The negative impact of pain catastrophising on disease activity: analyses of data derived from patient-reported outcomes in psoriatic arthritis and axial spondyloarthritis

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Abstract

Objective

Psychosocial factors are recognised as important determinants of pain experience in patients with inflammatory arthritides. Among them, pain catastrophising, a maladaptive cognitive style, observed in patients with anxiety and depressive disorders, garnered specific attention. Here, we evaluated pain catastrophising (PC) and its related domains (Rumination, Magnification, and Helplessness), in psoriatic arthritis (PsA) and axial spondyloarhtiritis (axSpA) participants, to assess its impact on disease activity. Furthermore, we analysed possible correlations of PC-Scale (PCS) with those psychometric domains which have been already related to catastrophisation in patients with chronic pain. Lastly, we aimed to define the relationship between PCS and the different variables included in the composite indices of disease activity.

Methods

A multi-centre, cross-sectional, observational study has been conducted on 135 PsA (age 56 (47–64) years, males/females 40.74/59.26%; Disease Activity in Psoriasic Arthritis (DAPSA) 13.34 (5.21-22.22)) and 71 axSpA (age 49 (37–58) years, males/females 56.34/43.66%; Bath Ankylosing Spondylitis Arthritis Activity (BASDAI) 4.17 (2.1–6.3)) participants. Multivariable regressions and correlations were performed to evaluate the relationship between pain catastrophising and both disease activity and patient-reported outcomes.

Results

The adjusted linear regression model showed a positive association between PCS and DAPSA as well as between PCS and BASDAI; PCS negative impacts on the subjective domains of disease activity scores.

Conclusion

This study suggests the role of PC, independently of inflammation, in disease perception and achievement of remission or low disease activity in chronic arthritides.

Key words

pain catastrophising, psoriatic arthritis, axial spondyloarthritis

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Introduction

Spondyloarthritis, (SpA) a group of related chronic rheumatic diseases with different phenotypes, shares clinical signs and typical genetic features. Among SpA, the most common forms are Psoriatic arthritis (PsA) and Axial spondyloarthritis (axSpA) (1, 2). SpA patients show an increased prevalence of obesity, type 2 diabetes, hypertension, metabolic syndrome, increased risk of cardiovascular morbidity and psychological comorbidities (3-7).

Both musculoskeletal and not-musculoskeletal manifestations strongly impact the patients' quality of life (QoL) and pain perception (8).

Psychosocial factors are recognised as important determinants of the pain experience in patients with inflammatory arthritides and among them, pain catastrophising garnered specific attention (8, 9). The term catastrophising was formally introduced by Albert Ellis and adapted by Aaron Beck to describe a maladaptive cognitive style employed by patients with anxiety and depressive disorders. They defined catastrophising as the concept of an irrationally negative forecast of future events. Similarly, pain-related catastrophising is broadly conceived as a set of exaggerated and negative cognitive and emotional feelings brought to bear during actual or anticipating painful stimulation (10). The assessment of catastrophisation is obtained using the Pain Catastrophising Scale (PCS), assessing 3 domains believed to include many pain catatastrophising constructs. The first component of PCS, labelled rumination, includes 4 items, describing ruminative thoughts, worry, and an inability to inhibit pain-related thoughts. The second component, labelled magnification, includes 3 items reflecting magnification of the unpleasantness of pain situations and expectancies for negative outcomes. The third component, labelled helplessness, includes 5 items from the Coping Strategies Questionnaire (CSQ) and one more item reflecting the inability to deal with painful situations (10).

In this study, we evaluated pain catastrophising and its related domains to assess its possible impact on disease activity, expressed by composite indices. Furthermore, in the same participants, we analysed possible correlations of pain catastrophising (PC) with those psychometric domains which have been related to the catastrophisation in patients with chronic pain. Lastly, we aimed to define the relationship between PC and the different variables included in the composite indices of disease activity.

Patients and methods

A multi-centre, cross-sectional, observational study has been conducted on PsA and axSpA participants enrolled in seven Rheumatology Clinics. Consecutive outpatients have been enrolled from January 2021 to July 2021; at baseline, PsA participants fulfilled the Classification Criteria for Psoriatic Arthritis (CASPAR), and axSpA participants fulfilled the 2009 Assessment of SpondyloArthritis international Society (ASAS) Criteria. The study was approved by the Ethics committee of the University Campus Bio-Medico of Rome and conducted in conformity with the Declaration of Helsinki and its later amendments.

Inclusion criteria were: both genders, age >18 years, and the fulfilment of CASPAR/2009 ASAS criteria. The exclusion criteria were: history of any malignancy, pregnancy, age >75, inability to express informed consent to participate in the study and history of any psychiatric disorder according to DSM-V prior the recruitment. Therefore, SNRI (serotonin-norepinephrine reuptake inhibitor), antispasmodic drugs, anticonvulsants and hypnotic treatments were allowed only for the management of concomitant fibromyalgia.

At enrolment, the following PsA disease activity scores were collected by clinicians who carried out the visit: Disease Activity for Psoriatic Arthritis (DAPSA), Minimal Disease Activity (MDA), Very Low Disease Activity (VLDA), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Psoriasis Area Severity Index (PASI), Leeds Enthesitis Index (LEI). Furthermore, the following axSpA disease activity scores were collected: BASDAI, Bath Ankylosing Spondylitis Functional Index (BASFI), Ankylosing Spondy-

litis Disease Activity Score-C-Reactive Protein (ASDAS-CRP).

Patients fulfilling the 2016 American College of Rheumatology revised criteria for fibromyalgia were further identified in our cohort (11).

Pain Catastrophising, with its domains of helplessness, rumination and magnification, was analysed through PCS.

Several domains considered in this study were analysed through the following standardised patients-reported outcomes (PROs): Health Assessment Questionnaire (HAQ) for the disability and the physical function, Hospital Anxiety and Depression Scale (HADS) for the depressive-anxious symptoms, THS Trait Hope Scale (THS) for hope, Acceptance and Action Questionnaire (AAQ) for psychological flexibility and Compassionate Engagement and Action Scales (CEAS) to evaluate the ability to receive compassion from others and self-compassion.

Continuous variables are described as median (25–75th percentile), whilst categorical variables are described as percentages (%). The Shapiro-Wilk test was used to evaluate the normality of data. χ^2 was used for the analysis of contingency tables, while Mann-Whitney test and Kruskal-Wallis with Holm's pairwise comparison corrections were used to compare ranks. To evaluate variables associated to the disease activity scores, univariable and multivariable regressions were used, considering for the multivariable analysis every variable with $p<0.1$ in the univariate analysis plus age and sex. Spearman's Rank correlation was used to evaluate correlation between PCS, disease activity scores and PROs. The whole statistical analysis was performed using Stata v. 14 and p-values <0.05 have been considered as significant.

Results

The main demographic, anthropometric and clinical characteristics of the study population are reported in Table I. Of interest in PsA, concomitant fibromyalgia was present in 29.6% out of participants. In this subset, we observed that the median DAPSA value was 13.34 (5.21–22.2), the median CPDAI value was 2 (1–4), and the median BASDAI score was 5.1 (2.4–7.33); 33.33% of participants achieving MDA criteria, while VLDA were achieved in 16.8% out of our participants. Furthermore, we observed a PCS median value of 18 (6-31) and about its domains, Helplessness was 9 (2–14), Rumination was 8 (2–13), Magnification was 3 (1–5).

In the axSpA cohort, BASDAI value of 4.17 (2.1–6.3), ASDAS-CRP of 2.32 (1.29–3.16), and BASFI of 2.35 (0.5–5.9). The analysis of the PCS showed a median value of 16 (6–28) and about its specific domains, helplessness was 7 (2–12), Rumination was 7 (4–12), Magnification was 2 (0–4).

Table I. Demographic and clinical characteristics of PsA and axSpA participants.

Variables	Total PsA Participants (n=135)	DAPSA<14 (n=68)	DAPSA>14 (n=67)	*p*-value
Age (years)	56 (47-64)	56 (44.5-63)	56 (49-63)	0.79
Males/Females (%)	40.74/59.26	52.94/47.06	27.69/72.31	0.003
Disease duration (months)	84 (48-144)	84 (60-150)	84 (40-144)	0.41
BMI	26.6 (24.6-30.2)	26.15 (24.2-29.7)	27.78 (25-31.1)	0.29
Fibromyalgia (%)	29.60	14.29	46.67	**<0.0001**
Charlson Comorbidity Index	1 (0-2)	1 (0-2)	1 (1-2)	0.5
Peripheral arthritis (%)	95.56	92.65	98.46	0.2
Axial involvement (%)	48.89	51.47	47.69	0.66
Enthesitis (%)	35.56	41.18	30.77	0.21
Dactylitis (%)	14.07	17.65	9.23	0.17
Psoriasis (%)	74.07	77.94	69.23	0.25
DMARDs no use, (%)	51.11	47.06	55.38	0.66
Metotrexate (%)	32.59	35.29	29.23	
Sulfasalazine (%)	8.15	8.82	7.69	
Leflunomide (%)	5.19	4.41	6.15	
Cyclosporine (%)	1.48	2.94	0	
Hydroxychloroquine (%)	1.48	1.47	1.54	
b/tsDMARDs no use, (%)	25.39	29.41	23.08	0.26
Infliximab (%)	2.96	2.94	3.08	
Adalimumab (%)	20	26.47	13.85	
Etanercept (%)	17.04	16.18	16.92	
Golimumab (%)	8.89	8.82	9.23	
Certolizumab-pegol (%)	3.70	1.47	6.15	
Secukinumab (%)	8.89	8.82	7.69	
Ixekizumab (%)	1.48	0	3.08	
Ustekinumab (%)	6.67	4.41	9.23	
Apremilast (%)	4.44	1.47	7.69	
CCS (%)	22.96	17.65	27.69	0.17
NSAIDs (%)	34.81	39.71	30.77	0.28
SNRI (%)	7.41	2.94	12.31	**0.04**
Anticonvulsant drugs use (%)	8.15	4.41	12.31	0.1
Antispasmodics drugs use (%)	19.26	10.29	29.23	**0.0006**
Hypnotic drugs use (%)	5.19	0	10.77	**0.005**
TJ	2 (0-6)	0 (0-1)	6 (3-10)	**<0.0001**
SJ	0 (0-0)	0 (0-0)	0 (0-1)	**<0.0001**
PP	6 (3-8)	3 (1-5)	8 (7-9)	**<0.0001**
PtGA	5 (2-7)	2 (1-4)	7 (6-8)	**<0.0001**
PhGA	1 (0-2)	0 (0-1)	2 (1-5)	**<0.0001**
LEI	0 (0-0)	0 (0-0)	0 (0-0.5)	0.07
Dactylitis	0 (0-0)	0 (0-0)	0 (0-0)	0.31
CRP, mg/dl	0.37 (0.14-0.8)	0.3 (0.115-0.54)	0.4 (0.2-1.06)	0.07
ESR, mm/h	14 (7-25)	12 (6-25)	15 (9-26)	0.17
HAQ	1 (0.2-1.75)	0.315 (0-.94)	1.63 (1-1.88)	**<0.0001**
PASI	0 (0-0)	0 (0-1)	0 (0-0)	0.09
DAPSA	13.34 (5.21-22.2)	5.655 (2.4-10.15)	22.33 (19.18-27.2)	**<0.0001**
CPDAI	2 (1-4)	1 (1-2)	3 (2-5)	**<0.0001**
BASDAI	5.1 (2.4-7.33)	2.7 (1.25-4.95)	7.2 (5.5-8.1)	**<0.0001**
MDA (%)	33.33	63.49	3.23	**<0.0001**
VLDA (%)	16.80	33.87	0	**<0.0001**
PCS	18 (6-31)	7.5 (3.5-22)	29 (17-36)	**<0.0001**
Helplessness	9 (2-14)	3 (1-9)	12 (7-16)	**<0.0001**
Rumination	8 (2-13)	3 (1-9)	12 (7-15)	**<0.0001**
Magnification	3 (1-5)	2 (0-4)	4 (2-6)	**0.0002**

Variables	Total axSpA Participants (n=71)	BASDAI <4 (n=33)	BASDAI ≥4 (n=38)	*p*-value
Age (years)	49 (37-58)	47.5 (33-55.5)	51.5 (43-61)	0.2
Males/females (%)	56.34/43.66	69.7/30.3	44.74/55.26	**0.03**
Disease duration (months)	72 (48-120)	84 (50-129)	72 (36-120)	0.3
BMI	26.04 (23.5-30.4)	25.6 (23.63-30.45)	26.4 (23.2 –30.1)	0.9
Fibromyalgia (%)	12.5	0	21.05	**0.01**
Charlson Comorbidity Index	1 (0-1)	0 (0-1)	1 (0-2)	0.24
Smokers, No (%)	61.9	57.58	65.79	0.7
Yes (%)	28.17	33.33	28.68	
Ex (%)	9.86	9.09	10.53	
Peripheral arthritis, (%)	54.93	48.48	60.53	0.3
HLAB27(%)	43.08	51.72	36.11	0.2
MRI sacroiliitis (%)	74.65	78.79	71.05	0.5
RX sacroiliitis (%)	49.28	53.12	45.95	0.6
cDMARDs (%)	23.94	15.15	31.58	0.1
bDMARDs, no use (%)	9.86	6.06	13.16	0.5
Infliximab	15.49	12.12	18.42	
Adalimumab	35.21	33.33	36.84	
Etanercept	12.68	21.21	5.26	
Golimumab	16.9	18.18	15.79	
Certolizumab-pegol	2.82	3.03	2.63	
Secukinumab	7.04	6.06	7.89	
CCS (%)	5.63	0	10.53	0.1
nSAIDs (%)	47.89	45.45	50	0.7
SNRI (%)	2.82	0	5.26	0.5
Tricyclic antidepressants (%)	4.23	3.03	5.26	1
Anticonvulsant drugs use (%)	8.45	0	15.79	**0.027**
Antispasmodics drugs use (%)	9.86	3.03	15.79	0.1
Hypnotic drugs use (%)	4.23	0	7.89	0.2
LEI	0 (0-0)	0(0-0)	0(0-1)	**0.02**
CRP mg/dl	0.2 (0.08-0.5)	0.12 (0.1-0.4)	0.3 (0.07-0.68)	0.2
ESR mm/h	9 (4-19)	8(4-14)	12 (7-25)	**0.019**
BASDAI	4.17 (2.1-6.3)	2 (1-2.9)	6.15 (5.1-7.4)	**<0.0001**
PtGA	5 (3-8)	3 (1-4)	7(6-10)	**<0.0001**
PhGA	1(0-3)	0 (0-0.2)	2 (1-7)	**0.001**
ASDAS-CRP	2.32 (1.29-3.16)	2.265(1.05-1.85)	3.13 (2.55-3.785)	**<0.0001**
BASFI	2.35 (0.5-5.9)	1.1(0.2-2.3)	5.6 (2.2-6.8)	**<0.001**
PCS	16 (6-28)	11 (6-18.5)	25 (12-30)	**0.003**
Helplessness	7 (2-12)	3 (2-8)	10 (5-15)	**0.0016**
Rumination	7 (4-12)	5 (2-10)	10 (5-14)	**0.017**
Magnification	2 (0-4)	2 (0-3)	3 (0-6)	**0.027**

PsA: Psoriatic Arthritis; DAPSA: Disease Activity in PSoriatic Arthritis; BMI: Body Mass Index; csDMARDs: conventional synthetic disease-modifying anti-rheumatic drugs; bDMARDs: biologic disease-modifying anti-rheumatic drugs; CCS: corticosteroids; NSAIDs: non-steroidal anti-inflammatory drugs; SNRI: serotonin-norepinephrine reuptake inhibitor; TJ: tender joints; SJ: swollen joints; PP: patient pain; PtGA: patient global assessment; PhGA: Physician global assessment; LEI: Leeds Enthesitis Index; CRP: C-reactive protein; ESR: erythrocyte sedimentation rate; HAQ: Health Assessment Questionnaire; PASI: Psoriasis Area Severity Index; CPDAI: Composite Psoriatic Disease Activity Index; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; MDA: minimal disease activity; VLDA: very low disease activity; PCS: Pain Catastrophising Scale; axSpA: axial Spondyloarthritis; MRI: Magnetic Resonance Imaging; BASFI: Bath Ankylosing Spondylitis Function Index; DAS: Ankylosing Spondylitis Disease Activity Score.

Overall, a greater proportion of male participants were in low disease activity according to DAPSA<14 or BASDAI<4 (p=0.003 and 0.034, respectively). as well as a higher percentage of participants with concomitant fibromyalgia did not fulfil low levels of disease activity when compared to participants without fibromyalgia (p<0.0001 for PsA and p=0.012 for axSpA). Moreover, participants in DAPSA>14 or BASDAI>4 showed significantly worse PC when compared to low disease activity participants; particularly these patients had a higher total PCS (p<0.0001 and p=0.003) and higher score for Helplessness (p<0.0001 and p=0.0016), Rumination (p<0.0001 and p=0.01) and Magnification (p=0.0002 and p=0.02).

To further evaluate the relationship between PC and disease activity, univariable and multivariable linear regression analyses have been performed and the results are reported in Table II.

Of note, the adjusted linear regression model showed a positive association between PCS and DAPSA (b=0.326, 95% CI 0.184–0.467, p<0.001), as well as between PCS and BASDAI (b=0.094, 95% CI 0.055–0.133, p<0.001). Furthermore, multivariable linear regressions showed significant correlations between each of the three components of PCS (helplessness, rumination and magnification) and disease activity, as reported in Table III.

Finally, to evaluate correlation between pain catastrophising, disease activity scores and PROs, spearman's rank correlation was used (Table IV).

Discussion

In our study, we clearly showed that PC, a self-maladaptive cognitive perception of pain, strongly influencing the patient's perception of the disease, was able to negatively impact on the disease activity, thus limiting the achievement of therapeutic targets.

In fact, we demonstrate a strong correlation between PCS (considering both total PCS and the domains rumination, magnification and helplessness) and higher levels of DAPSA, as well as PCS and BASDAI, confirming that maladaptive cognitive PC significantly interferes with the achievement of low disease activity and remission. Interestingly, PC seems to be independent from the concomitant fibromyalgia, as assessed by multivariable analyses. Furthermore, we observed significant correlations between PC and several different domains evaluated by PROs, such as depressive-anxiosous symptoms, hope, psychological inflexibility and the ability to receive compassion from others and self-compassion.

Thus, this study is the first work confirming also in PsA and axSpA patients the close relationship between those psychometric domains and PC, which has been already observed in inflammatory bowel diseases, cancer, chronic pain, osteoarthritis, and rheumatoid arthritis patients (12, 13).

Table II. Univariable and Multivariable regression; DAPSA (PsA participants) and BASDAI (axSpA participants) as dependent variable.

DAPSA as dependent variable (PsA participants)	Univariable				Multivariable			
Independent variables	b	95%CI		*p*	b	95%CI		*p*
Age	0.091	-0.062	0.244	0.24	-0.030	-0.154	0.094	0.632
Female	4.621	0.846	8.397	0.017	-1.903	-5.599	1.792	0.310
BMI	0.437	0.052	0.822	0.026	0.1311	-0.315	0.701	0.453
Fibromyalgia	8.751	4.664	12.839	<0.0001	3.789	-0.454	8.033	0.080
Peripheral arthritis	8.111	-0.911	17.134	0.08	5.316	0.567	10.0677	0.029
SNRI	11.298	4.382	18.214	0.002	4.427	-4.586	13.441	0.333
Anticonvulsant drugs use	7.807	1.061	14.554	0.024	0.838	-5.578	7.254	0.796
Antispasmodics drugs use	7.428	2.825	12.0312	0.002	2.689	-2.054	7.434	0.264
PCS	0.413	0.230	0.526	<0.001	0.325	0.184	0.467	<0.001
BASDAI as dependent variable (axSpA participants)								
Independent variables	b	95%CI		*p*	b	95%CI		*p*
Age	0.036	-0.007	0.078	0.1	0.012	-0.023	0.047	0.5
Female	1.654	0.450	2.857	0.008	0.869	-.0216	1.955	0.1
Fibromyalgia	2.740	0.864	4.616	0.005	2.081	0.90	3.2661	0.001
SNRI	4.495	0.853	8.137	0.016	1.410	-0.050	2.870	0.058
Anticonvulsant drugs use	2.678	0.512	4.844	0.016	0.054	-0.287	2.865	0.1
Hypnotic drugs use	3.970	0.994	6.945	0.01	1.800	0.005	3.5961	0.04
PCS	0.114	0.075	0.153	<0.001	0.094	0.0553	0.133	<0.001

PsA: psoriatic arthritis; DAPSA: Disease Activity in PSoriatic Arthritis; BMI: Body Mass Index; SNRI: serotonin-norepinephrine reuptake inhibitor; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; axSpA: axial Spondyloarthritis; PCS: Pain Catastrophising Scale.

Table III. Multivariable regression adjusted for age, sex, BMI, fibromyalgia, peripheral arthritis, SNRI, antispasmodic drugs (PsA participants); multivariable regression adjusted for age, sex, fibromyalgia, SNRI, anticonvulsant drugs, hypnotic drugs (axSpA participants).

DAPSA as dependent variable (PsA participants)				
Independent variable	b	95%CI		*p*
Helplessness	0.775	0.446	1.105	<0.001
Rumination	0.685	0.332	1.038	<0.001
Magnification	1.023	0.213	1.834	0.01
BASDAI as dependent variable (axSpA participants)				
Independent variable	b	95%CI		*p*
Helplessness	0.191	0.079	0.303	0.001
Rumination	0.199	0.081	0.3189	0.001
Magnification	0.429	0.180	0.677	0.001

PsA: psoriatic arthritis; DAPSA: Disease Activity in PSoriatic Arthritis; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; axSpA: axial spondyloarthritis.

Table IV. Spearman's rank correlation between PCS (as dependant variable), disease activity scores and PROs.

PsA participants		
Variable	Rho	*p*
HADS anxiety	0.702	<0.0001
HADS depression	0.674	<0.0001
AAQ	0.548	<0.0001
THS	-0.352	<0.0001
THS agency	-0.311	0.0003
THS pathway	-0.329	0.0001
Self-compassion	-0.003	0.9
Compassion from others	0.085	0.3
BASDAI	0.649	<0.0001
HAQ	0.639	<0.0001
TJ	0.384	<0.0001
SJ	0.128	0.1
CRP mg/dl	0.032	0.7
PtGA	0.594	<0.0001
PP	0.547	<0.0001
PASI	0.015	0.9
LEI	0.009	0.9
Dactylitis	-0.007	0.9
axSpA participants		
Variable	Rho	*p*
HADS anxiety	0.649	<0.0001
HADS depression	0.537	<0.0001
AAQ	0.636	<0.0001
THS	-0.515	<0.0001
THS agency	-0.439	0.0002
THS pathway	-0.505	<0.0001
Self-compassion	-0.338	0.0046
Compassion from others	-0.173	0.1
BASDAI 1st question	0.487	<0.0001
BASDAI 2nd question	0.462	0.0001
BASDAI 3rd question	0.466	0.0001
BASDAI 4th question	0.427	0.0003
BASDAI 5th question	0.512	<0.0001
BASDAI 6th question	0.472	<0.0001
PtGA	0.442	0.0002
CRP mg/dl	0.256	0.03

PsA: psoriatic arthritis; HADS: Hospital Anxiety and Depression Scale; AAQ: Acceptance and Action Questionnaire; THS:Trait Hope Scale; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; HAQ: Health Assessment Questionnaire; TJ: tender joints; SJ: swollen joints; CRP: C-reactive protein; PtGA: patient global assessment; PP: patient pain; PASI: Psoriasis Area Severity Index; LEI: Leeds Enthesitis Index; axSpA: axial spondyloarthritis.

Previous studies in rheumatoid arthritis, PsA and axSpA demonstrated that PC and illness perceptions were independently associated with the widely used patient-reported disease activity assessments (14, 15).

On the other hand, our data include several new elements, which deepen and widen this pivotal side of pain perception in chronic diseases. We have shown that pain catastrophising correlates with the number of tender joints, patient pain and patient global assessment; on the contrary, PCS does not correlate with swollen joints, CRP, PASI, number of enthesitis and dactylitis. These data allow us to suggest that pain catastrophising has a negative impact on the subjective domains of disease activity scores and seems to be independent from inflammation. So, treating physicians should take this into account in the follow-up and treatment of PsA and axSpA patients.

We are aware of some possible limitations of our study, such as the relatively low number of participants, probably not fully capturing the heterogeneity of the disease, the retrospective definition of clinical remission, and finally the cross-sectional design, not allowing us to recognise the possible modification over time of PC, due to changing or optimising the DMARD therapy or eventually any psychological interven-

tion. On the other hand, despite the reported limitations, the very low impact of concomitant fibromyalgia, and the screening for any previous psychological intervention in our participants, clearly select a well-defined cohort to better assess the role of PC.

In conclusion, this study suggests that many psychometric variables, independent of inflammation, which are able to influence the patient's perception of the disease, and related PROs, significantly impact the achievement of remission or low disease activity in inflammatory arthritides.

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