work is needed now to differentiate between sub-groups within the high-risk category and match them more closely to treatment. A discussion of moderators and mediators of treatment in back pain is offered in chapter 10 of this issue.

Emerging Treatment Approaches:

Theoretically-informed Treatments

One point raised repeatedly is that research into psychological treatment for chronic LBP could be improved by more consistent application of theory. Well-designed theoretical models can help guide what researchers do and think, can integrate a wide array of variables in a smaller number of core dimensions, and can promote a more systematic and progressive pattern of research over time. In order to achieve these things a model needs precise principles, broad scope, and an ability to integrate with other areas of work within the broader biopsychosocial model [[61](#_ENREF_61)].

We suggest that none of the current psychological models applied in chronic pain has yet achieved complete success in guiding, integrating, and progressing treatment development. The fear-avoidance model has been extremely successful, but it has been noted that it has limitations that must be addressed. It does not inform researchers enough about patterns of recovery and rehabilitation, it focuses predominantly on pathological processes, and does not include motivational influences [[26](#_ENREF_26)]. We suggest that the psychological flexibility model carries design features that may provide good theoretical model in this area, and successfully extend and improve the fear-avoidance model. It addresses avoidance and adverse cognitive and emotional influences on disability through acceptance, defusion and perspective taking, and through a focus on values and commitment for creating motivated patterns of activation and engagement [[9](#_ENREF_9)]. There is already a well-developed approach to treatment for these processes, Acceptance and Commitment Therapy (ACT; [[9](#_ENREF_9),[62](#_ENREF_62)]). Accumulated evidence for ACT improving the functioning of people with chronic pain exists in the form of five published RCTs (McCracken & Morley, under review), although none of these focused specifically on back pain. An additional trial in LBP is in development [[63](#_ENREF_63)].

Treatment Matching

In addition to a more organised approach to treatment models, the field could also benefit from a related, more specific, focus on matching patient problems with treatment processes designed to address those problems. Some of this type of matching has been done. For example, if fear and avoidance patterns predominate, this could be matched with exposure-based methods or with ACT [[64](#_ENREF_64)]. Results from trials that used in-vivo exposure techniques are mixed: Against a waiting list control, the intervention performs strongly [[65](#_ENREF_65)]; it improved outcomes, but no more than graded activation in another trial [[66](#_ENREF_66)]; and was superior to both waiting list control and graded activation in changing beliefs, but not disability, in a third study [[67](#_ENREF_67)]. Numbers in all three trials were modest, but there is sufficient evidence to suggest that interventions that target the fear-avoidance model are promising. However, further refinement of the model (and the interventions) is needed.

Another aspect of matching concerns who delivers treatment to whom. The majority of health care providers in the front line of back care treatment are not trained to identify and address the full range of psychological problems that can occur. General practitioners may be unable to recognise and elicit psychological problems [[58](#_ENREF_58)] and physical therapists lack the training and the culture [[68](#_ENREF_68)]. There is also some confusion amongst health care providers about their role in addressing psychological aspects of back pain [[24](#_ENREF_24)], and about which aspects to address [[68](#_ENREF_68)]. When these health care providers do engage with patients on a psychological level, this can surprise or confuse the patient and may conflict with their expectations [[69](#_ENREF_69),[70](#_ENREF_70)]. Trials that have aimed to change practitioners’ beliefs to include a better acceptance and understanding of psychological aspects of back pain have shown promising results in changing practitioner beliefs, but not their behaviour, or patient outcomes [[71-73](#_ENREF_71)]. However, further evidence about predictors might help practitioners decide which factors can be easily recognised and addressed within their skills and their settings, and which require referral to specialists. For example physiotherapists may be able to address self-efficacy, and perhaps unhelpful cognitions, with further training, but more significant psychopathology may require referral elsewhere [[68](#_ENREF_68)].

New avenues in prevention: effective reassurance

A recent systematic review attempted to investigate which components in primary care consultations for non-specific conditions best predicted patient’ outcomes [[63](#_ENREF_63)]. Based on a model of effective persuasion [[74](#_ENREF_74)], the authors categorised HCP behaviours in the latter part of the consultation into cognitive and affective components. Cognitive reassurance was defined as offering explanations, giving advice and information, and agreeing a specific treatment plan. Affective reassurance was defined as attempts to communicate empathy, create rapport and offer generic non-specific reassurance. The findings from the review suggest that cognitive reassurance is linked to improved outcomes, but affective reassurance was at best linked to higher patient’ satisfaction. Three studies, all with good methodology, provided evidence that affective reassurance is associated with negative long-term outcomes. These intriguing findings could be explained by high risk groups being identified by practitioners, who may offer them more affective reassurance. However, clinical status and demographics were adjusted for in the studies that report negative associations with patients’ outcomes. It could be that doctors are responding to psychological needs that remain unmeasured in the studies. It is also possible that providing affective reassurance is not particularly well done, so patients in need remain needy and progress to worse outcomes. Another explanation, based on a model of persuasion [[74](#_ENREF_74)] is offered by the reviewers [[63](#_ENREF_63)]. The authors suggest that offering affective reassurance may reduce patients’ willingness and ability to take on the responsibility for managing their condition, and might reduce their ability and motivation to process new information. While these findings need to be replicated, they offer scope for future research into reassurance at early stages of consultation for back pain, and might direct practitioners to spend their limited time focusing on providing clear explanations and education.

Technology assisted delivery

Perhaps the most readily apparent development in the delivery of psychological treatments for chronic pain, including back pain, is technology- assisted delivery. Several systematic reviews of web-based treatment for chronic pain suggest significant but small effects in terms of pain reduction [[75](#_ENREF_75)], and inconsistent effects in reduced anxiety and depression [[76](#_ENREF_76)]. There are now several studies of internet-based treatment for LBP, including pilot studies [[77](#_ENREF_77)], a small study of internet-delivered treatment plus telephone support [[78](#_ENREF_78)], and a larger pilot study without added therapist contact [[79](#_ENREF_79)]. In general each of these studies reports positive results, particularly in terms of pain and disability reduction. Studies that are better designed to determine for whom these treatment work are recommended [[76](#_ENREF_76)].

Research agenda

1. Testing the effectiveness of theory-informed, mechanism or process-focused, psychological interventions for specific sub-groups.

2. Testing the relative impact of affective and cognitive reassurance on patients’ behaviours and outcomes.

3. Reaching an evidence-based consensus on effective delivery of reassurance to patients.

Practice points:

1. Continue to elicit and address patients’ individual psychological concerns.
2. Refer to psychological services when appropriate.
3. Provide clear explanations to all patients, and check if understood.

Summary

While the research on psychological processes suggests that there are key processes, including emotions and cognitions, that are linked to patients outcomes, the evidence from trials of psychological interventions is considerably less strong. In this review we have attempted to demonstrate the need for clearer links between models, identification of sub-groups who require specific intervention, and the matching of focused intervention to the needs of these sub-groups. We have also described the conflict between the need to provide treatment to integrity, delivered by skilled practitioners at optimal doses, and the practical needs within modern health care systems, which require quick, packaged front line interventions delivered by available staff. The most promising new directions for research include the development and testing of theory-driven interventions to appropriate groups of patients at optimal conditions: this may be complex and costly, but it is the only way to avoid wasting resources by testing watered-down interventions that replicate the moderate effects we already know about. A way forward might be through the utility of new technology to offer interventions at full integrity by overcoming the shortage of qualified therapists through the use of remote delivery. Finally, new evidence on reassurance suggests that offering clear explanations and information about aetiology, prognosis, and interventions could improve patient outcomes, but the content of this information, considering the uncertainty about diagnosis and prognosis, remains unknown.

*Conflict of interest statement’*

*The authors have no conflict of interest.*

References

1. Kerns RD, Sellinger J, Goodin BR. Psychological treatment of chronic pain. Annu Rev Clin Psychol. 2011;**7**:411-434.

2. Turk DC, Meichenbaum D, Genest M. Pain and behavioral medicine: a cognitive-behavioral perspective. New York: Guilford Press; 1983.

3. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. Pain. 2000;**85**(3):317-332.

4. Hasenbring MI, Verbunt JA. Fear-avoidance and endurance-related responses to pain: new models of behavior and their consequences for clinical practice. Clin J Pain. 2010;**26**(9):747-753.

5. Hasenbring MI, Hallner D, Rusu AC. Fear-avoidance- and endurance-related responses to pain: development and validation of the Avoidance-Endurance Questionnaire (AEQ). Eur J Pain. 2009;**13**(6):620-628.

6. Jensen MP. Psychosocial approaches to pain management: an organizational framework. Pain. 2011;**152**(4):717-725.

7. McCracken LM. Learning to live with the pain: acceptance of pain predicts adjustment in persons with chronic pain. Pain. 1998;**74**(1):21-27.

8. Hayes SC, Villatte M, Levin M, et al. Open, aware, and active: contextual approaches as an emerging trend in the behavioral and cognitive therapies. Annu Rev Clin Psychol. 2011;**7**:141-168.

9. Hayes SC, Strosahl KD, Wilson KG. Acceptance and commitment therapy: the process and practice of mindful change. New York: Guilford Press; 2012.

10. Hayes SC, Luoma JB, Bond FW, et al. Acceptance and commitment therapy: model, processes and outcomes. Behav Res Ther. 2006;**44**(1):1-25.

11. Kazdin AE. Mediators and mechanisms of change in psychotherapy research. Annu Rev Clin Psychol. 2007;**3**:1-27.

12. Nicholas MK, Linton SJ, Watson PJ, et al. Early identification and management of psychological risk factors ("yellow flags") in patients with low back pain: a reappraisal. Phys Ther. 2011;**91**(5):737-753.

13. Main CJ, Sullivan MJ, Watson PJ. Risk identification and screening. In: Main CJ, Sullivan MJ, Watson PJ, editors. Pain management: Practical applications of the biopsychosocial perspective in clinical and occupational settings. Edinburgh, Scotland: Elsevier Health Sciences; 2007. p. 97-134.

14. Foster NE, Thomas E, Bishop A, et al. Distinctiveness of psychological obstacles to recovery in low back pain patients in primary care. Pain. 2010;**148**(3):398-406.

15. Pincus T, Burton AK, Vogel S, et al. A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. Spine (Phila Pa 1976). 2002;**27**(5):E109-120.

16. Kent PM, Keating JL. Can we predict poor recovery from recent-onset nonspecific low back pain? A systematic review. Man Ther. 2008;**13**(1):12-28.

17. Hayden JA, Dunn KM, van der Windt DA, et al. What is the prognosis of back pain? Best Pract Res Clin Rheumatol. 2010;**24**(2):167-179.

18. Chou R, Shekelle P. Will this patient develop persistent disabling low back pain? JAMA. 2010;**303**(13):1295-1302.

19. Mallen CD, Peat G, Thomas E, et al. Prognostic factors for musculoskeletal pain in primary care: a systematic review. Br J Gen Pract. 2007;**57**(541):655-661.

20. Henschke N, Maher CG, Refshauge KM, et al. Prognosis in patients with recent onset low back pain in Australian primary care: inception cohort study. BMJ. 2008;**337**:a171.

21. Melloh M, Elfering A, Egli Presland C, et al. Identification of prognostic factors for chronicity in patients with low back pain: a review of screening instruments. Int Orthop. 2009;**33**(2):301-313.

22. Bair MJ, Robinson RL, Katon W, et al. Depression and pain comorbidity: a literature review. Arch Intern Med. 2003;**163**(20):2433-2445.

23. Linton SJ, Bergbom S. Understanding the link between depression and pain. Scandinavian Journal of Pain. 2011;**2**(2):47-54.

24. Pincus T, Vogel S, Santos R, et al. The attitudes to back pain scale in musculoskeletal practitioners (ABS-mp): the development and testing of a new questionnaire. Clin J Pain. 2006;**22**(4):378-386.

25. Pincus T, Smeets RJ, Simmonds MJ, et al. The fear avoidance model disentangled: improving the clinical utility of the fear avoidance model. Clin J Pain. 2010;**26**(9):739-746.

26. Crombez G, Eccleston C, Van Damme S, et al. Fear-avoidance model of chronic pain: the next generation. Clin J Pain. 2012;**28**(6):475-483.

27. Morley S, Eccleston C. The object of fear in pain. In: Asmundson GC, Vlaeyen JW, Crombez G, editors. Understanding and treating fear of pain. Oxford: Oxford University Press; 2004.

28. Eccleston C, Fisher EA, Vervoort T, et al. Worry and catastrophizing about pain in youth: a reappraisal. Pain. 2012;**153**(8):1560-1562.

29. Boersma K, Linton SJ. Expectancy, fear and pain in the prediction of chronic pain and disability: a prospective analysis. Eur J Pain. 2006;**10**(6):551-557.

30. Crombez G, Vlaeyen JW, Heuts PH, et al. Pain-related fear is more disabling than pain itself: evidence on the role of pain-related fear in chronic back pain disability. Pain. 1999;**80**(1-2):329-339.

31. McCracken LM, Dhingra L. A short version of the Pain Anxiety Symptoms Scale (PASS-20): preliminary development and validity. Pain Res Manag. 2002;**7**(1):45-50.

32. Roelofs J, McCracken L, Peters ML, et al. Psychometric evaluation of the Pain Anxiety Symptoms Scale (PASS) in chronic pain patients. J Behav Med. 2004;**27**(2):167-183.

33. McCracken LM, Samuel VM. The role of avoidance, pacing, and other activity patterns in chronic pain. Pain. 2007;**130**(1-2):119-125.

34. Iles RA, Davidson M, Taylor NF. Psychosocial predictors of failure to return to work in non-chronic non-specific low back pain: a systematic review. Occup Environ Med. 2008;**65**(8):507-517.

35. Ellis A. Reason and emotion in psychotherapy. New York, USA: Lyle Stuart; 1962.

36. Quartana PJ, Campbell CM, Edwards RR. Pain catastrophizing: a critical review. Expert Rev Neurother. 2009;**9**(5):745-758.

37. Cook AJ, Brawer PA, Vowles KE. The fear-avoidance model of chronic pain: validation and age analysis using structural equation modeling. Pain. 2006;**121**(3):195-206.

38. Sieben JM, Vlaeyen JW, Tuerlinckx S, et al. Pain-related fear in acute low back pain: the first two weeks of a new episode. Eur J Pain. 2002;**6**(3):229-237.

39. McCracken LM, Eccleston C. A prospective study of acceptance of pain and patient functioning with chronic pain. Pain. 2005;**118**(1-2):164-169.

40. McCracken LM, Vowles KE. A prospective analysis of acceptance of pain and values-based action in patients with chronic pain. Health Psychol. 2008;**27**(2):215-220.

41. Main CJ, Foster N, Buchbinder R. How important are back pain beliefs and expectations for satisfactory recovery from back pain? Best Pract Res Clin Rheumatol. 2010;**24**(2):205-217.

42. Hilfiker R, Bachmann LM, Heitz CA, et al. Value of predictive instruments to determine persisting restriction of function in patients with subacute non-specific low back pain. Systematic review. Eur Spine J. 2007;**16**(11):1755-1775.

43. Myers SS, Phillips RS, Davis RB, et al. Patient expectations as predictors of outcome in patients with acute low back pain. J Gen Intern Med. 2008;**23**(2):148-153.

44. Turner JA, Franklin G, Fulton-Kehoe D, et al. ISSLS prize winner: early predictors of chronic work disability: a prospective, population-based study of workers with back injuries. Spine (Phila Pa 1976). 2008;**33**(25):2809-2818.

45. Asghari A, Nicholas MK. Pain self-efficacy beliefs and pain behaviour. A prospective study. Pain. 2001;**94**(1):85-100.

46. Lacker JM, Carosella AM, Feuerstein M. Pain expectancies, pain, and functional self-efficacy expectancies as determinants of disability in patients with chronic low back disorders. J Consult Clin Psychol. 1996;**64**(1):212-220.

47. Pincus T, Vogel S, Santos R. The attitudes and beliefs of clinicians treating back pain: Do they affect patients’ outcome? In: Hasenbring MI, Rusu AC, Turk DC, editors. From acute to chronic back pain: risk factors, mechanisms, and clinical implications: Oxford University Press; 2012.

48. Darlow B, Fullen BM, Dean S, et al. The association between health care professional attitudes and beliefs and the attitudes and beliefs, clinical management, and outcomes of patients with low back pain: a systematic review. Eur J Pain. 2012;**16**(1):3-17.

49. Ramond A, Bouton C, Richard I, et al. Psychosocial risk factors for chronic low back pain in primary care--a systematic review. Fam Pract. 2011;**28**(1):12-21.

50. Williams AC, Eccleston C, Morley S. Psychological therapies for the management of chronic pain (excluding headache) in adults. Cochrane Database Syst Rev. 2012;**11**:CD007407.

51. Guzman J, Esmail R, Karjalainen K, et al. Multidisciplinary rehabilitation for chronic low back pain: systematic review. BMJ. 2001;**322**(7301):1511-1516.

52. Ostelo RW, van Tulder MW, Vlaeyen JW, et al. Behavioural treatment for chronic low-back pain. Cochrane Database Syst Rev. 2005(1):CD002014.

53. van Tulder MW, Koes B, Malmivaara A. Outcome of non-invasive treatment modalities on back pain: an evidence-based review. Eur Spine J. 2006;**15 Suppl 1**:S64-81.

54. Hoffman BM, Papas RK, Chatkoff DK, et al. Meta-analysis of psychological interventions for chronic low back pain. Health Psychol. 2007;**26**(1):1-9.

55. Chou R, Huffman LH, American Pain S, et al. Nonpharmacologic therapies for acute and chronic low back pain: a review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline. Ann Intern Med. 2007;**147**(7):492-504.

56. Kamper SJ, Maher CG, Hancock MJ, et al. Treatment-based subgroups of low back pain: a guide to appraisal of research studies and a summary of current evidence. Best Pract Res Clin Rheumatol. 2010;**24**(2):181-191.

57. Foster NE, Dziedzic KS, van der Windt DA, et al. Research priorities for non-pharmacological therapies for common musculoskeletal problems: nationally and internationally agreed recommendations. BMC Musculoskelet Disord. 2009;**10**:3.

58. Jellema P, van der Horst HE, Vlaeyen JW, et al. Predictors of outcome in patients with (sub)acute low back pain differ across treatment groups. Spine (Phila Pa 1976). 2006;**31**(15):1699-1705.

59. Hill JC, Whitehurst DG, Lewis M, et al. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. Lancet. 2011;**378**(9802):1560-1571.

60. Hill JC, Dunn KM, Lewis M, et al. A primary care back pain screening tool: identifying patient subgroups for initial treatment. Arthritis Rheum. 2008;**59**(5):632-641.

61. Hayes SC. Eleven rules for a more successful clinical psychology. J Clin Psychol. 2005;**61**(9):1055-1060.

62. Hayes SC, Strosahl KD, Wilson KG. Acceptance and commitment therapy: the process and practice of mindful change. . New York: Guilford Press; 1999.

63. Pincus T, Holt N, Vogel S, et al. Cognitive and affective reassurance and patient outcomes in primary care: a systematic review. Pain. 2013.

64. Bailey KM, Carleton RN, Vlaeyen JW, et al. Treatments addressing pain-related fear and anxiety in patients with chronic musculoskeletal pain: a preliminary review. Cogn Behav Ther. 2010;**39**(1):46-63.

65. Linton SJ, Boersma K, Jansson M, et al. A randomized controlled trial of exposure in vivo for patients with spinal pain reporting fear of work-related activities. Eur J Pain. 2008;**12**(6):722-730.

66. Leeuw M, Goossens ME, van Breukelen GJ, et al. Exposure in vivo versus operant graded activity in chronic low back pain patients: results of a randomized controlled trial. Pain. 2008;**138**(1):192-207.

67. Woods MP, Asmundson GJ. Evaluating the efficacy of graded in vivo exposure for the treatment of fear in patients with chronic back pain: a randomized controlled clinical trial. Pain. 2008;**136**(3):271-280.

68. Foster NE, Delitto A. Embedding psychosocial perspectives within clinical management of low back pain: integration of psychosocially informed management principles into physical therapist practice--challenges and opportunities. Phys Ther. 2011;**91**(5):790-803.

69. Hills R, Kitchen S. Satisfaction with outpatient physiotherapy: focus groups to explore the views of patients with acute and chronic musculoskeletal conditions. Physiother Theory Pract. 2007;**23**(1):1-20.

70. Parsons S, Harding G, Breen A, et al. The influence of patients' and primary care practitioners' beliefs and expectations about chronic musculoskeletal pain on the process of care: a systematic review of qualitative studies. Clin J Pain. 2007;**23**(1):91-98.

71. Overmeer T, Boersma K, Main CJ, et al. Do physical therapists change their beliefs, attitudes, knowledge, skills and behaviour after a biopsychosocially orientated university course? J Eval Clin Pract. 2009;**15**(4):724-732.

72. Sieben JM, Vlaeyen JW, Portegijs PJ, et al. General practitioners' treatment orientations towards low back pain: influence on treatment behaviour and patient outcome. Eur J Pain. 2009;**13**(4):412-418.

73. Vonk F, Pool JJ, Ostelo RW, et al. Physiotherapists' treatment approach towards neck pain and the influence of a behavioural graded activity training: an exploratory study. Man Ther. 2009;**14**(2):131-137.

74. Coia P, Morley S. Medical reassurance and patients' responses. J Psychosom Res. 1998;**45**(5):377-386.

75. Macea DD, Gajos K, Daglia Calil YA, et al. The efficacy of Web-based cognitive behavioral interventions for chronic pain: a systematic review and meta-analysis. J Pain. 2010;**11**(10):917-929.

76. Bender JL, Radhakrishnan A, Diorio C, et al. Can pain be managed through the Internet? A systematic review of randomized controlled trials. Pain. 2011;**152**(8):1740-1750.

77. Moessner M, Schiltenwolf M, Neubauer E. Internet-based aftercare for patients with back pain-a pilot study. Telemed J E Health. 2012;**18**(6):413-419.

78. Buhrman M, Faltenhag S, Strom L, et al. Controlled trial of Internet-based treatment with telephone support for chronic back pain. Pain. 2004;**111**(3):368-377.

79. Carpenter KM, Stoner SA, Mundt JM, et al. An online self-help CBT intervention for chronic lower back pain. Clin J Pain. 2012;**28**(1):14-22.