A SELF-REGULATION PERSPECTIVE ON AVOIDANCE AND PERSISTENCE BEHAVIOUR IN CHRONIC PAIN: NEW THEORIES, NEW CHALLENGES?

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Abstract

Objective: Behavioural factors such as avoidance and persistence have received massive theoretical and empirical attention in the attempts to explain chronic pain and disability. The determinants of these pain behaviours remain, however, poorly understood. We propose a self-regulation perspective to increase our understanding of pain-related avoidance and persistence.

Methods: A narrative review.

Results: We identified several theoretical views that may help explaining avoidance and persistence behaviour, and organized these views around 4 concepts central in self-regulation theories: (1) identity, (2) affective-motivational orientation, (3) goal cognitions, and (4) coping. The review shows that each of these self-regulation perspectives allows for a broadened view in which pain behaviors are not simply considered passive consequences of fear, but proactive strategies to regulate the self when challenged by pain.

Discussion: Several implications and challenges arising from this review are discussed. In particular, a self-regulation perspective does not consider avoidance and persistence behaviour to be intrinsically adaptive or maladaptive, but argues that their effects on disability and wellbeing rather depend on the goals underlying these behaviours. Such view would require a shift in how avoidance and persistence behaviour are assessed and approached in clinical interventions.

Key words: pain, avoidance, persistence, self-regulation, motivation

1. Introduction

Acute pain is a common experience, but fortunately, often such pain is easily resolved and daily activities can be relatively quickly resumed. However, sometimes pain persists and brings with a myriad of adverse consequences, including multiple somatic complaints, disability, psychological distress, and deteriorating social functioning.

Behavioural factors have received massive theoretical and empirical attention in the attempts to identify variables accounting for the exacerbation and chronification of pain and suffering. One class of theories that have become particularly influential in research as well as in clinical practice, are fear-avoidance models[1-7]. These models have in common that they describe how acute pain evolves into chronic pain and disability as a result of an avoidant behavioural style provoked by excessive fear of pain, movement, and (re)injury. The basic assumptions of fear-avoidance models have received ample empirical support. A review of this empirical evidence is beyond the scope of this paper, and has been presented elsewhere[8-10].

Nevertheless, the fear-avoidance model has also been criticized, because interventions based on the model have not delivered convincing results, and observations from clinical practice suggest that this may be due to suboptimal identification and assessment of subgroups within the population of fearful-avoidant patients[11]. Furthermore, it has become increasingly clear that the typical fear-avoidance pattern is not the default mode for all patients suffering from chronic pain. Not all chronic pain patients display this pattern, and some patients even show an opposite behaviour pattern, namely persistence of activity despite pain[12-14]. Also, studies on activity levels of pain patients could not demonstrate the existence of generally decreased activity levels in pain patients and there appears to be only a

subgroup of patients who do show a decrease in physical activity over one year after pain-onset[15-16]. In response to these observations, there have been some attempts to provide a theoretical explanation for persistence or overuse[14,17,18]. One theory that has received a lot of attention is the avoidance-endurance model[18]. This model states that the path from acute to chronic pain may occur not only by fear-induced avoidance behaviour, but also by continuing task persistence despite severe pain, during which pain and pain-related thoughts are suppressed or minimized. Persistence behaviour patterns have been identified in a substantial subgroup of chronic pain patients[19], and empirical support for the avoidance and endurance model is starting to accumulate[20,21].

With this review, we want to point at the challenges coming with the addition of persistence behaviour as a possible risk factor in chronic pain. An important question is when, and particularly why, individuals engage in avoidance and persistence behaviours. In their current state, the fear-avoidance model and the avoidance-endurance model do not provide a thorough explanation of the motivational mechanisms underlying avoidance or endurance behaviours[22,23]. In the present paper, we argue how self-regulatory concepts and theories may help overcoming current limitations of the models, and propose a self-regulation perspective on avoidance and persistence behaviour that is built around the organizing powers of goals. We provide a short overview of recent motivational theories that have been applied in the context of (chronic) pain, and that bear promise in increasing our understanding of pain-related avoidance and persistence. Finally, we discuss a number of remaining key challenges to the study of avoidance and persistence behaviours.

2. A self-regulation perspective on avoidance and persistence

An emerging approach to understand pain behaviours is to reconsider these within a broader motivational perspective[22-26]. This perspective starts from the basic tenet that behaviour is the result of the organizing power of goals in a broad array of domains (e.g., social, work-related, health)[27,28]. More specific, a self-regulatory feedback system has been proposed that aligns a person's behaviours with pre-set internal standards or reference levels[27,29]. An important aspect of self-regulation is how people cope with negative states, adversities or setbacks in the process of goal striving. Pain typically represents such negative state, and chronic pain is often perceived as a barrier to the pursuit of valued goals[30-32]. Within this self-regulation perspective, pain behaviours such as avoidance and persistence are no longer viewed as the direct consequence of how pain is perceived or interpreted, but rather as the result of self-regulation of current goals in the context of pain.

In recent years, a growing number of self-regulation and motivational theories have been adopted to increase our understanding of pain behaviours. In the following section, we provide a short review of these theories, organized around a number of key concepts, and describe empirical work based upon these theories.

2.1 Identity

One type of self-regulation theories has specifically focused upon how (chronic) pain may change patients' sense of identity (i.e., the view one has of his or her self) and how such change may affect behavior[33]. In a goal hierarchy structure, ranging from concrete ("do the dishes") to abstract ("being successful"), identity can be placed at the top of the hierachy[28]. Chronic pain is believed to have an impact on all levels within this hierarchy, referred to by Morley[32] as interruption, interference,

and identity. Interruption refers to the process that pain immediately draws attention and disrupts behaviour. This is illustrated by the observation that one is most likely to stop immediately with performing other activities when suddenly feeling sharp pain. Interference is a result of repeated interruption and refers to the inability to complete tasks (in a satisfactory way) due to the continuing presence of pain. In this way, chronic pain may start to interfere with work-related or leisure activities. Yet, beyond interruptive and interference effects, chronic pain also affects the person's identity or self. When chronic pain prevents the achievement of valued life goals, it may alter the feeling of 'self', and the patient may no longer feel to be the same person[34,35].

One line of research has specifically zoomed in on explaining avoidance and persistence behaviours in chronic pain from those goals at the top of the hierarchy, which are related to identity. The effects of pain on the self can be understood in terms of self-discrepancies. Based upon self-discrepancy theory, a differentiation can be made between three types of identity-related goals or so-called self-guides, i.e., the ideal self, ought self, and feared self[36,37]. These respectively include representations of the person one ideally would like to be, feel one should be, and fear to become. Furthermore, all three self-guides can be considered from two perspectives, the own perspective (e.g. "who would I ideally like to be") and the perspective of an important other (e.g. "who would my boss ideally like me to be"). If discrepancy is experienced between the actual self and the self-guides, emotions and self-regulatory behaviours are elicited[36].

Avoidance and persistence can be considered as behavioural attempts to resolve discomfort and restore balance at the level of identity. In the application of self-discrepancy theory to chronic pain, it could be predicted that ideal and ought self-discrepancies would lead to persistence behaviour, whereas feared self-

discrepancies would result in avoidance behaviour. These predictions have been tested in patients with chronic low back pain[38,39]. Results from cross-sectional and daily diary studies indicated that ideal self-discrepancies are indeed related with persistence behaviour. However, large congruency and large discrepancy between the actual and the ideal self were both found to be associated with persistence behaviour. Possibly, patients who feel close to their ideal self might persist to maintain this congruency while patients who feel distant from their ideal self might (often unsuccessfully) persist in activities in an attempt to get closer to their ideal self. Furthermore, as expected, feared self-discrepancies were related with avoidance behaviour. Despite these promising results, a number of expected relationships from the model, such as between ought self-discrepancies and persistence behaviour, could not be demonstrated. Furthermore, the predictive value of the model has yet to be investigated. Nevertheless, the aforementioned findings do lend support to the notion that higher order goals may play a role in avoidance and persistence behaviour.

2.2. Affective-motivational orientation

A number of theories have focused upon the interactions between affect (mood), motivational orientation, and pain behaviors. One of the ideas put forward by the avoidance-endurance model is that positive mood may be a risk factor for excessive persistence behaviour and subsequent disability as a result of overuse[18]. While there are indications that mood may indeed affect pain behaviour, it has been argued that mood alone is not enough to explain task avoidance and persistence[14]. More complex models have been proposed, in which behaviour is predicted by interactions between mood and motivational orientation. One of these models is the

mood-as-input model. The original mood-as-input model proposes that behaviour is a consequence of interactions between stop rules and affect-regulation processes[40]. One of the basic assumptions is that task performance is not directly influenced by mood but rather that mood has an informational value within a motivational context, which affects behaviour. This motivational context is defined by which stop rules an individual employs. On the one hand, an “as-many-as-can” stop rule means that the progress made on the task is the primary interest. On the other hand, a “feel-like-discontinuing” stop rule refers to the preoccupation with how much one enjoys the task. An as-many-as-can stop rule in combination with positive mood would then indicate sufficient task progress and would lead to early task disengagement. Negative mood however would signal discontentment with task progress and would lead to task persistence. An opposite pattern would occur in combination with a feel-like- discontinuing stop rule. Positive mood would then indicate task enjoyment, and thus motivate task persistence while negative mood would instigate task disengagement. Vlaeyen and Morley[13] suggested that the mood as input model might help to explain (avoidance and persistence) behavioural patterns in chronic pain patients based on the habitual use of stop rules in changing moods or, when in a certain mood, fluctuating task performance because of changing stop rules. Studies testing these hypotheses were largely unsuccessful in producing the expected effects. Typically, independent, but not interaction effects of mood and stop rules were found. It has been concluded that the mood-as-input predictions may not apply to task persistence in the context of pain[41-43]. This line of research does however lend support for the role of affect and motivational orientation in task persistence. More specifically, negative mood and holding hedonic goals are associated with less task persistence while positive mood and achievement goals predict longer task

persistence[42-45].

Motivational orientation may thus seem a promising way to account for pain-related avoidance end persistence behaviour. Possibly helpful in this context is the Regulatory Focus Theory[46]. Individual differences in regulatory focus may explain why some people tend to avoid while others tend to persist when experiencing pain. Regulatory focus distinguishes between two types of orientations, a promotion versus a prevention focus in which the focus is on the presence or absence of respectively positive (promotion) versus negative (prevention) outcomes. Whereas a promotion focus is associated with eagerness and advancement, a prevention focus is characterized by vigilance and safety seeking behaviour[46,47]. Experimental research has indicated that when task difficulty is high, promotion-focused persons persist longer in contrast with prevention-focused individuals[48]. Applied to the context of pain, holding a promotion focus might facilitate task persistence by keeping the focus on the goal whereas in a prevention focus attention might be easily drawn to the pain and result in task avoidance or disengagement. Obviously, experimental and clinical research is needed to test these predictions, and to investigate how regulatory focus interacts with other, more situation-specific, factors in explaining pain-related avoidance and persistence.

2.3. Goal cognition

One class of motivational theories have proposed that people possess schematic models of their goal pursuit processes in which goal-relevant experiences and cognitions are stored[49,50]. It has been hypothesized that individuals who live with persistent pain create specific schematic working models of the relationship between their pain and the pursuit of life goals[51]. These schematic goal cognitions may affect

the day-to-day experience of pain and guide behavior in the context of pain. Several studies have shown the detrimental effects of chronic pain on goal cognitions. From a telephone survey in a sample from the general population, it was found that the presence of persistent or chronic pain strongly interfered with the construal of work goals, as reflected in lower levels of work goal value and self-efficacy, and higher levels of goal conflict between work-related and other goals[52]. Using a more fine-grained daily process analysis in women with fibromyalgia, obtained from diary assessments, Affleck and colleagues[53] found that on days on which pain increased during the day, more goal hindrance was experienced.

Exemplary for this theoretical approach are value-expectancy models of motivation[27,54], which may be helpful in explaining if and how persons with chronic pain engage in goal-directed behaviour. These models assume that behaviour is organized around valued goals, and that the pursuit of these goals is driven by the expectation that they can actually be achieved. Particularly when a goal is perceived as both highly valued and attainable, individuals will persist in their efforts to achieve the goal, even when confronted with obstacles such as pain. Affleck and colleagues[30] specifically investigated the value-expectancy model in the context of chronic pain, by analyzing daily reports of goal cognitions in a sample of women with fibromyalgia. They found that goal valuation, but not self-efficacy, was a unique predictor of the amount of effort expended to attain personal goals. The results further suggested that dispositional optimism, rather than situation-specific self-efficacy was predictive for self-reported goal progress. It has to be mentioned, though, that in this study no behaviour assessment was included, making it difficult to make firm conclusions of the effects of goal cognitions on actual avoidance and persistence behaviour. Further experimental and clinical research is required to test the validity of value-expectancy

theories in predicting pain-related avoidance and persistence.

2.4. Coping

Central to any motivational account of pain behavior is the idea that pain is a fundamentally disruptive experience occurring within a context of daily goal pursuit. Pain can interfere with the efficiency and effectiveness of everyday task performance, thus becoming a profound obstacle. A recently proposed self-regulation view on coping[55] with pain may also prove a useful framework to understand avoidance and persistence. This view has been based upon the Dual Process Model[56], which distinguishes two mutually inhibiting regulatory processes when a certain goal has become blocked: (1) *assimilation*, in which the current situation is adjusted to a blocked goal by either increasing goal effort or removing the goal obstacle, and (2) *accommodation*, in which blocked goals are adapted to the current situation by either reducing their importance or positively reappraising the situation.

Within such framework, coping with pain is recast as attempts to pursue valued activities and life goals[55]. When ongoing behavior is disrupted by pain, both avoidance and persistence may reflect the assimilative coping path. One possible response is to simply try harder to accomplish the interrupted task goal, by increasing effort and ignoring the pain. Such response may largely correspond with the pattern that has been previously described as persistence or endurance behaviour[14,18]. Experimental research has revealed that when individuals pursue goals they become more sensitive to information that is relevant for their goals, and tend to become less sensitive to information that is goal irrelevant[57]. We may thus expect that individuals become less sensitive to pain when pursuing valued goals, which may correspond with what has been described in the avoidance-endurance model as ignoring and

suppressing pain[18]. Although there is some evidence in healthy persons that pursuing an important goal (e.g., obtaining financial reward) suppresses the amount of attention allocated to (signals of impending) experimental pain[58,59], such finding has yet to be demonstrated in patients with chronic pain.

Another possible response is that one attempts to solve the pain problem in order to protect and restore threatened life goals[22]. In such situation, searching for pain relief or for a solution to pain may become a highly salient or dominant goal. When the person has a strong biomedical frame of reference, in which pain is considered as a sign of bodily damage, the typical fear-avoidance pattern[10] may occur, in which activity is avoided to allow the body to heal. When pain relief has become a salient or dominant goal, individuals will become more sensitive to information that is relevant for that goal, possibly increasing hypervigilance for pain-related information[57]. Indeed, it has been shown in healthy persons that pursuing the goal to avoid pain significantly increases attentional biases to signals of impending experimental pain[60]. How the prioritization of pain-related goals affects the pursuit of other goals and pain behaviours in patients with chronic pain is less clear, and provides an intriguing path for future research. Potentially useful in this context is the concept of inter-goal relations. People typically pursue several goals at the same time, and these goals are not always independent of each other. They may influence each other in a positive (facilitation) or negative (interference) way[61-63]. Both inter-goal interference and facilitation may play a role in avoidance as well as persistence behaviour. A strong focus on the goal of pain relief may be perceived incompatible with goals on other domains of life such as work and social life. This inter-goal interference may result in increased levels of inactivity or avoidance. However, also inter-goal facilitation may play a role. When certain behaviour is instrumental in

attaining different goals, this may induce persistence despite the presence of pain. It is also possible that patients see pain relief as a necessity to be able to re-engage in other valued life goals. The conditional goal setting (CGS) theory may be informative in this respect[64]. CGS refers to the process by which a concrete goal has become directly linked to a higher-order value. Such may be the case when a patient, for example, believes to be only able to have a rich social life when the pain problem is resolved or controlled. When the goal to control pain becomes the sole prerequisite for the attainment of other goals, it gains significant importance, and as such may maintain avoidance behaviour. The effects of perceived inter-goal relations and conditional goal setting on pain-related avoidance and persistence behaviours have yet to be empirically investigated, and provide a potentially intriguing avenue for future research[65].

3. Open questions and challenges

Although all of the above-described self-regulation perspectives have shown promise in increasing our understanding of avoidance and persistence, several questions and challenges remain. These will be discussed below.

3.1. Capturing the dynamics between personal and contextual factors

The different behavioral patterns in the fear-avoidance model and the avoidance-endurance model are often seen as habitual styles that are stable across time and across situations. Although there are undoubtedly individual differences in temperament, regulatory orientation, and pain-related coping style, this view may be too restrictive to account for the complexity of daily life in which there is a continuous interaction between personal and contextual factors. In the light of the temporal and

contextual dynamics of behavior, it may well be that on some occasions patients do not display their “typical” behavioral pattern[22]. For example, a patient may usually avoid back-bending activities, but may occasionally endure in some situations, for example to be able to play with the grandchildren during a visit. Current models insufficiently address the question how patients try to function despite pain. In a recent experimental study, it was demonstrated that the decision to avoid or persist a pain-provoking task, is strongly affected by the motivational context[66]. Healthy volunteers were offered the choice to perform or avoid trials from a pain-provoking task. The motivational context was experimentally manipulated by informing half of the participants that they would receive additional financial rewards for every performed trial of the task. The results showed that the participants in which the value of the task goal was increased, performed more trials of the pain-provoking task, and that the correlation between fear of the experimental pain stimulus and avoidance of the pain task was significantly reduced, suggesting that when a competing goal is activated, behavior becomes less affected by pain-related fear. Further research is needed to investigate whether similar goal dynamics play a role in the avoidance and persistence behaviours of persons with chronic pain. There are already indications that an activity pattern characterized by extreme alternations between activity and rest, thus incorporating both avoidance and persistence characteristics, is highly prevalent in the chronic pain population and represents the most detrimental activity pattern in terms of pain-related outcomes[39,67]. While these results are intriguing, they cannot be easily explained by means of the current theoretical models. Possible interactions between personal and contextual factors in pain behaviours should be taken into account. The way in which pain-related versus

other goals are selected or primed, and how this interacts with individual characteristics, is definitely an area to explore in future research.

3.2. Investigating the effects of avoidance and persistence

An important issue in studying activity patterns and especially persistence behaviour in chronic pain is the fact that rather little is known about their effects on important outcomes such as disability and quality of life. A recent meta-analysis showed that in chronic low back pain patients there was a moderate negative association between avoidance behaviour and disability, indicating that those patients avoiding the most also experience most disability[68]. Note, however, that this meta-analysis concerned cross-sectional studies, and that no conclusions could be drawn in terms of causality. Longitudinal studies are needed to address the question if avoidance behaviour actually leads to disability. For persistence behaviour the picture is even less clear. Undue suppression of normal, pain-related interruption of daily activities may lead to an overuse or overload of musculoskeletal structures, thereby attenuating physical recovery. Preliminary evidence suggests that excessive task persistence might predict less successful rehabilitation and may eventually increase vulnerability for inflammatory diseases[18]. Research on the relations between persistence behaviour and disability and wellbeing has, however, yielded mixed results[19,39,67,69]. Possibly, the (mal)adaptive character of persistence behaviour largely depends on the definition and accordingly the measurement method employed. More specifically, factor analyses on several persistence items from different self-report questionnaires indicated three factors underlying persistence behaviour namely, task-contingent, pain-contingent, and excessive persistence. Of these, only excessive persistence was associated with higher levels of disability and

depressed mood whereas task-contingent persistence was associated with lower levels of disability. Pain-contingent persistence was not related with disability or depressed mood[69]. Noteworthy, current findings largely rely on self-report while it is known that there are significant differences between self-reported and objectively assessed activity levels[39]. Thus, in order to reliably determine the (mal)adaptive nature of activity patterns, agreement on both the definition as well as the measurement method is necessary.

Another problem is that, when examining the effects of avoidance and persistence behaviour on disability, there is often considerable overlap in how pain behaviours and disability are conceptualized and assessed. Disability is typically operationalized as the extent to which pain interferes with functioning[70]. According to the International Classification of Functioning, Disability and Health (ICF; World Health Organization, 2001), disability involves dysfunctioning at several levels: impairment (problems in body function or structure), activity limitation (difficulties in executing activities), and participation restriction (reduced involvement in life situations)[71]. However, the assessment of avoidance and endurance behaviours[19] is highly overlapping with this definition of disability. This is problematic, as it paves the path for artificially high correlations between measures of pain behaviours and disability, and thus to possible over-estimation of effects. A conceptual analysis of avoidance, persistence, and disability is urgently needed, and the question has to be posed if a strict differentiation between pain behaviours as independent variables and disability as a dependent variable is realistic.

Apart from methodological issues, one could also speculate that the effects of behavioural patterns on perceived disability may depend on the goals one is attempting to pursue with these behaviours, rather than on the behavioural pattern

itself[25]. For example, stop working in the garden only because one does not want to be confronted with the aversive event pain is, may be more maladaptive than to do so because one wants to be able to perform one's job at a satisfactory level the next day. In a similar way, persisting a certain task because it serves a positive goal may be more adaptive than doing so because one wants to avoid negative emotions such as shame. A research program systematically testing the moderating effects of intentions and goals underlying avoidance and persistency behaviours on their effects would be highly valuable.

3.3. Goal content or type of motivation?

One aspect of self-regulation that has not been considered in the prediction of pain behaviours is the multimodal nature of motivation. Traditionally, motivation is cut down into two types, i.e., autonomous versus controlled motivation. In contrast with controlled motivation, autonomous motivation entails goals and accompanied behavior that is in line with the individual's needs and is a choice rather than a felt obligation[72]. These types of motivation have been studied in relation with many behavioural concepts such as learning behavior[73] but also in the domain of sports and exercise. One recent study among sport athletes may be of particular interest with respect to pain behavior. In this study it was shown that autonomous motivation predicted task persistence on a cycle ergometer especially in the case of goal difficulty[74]. It would be interesting to extend this research to investigate persistence and avoidance behavior in the context of pain. It could be expected that, while in pain, task goals that are autonomously motivated might lead to longer persistence than task goals that are under controlled motivation, irrespective of the content of these goals. Both experimental studies and research in naturalistic settings are

needed to test the validity of these ideas. For example, in previous studies it was found that the goal of obtaining a financial reward increased task persistence during experimental pain[66], suppressed attention to pain-related cues[58], and even reduced pain perception in high pain catastrophizers[59]. It would be interesting to extend this line of research by manipulating the type of motivation with which task goals are pursued. To our knowledge, motivational interviewing prior to pain rehabilitation is the only domain in which autonomous and controlled motivation are being studied in the context of (chronic) pain[75]. The scope of that line of research is to ameliorate therapy compliance by aiding patients in finding autonomous motivation for possible treatment options. To our knowledge, no studies have investigated how motivational interviewing may affect pain behaviours.

3.4. Assessing goals and self-regulation

The assessment of goals in the context of chronic pain is not a well-studied area. Studies typically focus on the assessment of non-pain goals in chronic pain, and particularly how pain interferes with goal construal and goal cognitions[52]. A synthesis of this research suggests that chronic pain relates to less favorable goal process representations, such as lower valuations of goals, lower self-efficacy when pursuing goals, and a heightened perception of conflict between goals. Other researchers[30] have used prospective designs and unraveled the dynamic relations between pain, affect, and measures of goal progress and effort. In all of the above studies, the specific content of the goals was not the primary focus of study. Nor were patients asked to report upon their pain-related goals, such as the goal to control pain.

For such purposes, Personal Project Analysis (PPA) may be a useful tool. PPA[62] is one of the methods available to assess personal goals and their characteristics. According to PPA, personal projects are “extended sets of personally salient action”. Personal projects may be understood as middle-level goals, situated between higher values and specific behavioral acts that are volitional and purposeful in nature. Personal projects are typically assessed, first, by asking respondents to list all goals that are currently important to them, and, second, to let them rate these on a number of goal dimensions or appraisals. Typical examples of such appraisals include the extent to which one judges projects as difficult, important or stressful, whether one perceives having control over projects, spending a lot of time in the pursuit of projects, being satisfied with progress towards projects, and rating projects as valuable and self-identified. It would be interesting to use this kind of approach in patients with chronic pain, and test how they manage and integrate pain-related and other goals, and how this affects pain-related avoidance and persistence.

3.5. Translating the self-regulation perspective into clinical aims

One typical treatment objective in terms of behaviour is becoming more active again, particularly when patients are characterized by fear-avoidance patterns. This is often one of the central aims of cognitive-behavioral therapy (CBT) approaches, including exposure[76]. It has been suggested already that personal goals and inter-goal relations should be taken into account during CBT[77]. One way of doing this is by means of motivational interviewing, which may help patients clarifying their goals in making the decision to become more physically active[78]. Results from clinical trials will determine the added value of motivational interviewing[75].

When patients have taken the decision to become more active again, the realization of this goal could be facilitated by adding self-regulation strategies to the treatment, such as the formation of implementation intentions[79]. These are if-then plans specifying when, where and how the patient would do physical activities. It has been shown that such intervention led to greater increases in physical capacity, although this doesn't necessarily say something about avoidance and persistence behaviour. Such interventions could be further refined, by taking into account individual life goals and relations among these goals[80]. Insights from Acceptance and Commitment Therapy (ACT), directed at stimulating committed action and living according to one's values and life goals[81,82], may be a useful addition.

Although interventions aimed at increasing activity, such as exposure, have shown promising results, it is unlikely that this is the best approach for all patients, as has become evident from the rather subtle effects found in clinical trials[83-85]. Certainly when patients are rather characterized by excessive task persistence, other approaches may be needed. An intervention that has been proposed in this context is activity pacing. However, the method of activity pacing as a clinical technique still lacks a clear description and systematic research to its precise effects[86,87]. A helpful approach may be to look at pacing from the perspective of goal flexibility and acceptance. In some patients, an adequate activity level may imply a rescheduling of daily life, which may require the pursuit of behaviours that are guided by values and life goals, but can be adapted or abandoned when unsuccessful[22,81]. Recasting pacing within a self-regulation perspective may prove fruitful to improve its description and the exact way in which it is used as a clinical intervention.

4. Conclusion

We have identified several concepts and theories within a self-regulation perspective that may help increasing our understanding of avoidance and persistence behavior. Each of the self-regulation concepts discussed (i.e., identity, affective-motivational orientation, goal cognitions, coping) allows for a broadened view in which pain behaviors are not simply considered passive consequences of fear, but proactive strategies to regulate the self when challenged by pain.

Several implications and challenges arise from this review. In particular, a self-regulation perspective does not consider avoidance and persistence behaviour to be intrinsically adaptive or maladaptive, but argues that the effects of these behaviours on disability and wellbeing may rather depend on the underlying goals and intentions. This probably means that we should not only ask the question *if* patients are displaying avoidance or persistence behaviour, but, perhaps even more importantly, *why* they behave in such ways. This implies that the mere assessment of activity patterns may not be sufficient to inform intervention strategies, but that we should add tools that may help us understanding the function of this behaviour in the pursuit of goals when facing pain.

However, we are not there yet. Several ideas are speculative and still need empirical corroboration, and a number of challenges remain. With regard to pain behaviors, the study of the different self-regulation concepts is rather fragmented, and the field may benefit from more theoretical integration and more concerted empirical efforts. With this paper we hope to have inspired future experimental and clinical research on pain behavior from a self-regulation perspective.

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