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The role of avoidance, pacing, and other activity patterns in chronic pain

Lance M. McCracken *, Victoria M. Samuel

Pain Management Unit, Royal National Hospital for Rheumatic Diseases, Bath, UK

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Abstract

The level and pattern of daily activities performed by persons with chronic pain are regarded as central determinants of their overall physical, social and emotional functioning. Within the chronic pain literature, various approaches to activity are typically considered, including activity avoidance, ‘‘pacing’’, and particular patterns of high rate activity, sometimes referred to as ‘‘overuse’’ or ‘‘activity cycling’’. Of these, activity avoidance has been most studied, while the others remain poorly understood. The purpose of this investigation was to examine distinct activity patterns of chronic pain sufferers, and to consider their relations with physical, social, and emotional functioning. Based on data from 276 individuals with chronic pain, four distinct activity patterns were identified with cluster analysis. Correlation and group comparison analyses confirmed that patients who avoid activity suffer greater physical disability and distress. Surprisingly, pacing activity was positively related to avoidance and disability. Patients who reported relatively high activity in conjunction with little avoidance demonstrated distinctly better physical and emotional functioning than other groups. Pain did not distinguish groups to a large extent but acceptance of pain did. Groups with the most avoidance and disability reported the lowest levels of acceptance of pain. These data suggest that activity patterns are complex and multidimensional, and that avoidance appears to be the overriding process with regard to daily functioning. Moreover, avoidance patterns may be subtle, sometimes resembling healthy coping, and sometimes presenting along side patterns of high activity.

Keywords: Chronic pain; Avoidance; Pacing; Cognitive-behavioral approaches; Acceptance

1. Introduction

Chronic pain can be associated with significant disruption of daily activity for the pain sufferer. This disruption can vary greatly for different individuals and appears to depend on patient behavior in response to pain, the ways physical and social activities are managed, and the choices made to engage in activities or not. It is clear that activity patterns in cases of chronic pain are not solely a product of variability in the pain itself (Fordyce et al., 1984; Linton, 1985), but are a product of multiple cognitive, emotional, and social factors. It is for these reasons that improving the physical and social activities of persons suffering with chronic pain has become a primary aim of interdisciplinary and cognitive-behavioral treatment approaches (e.g., Hanson and Gerber, 1990; Keefe et al., 1996; Williams et al., 1996); approaches that clearly produce significant results (Flor et al., 1992; Morley et al., 1999). There remains, however, a limited understanding of the ways in which activity patterns contribute to disability and suffering, the influences that determine these activity patterns, and how treatment methods can most effectively address them.

Avoidance of activity has been long recognized as a contributor to chronic pain (Fordyce, 1976) and has

* Corresponding author. Tel.: +44 1225 473 403; fax: +44 1225 421 248/473 461.
E-mail address: Lance.McCracken@RNHRD-tr.swest.nhs.uk (L.M. McCracken).

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gained a prominent place in current research and clinical attention, for example, in the form of the so-called "fear avoidance model of chronic pain" (Vlaeyen and Linton, 2000). There is now compelling evidence that a framework including fear, avoidance of activity, disuse, and disability constitutes a useful model of chronic disabling pain, for at least a portion of pain sufferers (see Vlaeyen and Linton, 2000; Asmundson et al., 2004, for reviews of this literature).

While avoidance of chronic pain has been carefully conceptualized and researched, other patterns of activity, such as task persistence and "overuse", have received less study (Vlaeyen and Morley, 2004). Researchers have investigated the role of unhealthy high-level activity (e.g., Hasenbring et al., 2006), task persistence (Jensen et al., 1995), and activity pacing (Nielson et al., 2001), however, these attempts have been limited in scope to this point, have generally focused on one aspect of activity at a time, and account for only small amounts of variance in patient functioning.

The purpose of this study was to investigate multiple activity patterns of chronic pain sufferers in relation to their physical, social, and emotional functioning. We sought to examine patterns of avoidance, pacing activity, and high activity; patterns that are described in the literature and addressed in cognitive-behavioral treatment approaches. Unlike in most previous investigations, we focused on measures of these patterns simultaneously, in multivariate analyses, and attempted to identify homogeneous patient subgroups from these analyses. Our prediction was that patients with chronic pain whose activity was most characterized by avoidance would demonstrate the lowest levels of functioning and the highest level of emotional distress. We presumed that patients whose activity was predominantly characterized by pacing would demonstrate better daily functioning and less emotional distress. Our consideration of other potential activity patterns was exploratory.

2. Method

2.1. Participants

Participants were 276 consecutive patients (65.6% women) referred for assessment of chronic pain in a pain management center at The University of Chicago Hospitals. Participants ranged in age from 18 to 82 years (mean = 46.6 years, SD = 13.7). Mean number of years spent in education was 13.9 (SD = 2.7). Most patients were married (54.3%); 22.8% were single, 15.9% divorced, and 6.9% widowed. The reported median duration of pain was 33.5 months (range 3–372 months). The most frequent site of pain was lower back (55.3%), followed by lower limbs (13.8%), upper shoulder and upper limb (8.7%), cervical region (7.3%), thoracic region (5.5%), head, face, and mouth (4.4%), and other areas (5.0%). Only 21.0% of patients were working full time; 46.4% were not working due to pain, 8.3% were working reduced hours due to pain, 10.1% were retired for other reasons, 5.8% indicated their work status were homemakers, and 8.4% had some other status.

2.2. Measures

All participants completed a series of standard measures as part of a psychological assessment to consider their treatment options. On an initial form they provided information about personal characteristics, pain severity (0–10 rating of usual pain in the past week), medication use, work status, and hours spent standing or walking daily (uptime). Participants also completed the measures described below.

The Pain and Activity Relations Questionnaire (PARQ) is a self-report scale, developed for this study, consisting of 32 rationally derived items, designed to assess patterns of activity. The items in the PARQ were drafted, based on clinical experience, by three clinical psychologists with training in chronic pain management. The items were designed to describe what patients do when they pace activity, avoid activity, or are highly active at least some of the time. The PARQ also includes items that measure patients' perceptions of the relationship between pain and activity, which were not included in the current study. Patients are instructed to rate the extent to which each statement is a true description of them on a six-point scale from 0 "never" to 5 "always". The three primary activity pattern scales from the PARQ were further developed as part of this study.

The Beck Depression Inventory (Beck et al., 1961) is a 21-item measure of depressive symptom severity. The inventory has been shown to have high internal consistency and adequate test–retest reliability and validity as an index of depression (Beck et al., 1988).

The Chronic Pain Acceptance Questionnaire (CPAQ; McCracken et al., 2004) is a 20-item measure of acceptance of chronic pain that yields a total score and two subscale scores for pain willingness and activity engagement. It has been used in at least 11 published studies of chronic pain, providing a consistent pattern of support for the reliability, validity, and usefulness of the scores it yields. The total score from the CPAQ was used to examine psychological processes that might relate to different patterns of activity management.

The Pain Anxiety Symptoms Scale (PASS; McCracken and Dhingra, 2002) used in this study was a 20-item version based on the original scale (McCracken et al., 1992) designed to assess pain-related anxiety responses. The PASS yields four internally consistent subscales assessing cognitive anxiety symptoms, avoidance, fearful appraisals of pain, and physiologic anxiety symptoms related to pain. Validity of the 20-item version has been supported by positive correlations with the original scales and with measures of pain, depression, and disability (McCracken and Dhingra, 2002; Roelofs et al., 2004). The avoidance subscale of the PASS was used to examine the validity of scores from the PARQ and the total score was used to examine relations between activity patterns and adjustment to chronic pain.

The SIP (Bergner et al., 1981) consists of 136 items sampling 12 domains of daily functioning. Patients identify those statements that describe their experience in relation to their health. The SIP yields composite scores for physical, psychosocial, other, and total disability. Only the physical and psychosocial scores were used in the present study. The SIP has been shown to have satisfactory internal consistency, temporal stability and evidence for the validity of the scores it yields as indices of health-related disability (Bergner et al., 1981).

2.3. Analyses

First, reliability and validity of the PARQ were examined. Item frequency, inter-item correlation, item-total correlation, and reliability statistics were calculated to determine appropriate item scale assignment and to demonstrate reliability. Validity analyses included examination of subscale associations with patient background variables, exploratory factor analysis, and correlations with related constructs. Next, as it was presumed that patients would not exclusively report one activity management approach on the PARQ, and that the activity management patterns under study would be variously interrelated, we sought to identify homogeneous subtypes of patient, considering their patterns of PARQ subscales in combination with cluster analysis. Once an appropriate cluster solution was identified, we compared the clusters on PARQ subscales to distinguish their key features. Finally, we compared the activity pattern clusters on measures of pain, uptime, emotional distress, disability, and acceptance of pain, to test differences in overall functioning between clusters, and to address the primary hypotheses of the study.

3. Results

3.1. Preliminary analyses and reliability

Based on item frequency and correlation analyses four items were eliminated from further consideration for failing to appropriately correlate with their intended scale, and one item was reassigned. The final item set submitted for further analyses included 21 items forming three subscales: Avoidance (e.g., "I do not engage in activities that cause my pain to increase", "I am inactive because of pain"), Pacing (e.g., "I use repeated rest breaks to help me complete activities", "I do tasks more slowly so that I can get them done with less pain"), and Confronting ("I push myself to get things done despite my pain", "I spend too much time on some activities and experience increased pain later"). All Cronbach's α coefficients were adequate, ranging from .79 to .84. Subscale statistics are included in Table 1.

Additional preliminary correlation analyses and mean comparisons showed a few small relationships between the PARQ scales and age, gender, education, pain duration, and pain location. The Avoidance subscale score was significantly correlated with years of education, $r = -.20$, $p < .001$. The Confronting scale was significantly correlated with gender ($1 = \text{men}$, $2 = \text{women}$), $r = .19$, $p < .01$, and years of education, $r = .16$, $p < .01$. The Pacing score was not correlated with any of these patient background variables. Analysis of variance (ANOVA) comparing the three most frequent primary locations of pain (upper extremity, lower back, and lower extremity) demonstrated group difference on Avoidance, $F(2, 211) = 5.6$, $p < .01$, but not on Confronting or Pacing. Post hoc tests indicated that this overall significant result was due to a significantly higher Avoidance score for the patients with low back pain in comparison to those with upper extremity pain.

3.2. PARQ validity analyses

An exploratory factor analysis of the items from the PARQ, including a Principal Components Analysis with Orthogonal Rotation, clearly showed three factors with eigenvalues greater than one. A scree plot also supported a break in variance increments after three factors were extracted and variance accounted for by the factors was 51.8%. Twenty of 21 items had single salient loadings matching their scale assignment, confirming the factor structure of the PARQ as scored here. One of the Confronting items ("When my pain decreases, I try to be as active as possible") had salient loadings on two factors including a marginally higher loading on a factor to which it was not originally assigned (i.e., Pacing). This item was retained on the Confronting scale on the basis of a larger corrected item-scale correlation and the resultant improved reliability for both scales.

PARQ subscale intercorrelations were calculated for descriptive purposes, but this also provided some evidence for validity. The Pacing and Avoidance subscales were more highly correlated than first expected, $r = .51$, $p < .001$. Confronting had a small but significant correlation with Avoidance, $r = -.13$, $p < .05$. See Table 1.

Three physical activity measures were selected for purposes of validating the PARQ subscales: the

Table 1
Descriptive statistics for the Pain and Activity Relations Questionnaire (PARQ)

Subscale	Items	α	M	SD	Subscale intercorrelations	
					1	2
1. Avoidance	8	.81	3.0	1.0		
2. Pacing	6	.84	3.0	1.0	.51**	
3. Confronting	7	.79	2.9	1.1	−.13*	.071

α, Cronbach's α reliability coefficient.
* $p < .05$.
** $p > .001$.

avoidance subscale of the PASS, the patients' estimate of average daily "uptime" in the past week, and the physical disability composite score from the SIP. Correlation results from analyses of these variables are shown in Table 2. The Avoidance subscale of the PARQ attained the highest correlation with the avoidance subscale of the PASS, $r = .64$, $p < .001$, and the Pacing subscale attained smaller but still significant correlation, $r = .34$, $p < .001$, while the correlation with Confronting did not reach significance, $r = -.11$. The results were somewhat similar in relation to the uptime measure. The Avoidance subscale of the PARQ attained the highest correlation with uptime, $r = -.35$, $p < .001$, the Pacing subscale was smaller, $r = -.14$, $p < .05$, while, again, the correlation with Confronting did not reach significance, $r = .10$. With the physical disability score from the SIP the pattern was the same: Avoidance was moderately correlated, $r = .43$, $p < .001$, Pacing somewhat less so, $r = .23$, $p < .001$, and the Confronting subscale not at all, $r = -.01$.

3.3. Cluster analyses of patient activity patterns

The 276 cases were submitted to cluster analysis using Wards method as the clustering strategy and the Squared Euclidian Distance as the distance measure. The agglomeration schedule and dendrogram were visually inspected to derive the appropriate number of clusters and a four-cluster solution was selected as maximizing both within cluster homogeneity and inter-cluster distance, and as potentially interpretable.

The four clusters are demonstrated in Fig. 1. The clusters were labelled Avoiders ($n = 87$), Medium Cyclers ($n = 72$), Doers ($n = 63$), and Extreme Cyclers ($n = 54$). The Avoiders were characterized by moderately high Avoidance and Pacing and low Confronting. Both of the Cycler clusters were characterized by high levels of Confronting but for the Extreme Cyclers this was done with frequent attempts at Pacing and Avoidance. For the Medium Cyclers the levels of pacing and avoidance were more moderate. And, finally, the Doers were characterized by the high levels of activity despite pain implied by the Confronting subscale but with low levels of trying to manage that pain with Pacing, and low levels of Avoidance.

Table 2
Correlation analyses of PARQ subscales in relation to measures of avoidance (PASS), daily uptime, and physical disability (SIP)

PARQ subscales	Avoidance	Daily uptime	Physical disability
Avoidance	.64**	−.35**	.43**
Pacing	.34**	−.14*	.23**
Confronting	−.11	.10	−.01

* $p < .05$.
** $p < .001$.

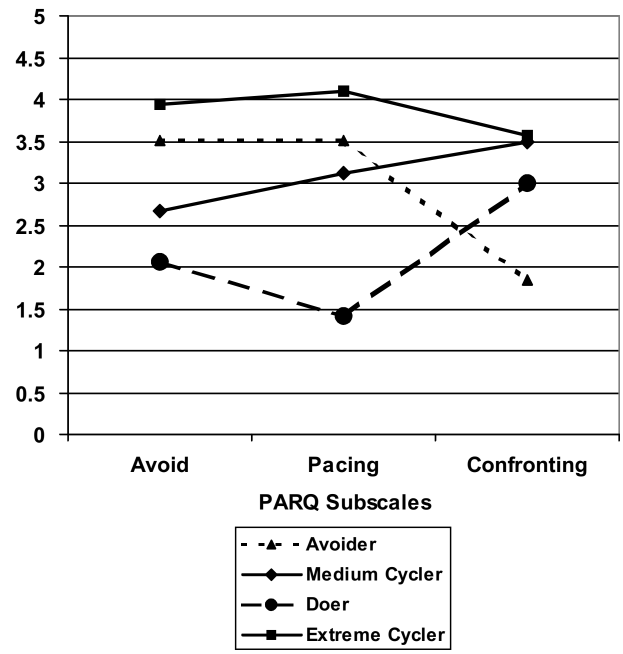

Fig. 1. Graph of PARQ subscale scores for four derived activity management clusters: Avoiders ($n = 87$), Medium Cycler ($n = 72$), Doers ($n = 63$), and Extreme Cyclers ($n = 54$).

A series of ANOVAs examining cluster differences on the scores from the PARQ yielded overall significant effects for the Avoidance, $F(3, 272) = 72.35$, $p < .001$, Pacing, $F(3, 272) = 203.06$, $p < .001$, and Confronting, $F(3, 272) = 83.85$, $p < .001$, subscales. Post hoc comparisons showed that all possible comparisons between the four clusters were statistically significant for the Avoidance and Pacing subscales, all $p < .01$. For the Confronting subscale the comparison between the Medium Cyclers and Extreme Cyclers failed to reach significance but all other comparisons were significant at $p < .001$.

3.4. Activity pattern cluster comparisons

For descriptive purposes a series of χ^2 tests and ANOVAs compared the clusters on categorical and continuous variables related to patient background characteristic. There were gender differences between the clusters, $\chi^2(3, N = 276) = 11.2$, $p < .05$, as a result of a higher frequency of men in the Avoider cluster, 43.2%, and a lower frequency in the Medium Cycler cluster, 16.8%, in comparison to women, 25.4% and 30.9%, respectively. There were also differences between clusters on primary location of pain, $\chi^2(6, N = 214) = 13.3$, $p < .05$, owing to upper extremity and lower extremity pain cases primarily falling in the Medium Cycler cluster, 41.7% and 39.5%, respectively, while the largest fraction of lower back cases fell primarily in the Avoider

Table 3
Mean and standard deviations for comparisons between clusters on measures of pain and functioning

M (SD)	Activity pattern clusters				Significant inter-cluster differences ($p < .05$)
	1. Avoider	2. Medium cycler	3. Doer	4. Extreme cycler	
Pain	7.3 (1.77)	6.78 (2.17)	7.16 (1.82)	8.02 (1.79)	2 < 4
Uptime (h/day)	6.76 (5.06)	8.14 (4.06)	9.36 (4.67)	6.96 (4.33)	3 > 1 3 > 4
Depression	13.69 (9.13)	12.61 (9.37)	14.23 (11.39)	15.11 (10.39)	
Pain-related anxiety	41.90 (20.13)	35.68 (17.23)	31.44 (21.65)	45.76 (19.54)	3 < 1 3 < 4 2 < 4
Physical disability	.17 (.13)	.13 (.11)	.11 (.12)	.22 (.16)	3 < 1 3 < 4 2 < 4
Psychosocial disability	.17 (.15)	.16 (.14)	.17 (.18)	.20 (.17)	
Acceptance of pain	54.03 (21.43)	64.60 (17.69)	67.73 (24.10)	52.36 (16.52)	3 > 1 2 > 1 2 > 4 3 > 4

Note. Overall tests for an effect of clusters were non-significant in the cases of depression and psychosocial disability.

cluster, 36.2%.[1] The clusters did not differ in terms of age or duration of pain, but did differ on education, $F(3,272) = 6.5, p < .001$, as a result of significantly higher education in the Medium Cycler cluster ($M = 14.8$ years) compared to the Avoider cluster ($M = 13.2$ years).

We next calculated a series of ANOVAs to examine differences between the four clusters on measures of pain, uptime, emotional functioning, disability, and acceptance of pain.[2] The clusters differed significantly on pain, $F(3,272) = 4.44$, $p < .01$, uptime, $F(2,243) = 4.16$, $p < .01$, pain-related anxiety, $F(2,269) = 6.42$, $p < .001$, physical disability, $F(3,272) = 9.07$, $p < .001$, and acceptance of pain, $F(3,221) = 7.63$, $p < .001$, but not on depression or psychosocial disability, where in both cases F was less than 1.0. Means, standard deviations, and results of post hoc comparisons are included in Table 3.

Post hoc comparisons following up from the overall significant ANOVAs showed that the Medium Cyclers reported less pain than the Extreme Cyclers, at $p < .05$, but no other clusters were significantly different. The Doers reported greater daily uptime than the Avoiders or the Extreme Cyclers. The Doers also reported significantly less pain-related anxiety, and less physical disability, than the Avoiders or Extreme Cyclers. The Medium Cyclers reported significantly less pain-related anxiety and physical disability than the Extreme Cyclers, who overall reported the highest levels. Finally, both the Doers and the Medium Cyclers reported significantly greater acceptance of pain than either the Extreme Cyclers or the Avoiders, who did not differ from each other. Once again, and somewhat interestingly, the clusters showed no overall differences on depression or psychosocial disability.

4. Discussion

Results presented here suggest that it is possible to assess patterns of avoidance, pacing, and high activity, in patients with chronic pain, and to identify distinctive subgroups of patients with regard to these patterns. Avoidance, Pacing, and Confronting patterns appear to be constituent parts of larger configurations of activity and appear complexly interrelated for particular individuals. Despite this complexity, it was clearly demonstrated that activity avoidance is associated with lower levels of physical activity, greater physical disability, and greater anxiety. Contrary to our prediction, pacing activity, as assessed here, did not emerge as positively associated with levels of functioning.

[1] Subsequent analyses showed that gender and pain location also were related, $\chi^2(6, N = 214) = 7.3$, $p < .05$, resulting from a disproportionate number of men with low back pain, 79.5%.

[2] As two of the clusters differed on education, this was tested as a covariate. It was a significant covariate in the analyses of pain, depression, and physical and psychosocial disability, but not in the analyses of uptime, pain-related anxiety, or acceptance of pain. Overall, inclusion of education did not alter the conclusions from main effects analyses or contrast results, and, thus, was excluded in the final analyses. Similarly, gender and pain location were considered for inclusion as separate factors in the cluster comparisons. Main effects of these variables on the seven key variables submitted to ANOVA were not significant, with the exception that the patients with upper extremity pain reported higher levels of depression. In this case, an ANOVA including pain location as a separate factor showed no significant interaction effect with cluster membership. Again, in the interest of simplifying our analyses, these factors were not included in a factorial design.

Interesting results emerged from the examination of high activity (Confronting). In the cluster analysis, activity patterns that included relatively high activity were related to measures of functioning depending on the degree to which these patterns also included avoidance. Those who reported high levels of activity and also reported high levels of avoidance were second only to the predominantly avoidant group with regard to their levels of anxiety and disability. On the other hand, those who reported high activity with low avoidance were the most functional group.

Also interesting were the unexpected results regarding gender and primary pain location. While men made up 34.4% of the sample overall they made up a disproportionate 47.1% of the Avoider cluster. Patients with a primary complaint of back pain also were more likely to fall in the Avoider cluster, while patients with upper extremity or lower extremity were more likely to fall in the Medium Cycler cluster. Unfortunately, as subsequent analyses showed that gender and pain location were highly correlated, with nearly 80% of men reporting a primary complaint of back pain, these confounded associations will require further investigation.

Our findings are wholly consistent with the fear avoidance model of chronic pain and disability (Vlaeyen and Linton, 2000) and with the many studies that have provided support for this model (e.g., Crombez et al., 1999). Our results regarding pacing activity, in contrast, appear at odds with previous work (Nielson et al., 2001), and with the tradition of including pacing training in cognitive behavioral treatments. In the study by Nielson and colleagues, the pacing measure achieved a significant negative correlation with a measure of depression, did not achieve a significant zero order correlation with a measure of physical disability, but did achieve a significant relation with physical disability in multiple regression, where it accounted for 4.0% of variance. It may be that subtle content differences between the PARQ pacing subscale and the measure developed in the earlier study are responsible for the different findings. Three of six items from the PARQ subscale include notions such as, "I do tasks more slowly so that I can get them done with less pain". The pacing items of Nielson et al. (2001) also include the word "pain" but it is less identified as the controlling issue, for example, "I focused on going 'slow and steady' instead of my pain". This distinction may be important.

"Pacing" done for purposes of reducing pain may indeed share features with avoidance, and obtain the same results as avoidance, while "pacing" done in a way that reduces pain's influence is likely to obtain different results, and promote better functioning (Williams and Wheatley, 2006). A *formal* approach to pacing would require merely that we train patient in certain steady rates of activity, perhaps without extreme fluctuations. A *functional* approach would require that we define pacing in a way that includes the variables that influence it, or, to put it more loosely, the purposes we want it to serve. The present results advocate for a functional approach to activity management in chronic pain.

We did not find our predicted differences between the activity pattern clusters on depression or psychosocial functioning. We did, however, find differences on pain-related anxiety and acceptance of pain. This may have occurred because the clustering scheme was based on variables in a very limited domain of pain and activity and did not take into account alternate potentially high impact influences on depression and emotional functioning. As these influences were uncontrolled they likely varied within the clusters and obscured differences between clusters. Pain-related anxiety and acceptance of pain, on the other hand, would be expected to have more specific relations with avoidance and activity in relation to pain as these variables are pain-specific as well. Fearful, avoidant, or un-accepting behavior patterns certainly are likely to develop from the same learning history. Pain-related anxiety includes avoidance as a component part, and acceptance of pain has a documented history of strong negative correlations with measures of avoidance (e.g., McCracken et al., 2004).

The fact that relatively high activity and low avoidance "Doers" report higher acceptance than "Avoiders", or than "Cyclers" who do high levels of avoidance, is consistent with previous investigations demonstrating that acceptance of pain is associated with less disability and with better overall functioning in patients with chronic pain (e.g. McCracken et al., 2004; McCracken and Yang, 2006), and with results from treatment aimed at increasing acceptance of pain (McCracken et al., 2005).

Results highlighting the disutility of avoidance in chronic pain generally support treatment approaches that focus on increasing activity. As mentioned earlier, this has been a longstanding focus of cognitive behavioral and interdisciplinary treatments. These results also call for greater attention to treatments aimed specifically at decreasing avoidance, treatments such as exposure-based methods (e.g., de Jong et al., 2005) and contextual cognitive behavioral therapy (McCracken et al., 2005).

This investigation has a number of limitations. Activity patterns are highly complex behavior patterns on which to report. They are extended over time, likely change depending on experience, and vary in different situations. The PARQ examines general tendencies in activity patterns and therefore will not capture these other sources of variability. It will be limited by patient's ability to remember and by other influences on patient behavior that occur during a clinical assessment encounter. These results also take into account one point in time, and involved no experimental manipulation, and thus can only indicate correlation but not confirm either originating or maintaining causes. Better assessment of activity patterns will require intensive repeated measures over extended time periods. These measures could include the use of electronic activity monitors, for example, to avoid limitations inherent in self-reports.

Clearly, general activity avoidance does not promote healthy functioning in patients with chronic pain. It is interesting, and possibly somewhat provocative, to consider whether indeed some attempts at pacing activity are functionally equivalent to avoidance. This is not far-fetched, as avoidance is an extremely natural response to pain and can come in many subtle forms. In essence, "overdoing it" is its own form of psychological avoidance, avoidance of experiences that come with making any change, or with facing real limitations, such as those presented by years of relative inactivity, limitations presented by advancing age, or limitations imposed by other health concerns. Patients may avoid confronting the fact that they are avoiding, through denying or rationalizing, or by calling it "pain management". It is up to further research and, in the meantime, careful therapeutic methods, to disentangle behavior patterns that provide free and full functioning from those that do not.

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