The Activity Patterns Scale
An Analysis of its Construct Validity in Women With Fibromyalgia

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Objectives: Avoidance, persistence, and pacing are activity patterns that have different adaptive effects in chronic pain patients. Some inconsistent findings have been explained from a contextual perspective that underlines the purpose of the activity. In this way, avoidance, persistence, and pacing are multidimensional constructs, nuanced by their goals. This multidimensionality has been supported with a new instrument, the Activity Patterns Scale, in heterogeneous chronic pain samples. Owing to the clinical implications of this conceptualization, the complexity of the activity patterns and their relationships with health outcomes in fibromyalgia (FM), our aim was to explore the construct validity of this scale in this pain problem, testing its internal structure and the relationships with other constructs.

Materials and Methods: The sample included 702 women with diagnosis of FM from tertiary (53.3%) and community settings (46.7%). Confirmatory factor analysis was conducted to test different factor structures of the activity patterns and Pearson correlation to explore the relationships with health outcomes and psychosocial variables.

Results: A 6-factor structure showed acceptable fit indices (standardized root mean square residual = 0.062; root mean-square error of approximation = 0.066; comparative fit index = 0.908). The highest significant relationships for health outcomes was between activity avoidance and FM impact ($r = 0.36$) and excessive persistence and negative affect ($r = 0.41$).

Discussion: Avoidance and persistence activity patterns are shown as multidimensional constructs but not pacing. The ongoing pain in these women may make it difficult to regulate their activity taking into account other goals not contingent on pain fluctuations.

Key Words: Activity Patterns Scale, construct validity, fibromyalgia, negative affect

(*Clin J Pain* 2021;37:887–897)

Received for publication April 13, 2021; revised July 23, 2021; accepted August 24, 2021.

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This work was supported by Ministerio de Economía y Competitividad (grant reference PSI2016-79566-C2-1-R) and by Fondo de Investigación en Salud from the Instituto de Salud Carlos III cofinanced by the European Union through the Fondo Europeo de Desarrollo Regional (FEDER) (grant reference PI17/00858), Spain. The authors declare no conflict of interest.

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DOI: 10.1097/AJP.0000000000000980

In fibromyalgia (FM), as in other chronic pain problems, activity management is a therapeutic objective due to its main role in the patients' adaptation process.[1,2] Several chronic pain models underline the relevance of people's activity in the development and maintenance of chronic pain.[3,4] Avoidance (a reduction of physical activities to avoid present or future pain), pacing (regulating the activity considering both patients' goals and symptoms), and persistence (like overdoing, engaging in activity without considering the physical limitations with negative consequences such as pain flares) are the 3 widely investigated behavioral patterns, with different effects on health outcomes.[5] The contribution of avoidance and overdoing on the worst chronic pain outcomes have a strong scientific backing.[5–7] However, the relationships of pacing and other ways of persistence remain less clear.

Regarding pacing, it is sometimes labelled as an adaptive activity to deal with chronic pain and at others as a nonadaptive close to avoidance[5,8,9]; in addition, several measurement problems have been underlined.[10,11]

Although overdoing or excessive persistence is considered dysfunctional, other ways of persistence such as task-contingent persistence has shown an adaptive effect.[12,13] In this vein, from a motivational perspective, contextual factors, such as the goal of the activity, have been proposed as relevant in their effects on chronic pain outcomes. Behavioral patterns would be not intrinsically adaptive or maladaptive, but their effects on health outcomes and functioning would depend on the goals and the context of when these behaviors occur.[11,14–16] Esteve et al[12] have developed a valid and reliable instrument, the Activity Patterns Scale (APS), which comprises 8 factors that support the multidimensional structure of avoidance, persistence, and pacing behavioral patterns. This instrument, based on previous scales,[17] has been the first to take into account the proposal of 3 ways of pacing (breaking down tasks into smaller ones, taking frequent short rests, and slowing down) connecting each one to a single goal (pacing to increase activity levels, to conserve energy for other valued activities, and to decrease pain) following Nielson et al.[11,18] The APS has been studied in heterogeneous chronic pain samples and have shown good psychometric properties and utility to classify chronic pain patients into activity subgroups.[19] The study of its internal structure showed an 8-factor structure as the best model fit. The 8-factor model showed better indices than both previous three (avoidance, persistence and pacing factors) and six-factor structures (pain avoidance, activity avoidance, task-contingent persistence, excessive persistence, pain-contingent persistence and pacing).[12] The 8-factor structure differs from the Kindermans et al[17]

6-factor structure in its pacing activity, which is multidimensional (3 ways of pacing with different goals), following the aforementioned Nielson and colleagues proposal. In this regard, all behavioral patterns, including pacing, would be nuanced by their goal related to the context of pain intensity or an ongoing task.[12] The content of these all patterns is explained in the Materials and Methods section.

In FM, pain avoidance and pain persistence have been reported as part of the heterogeneity of these patients and have been proposed to be tailored in cognitive-behavioral treatments to improve their effects.[20–22] This chronic health problem, more prevalent in women, is characterized by widespread pain, fatigue, sleep disturbance, emotional problems, and cognitive and somatic symptoms.[23–25] It is associated with higher perceived health outcomes, socioeconomic burden,[26] and a reduction in physical activity.[27] Although in these patients avoidance is a frequent behavior,[20] they often show persistent behaviors, ignoring pain and physical thresholds,[21] which leads to poorer symptoms and function. In FM, avoidance and pacing have been related to weaker and better psychological and physical functioning, respectively.[1] Recent studies have shown the role of contextual factors such as pain intensity and pain acceptance, moderating the effect of pacing and persistence patterns on FM impact.[28,29] Furthermore, using the multidimensional structure of avoidance and persistence behavior patterns, activity avoidance, task persistence, and excessive activity patterns mediated the effect of the preference for pain avoidance goals on disability, pain, and FM impact.[13] Hence, in FM, there is also evidence that behavior patterns are not intrinsically adaptive or nonadaptive, underlying the importance of contextual factors to explore their utility.[28,29] As a recent longitudinal study has shown, with the exception of overdoing, activity patterns are relatively stable in chronic pain, showing the need to have them as an intervention target.[30]

Owing to the importance of activity for improving FM adaptation and the reported heterogeneity of these patients in activity patterns, the APS seems to be a new and useful tool to investigate whether avoidance, persistence, and pacing patterns are, or are not, multidimensional constructs, contextualized for their goals. These findings would be helpful in making decisions on patient-oriented rehabilitation interventions. Therefore, in women with FM we aimed to explore the construct validity of this new instrument, the APS, exploring its internal structure and its relationships with other constructs.

MATERIALS AND METHODS

Participants

In all, 702 women with diagnosis of FM participated in the study. Of these, 374 attended the FM Unit (FU) of the Valencian Community (53.3%) and 328 belonged to different Spanish patients' associations (46.7%). Most of them were married (72.5%; n = 509) and had finished primary studies (45.2%; n = 317) (Table 1). At the time of the study, only 23.4% of women were working out of home (n = 164) and 11.4% were retired due to pain (n = 80). The mean age for the sample was 53.5 (SD = 8.9). The mean time from the first symptoms was 18.1 years (SD = 12.6) and the mean time from the FM diagnosis was 9 years (SD = 8.2). Of 10, the mean pain intensity perception was 7 (SD = 1.5). Significant differences in age and chronicity measures were found between samples from the 2 settings. Regarding occupational status, when we grouped by working (working out of home and housewives) versus not working status (the remaining categories), there were no significant differences (Table 1).

TABLE 1. Sociodemographic and Clinical Variables

	M (SD)			
	Entire Sample	**Patients' Associations**	**FU**	***t***
Age (y)	53.5 (8.9)	54.7 (9.6)	52.5 (8.1)	3.27***
Time from the first symptoms (y)	18.1 (12.6)	22.4 (13.8)	14.3 (10.1)	8.79***
Time from diagnosis	9.0 (8.2)	11.2 (8.6)	7.1 (7.4)	6.65***
Pain intensity (y)	7.0 (1.5)	7.0 (1.5)	7.1 (1.5)	−0.66 NS
	n (%)	n (%)	n (%)	χ^2
Civil status				
Married/couple	509 (72.6)	249 (76.1)	260 (69.5)	0.18 NS
Single	55 (7.8)	22 (6.7)	33 (8.8)	
Divorced	97 (13.8)	37 (11.3)	60 (16.0)	
Widow	40 (5.7)	19 (5.8)	21 (5.6)	
Educational level				
Read and write	62 (8.8)	31 (9.5)	31 (8.3)	0.70 NS
Primary studies	317 (45.2)	146 (44.9)	171 (45.8)	
Secondary education	231 (32.9)	103 (31.7)	128 (34.3)	
University	88 (12.5)	45 (13.8)	43 (11.5)	
Occupational status				
Working out of home	164 (23.4)	58 (17.8)	106 (28.3)	44.23***
Unemployed	120 (17.1)	47 (14.4)	73 (19.5)	
Retired	61 (8.7)	34 (10.4)	27 (7.2)	
Retired due to pain	80 (11.4)	55 (16.9)	25 (6.7)	
Sick leave	123 (17.6)	43 (13.2)	80 (21.4)	
House	152 (21.7)	89 (27.3)	63 (16.8)	
Working	316 (23.4)	147 (45.1)	169 (45.2)	0.001 NS
Not working	384 (54.9)	179 (54.9)	205 (54.8)	

***$P \leq 0.001$.
FU indicates fibromyalgia unit; NS, no significant differences.

Variables and Instruments

Sociodemographic and clinical variables were measured with ad hoc questions.

Activity Patterns

Measured by the APS,[12] with 24 items grouped into 8 3-item subscales (2 related to avoidance and 3 to persistence and pacing), the participants were asked to indicate to what extent the statements about activity apply to them on a 5-point scale (0 = not at all, 4 = always). The original scale showed adequate psychometric properties and comprises 3 items in each subscale which assess the following:

Pain avoidance: avoidance associated with perceived or anticipated changes in pain experience (ie, "I avoid activities that cause pain").

Activity avoidance: avoidance due to their own chronic pain condition (ie, "I have to put parts of my life on hold").

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Task-contingent persistence: persistence in finishing activities despite the pain felt (ie, "I kept on doing what I was doing").

Excessive persistence: strenuous activity without considering their own physical limits, experiencing negative consequences (ie, "I have tried to do too much and felt even worse as a result").

Pain-contingent persistence: persistence is associated with the pain experience and therefore, the level of activity fluctuates over time (ie, "When my pain decreases, I try to be as active as possible").

Pacing to increase activity levels: taking breaks, slowing down, and splitting activities into smaller ones with the purpose of increasing the activity levels (ie, "I usually take several breaks and so I can do a lot more things").

Pacing to conserve energy for valued activities: taking breaks, slowing down, and splitting activities into smaller ones with the purpose of conserving energy for others which are important for the person (ie, "I usually take several breaks and so I can save energy to do other things that matter to me").

Pacing to reduce pain: taking breaks, slowing down, and splitting activities into smaller ones with the purpose of reducing pain (ie, "I usually take several breaks so that it hurts less").

To explore the validity based on the relationships with other constructs, we used:

Health Outcome Variables

Taking into account the results of Esteve et al,[12,19] we expected significant and positive sign relationships of activity avoidance and excessive persistence scores, and negative sign relationships with pacing and task-persistence with health outcome measures.

Pain Intensity Perception

Pain intensity is measured with the mean score of the maximum, minimum, and usual pain intensity during the last week and pain intensity at the time of the assessment. These 4 items were answered with an 11-point numerical rating scale (0 = no pain at all and 10 = the worst pain you can imagine) ($\alpha = 0.81$). Higher scores indicate high pain intensity perception.

Distress

The total score of the Spanish adaptation of the Hospital Anxiety and Depression Scale was used[31] ($\alpha = 0.87$), which includes 14 items with different wording anchors. High scores indicate high distress. The use of the distress total score is recommended for chronic pain patients.[32]

Disability

Disability is measured with the total score of the corresponding subscale of the Spanish adaptation of the Revised FM Impact Questionnaire (FIQ-R).[33] With 9 items, this scale assesses the perceived difficulty of doing 9 daily activities (0 = no difficulty, 10 = very difficult). The internal consistency for this sample was $\alpha = 88$. Higher scores represent higher disability.

Perceived Impact of Fibromyalgia

This item is measured with the total score of the FIQ-R.[33] With 21 items this instrument measures the perceived health impact of FM in 3 domains: function (9 items), overall impact (2 items), and symptoms (10 items), scoring from 0 to 10 (wording anchors vary depending on each item). The total score is calculated with the sum of the 3 domains ($\alpha = 0.92$). Higher scores represent higher FM impact perception.

Psychosocial Variables

Positive and Negative Affect

We used the total score of the corresponding subscales (each 1 with 10 items) of the Spanish adaptation of the Positive and Negative Affect Schedule (PANAS).[34] The items are rated on a 5-point Likert scale from 1 (not at all or very slightly) to 5 (extremely). Scores range from 10 to 50 in each subscale. High total scores indicate high positive ($\alpha = 0.92$) or negative affectivity ($\alpha = 0.89$). We expected significant and positive sign relationships of negative affect with excessive persistence and activity avoidance scores and negative sign relationships with task-contingent persistence and pacing. Regarding positive affect we hypothesized relationships of positive sign with task-contingent persistence and pacing and negative with avoidance.

Catastrophizing

We used the total score of the Spanish adaptation of the Pain Catastrophizing Scale (PCS).[35] This scale contains 13 items answered on a 5-point Likert scale from 0 (not at all) to 4 (all the time) (rank 0 to 52). Higher scores indicate higher catastrophizing ($\alpha = 0.95$). We expected significant and positive sign relationships with avoidance and negative with persistence and pacing.

Fear of Movement

We used the total score of the Spanish adaptation of the Tampa Scale for Kinesiophobia (TSK).[36] This scale contains 11 items answered using a 4-point scale (1 = totally agree, 4 = totally disagree). Higher scores mean increased fear of movement. Internal consistency for this sample was $\alpha = 81$. We formulated the same predictions as catastrophizing.

Perfectionism

We used the total score of the Spanish adaptation[37] of the Frost Multidimensional Perfectionism Scale (MPS), composed of 35 items answered on a 5-point Likert scale (1 = totally disagree, 5 = totally agree). The internal consistency in this sample was $\alpha = 0.93$. We expected significant and negative sign relationships between perfectionism and avoidance activity patterns and the opposite sign with persistence patterns.

Commitment to Be Physically Active

The total score of 2 items ($\alpha = 0.71$) that asked to what the extent did the patients feel committed to being active and the importance of this goal in their lives was answered with a 10-point numerical rating scale (1 = little, 10 = a lot). We expected significant and negative sign relationships avoidance patterns and the opposite sign with pacing and task-persistence patterns.

Design and Procedure

This work is part of a broader study aimed at identifying a self-regulation model to predict physical activity in women with FM. The study was approved by the Ethics Committees of the Alicante General Hospital, Miguel Hernández and Rey Juan Carlos Universities. We conducted a descriptive, observational, cross-sectional design. For 2 years, women attending the FU of the San Vicente del Raspeig Hospital (Alicante) and women from different Spanish patients' FM associations were recruited for the study. Inclusion criteria consisted of being female, aged between 18 and 70 years, with a FM diagnosis according to the American College of Rheumatology[25,38] and having no difficulties in filling out the self-administered questionnaires. All patients signed their informed consent. Owing to the length of the assessment protocol and to prevent answer bias, 3 different forms were performed randomizing the questionnaire presentation order. The questionnaires were self-administered in an individual session where a researcher was available to give instructions and answer any questions.

Data Analysis

The data was analyzed with the SPSS-v25 and the R Statistical Package.[39] We performed a confirmatory factor analysis (CFA) to test the suitability of the different models originally studied with the APS in patients with chronic pain.[12] We performed this analysis with the entire sample because no significant differences were found in pain intensity and the differences in age and chronicity reproduce the situation of caring for FM in Spain, where specialized FM units were set up later than patients' associations. Therefore, the entire sample represents the usual variability of these patients. In addition, we tested the possible relationships between age and chronicity variables with activity patterns (see the Results section, preliminary analysis) and found that they were low and scarce. We used a structural equation modeling approach by lavaan package in R.[40] On the basis of raw data, correlations (Table 2) were converted to a covariance matrix to be used with the mentioned software.

No missing data imputation was done. Using Z scores, we identified possible outliers ($Z \geq 3$) and then examined their pattern of responses.

We reported the minimum indices suggested by Kline[41] and the fit criteria assessment was conducted according to the Hu and Bentler[42] criteria. A root mean-square error of approximation (RMSEA) close to 0.06 suggests a good fit and to 0.08 an acceptable fit. A cutoff value for the comparative fit index (CFI) >0.90 indicates a good fit. A standardized root mean square residual (SRMR) <0.06 indicates a good fit, but values as high as 0.08 are acceptable. Finally, the goodness-of-fit statistical test assesses the magnitude of unexplained variance and a ratio of $\chi^2/\text{gl} < 2$ suggests a good fit, but it is also acceptable to consider values as high as 3. Structural equation modeling is based on the assumption of normality of scores. Mardia's multivariate normality test and the Kolmogorov-Smirnov univariate normality tests were calculated using the MVN package in R[43] and showed non-normal data distribution. Therefore, a maximum likelihood estimation with robust SEs and Satorra-Bentler scaled test statistic was used. After evaluation of the original models, we tested possible changes in the composition of the scale according to the modification indices by the statistical software and the theoretical sense of the suggested changes. The Pearson product-moment correlations were used to explore the relationships between constructs. Statistical significance was set at $P < 0.01$. The internal consistency was calculated with the Cronbach α.

RESULTS

Preliminary Analysis

We removed 13 participants from the analysis due to their atypical pattern of responses (the score of all or most of the items was 0 or 4). Therefore, the analysis was conducted with 689 participants. The correlation analysis between activity patterns and variables where samples were statistically different showed significant relationships between age and pain avoidance ($r = 0.16$, $P \leq 0.01$), task-contingent persistence ($r = -0.12$, $P \leq 0.01$), and pacing ($r = 0.25$, $P \leq 0.01$). No significant relationships were obtained between avoidance and persistence activity patterns and chronicity variables, there was only a low correlation with pacing and time from the signs of first symptoms ($r = 0.12$, $P \leq 0.01$) and time from the diagnosis ($r = 0.20$, $P \leq 0.01$). Table 3 shows descriptive statistics and discriminant analysis of the items taking into account the 3 and the 8 original factor structures (note that in the 6-factor structure, pacing has the same composition as the 3-factor structure, and the avoidance and persistence subscales are identical in the 6 and 8 structures). The mean of the items ranged from 1.93 (item 7: I find myself rushing to get everything done before I crash) to 3.20 (item 22: I make the most of my good pain days by doing more things). The item skewness indices were between [−0.01, −1.10] and the kurtosis between [−0.24, 1.01]. All corrected item-factor correlations were above 0.30 (Table 3).

Construct Validity: Internal Structure

We explored the 3, 6, and 8 original factor structures previously tested by Esteve and colleagues. However, the 8-factor model was not possible to be performed as the covariance matrix was not positively definite, likely because of the proportion between the number variables (n = 32) and the sample size and the linear dependency of some variables.[44] In fact, the 3 pacing scores showed significant correlations, which ranged from $r = 0.81$ ("pacing for increasing activity"−"pacing for conserving energy" and "pacing for conserving energy"−"pacing for pain reduction") to $r = 0.79$ ("pacing for increasing activity"−"pacing for pain reduction"), suggesting a high degree of redundancy also pointed out by the modification indices of the R package. In these cases, it is recommended to reduce the number of latent variables.[44] As we mentioned, the original 6 and 8 factor models only differ in pacing structure. In the first, pacing is unidimensional and in the second it is multidimensional, with 3 different goals for pacing. Therefore, Table 4 shows the indices of the 3- and 6-factor models.

The 3-factor model did not reach the cutoff criteria for each goodness-of-fit index, whereas the 6-factor model showed acceptable indices. To improve the model, the modification indices showed by the statistic program suggested changing the items 7 and 2 to other latent variables (task-contingent persistence and pain avoidance). Other suggestions were related to the high correlations between 3 pair of items of the pacing subscales (3 and 24, 9 and 19, 17 and 23). The suggestions about pacing items were not followed due to the unidimensional structure of pacing in this model. However, items 7 and 2 were sequentially removed and tested in the final models. Although indices for the 6-factor structure were slightly improved (Table 4), the internal consistency of the excessive persistence scale without item 7 was affected (α = 0.59). Table 3 shows the α values for original avoidance, persistence, and pacing subscales, which ranged from α = 0.63 for the excessive persistence subscale to α = 0.92 for the unidimensional pacing subscale. Therefore, we continued the remaining analysis with the initial 6-factor model. Figure 1 shows the model and item loadings.

TABLE 2. Activity Pattern Scale Item Correlations

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	—																						
2	−0.48	—																					
3	0.44	−0.26	—																				
4	*−0.04*	0.27	−0.14	—																			
5	0.30	−0.17	0.51	−0.21	—																		
6	0.16	*−0.07*	0.12	−0.13	0.11	—																	
7	−0.23	0.35	−0.22	0.38	−0.23	*−0.01*	—																
8	0.37	−0.30	0.27	*0.01*	0.16	0.31	−0.12	—															
9	0.36	−0.18	0.44	−0.12	0.47	0.16	−0.31	0.31	—														
10	−0.41	0.53	−0.33	0.28	−0.29	*−0.07*	0.48	−0.23	−0.30	—													
11	0.43	−0.28	0.29	−0.08	0.34	0.16	−0.18	0.28	0.34	−0.27	—												
12	0.40	−0.26	0.51	−0.19	0.68	0.16	−0.25	0.25	0.57	−0.31	0.44	—											
13	0.26	−0.15	0.16	*0.07*	0.14	0.0.40	−0.11	0.42	0.25	−0.15	0.24	0.24	—										
14	0.41	−0.27	0.58	−0.15	0.62	0.16	−0.23	0.33	0.54	−0.33	0.35	0.62	0.31	—									
15	*0.05*	0.14	*0.05*	0.42	*−0.01*	0.10	0.30	0.08	*0.06*	0.19	*0.06*	*−0.04*	0.12	*0.09*	—								
16	0.43	−0.33	0.36	*−0.07*	0.36	0.15	−0.24	0.33	0.41	−0.31	0.57	0.48	0.22	0.41	*0.03*	—							
17	0.35	−0.16	0.44	*−0.04*	0.49	0.11	−0.21	0.19	0.56	−0.23	0.32	0.55	0.14	0.52	*0.09*	0.41	—						
18	*0.01*	0.10	*0.01*	0.17	*0.001*	*0.06*	0.25	*0.07*	*−0.03*	0.22	*−0.03*	*0.03*	*0.06*	*−0.01*	0.29	*0.04*	*0.05*	—					
19	0.32	−0.15	0.53	−0.10	0.66	0.11	−0.17	0.17	0.45	−0.21	0.33	0.68	0.14	0.61	*0.08*	0.37	0.65	*0.09*	—				
20	*−0.01*	0.14	*−0.03*	0.28	*−0.05*	*0.05*	0.32	*0.02*	*−0.06*	0.20	*−0.04*	*0.005*	*0.08*	*0.01*	0.32	*−0.03*	0.10	0.52	0.12	—			
21	−0.38	0.50	−0.28	0.34	−0.28	−0.12	0.49	−0.22	−0.30	0.68	−0.27	−0.33	−0.15	−0.30	0.26	−0.33	−0.18	0.23	−0.20	0.30	—		
22	*−0.02*	0.17	*0.01*	0.19	*−0.005*	0.10	0.26	*0.03*	*−0.05*	0.22	*−0.08*	*−0.02*	*0.06*	*0.004*	0.23	*−0.02*	*0.06*	0.52	*0.09*	0.59	0.27	—	
23	0.37	−0.19	0.49	−0.10	0.61	0.11	−0.21	0.16	0.54	−0.26	0.36	0.61	0.13	0.60	*0.04*	0.44	0.67	*0.09*	0.68	*0.03*	−0.25	*0.09*	—
24	0.50	−0.35	0.66	−0.15	0.58	0.13	−0.28	0.32	0.57	−0.40	0.40	0.64	0.27	0.68	*0.07*	0.48	0.58	*0.01*	0.62	*−0.03*	−0.40	*0.01*	0.67

All significant correlations $P < 0.01$; in italics no significant values.

TABLE 3. Descriptive Statistics and Item Discriminant Index for Activity Pattern Scale

Original 8 and 3 Factor Models and Items*	*M*	SD	Skew	Kurtosis	r_{i-t}†	Alpha
Factor I. Pain avoidance						0.73/0.73‡
1. I stop what I am doing when my pain starts to get worse	2.33	1.06	−0.06	−0.53	0.49	0.50
11. If I know that something will make my pain worse I don't do it anymore	2.13	1.16	0.01	−0.70	0.59	0.50
16. I avoid activities that cause pain	2.26	1.13	−0.15	−0.61	0.60	0.51
Factor II. Activity avoidance						0.64
6. I have not been able to carry on with my usual level of activity	2.65	1.17	−0.48	−0.65	0.41	0.33
8. Because of my pain most days I spend more time resting than doing activities	2.18	1.19	−0.04	−0.86	0.43	0.51
13. I have to put parts of my life on hold	2.72	1.07	−0.48	−0.48	0.51	0.46
Factor III. Task-contingent persistence						0.80/0.81‡
2. Kept on doing what I was doing	2.32	1.07	−0.32	−0.42	0.56	0.45
10. I just kept going	2.20	1.18	−0.17	−0.78	0.70	0.58
21. Once I start an activity I keep going until it is done	2.36	1.16	−0.33	−0.60	0.68	0.64
Factor IV. Excessive persistence						0.63
4. I have tried to do too much and felt even worse as a result	2.64	1.17	−0.48	−0.66	0.50	0.47
7. I find myself rushing to get everything done before I crash	1.93	1.33	0.11	−1.11	0.41	0.58
15. I have overdone things, then needed to rest up for a while	2.67	1.07	−0.57	−0.24	0.43	0.41
Factor V. Pain-contingent persistence						0.78
18. When my pain decreases I try to be as active as possible	3.18	0.91	−1.10	1.01	0.58	0.43
20. I do extra on days when my pain is less	3.10	0.90	−0.85	0.33	0.64	0.50
22. I make the most of my good pain days by doing more things	3.20	0.86	−0.95	0.64	0.64	0.46
Factor VI. Pacing for increasing activity level						0.78/0.92‡
3. I usually take several breaks and so I can do a lot more things	2.56	1.19	−0.54	−0.54	0.53	0.65
17. I do things more slowly so that I can do a lot more things	2.11	1.17	−0.01	−0.81	0.62	0.70
19. I split activities into smaller parts and so I can do a lot more things	2.19	1.19	−0.13	−0.800	0.70	0.77
Factor VII. Pacing for conserving energy for valued activities						0.82
5. I split activities into smaller steps so I can save energy to do other things that matter to me	2.18	1.22	−0.15	−0.92	0.69	0.72
14. I usually take several breaks so I can save energy to do other things that matter to me	2.32	1.19	−0.26	−0.75	0.68	0.75
23. I do things more slowly and so I can save energy to do other things that matter to me	2.24	1.20	−0.21	−0.81	0.67	0.77
Factor VIII. Pacing for pain reduction						0.82
9. I do things slowly so that it hurts less	2.36	1.22	−0.33	−0.75	0.63	0.64
12. I split activities into smaller steps so that it hurts less	2.20	1.20	−0.21	−0.80	0.69	0.77
24. I usually take several breaks so that it hurts less	2.38	1.22	−0.30	−0.82	0.68	0.79

*Avoidance and persistence subscales of the 6 and 8 factor models are identical; pacing subscale of the 6 and 3 models are identical.
†Corrected item-factor correlations for discriminant analysis, considering the 8 original subscales (pacing as multidimensional activity pattern).
‡Alpha value and corrected item-factor correlations considering the 3 subscales structure (avoidance, persistence, and pacing as unidimensional activity patterns).
All correlation scores should have positive sign and > 0.30.

Descriptive and correlations between the subscale scores of the 6-factor model are in Table 5. Significant relationships ranged between $r = -0.15$ (pain avoidance and excessive persistence scores) and $r = 0.59$ (pain avoidance and pacing scores).

Validity Based on the Relationships With Other Constructs

Significant correlations of the activity patterns with health outcome measures ranged from $r = 0.11$ (pain-contingent persistence and distress) to $r = 0.36$ (activity avoidance and FM impact) and with psychosocial variables from $r = 0.15$ (task-contingent persistence−negative affect) to $r = 0.41$ (excessive persistence−negative affect) (Table 6).

DISCUSSION

The APS structure of the 6-factor model applies to women with FM. Avoidance and persistence seem to be multidimensional behavioral domains but not pacing, in agreement with Kindermans et al.[17] In general terms, the 24 items of the APS seem suitable for women with FM. However, more work is needed, on the one hand, with items 7 (excessive persistence subscale) and 2 (task-contingent persistence subscale) and, on the other hand, with the 6 items highly related to the different pacing subscales. Future studies should perform a thinking-aloud procedure to be sure that the content of items of the persistence and pacing are understood in the intended sense and their respective purposes are clearly differentiated by women with FM.[45] Although the assessment protocol includes more than 130 items, some of which are very similar, their wording is different. Only pacing items combine the behaviors and goals using the same wording. It might add difficulties in discriminating the meaning of pacing items.

We found a significant relationship of pacing with pain avoidance activity. This finding is in line with the Esteve' study where pacing was a multidimensional construct.[12] With the APS, it does not seem to be due to the measurement overlap between avoidance and pacing, which has been pointed out previously.[10] These relationships suggest that patients with FM could engage in pacing as a way of avoidance behavior contingent to pain intensity, in agreement with the energy conservation perspective about pacing.[1,2,12,19] From this perspective, due to the limited energy resources of these women, because of pain and

TABLE 4. Activity Pattern Scale Structure

	Fit Indices			
	RMSEA	CFI	SRMR	χ^2/df
3 Factor Model	0.093	0.806	0.098	5.40
Avoidance (1, 6, 8, 11, 13, 16)*				
Persistence (2, 4, 7, 10, 15, 18, 20, 21, 22)				
Pacing (3, 5, 9, 12, 14, 17, 19, 23, 24)				
6 Factor Model	0.066	0.908	0.062	3.17
Pain avoidance (1, 11, 16)				
Activity avoidance (6, 8, 13)				
Task-contingent persistence (2, 10, 21)				
Excessive persistence (4, 7, 15)				
Pain-contingent persistence (18, 20, 22)				
Pacing (3, 5, 9, 12, 14, 17, 19, 23, 24)				
(1) Removing item 7	*0.065*	*0.914*	*0.055*	*3.11*
(2) Removing item 2	*0.065*	*0.920*	*0.053*	*3.08*

In italics, models tested following the modification indices.
*Item number.
CFI indicates comparative fit index; RMSEA, root mean-square error of approximation; SRMR, standardized root mean square residual, parentheses include Activity Pattern Scale item numbers.

fatigue, they tended to balance the energy needed for implying in activities and for alleviating their symptoms. As a result, they would behave contingent to their pain (or fatigue) intensity and, therefore, pacing would be close to a form of avoidance. The mean of pain intensity in this sample was high and it is possible that pain may be so significant and continuous that women feel unable to adapt pacing to other goals. Even if we propose other relevant goals, they will be always conditioned by current or anticipated pain. This could explain the high correlation of pacing with pain avoidance behavior in this sample and even the result about the unidimensionality of pacing. Another possible explanation of pacing unidimensionality may be the three behaviors comprised in the pacing items (breaking down tasks, rest breaks, and slowing down) are all included in the same theme of pacing named by Antcliff et al[8] as activity adjustment (pacing focused on decreasing activities). These authors identified other ways of pacing as, among others, activity consistency (undertaking similar levels of daily activity not contingent to the symptoms intensity), which was also associated with better functioning. This issue suggests working on the content validity of the pacing measure in women with FM, considering other relevant pacing behaviors. The APS items are in line with the recommendations about including the intent of pacing behaviors and overcoming the reported problems about pacing measures.[11] Our results showed pacing was clearly a unidimensional construct, while in Esteve's original work the

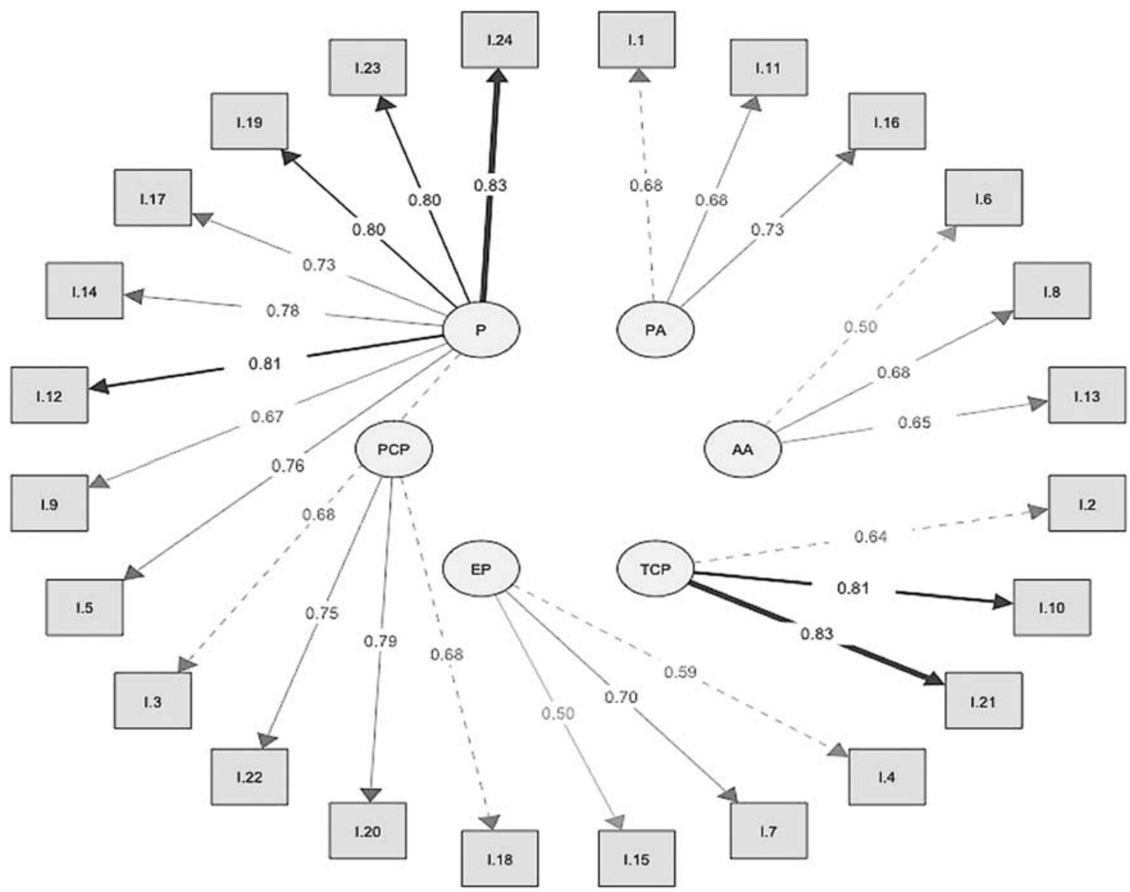

FIGURE 1. Structure of the 6-factor model. AA indicates activity avoidance; EP, excessive persistence; I, item; P, pacing; PA, pain avoidance; PCP, pain-contingent persistence; TCP, task-contingent persistence.

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TABLE 5. Descriptive and Correlations Between Activity Pattern Scale Subscale Scores

	M	SD	Skewness	Kurtosis	1	2	3	4	5
1. Pain avoidance	6.71	2.70	0.03	−0.26					
2. Activity avoidance	7.55	2.62	−0.14	−0.43	0.39				
3. Task contingent persistence	6.88	2.88	−0.18	−0.33	−0.49	−0.25			
4. Excessive persistence	7.23	2.72	−0.22	−0.23	−0.15	*0.04*	0.50		
5. Pain contingent persistence	9.47	2.23	−0.76	0.28	*−0.03*	*0.09*	0.29	0.40	
6. Pacing	20.55	8.55	−0.29	−0.29	0.59	0.31	−0.40	−0.20	*0.03*

Theoretical range for the subscales 1 to 5 = 0 to 12 and for subscale 6 = 0 to 36.
All significant correlations $P < 0.01$.
In italics no significant values.

8-factor model with pacing as multidimensional slightly improved the fit indices of the 6-factor model.[12] All these findings seem controversial and suggest conducting new research to study the pacing construct in FM more in depth.

In general terms, significant correlations of the different APS subscale scores with health outcome measures were low. However, they were similar to previous research about avoidance and persistence behavioral patterns. Activity avoidance and excessive persistence were the 2 activity patterns with the largest number of significant relationships, some of them reaching a moderate effect size. Both activity patterns were related to the worst health outcomes in a more consistent way than other activity patterns of the same behavioral domains, supporting previous results.[12,16,17,46] In our study, it also included for pain intensity in contrast with the results of Esteve et al[12] where pain intensity was fully independent of activity patterns. The excessive persistence results confirm this pattern should be a treatment target in FM patients,[2] but also, activity avoidance, which is related to the fact of suffering from a chronic pain illness and that does not depend on present or anticipated pain fluctuations.[12,17] Bearing in mind that no causal relationships can be drawn from our study, these findings are important due to the APS multidimensionality in avoidance and persistence behavioral domains. Results support previous findings also obtained with multidimensional activity patterns, where activity avoidance and excessive persistence were the most harmful for health outcomes,[17] or where activity avoidance mediated the effect of motivational variables in functioning.[13]

Surprisingly, task-contingent persistence did not show the positive effect on functioning previously reported[12,13,17] and pain avoidance showed only a minor relationship with FM impact. In general terms, these 2 results are inconsistent with previous findings and theory-based predictions. However, regarding pain avoidance, and using the APS, Esteve et al[12] obtained similar results. Both samples, Esteve's and ours, comprised long-standing illnesses, with more than 10 years from the first symptoms. We therefore wonder if this high chronicity could make the chronic pain illness itself becomes more relevant than dealing with pain fluctuations. Looking into the content of the 2 avoidance patterns, pain avoidance is a more reactive pattern than activity avoidance. With regard to task-contingent persistence, it was the least used activity pattern of its behavioral domain and showed only a low negative relationship with disability. Although, this activity pattern has shown positive effects on health outcomes, being considered as a functional persistence pattern in the face of excessive persistence,[17] other authors, using the APS in FM, have found no links of task-contingent persistence and functioning.[29] However, in FM, results from the intervention studies targeting activity patterns have shown that increases in overdoing predicted less pain interference,[2] being explained by the possible shift, due to the treatment, from dysfunctional type of persistence (excessive) to a functional task-contingent persistence. In Racine et al's study,[2] persistence was assessed as a unidimensional activity pattern. Therefore, in order to clarify the role of task-contingent persistence in FM health outcomes, more experimental research is needed using multidimensional tools.

TABLE 6. Relationships Between Activity Patterns, Health Outcomes, and Psychosocial Variables

	Pain A.	Activity A.	Task-contingent P.	Excessive P.	Pain-contingent P.	Pacing
Health outcomes						
Pain	0.06	0.15**	−0.01	0.16**	0.05	0.04
Distress	−0.03	0.32**	0.06	0.25**	0.11**	−0.18**
Disability	0.09	0.29**	−0.10*	0.14**	0.01	0.08
FM impact	0.11**	0.36**	−0.06	0.20**	0.06	0.08
Psychosocial variables						
Positive affect	0.09	−0.24**	0.10	0.08	0.17**	0.22**
Negative affect	−0.04	0.17**	0.15**	0.41***	0.23**	−0.17**
Catastrophizing	0.21**	0.37**	−0.04	0.24**	0.13	0.04
Fear of movement	0.35**	0.24**	−0.10	0.08	0.09	0.17
Perfectionism	−0.10	0.16**	0.24**	0.40***	0.23**	−0.10
Commitment to be active	−0.16**	−0.23**	0.09	0.08	0.25**	−0.003

**$P \leq 0.01$.
***$P \leq 0.001$.
Sample for correlation analysis with health outcomes, 689; idem with psychosocial variables, 486.
A indicates avoidance; FM, fibromyalgia; P, persistence.

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Finally, the scarce results of pacing could be explained by its item composition grouping the different behaviors and goals of pacing. In the study carried out by Esteve et al,[12] the different pacing patterns showed different relationships with health outcomes. In our case, the different effects of pacing are likely overturning each other due to its unidimensional structure. Pacing was independent of pain, disability, and FM impact and was only related to less distress. This last relationship is a common result independent of the pacing conceptualization[1,5,6] and the absence of relationships with disability has been also previously reported by other authors.[46]

Activity avoidance and the 3 ways of persistence (excessive persistence with the highest correlation) were associated with poor affective status, suggesting women could be dealing with their discomfort through different behaviors but mainly doing things as a possible way of experiential avoidance.[15] These results are similar to the Esteve et al' results except they found task-contingent persistence associated with less negative affect.

We also explored the activity pattern relationships with other psychosocial variables relevant in chronic pain models,[3,15,47,48] such as catastrophizing, fear of movement, and goals (perceived importance and commitment of being physically active). In addition, we took perfectionism into account due to the fact that personality can also guide a person's action.[49] In agreement with the large evidence of fear of movement models, fear and catastrophizing were related to both pain and activity avoidance patterns. Furthermore, fear of movement was independent of the 3 persistence patterns and pacing, but not catastrophizing, which interestingly was also positive related to excessive persistence. This last result could be understood in the same way of previously mentioned experiential avoidance process about the behavioral coping of negative thoughts and feelings in women with FM.

As we expected, perfectionism was associated with persistence, mainly with excessive persistence, but also with activity avoidance. FM patients show high perfectionism, frequently associated with an overactive lifestyle, playing a maladaptive role in coping with the illness[50] consistent with the Stress and Coping Cyclical Amplification Model of Perfectionism in Illness (SCCAMPI[51]). The SCCAMPI points out that dealing with pain, fatigue, and disability associated with chronic health conditions can be particularly challenging for perfectionists because of their heightened responses to stress and maladaptive coping. Living with FM requires a renegotiating of personal goals (so that they are more realistic) and perfectionism has been associated with difficulties in disengaging from unproductive goals.[52] The perceived possibility of reaching the overly high established standards set by these women would explain the association of perfectionism with excessive persistence and activity avoidance based on other relevant contextual variables (ie, pain intensity).[53]

Finally, those women for whom being active is important in their life and were committed to this goal, reported less pain avoidance and activity avoidance and more pain-contingent persistence, in agreement with the self-regulation and motivational approach of chronic pain. Nonpain goals and the commitment to them can reduce avoidance behaviors[49,54] and, on the other hand, according to our findings, can drive persistence behaviors when the pain intensity decreases (pain-contingent persistence). This last result might be showing a way of functioning close to the committed action of the psychological flexibility model.[14,15] This model understands the committed action as a way of flexible persistence and the content of the items of pain-contingent persistence subscale could be reflecting this flexibility.

In general terms, the results support the construct validity of the APS and suggest activity patterns are not intrinsically adaptive or nonadaptive, underlining the relevance of multidimensional avoidance and persistence in women with FM.

Behavior change interventions focused on physical activity in FM show limited success and most of them were not theory driven.[55] Activity, or behavior, is the main focus of models such as psychological flexibility[14,15] and there is a consensus of tailoring and individualized interventions in FM patients, in particular, due to their heterogeneity. In this sense, having a tool such as APS that assesses activity in context can guide professional practice in order to achieve patient-oriented treatments and assess its effectiveness. In fact, using APS has identified different profiles of activity with different adaptation outcomes.[19] Currently, the motivational context where pain behavior is performed is a main issue and the APS reflects the shift required for measuring activity patterns from a self-regulation point of view.[16]

We should bear in mind that the findings of this study are only applicable to women with FM and not to other chronic pain populations. In addition, the correlations of the 3 pacing subscales and the modification indices of the CFA have shown a unidimensional pacing composition in women with FM. More work is needed to make sure of both the content validity of pacing construct and its real meaning for these women. Finally, we would also like to point out that all FU participants were new patients and had filled out the questionnaires before starting the treatment in the FU. Therefore, they had not yet received formal treatment on activity patterns. However, we did not ask a specific question to record if all our participants had received other interventions before addressing activity pacing, which is a limitation of this study. Despite these, the APS is a promising tool for assessing activity patterns in these women.

ACKNOWLEDGMENTS

The authors are grateful to the women with FM who agreed to participate in the study, as well as to the professionals of the Fibromyalgia Unit of the Valencian Community (San Vicente del Raspeig Hospital) for their support throughout the entire research period.

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