

From the clinic to the lab (and back) – A call for laboratory research to optimize cognitive-behaviour treatment of pain

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Introduction

The biopsychosocial model is widely accepted as the most heuristic approach to the understanding and treatment of chronic pain (6). Within this approach, cognitive-behaviour therapy (CBT) is the dominant psychological treatment. Despite its popularity, a systematic review of randomized controlled trials (RCT) showed that effects on pain and disability are rather modest (5). The authors proposed several possible explanations, such as large variations in dose and quality, and lack of focus in content and identified treatment outcomes. Particularly striking is the relative lack of specificity of CBT, covering a mixture of aims and a broad range of techniques, including attentional control, modification of maladaptive beliefs and coping strategies, and acceptance (23). Patients are exposed to varying selections of these strategies, and a major challenge for clinical practice is to determine what works for whom in which context.

We propose that incorporating laboratory research into translational behaviour medicine is a critical developmental step that will help fine-tuning and tailoring CBT. Rather than presenting an exhaustive review of contemporary views on chronic pain, we describe a number of areas within the psychology of pain, argue how laboratory research can help optimizing CBT in each of these areas, and provide examples of representative experimental research programs. As an organizing framework we use the areas previously identified by Morley (22) as targets for CBT: interruption, interference, and identity.

Interruption

Temporarily interruption of attention by pain can be seen as a beneficial process to warn of potential danger, and promote analgesic behavior (3). However

this can be very disruptive to daily activities such as work and leisure behaviour. There is a wealth of behavioural, neuropsychological, and neurophysiological evidence showing that cognitive functioning is impaired by the presence of chronic pain (7,21). Less is known about the underlying mechanisms of pain-related cognitive interruption and the conditions moderating its magnitude. Fundamental research using experimental pain models would allow a more detailed exploration of these issues. Although such research exists, studies have typically focused on simple interruptive effects (3,15). It is, however, acknowledged within cognitive psychology that attention has a wide range of separable functions (17). More precise investigation of which components of the cognitive system are affected by pain may prove valuable for clinical practice. For instance, advances have been made in the development of a standardized test protocol allowing the specific assessment of cognitive dysfunctions (20). This may be particularly helpful in the evaluation of interventions aimed at reducing the interruptive function of pain.

In addition there is also a history of research examining the effects of attentional distraction on pain (30), and attentional strategies to manage pain are often part of CBT (24). The effectiveness of distraction techniques is, however, less clear than originally thought. Experimental research is particularly helpful in identifying when, how, and for who distraction works. For instance, it is well-known that it is more difficult to direct attention away from pain when it is interpreted as threatening, rendering distraction less effective in those who are characterized by a high level of pain catastrophizing (30). Furthermore, recent advances in experimental distraction research may help further refining and optimizing the use of distraction in clinical practice. One example is research examining the role of executive functioning abilities in distraction effectiveness. Results from the first studies are promising and

suggest that specifically inhibition capability may play an important role in the attentional control of pain (26,34). Another example concerns the role of motivational factors. Contemporary theories propose that attention is prioritized to information that is relevant for valuable goals, and that attentional control over pain may be optimized when the distraction has high personal relevance and is related to a valuable personal goal (30). A recent study experimentally manipulating the motivational value of the distraction task provides preliminary evidence for this idea (33).

Interference

Continued interruption leads to interference, meaning failure to complete tasks effectively or task performance at an unsatisfactory level (22). The extent to which pain interferes with the accomplishment of daily life tasks, often called disability, is the main reason of patients to consult health care providers, and is associated with high costs when pain becomes chronic (6). Patients' beliefs about their pain have been argued to play an essential role in maintaining disability. Specifically, the fear-avoidance (FA) model states that a confrontational style, in which individuals with acute pain gradually resume activities despite pain, leads to recovery, whereas catastrophic beliefs about pain, i.e., interpretation of pain as a sign of serious injury or pathology, lead to excessive fear of pain/injury that gradually extends to avoidance of activities that are presumed to worsen the pain (35). The FA model has been empirically validated by both clinical and experimental findings (14,28), and has become one of the most popular biopsychosocial models in pain. Part of this success lies in its conceptual clarity and natural flow from diagnostic information to clinical interventions such as exposure therapy (2).

However, not all chronic pain patients seem to display the typical fear-avoidance pattern (36), and one subgroup even reports task persistence and suppression of pain-related thoughts (10). It has also been suggested that fear-avoidance may not be a stable behaviour pattern, and may be influenced by the motivational context (2). Specifically, avoiding pain is often only one goal in a dynamic environment with concomitant, competing, goals (11,29,37), and the decision to avoid or persist pain-evoking activities may depend on the value of other activated goals (2). This may have implications for the applicability of exposure as a clinical technique.

An experimental research program testing the boundaries of the fear-avoidance model by systematically investigating determinants of avoidance and persistence behavior may be an important step in further refining treatment. For example, recent studies have experimentally manipulated goals during pain-provoking tasks, and found that the pursuit of a valuable goal reduces avoidance behavior (12,31). More systematic experimental research embedded within a dynamic motivational view on disability, taking into account the goals and values of patients, may help further optimizing the efficacy of therapeutic approaches aimed at increasing functional ability of patients, such as exposure (19).

Identity

Repeated interference with tasks that are essential to achieve valued personal goals affects patients' sense of self (22). It is therefore likely that patients often perceive pain relief as a necessary step to allow successful pursuit of life goals (2). In patients with chronic pain, this search for pain relief often becomes the dominant goal in life. Paradoxically, this increase in effort may contribute to the maintenance in

suffering. Persistent attempts to control or solve the pain problem when actual control is low and the problem is chronic, often called “misdirected problem-solving”, might become part of the problem, and bring along negative consequences (4). In such situation, accepting pain may be more adaptive response, and an extensive body of research has demonstrated that acceptance is associated with better mental and physical wellbeing in patients with chronic pain (27). However, note that research about acceptance is dominated by correlational studies in which no conclusions can be drawn about its causal effects.

Of clinical interest are treatments aimed at acceptance and restoration of patients’ capacity to live according to their life values despite the presence of pain. Examples of acceptance-based treatments are acceptance and commitment therapy (18,39), mindfulness-based cognitive therapy (38,40), and contextual cognitive-behavioural therapy (19). A recent meta-analysis (32) suggests that although acceptance-based interventions are promising, many treatment outcome studies lack (adequate) control groups, and RCT’s are small and as yet unconvincing.

In sum, it is still unclear if and by which mechanisms patient functioning is exactly affected by acceptance, or by lack of acceptance, i.e., perseveration in the search for pain relief. Therefore, experimental research to the precise consequences of acceptance-based versus control-based coping strategies is necessary. Recent studies in which participants’ goal was to obtain control over a painful stimulus that was actually uncontrollable, showed negative consequences such as increase in fear and attentional biases (1,25). Other studies have experimentally manipulated acceptance of laboratory-induced pain, and showed that, compared to suppression-based strategies, acceptance resulted in higher pain tolerance and less pain-related distress (8,16).

Conclusion

Reflecting on the evidence reviewed in this essay provides important considerations for the translation of basic scientific research to clinical pain management. Recent theoretical advances suggest a number of pain-cognition relationships to be less universal than originally thought. This has important implications for the utilization of CBT, and careful examination of pain-cognition interactions under laboratory conditions is essential to allow further optimizing CBT. Individual tailoring of CBT by means of evidence-based selection criteria may be a step in the right direction [9]. This does not necessarily mean that we should abandon group-based interventions. One promising way of adding individual accents while still preserving the benefits of group programs, is the implementation of e-health innovations allowing both assessment of patient features requiring specific treatment techniques and delivery of such interventions [13].

To conclude, we recommend that in order to maximize effectiveness of CBT, more use should be made of the advantages of clinically informed experimental research.

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