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Activity Pattern Profiles: Relationship With Affect, Daily Functioning, Impairment, and Variables Related to Life Goals

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Abstract: The aim of this cross-sectional study was to identify subgroups of patients on the basis of their activity patterns and to investigate their relationship with life goals, optimism, affect, and functioning. The sample was comprised of 276 patients with chronic musculoskeletal pain. Hierarchical cluster analysis was performed on the activity pattern variables and the resulting clusters were compared using 1-way analysis of variance. The 4-cluster was the optimal solution. The 4 clusters comprised: 1) avoiders: patients with high levels of avoidance and low levels of persistence, who use pacing to reduce pain, 2) doers: patients with high levels of persistence and low levels of pacing and avoidance, 3) extreme cyclers: patients with high levels of avoidance and persistence and low levels of pacing, and 4) medium cyclers: patients with moderately high levels of avoidance and persistence and high levels of pacing. Comparison of the clusters showed that doers had the most adaptive profile, whereas avoiders, followed by extreme cyclers, had unhealthy profiles. Doers showed a high level of optimism and a good balance between goal value, expectancy, and conflict.

***Perspective:** It is useful to distinguish profiles on the basis of various activity patterns. In contrast to profiles characterized by avoidance, profiles characterized by high persistence and low avoidance were associated with adaptive results. Patients with this profile also showed a high level of optimism and a good balance between goal value, expectancy, and conflict.*

Key words: *Activity patterns, life goals, avoidance, persistence, pacing, chronic pain.*

Chronic pain interferes with daily activities and goals and changes the way in which patients engage in such activities. The activity patterns of patients play a crucial role in their well-being. Traditionally, 3 activity patterns have been distinguished: avoidance, persistence, and pacing. Avoidance has been defined as the reduction in physical or other daily activities with the aim of minimizing pain increases[44] (eg, "Because of my pain most days I spend more time resting than doing activities."). The persistence pattern involves continuing with activities despite pain[26] (eg, "When I am in pain I just keep on doing what I was doing."). Pacing is characterized by dividing daily activities into smaller tasks[21] (eg, "I usually take several breaks."). A meta-analysis[2] of the relationship between different approaches to activity and functioning in chronic pain patients reported that activity avoidance was linked to worse physical and psychological functioning and increased pain. The results concerning the association between persistence and functioning depended on the measure used: instruments that assessed overactivity were associated with poorer outcomes, whereas instruments that assessed persisting with activity despite pain were associated with positive

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outcomes. Finally, pacing was associated with better psychological functioning and higher levels of pain and disability.

Recently, Kindermans et al[32] identified more specific patterns: pain avoidance (avoidance behavior in the presence or anticipation of changes in pain); activity avoidance (avoidance refers to the patients' condition of being in pain rather than the fluctuating pain experience); task-contingent persistence (behavioral persistence in finishing tasks or activities despite pain); excessive persistence (doing too much, not respecting one's physical limits, and experiencing the rebound effects of heightened activity levels); pain-contingent persistence (the level of experienced pain as the determinant of the behavior performed with activity fluctuating over time as a result); and pacing (dividing daily activities into smaller tasks).

Nielson et al[38,39] proposed that pacing measures should be developed that address a specific pacing behavior with a single goal. They identified the following pacing behaviors: breaking tasks into smaller, manageable tasks; taking frequent short rests; and slowing down. They proposed the following as the main aims of pacing: increasing activity levels, energy conservation for valued activities, and pain reduction. The recently developed Activity Patterns Scale (APS)[17] incorporates the specific activity patterns reported by Kindermans et al[32] and the aforementioned suggestion by Nielson et al[38,39] on the assessment of pacing.

Activity patterns are interrelated and patients do not exclusively report one activity pattern. Cluster analysis has been used to identify 4 homogeneous patient subgroups (avoiders, medium cyclers, extreme cyclers, and doers) on the basis of their scores on different activity pattern subscales.[36] Avoiders were characterized by moderately high avoidance and pacing and low confronting. Both cyclers subgroups were characterized by high confronting; extreme cyclers also showed high levels of pacing and avoidance and for the medium cyclers, the levels of pacing and avoidance were more moderate. The doers showed high levels of activity despite pain and low levels of pacing and avoidance.

Within the framework of fear-avoidance models,[57] an avoidant behavioral style provoked by excessive fear of pain, movement, and reinjury plays a central role in pain chronification. Nevertheless, as the avoidance-endurance model has highlighted,[26] not all chronic pain patients display this pattern. Some patients even show an opposite behavioral pattern; namely, persistence of activity despite pain. A recent review[55] highlighted the importance of studying the motivational mechanisms underlying activity patterns to explain why individuals engage in avoidant or persistent behaviors. From a motivational perspective, activity patterns are conceived not solely as a product of pain, but as a product of the self-regulation of current goals in the context of pain.[55] Goal conflict results when 2 goals compete for the same resources, particularly time and energy. Chronic pain interferes with daily activities and goals and consequently patients may need to negotiate competition between their goals for limited physical and cognitive resources. Several experimental studies have shown that the activation of competing goals attenuates pain avoidance behavior[9,10,56] and nonpain goal pursuit inhibits attention to pain.[52]

However, cross-sectional studies have suggested that distress results from goal conflict on the basis of the findings that goal conflict correlated with worse affect, less life satisfaction, poor self-rated physical health, higher pain ratings,[15,16,25,31,47] and more pain-related fear.[29]

However, the finding that goal conflict has detrimental effects on well-being has not always been replicated, which suggests that contextual or situational factors may play a role.[22] Optimism is one such factor,[1] as well as self-efficacy, which has been considered to be a critical appraisal directing the choice to actively pursue a goal.[4,28,29,31,33] It has been shown that although optimistic persistence in goal pursuit was linked to higher goal conflict, such conflict did not undermine adjustment, because optimists were more efficient at balancing the benefits and costs of their conflicting goals.[53]

The aim of this study was to identify the profiles of patients on the basis of their scores on the different activity pattern subscales that comprise the APS,[17] and to compare the resulting subgroups in relation to affect, daily functioning, impairment, and variables related to life goals. The present study constitutes a relevant contribution because it attempts to replicate previous findings on activity pattern subgroups,[36] while including new and innovative dimensions of the pacing, persistence, and avoidance constructs measured using the APS. To our knowledge, it is also the first study to investigate the relationship between activity patterns and motivational mechanisms. On the basis of previous research,[36] it was postulated that 4 subtypes would be identified: extreme cyclers, medium cyclers, avoiders, and doers. It was also postulated the doers would report better daily functioning and positive affect and less functional impairment and negative affect than avoiders and extreme cyclers. Regarding goal-related variables, it was postulated that doers would be more optimistic and more efficient at balancing the benefits and costs of their conflicting goals, despite experiencing more conflict between their most valued pain-related goal and their most valued nonpain-related goal.

Methods

Procedure

This study was part of a larger research project,[17] which was approved by the University of Málaga Ethics Committee. Participants were recruited through 2 local associations of patients with fibromyalgia, an association of patients with rheumatic diseases, 1 physiotherapy unit, and through doctors working at the Pain Unit of the Hospital Costa del Sol. The data were collected between January 2015 and February 2016. Individuals were considered eligible for inclusion if they met the following criteria: at the moment of participation in the study they were experiencing pain and had been experiencing

pain for at least the past 6 months; they were between 18 and 65 years old; they were not being treated for a malignancy, terminal illness, or psychiatric disorder; they were able to understand the Spanish language (spoken and written); and they were able to understand the instructions and questionnaires. Patients were informed of the study aims, confidentiality was assured, and informed consent was obtained. Each participant had a semistructured interview with a psychologist to obtain demographic, social, and medical history data; their current goals and subjective goal conflict were elicited using a method developed by Emmons[15] (for details, see the section, Goals and goal value). Subsequently, they completed self-report questionnaires in the order described in the Self-Report Instruments section.

Three psychologists took part in data collection. They were trained in the application of the protocol to guarantee the standardization of the assessment process and were blinded to the study design and hypotheses. The patients were always assessed in their usual health center or in the facilities of the associations. Each session lasted approximately 1 hour.

Participants

Three hundred eighty-five patients were invited to take part in the study. Of these patients, 82 refused participation, 17 did not meet the inclusion criteria, and 10 were eliminated because of incomplete data.

The final sample comprised 276 chronic pain patients (196 women and 80 men). The average age was 52 years (SD = 8.83). At the time of the study, 71.30% were married or cohabiting. Regarding employment, 35.10% were active workers, 26.80% were retired, 22.10% were unemployed, and 15.9% were homemakers.

A total of 34.40% had completed high school education and 40.70% had completed primary education. Median pain duration was 12.49 years (SD = 11.05). The participants had musculoskeletal pain at different locations: The most frequent site of pain was the lower back (49.3%), followed by generalized pain conditions such as fibromyalgia (23.2%), pain in the upper shoulder and upper limbs (15.6%), pain in the lower limbs (11.6%), and pain in other areas (.30%).

Variables and Instruments

Goal Assessment

Goals and goal value. Current goals were elicited using a method developed by Emmons.[15] Participants were asked to list their current goals (ie, objectives that they are trying to accomplish at the time), and were given examples of approach and avoidance goals. They were asked to list goals on the basis of what they were trying to do rather than whether they had been successful and "to list as many or as few" as they were currently trying to or attain or avoid.

Thus, every participant produced a single list of goals and then rated each one on a 5-point Likert-type scale for 4 dimensions of goal value[15]: commitment ("How committed are you to this goal?"), importance ("How important is this goal to you in your life?"), anticipated joy ("How much joy or happiness do you or will you feel when you are successful in this goal?"), and anticipated sorrow ("How much sorrow or unhappiness do you or will you feel if you fail to succeed in this goal?"). The value of each goal was represented by the sum of the scores on commitment, importance, anticipated joy, and anticipated sorrow. In the present study, the internal consistency of the measurement of goal value ranged from α = .75 to α = .80. As shown below, to be able to calculate the variable "balance between goal expectancy, anticipated joy, and conflict," a question was included to assess expectancy ("How confident are you that you will be able to accomplish this goal?").[53] Because these variables were negatively skewed, analyses (except descriptive statistics) were performed on squared-transformed variables to reduce the influence of more extreme cases.

Two independent judges analyzed the answers and determined whether the goals were related or unrelated to pain. Interjudge reliability was very satisfactory (κ = .96). The following variables were considered: total number of goals, number of pain-related goals, number of nonpain-related goals, and goal value.

Subjective conflict between the most valued pain-related goal and the most valued nonpain-related goal. Subjective conflict was assessed using the Striving Instrumentality Matrix.[15] The goals previously listed by the participants were placed in the rows and columns of a matrix. The participants were asked to compare each pair of goals and rate the degree of conflict between them on a 5-point scale where 0 = not at all, 1 = very little, 2 = somewhat, 3 = definitely, and 4 = extremely. Goal conflicts were defined as the degree to which 2 goals used the same resources, such as time, money, or energy, or the degree to which the pursuit of one goal interfered with the pursuit of another goal. Examples were given.

Taking into account the aims of this study, goal conflict was operationalized as the conflict between the most valued pain-related goal and the most valued nonpain-related goal. Most patients reported at least 1 pain-related and 1 nonpain-related goal. When this was not the case their score on goal conflict was 0.

Balance between goal expectancy, anticipated joy, and conflict. The balance between expected joy on goal attainment, expectancy (the likelihood of attaining the goal), and conflict is a useful index of effective goal strategy management. The balance was calculated by adapting and applying the formula developed by Segerstrom and Solberg Nes[53]:

$$R = (\lambda e - s)$$

where: λ = attainment expectancy of the most valued nonpain-related goal, e = expected joy on attainment of the most valued nonpain-related goal, and s = subjective conflict between the most valued pain-related goal and the most valued nonpain-related goal.

The higher the value of R, the greater the balance. Differences in scaling were solved by transforming these 3 variables to have an SD of 1 before calculating R.

Self-Report Instruments

Dispositional optimism. Dispositional optimism was assessed using the Spanish version of the Life Orientation Test Revised (LOT-R).[40,51] The LOT-R consists of 6 scored items (items 1, 4, and 10 are positively worded and items 3, 7, and 9 are negatively worded) plus 4 filler items. Respondents indicate the extent to which they agree with each item on a 5-point Likert-type scale ranging from 0 (strongly disagree) to 4 (strongly agree). The total score of the LOT-R was used to reflect the general expectancy of a positive outcome, with higher scores representing higher levels of optimism. The optimism and pessimism subscale scores were calculated by summing the positive and negative items, respectively. In the present study, the LOT-R total score had a Cronbach α of .85. Cronbach α for the optimism and pessimism subscales were .85 and .70, respectively. The Spanish LOT-R has shown adequate criteria validity.[18,34]

Positive and negative affect. Positive and negative affect were assessed using the Spanish version of the Positive and Negative Affect Schedule,[48,49,59] which is one of the most reliable, valid, and efficient means to measure these aspects. It is comprised of two 10-item scales. The instrument has shown appropriate stability over a 2-month time period. The Spanish Positive and Negative Affect Schedule also has excellent construct and criterion validity. In this study, the Positive Affect and Negative Affect scales had a Cronbach α of .92 and .89, respectively.

Self-efficacy. Self-efficacy was assessed using the Spanish adaptation of the General Self-Efficacy Scale.[5,50] This instrument assesses people's stable beliefs about their ability to appropriately manage a wide range of life stressors. The instrument has shown adequate validity. In this study, the instrument showed high internal consistency (α = .97).

Impairment and functioning. Impairment and functioning were assessed using the Impairment and Inventory,[45] which consists of 30 items each referring to a specific activity associated with 1 of the following areas: household (eg, make the beds), autonomous behavior (eg, dress by yourself), leisure (eg, go to a bar or cafe), and social relationships (eg, visit friends). Patients are asked if they performed an activity during the previous week (or during the previous month for certain activities). If they did not perform the activity, they are assigned a score of 0; if they did, they are asked how often they performed it, answering on a 4-point scale (1 = between 1 and 2 times, 2 = between 3 and 6 times, 3 = between 6 and 9 times, and 4 = 10 or more times). If they did not perform the activity, they are asked if they practiced this activity before the onset of their chronic pain. The instrument provides an index of daily functioning, and an index of activity impairment. The 'daily functioning index' is calculated by adding the frequencies at which every activity is performed. The 'activity impairment index' is calculated by adding the total number of activities that the patients have given up since pain began. This approach differentiates between present functioning and impairment and is useful in assessing patients with a long history of pain, concerning for whom the degree of deterioration is at least as informative as the current level of functioning.[45] In this study, the global scales were highly reliable (daily functioning, α = .88; impairment, α = .97).

Pain intensity. Patients were asked to rate their mildest, average, and worst pain during the past 2 weeks, as well as their current pain, on a scale ranging from 0 to 10, with a "0" indicating "no pain" and "10" indicating pain as "intense as you could imagine." A composite pain intensity score was calculated for each participant by calculating the average of the mildest, average, worst, and current pain.[27]

Activity patterns. The APS[17] consists of 24 items grouped into 8 three-item subscales: pain avoidance (α = .78), activity avoidance (α = .77), task-contingent persistence (α = .87), excessive persistence (α = .80), pain-contingent persistence (α = .89), pacing to increase activity levels (α = .80), pacing to conserve energy for valued activities (α = .86), and pacing to reduce pain (α = .79). Participants are asked to indicate to what extent the statement applies to them on a 5-point scale ranging from 0 (not at all) to 4 (always). The instrument showed adequate reliability as well as structural, convergent, and criteria validity.[17]

Statistical Analysis

Correlation analyses were performed to examine the relationship between the activity pattern subscales and optimism, pessimism, optimism-total, positive affect, negative affect, self-efficacy, daily functioning, functional impairment, pain intensity, total number of goals, number of pain-related goals, number of nonpain-related goals, goal conflict, and goal balance. Correlations were interpreted following the guidelines proposed by Cohen,[11] wherein low correlations range from .10 to .29, moderate correlations range from .30 to .49, and high correlations range from .50 to 1.

Hierarchical cluster analysis was performed on the activity pattern variables. The objective of cluster analysis is to profile individuals into specific groups that reveal patterns that show similarities and differences between groups. This analytic approach was chosen because the aim of this study was to identify homogeneous subtypes of patients by considering their scores on the different activity pattern subscales that comprise the APS. As suggested by previous research,[36] it was assumed that the activity patterns were inter-related and that patients would not exclusively report 1 activity pattern. The sample size recommended for cluster analysis must be at least $2 \times m$, where m equals the number of clustering variables[13]; in this study, the 8 patterns of activity were the clustering variables ($2 \times 8 = 256$). Thus, the sample size (N = 276) was adequate. The hierarchical cluster analysis was conducted using the Ward method with squared Euclidean distance. Before cluster analysis, all variables were standardized (Z-score) to obtain similar metrics. The scree plot (elbow criterion) was used to select the optimal number of clusters. After clustering, a postcluster analysis was performed to determine which variables

Table 1. Correlations Between the APS Subscales and Optimism, Pessimism, Optimism-Total, Positive Affect, Negative Affect, Daily Functioning, Functional Impairment, Pain Intensity, Total Number of Goals, Number of Pain-Related Goals, Number of Nonpain-Related Goals, Goal Conflict, and Goal Balance

Variables	Pain Avoidance	Activity Avoidance	Task-Contingent Persistence	Excessive Persistence	Pain-Contingent Persistence	Pacing to Increase Activity Level	Pacing to Conserve Energy for Valued Activities	Pacing to Reduce Pain
Optimism	−.16**	−.33**	.21**	−.09	−.00	.07	.08	.07
Pessimism	.30**	.43**	−.17**	.18**	.07	.11	.06	−.02
Optimism-total	−.25**	−.42**	.21**	−.15*	−.04	−.02	.02	.05
Positive affect	−.26**	−.41**	.36**	−.06	.03	.04	.12*	.08
Negative affect	.14*	.39**	−.16**	.35**	.17**	−.09	−.12*	−.04
Self-efficacy	−.24**	−.35**	.27**	−.12	.00	−.06	.01	.12*
Daily functioning	−.37**	−.48**	.34**	.20**	.20**	.14*	.09	−.10
Functional impairment	.38**	.52**	−.27**	.00	.00	.10	.06	.05
Pain intensity	.20**	.31**	−.12*	.11	.01	.04	−.17**	−.02
Total number of goals	−.01	−.01	.04	.14*	.17**	.02	.08	.08
Number of pain-related goals	.09	.12	−.06	.07	.05	.02	.01	.04
Number of nonpain-related goals	−.14*	−.08	.07	.09	.12*	.01	.06	.05
Goal conflict	−.07	−.09	.03	.13*	.02	.06	.09	.16**
Goal balance	−.19**	−.22*	.12*	−.05	.02	−.07	−.05	.04

*$P < .05$.
**$P < .01$.

differentiated the clusters. Postcluster analysis was performed using a χ^2 test for categorical variables and 1-way analysis of variance (ANOVA) for continuous variables. Bonferroni post hoc tests were used to correct for multiple comparisons. All analyses were performed using SPSS version 21 (IBM Corp, Armonk, NY).

Results

Correlation Analyses

Table 1 shows the correlation analyses of the activity pattern subscales and optimism, pessimism, optimism-total, positive affect, negative affect, self-efficacy, daily functioning, functional impairment, pain intensity, total number of goals, number of pain-related goals, number of nonpain-related goals, goal conflict, and goal balance.

Cluster Analysis of Activity Patterns

Hierarchical cluster analysis using the Ward method with squared Euclidean distance was applied to the 8 activity pattern variables. Fig 1 shows the scree plot of the distance coefficients from the hierarchical cluster analysis. The elbow criterion is defined as the step in which a significant jump in distance coefficients occurs subtracted from the number of cases (ie, 276, step 272.). Use of this criterion shows that the 4-cluster solution is the optimal number of clusters for the variables. The distribution of patients within the 4-cluster solution was as follows: 21.01% (n = 58, cluster 1), 28.26% (n = 78; cluster 2), 28.62% (n = 79; cluster 3), and 22.10% (n = 61, cluster 4). Although the clusters found were similar to those of McCracken and Samuel,[36] they were not identical, because the APS differentiated more activity patterns than the instrument used by these authors. We used their labels and differences with respect to their results are highlighted: cluster 1, extreme cyclers; cluster 2, medium cyclers; cluster 3, avoiders; and cluster 4, doers. Avoiders were characterized by high levels of pain avoidance, activity avoidance, and pacing to reduce pain with low levels of the 3 types of persistence, pacing to do more things, and pacing to save energy for valued activities. Doers were characterized by high levels of task-contingent persistence, and moderately high levels of excessive persistence and pain-related persistence with low levels of the 3 types of pacing. Extreme and medium cyclers were both characterized by high levels of pain-related persistence, but extreme cyclers had high levels of avoidance, moderately high

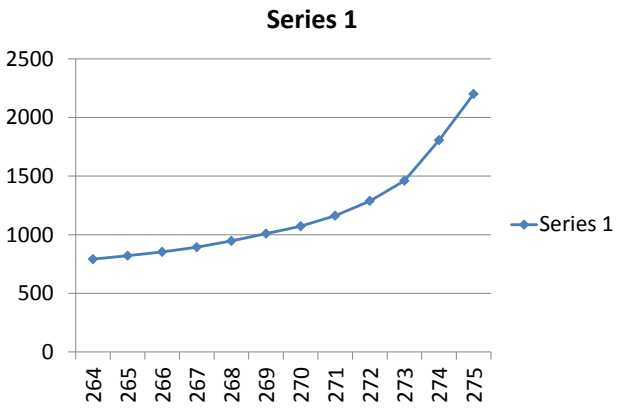

Figure 1. Scree plot of the distance coefficients in the steps of the cluster analysis.

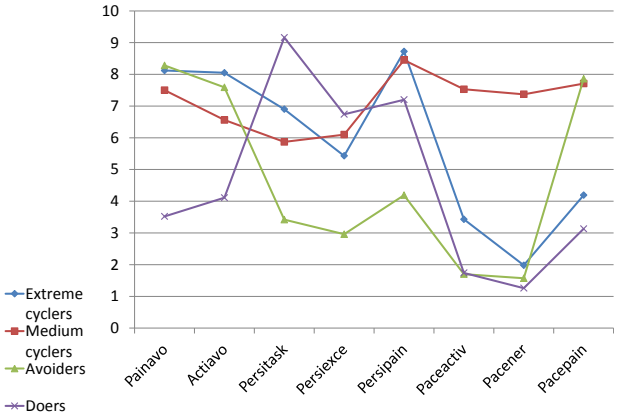

Figure 2. APS subscale scores for 4 derived activity management clusters: extreme cyclers, medium cyclers, avoiders, and doers. Abbreviations: painavo, pain avoidance; actiavo, activity avoidance; persitask, task-contingent persistence; persiexce, excessive persistence; persipain, pain-contingent persistence; paceactiv, pacing for increasing activity level; pacener, pacing for conserving energy for valued activities; pacepain, pacing for pain reduction.

levels of task-contingent persistence, and excessive persistence, and low levels of the 3 types of pacing. Medium cyclers had high levels of the 3 types of pacing and moderately high levels of pain avoidance, activity avoidance, task-contingent persistence, and excessive persistence. Fig 2 shows the APS subscales scores for the 4 patterns of activity obtained.

We performed ANOVAs to analyze the differences between the scores of the 4 clusters obtained on the APS. Overall significant effects were found for all the subscales (Table 2).

Activity Pattern Cluster Comparisons

A series of χ^2 tests and ANOVAs were used to compare the clusters on categorical and continuous variables related to the patients' demographic and clinical characteristics. There were gender differences between clusters χ^2 (3, N = 276) = 9.76, $P < .05$. The proportion of men (30%) was higher than the proportion of women (17.3%) in the extreme cyclers cluster; the proportion of women (32.7%) was higher than the proportion of men (17.5%) in the medium cyclers cluster; the proportion of men (32.5%) was slightly higher than the proportion of women (27%) in the avoiders cluster. There were no significant differences between clusters on the primary location, χ^2 (9, n = 273) = 15.68, $P < .07$; however, it is striking that 40.6% of the patients with relatively generalized pain syndromes were located in the avoiders cluster. The clusters did not differ in age, civil status, or education, but did differ on pain duration (in years), $F_{3,264} = 3.25$, $P < .022$, because the medium cyclers had experienced pain for more years (mean = 14.74) than the doers (mean = 9.31).

We performed ANOVAs to analyze the differences between clusters on optimism, pessimism, positive and negative affect, self-efficacy, daily functioning, functional impairment, and pain intensity. The clusters were also compared on several goal-related variables (total number of goals, number of pain-related goals, number of nonpain-related goals, goal conflict, and goal balance). As shown in Table 3, doers showed significantly higher optimism and positive affect and lower pessimism and pain intensity than avoiders. Doers also showed significantly higher daily functioning and significantly lower functional impairment than the other 3 clusters. In relation to the goal-related variables, doers showed a higher goal balance than medium cyclers.

Medium cyclers showed higher positive affect and lower negative affect than avoiders. Medium cyclers also had higher scores on daily functioning than avoiders and extreme cyclers. Regarding goal conflict, medium cyclers had significantly higher scores than extreme cyclers.

Table 2. Means, SDs, and ANOVAs for Comparisons Between Activity Pattern Clusters in the APS Subscales

Variable	*1 Extreme Cyclers*	*2 Medium Cyclers*	*3 Avoiders*	*4 Doers*	$F_{3,272}$	P	*Significant Intercluster Differences (P < .05)*
Pain avoidance	8.12 (2.51)	7.50 (2.27)	8.28 (2.28)	3.52 (1.37)	68.25	.000	1 > 4, 2 > 4, 3 > 4
Activity avoidance	8.05 (2.15)	6.56 (2.24)	7.59 (2.58)	4.11 (2.48)	34.03	.000	1 > 2, 1 > 4, 2 > 4, 3 > 2, 3 > 4
Task-contingent persistence	6.90 (2.95)	5.87 (2.50)	3.42 (1.85)	9.16 (1.66)	75.91	.000	1 > 3, 2 > 3, 4 > 1, 4 > 2, 4 > 3
Excessive persistence	5.43 (2.59)	6.10 (2.93)	2.96 (2.36)	6.74 (3.75)	23.68	.000	1 > 3, 2 > 3, 4 > 3
Pain-contingent persistence	8.72 (2.40)	8.45 (2.59)	4.19 (2.58)	7.20 (4.02)	37.37	.000	1 > 3, 1 > 4, 2 > 3, 2 > 4, 4 > 3
Pacing to increase activity level	3.43 (2.19)	7.53 (1.99)	1.70 (2.02)	1.74 (2.18)	130.43	.000	1 > 3, 1 > 4, 2 > 1, 2 > 3, 2 > 4
Pacing to conserve energy for valued activities	1.99 (1.50)	7.37 (2.22)	1.57 (1.92)	1.26 (1.47)	184.62	.000	2 > 1, 2 > 3, 2 > 4
Pacing to reduce pain	4.19 (2.65)	7.71 (2.57)	7.86 (2.52)	3.13 (2.53)	60.48	.000	2 > 1, 2 > 4, 3 > 1, 3 > 4

NOTE. Data are presented as mean (SD) except where otherwise noted.

Table 3. Means and SDs for Comparisons Between Activity Pattern Clusters

Variable	1 Extreme Cyclers	2 Medium Cyclers	3 Avoiders	4 Doers	$F_{3,272}$	P	Significant Intercluster Differences (P < .05)
Optimism	7.84 (2.71)	8.03 (3.17)	6.99 (3.20)	8.39 (3.17)	2.70	.046	4 > 3
Pessimism	5.24 (2.84)	5.51 (2.91)	5.80 (2.61)	4.40 (2.76)	3.12	.027	3 > 4
Optimism- total	14.60 (4.97)	14.51 (5.14)	13.19 (5.48)	16.02 (5.54)	3.26	.022	4 > 3
Positive affect	29.62 (9.40)	31.75 (7.80)	28.09 (8.95)	33.77 (7.98)	5.80	.001	2 >3, 4 > 3
Negative affect	27.66 (9.26)	24.36 (7.37)	27.92 (8.26)	25.10 (8.86)	3.30	.021	3 > 2
Self-efficacy	68.83 (20.66)	70.55 (19.07)	67.16 (21.75)	75.97 (18.42)	2.37	.071	n.s.
Daily functioning	44.85 (11.27)	51.29 (15.17)	40.33 (13.20)	57.53 (11.77)	2.44	.000	2 > 1, 2 > 3, 4 > 1, 4 > 2, 4 > 3
Functional impairment	5.64 (4.14)	4.21 (3.85)	6.09 (6.49)	1.84 (4.03)	10.15	.000	1 > 4, 2 > 4, 3 > 4
Pain intensity	5.98 (1.71)	6.39 (1.65)	6.65 (1.41)	5.78 (1.76)	3.99	.008	3 > 4
Total number of goals	2.71 (1.11)	3.01 8 (1.11)	2.86 (.92)	2.97 (.98)	1.12	.344	n.s.
Number of pain-related goals	.79 (.69)	.74 (.50)	.78 (.50)	.66 (.57)	.79	.50	n.s.
Number of nonpain-related goals	1.89 (1.24)	2.27 (1.18)	2.08 (.97)	2.31 (1.10)	1.82	.114	n.s.
Goal conflict	1.15 (1.53)	1.92 (1.79)	1.46 (1.29)	1.38 (1.53)	3.06	.046	2 > 1
Goal balance	7.50 (5.83)	7.46 (5.07)	8.54 (5.18)	10.06 (4.99)	3.44	.017	4 > 2

Abbreviation: n.s., not significant.
NOTE. Data are presented as mean (SD) except where otherwise noted.

Discussion

The aim of the present study was to identify patient profiles on the basis of their scores on different activity pattern subscales which comprise the APS,[17] and to compare these groups in relation to affect, daily functioning, impairment, and variables related to life goals. Four groups were identified in cluster analysis: extreme cyclers, medium cyclers, avoiders, and doers. Significant differences were found between clusters. Taking into account that the APS distinguishes more types of activity patterns than the Pain and Activity Relations Questionnaire, the 4 groups were similar, but not identical, to the ones identified by McCracken and Samuel.[36]

In line with previous research,[17] the correlational analyses showed that activity avoidance was associated with more negative outcomes than pain avoidance. As expected, task-contingent persistence was associated with adaptive results, whereas excessive persistence was associated with negative results. However, in contrast to previous research,[17] the 3 pacing subscales only showed low correlations with the outcome measures. This result could be explained by the fact that the frequency of use of pacing in this sample was low, especially pacing to increase activity levels and pacing to conserve energy for valued activities.

Avoiders were characterized by high levels of pain avoidance, activity avoidance, and pacing to reduce pain with low levels of the 3 types of persistence, pacing to do more things, and pacing to save energy for valued activities. These results are in line with previous research, which showed that pacing, when practiced to reduce pain, could be functionally equivalent to avoidance.[17,36] Thus, it would appear useful to distinguish between different types of pacing depending on the goal of the behavior.

In sharp contrast to avoiders, doers were characterized by high levels of task-contingent persistence and moderately high levels of excessive persistence and pain-related persistence with low levels of the 3 types of pacing and the lowest levels of pain and activity avoidance. Comparisons showed that most of the differences between groups were between doers and avoiders. As postulated, doers had significantly higher scores than avoiders in optimism, positive affect, and daily functioning. In contrast, avoiders had significantly higher scores than doers in pessimism, functional impairment, and pain intensity. Doers had significantly higher scores than the other 3 groups in daily functioning and significantly lower scores than the other groups in functional impairment. These results show that a behavior pattern characterized by "doing" despite pain has more adaptive results than a pattern characterized by avoidance even when this pattern has elements of excessive persistence.[2] These results highlight the association between avoidance and pain intensity in the avoider profile. As some authors[12] have pointed out, pain functions as a signal of bodily threat that will disrupt ongoing behavior, and so its association with avoidance should not be underestimated.

According to these results, the patients' general expectations about the likelihood of achieving their goals[8] (ie, optimism and pessimism), and their positive/negative affect are related to how they regulate their activity (ie, patterns of avoidance and persistence). The correlational analysis also showed that optimism was positively correlated with task-contingent persistence and negatively correlated with pain avoidance and activity avoidance; the opposite pattern of correlations was observed for pessimism. Optimism was also associated with higher persistence. Doers had the highest goal balance. These results are in line with previous research,[53] which showed that optimists are persistent because they expect to overcome adversity[1]; however, this is not simply sterile persistence because they are also more flexible in their goal

management.[24] That is, when they repeatedly fail to attain certain goals, they substitute these goals with attainable goals[14,46] because they are sensitive to the contextual parameters[20,41] that are linked to a positive affect that may broaden their perspectives.[19]

In line with previous research,[53] the present study postulated that doers would experience more conflict between their most valued pain-related goal and their most valued nonpain-related goal than the other groups; contrary to our expectations, the doers did not obtain the highest scores in goal conflict. It must be taken into account that, in this study, goal conflict was operationalized as the conflict between the most valued pain-related goal and the most valued nonpain-related goal instead of a general measure of goal conflict. Perhaps, the measure used in the present study did not capture the tendency of optimists to engage in many life goals. No significant differences were found among the 4 groups in the total number of goals or in the number of pain-related or nonpain-related goals. It should be emphasized that there was little variability in these variables.

Medium cyclers had the highest score in the conflict between the most valued pain-related and nonpain-related goals; in addition, their score was significantly higher than the score of the extreme cyclers. Medium cyclers could also be labeled as 'pacers' because this group had the highest scores on the 3 pacing subscales. They were also were characterized by high levels of pain-related persistence, and moderately high levels of pain avoidance, activity avoidance, task-contingent persistence, and excessive persistence. The proportion of women was higher than the proportion of men in the medium cyclers group, which had been experiencing pain for a significantly longer time than the doers group. Medium cyclers showed significantly higher levels of positive affect and significantly lower levels of negative affect than avoiders, and had better daily functioning than extreme cyclers and avoiders. In summary, the medium cyclers group appeared to put into action all the different patterns of activity at a high level and, after the doers, showed better adaptation than avoiders and extreme cyclers. It could be speculated that medium cyclers are motivated by the conflict between a pain-related and a nonpain-related goal, and that they use a wide range of patterns of activity that they fine-tune depending on the circumstances leading to adaptive results. This profile may develop over time; thus, future longitudinal research could investigate if patients evolve from a doer profile to a medium cycler profile. On the basis of previous experimental studies,[9,10,56] it would have been reasonable to expect that the presence of conflict between the most valued nonpain-related goal and the most valued pain-related goal could have been associated with an attenuation of avoidance behavior. Instead, in the present study, goal conflict appeared to be associated with a moderately high use of persistence, avoidance, and pacing in all their forms and with adaptive results. This finding is in contrast with the results of several cross-sectional studies, which showed that distress results from goal conflict.[15,16,25,29,31,47]

Finally, extreme cyclers were characterized by high levels of pain-related persistence and the 2 forms of avoidance, by moderately high levels of task-contingent persistence and excessive persistence, and by low levels of the 3 types of pacing. They had a low level of daily functioning and a high level of functional impairment; after avoiders, this profile experienced the most disabling effects. As mentioned, they also had the lowest score in goal conflict; this score was significantly lower than that of the medium cyclers. Extreme cyclers are characterized by high persistence and avoidance at the same time, and so it could be speculated that their behavior is mainly controlled by the fluctuations in pain intensity along with the limited motivational influence of nonpain-related goals. This hypothesis could be tested in future research with the use of daily diaries.

One of the suggestions of the avoidance-endurance model is that positive mood may be a risk factor for excessive persistence behavior and subsequent disability as a result of overuse.[26] This hypothesis was not supported by the results of the present study because although doers had the highest score on positive affect, they had the lowest levels of functional impairment. It should be borne in mind that this profile is characterized by high levels of the 3 forms of persistence, and not simply by excessive persistence.

Self-efficacy has been considered to be a critical appraisal that directs the choice to actively pursue a goal.[30] In contrast, Carver and Scheier[7] emphasized the importance of the expectation itself that the goal will be achieved (ie, optimism). In this study, optimism (at least in relation to patterns of activity profiles), seemed to play a more important role than self-efficacy because no significant differences were found between groups in self-efficacy.

The present study has a number of limitations. First, the only method used was self-reporting. Shared method variance may have contributed to the results. Future research should not only rely on self-reports, but should also use objective measures of activity patterns.[55] Nevertheless, the objective measurement of activity patterns remains a controversial issue because the patterns actually performed by people are not only the result of their habitual style, but are also the result of contextual factors in which motivational elements play a central role. It is only with difficulty that objective measures can capture these aspects.[3] The results on goal balance should be taken with caution because the use of a compound score to express the balance between goal expectancy, anticipated joy, and conflict[53] could be limited by the fact that the measurement errors in each of the original scores are inherited by the new compound score. Second, the cross-sectional nature of the study does not allow causality to be inferred. Finally, because the variability in the number of goals expressed by the patients was low, goal conflict was operationalized as the conflict between the most valued pain-related goal and the most valued nonpain-related goal; future studies should consider the total amount of conflict between all goals.

Conclusions

This study supports the therapeutic approaches proposed within the framework of the Fear-Avoidance Model aimed at the extinction of avoidance behaviors such as graded exposure in vivo[58] and those that emphasize engaging in activities linked to valued nonpain life goals despite pain (eg, Acceptance and Commitment Therapy[35]). On the basis of our results, these interventions could be reinforced by techniques aimed at strengthening the expectations that personal goals can be achieved (eg, Best Possible Self, which aims to increase optimism[23,37,42,43]). As several studies have shown, optimism could counteract the fatigue in self-regulation resources, which is common in patients who have chronic pain.[6,54]

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