Can health care providers recognise a fibromyalgia personality?

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ABSTRACT

Objective. *To determine if experienced health care providers (HCPs) can recognise patients with fibromyalgia (FM) based on a limited set of personality items, exploring the existence of a FM personality.*

Methods. *From the 240-item NEO-PI-R personality questionnaire, 8 HCPs from two different countries each selected 20 items they considered most discriminative of FM personality. Then, evaluating the scores on these items of 129 female patients with FM and 127 female controls, each HCP rated the probability of FM for each individual on a 0–10 scale. Personality characteristics (domains and facets) of selected items were determined. Scores of patients with FM and controls on the eight 20-item sets, and HCPs' estimates of each individual's probability of FM were analysed for their discriminative value.*

Results. *The eight 20-item sets discriminated for FM, with areas under the receiver operating characteristic curve ranging from 0.71–0.81. The estimated probabilities for FM showed, in general, percentages of correct classifications above 50%, with rising correct percentages for higher estimated probabilities. The most often chosen and discriminatory items were predominantly of the domain neuroticism (all with higher scores in FM), followed by some items of the facet trust (lower scores in FM).*

Conclusion. *HCPs can, based on a limited set of items from a personality questionnaire, distinguish patients with FM from controls with a statistically significant probability. The HCPs' expectation that personality in FM patients is associated with higher levels for aspects of neuroticism (proneness to psychological distress) and lower scores for aspects of trust, proved to be correct.*

Introduction

Fibromyalgia (FM) is a common condition characterised by otherwise unexplained widespread musculoskeletal pain and tenderness (1), commonly associated with fatigue, poor quality sleep, cognitive disturbance and emotional distress (1-3). It affects 2–5% of the population within Western societies (4, 5), more women than men and has a major negative impact upon quality of life, resulting in high societal costs from medical, psychological and financial points of view (2, 6). The condition is poorly understood and difficult to manage (7). There are overlapping features between FM, chronic fatigue syndrome and mood spectrum disorders, suggesting common underlying mechanisms (8).

Health care providers (HCPs) typically associate FM with certain personality traits, leading to descriptions such as demanding (9, 10), perfectionistic, ambitious, active, illness focused, medicalising (10), and difficult to deal with (11). One paper reflects this in its title: "helping your patient while maintaining your sanity" (12). In a study, over 70% of rheumatologists considered that they should not be the main HCP for these patients, on the basis that FM could better be considered a psychosomatic disorder (13).

However, research into the association of personality with FM has provided inconclusive results. Most studies indicate that FM is associated with high neuroticism (14, 15), or high levels of correlates of this trait, such as harm avoidance (16, 17) or alexithymia (18). However, some studies find no significant difference for neuroticism or negative affect regulation (9, 19, 20), but lower levels of extraversion and positive affect regulation (19). A comprehensive review suggested that, although many patients with FM show personality characteristics associated with in-

adequate psychological responses to stressful situations, such as catastrophising or applying poor coping techniques, no personality profile is specific to FM (21).

Personality is generally seen as a relatively stable assembly of behavioural, cognitive and affective patterns of individual response (10), which determine how an individual reacts and adapts to external stimuli and circumstances. Although no single instrument can fully capture the complexity of personality, there is general consensus that personality is structured by 5 main domains (the so-called "big five") (22). These are neuroticism (anxious, easily upset vs. calm, emotionally stable), extraversion (energetic, enthusiastic vs. reserved, quiet), openness to experience (open to new experiences, complex *vs*. conventional, uncreative), agreeableness (sympathetic, warm *vs*. critical, quarrelsome) and conscientiousness (dependable, self-disciplined vs. disorganised, careless) (23).

Aims of the study

The primary aim was to investigate whether and to what extent experienced HCPs can recognise FM patients among a sample of FM patients and healthy controls, based solely on a limited set of personality inventory items, exploring the existence of a FM personality.

Secondary aims were: a) to investigate which of a limited set of personality items can discriminate individuals with and without FM and to which personality characteristics (domains and facets) these items belong; b) to assess agreement between HCPs upon the most discriminating personality questionnaire items; c) to assess agreement between HCPs upon their ratings of estimated probability of FM for individual persons. We had no intentions of establishing or implying causality in this study.

Material and methods

Population sample

Participants were recruited in two private rheumatology and gynaecology outpatient clinics in Coimbra, Portugal, sharing similar socio-demographic settings (mainly low to middle class females). Consecutive female patients satisfying the 1990 ACR criteria for FM (1), (basically, a history of unexplained chronic generalised pain and tender points at physical examination), n=129, were invited to take part in this study at the end of their first visit. They were asked to fill out the personality questionnaire, before they were given information on their FM. Controls, n=127, were recruited among females attending a routine gynaecological observation. The only exclusion criteria were, 1) for FM patients, presence of any other chronic painful condition, and for controls, chronic pain of any origin, by self-report; 2) inability to read and understand the questionnaires and 3) refusal to sign informed consent. Their professions were classified into white or blue collar avocations or retired/no profession.

Health care providers

Four rheumatologists and four psychologists experienced in the management of FM patients, two from Portugal and two from the Netherlands in each profession, accepted to participate. There were 2 women and 6 men, their mean age was 51 (range 36–62) years, and their mean years of professional experience with FM was 19 (range 11–25). A ninth researcher, JWGJ, kept the database, collected the HCPs' responses and performed statistical analyses, while blinded to the group classification of the participants and the actual description of each NEO-PI-R item. This blinding was only broken in the writing phase of this manuscript, after data analyses had been completed.

Questionnaire

Participants were asked to fill out without assistance the validated Portuguese version of the NEO Personality Inventory – Revised (NEO-PI-R) questionnaire, (24-26) and to send it through the mail to the principal investigator (JAPS), prior to the subsequent outpatient consultation. The attached information explained that the objective was to investigate whether different rheumatic conditions are associated with different psychological profiles, and that the data were collected for research only, fully independent of the subsequent consultation. No hints were given regarding character traits potentially associated with FM.

The NEO-PI-R consists of 240 items, each presenting a statement about oneself, to be scored from 0 (totally disagree) to 4 (totally agree). The NEO PI-R is a well validated, transculturally generalisable measure of the five major domains of personality (24, 25, 27). Each domain consists of 6 facets and each facet consists of 8 items; for facet and domain scores, corresponding item scores are summed, after recoding for negative formulated items (28), see Supplementary file S1 and Table S2.

Procedures

The HCPs were asked to complete tasks in two successive phases.

Phase 1. Selection of potentially discriminating NEO-PI-R items.

HCPs received a numbered list with actual description of all the 240 NEO-PI-R items (28), in their validated native language versions (26, 27, 29), and were given the following assignment: "*Please make your best effort to select, from these 240 items of NEO-PI-R a set of up to 20 items you feel as capable of discriminating between FM patients and controls. Please indicate, for each of the items you select, whether it would be scored higher or lower by FM patients as opposed to controls.*"

Phase 2. Estimation of the probability of having FM among individual participants.

Each of the HCPs received the scores of participants on the 20 NEO-PI-R items they had selected in phase 1, for each HCP in a different random order of participants. The scores were presented as filled out by participants, *i.e*. without recalculation of scores on negative items. HCPs were asked to "*attribute to each individual participant a probability of her having FM, on a zero to 10 scale: 0= surely not an FM patient to 10= surely an FM patient, 5 representing absolute uncertainty. Please note that you are not being informed, at this phase, how many of the participants are FM patients and how many are controls. They are all female.*" It was stressed that all HCPs were expected to do their best possible evaluation, irre-

Table I. The number, age distribution and profession category of fibromyalgia and non-fibromyalgia control subjects, all female*.

	Fibromyalgia subjects	Control subjects
Number	129	127
Age, median (95% CI), years*	46 (42-48)	49 (47-51)*
Profession (n)		
White collar	82	80
Blue collar	25	23
Retired/no profession	22	24

*no statistically significant differences between groups, except for age, p=0.002.

spective of their pre-existing opinion on the research questions and hypotheses. All HCPs (with exception of JAPS, who had recruited the participants) remained blind as to the number of FM patients and controls.

Ethics

The study was approved by Ethics Committee of the Portuguese Medical Board (Centre Section). All participants signed an approved informed consent form before any study procedures were undertaken.

Statistics

For the primary aim, to investigate whether and to what extent HCPs can recognise a specific FM personality, the scores on each individual set of 20 items selected in phase 1 were analysed as independent variables in logistic regression. This yielded for each HCP's set an area under the receiver operating characteristic (AU ROC) curve with 95% confidence interval.

In a 2x2 table, the number of NEO-PI-R items selected in phase 1 as discriminating between FM and controls and the number of not selected items were tabulated versus the number of NEO-PI-R items with and those without statistically significantly different scores between FM patients and controls. This 2x2 table was tested for significance using Fisher's exact test. Also the scores of NEO-PI-R items selected by ≥3 of the 8 HCPs in phase 1 were tested for differences between FM patients and controls. Testing item scores between FM patients and controls was performed with Mann-Whitney U-tests. To test item scores corrected for covariates, analysis of covariance was applied.

For each probability score for FM acquired during phase 2 (integers, range 0-10), the numbers of participants having been given that score were calculated, with the percentages correct classification. Correct classification was defined as a score ≥6 for FM and ≤4 for controls. For calculations of statistical significance of differences of proportions from 0.5 (chance), exact (binominal) tests were used.

Between the 8 sets of 20 items chosen and 220 items not chosen, agreement analyses were performed, some of them chance-corrected (30). We chose to perform several agreement tests, because of the nature of this data with many not chosen items, yielding different agreement results and interpretations. *E.g.*, if we would have had 2 HCPs, each selecting 20 out of 240 items, and if 5 items would have been chosen by both, kappa would have been 0.18, which would be interpreted as slight agreement, but the percentage agreement would have been 0.88, which could be interpreted as almost perfect agreement.

The agreement tests applied were Conger's kappa (generalised kappa), Gwet for chance adjusted first-order agreement coefficient, Fleiss' kappa (generalised Pi of Scott), Krippendorff's alpha (agreement coefficient based on observed and expected disagreement), and the free-marginal kappa of Brennan and Prediger (30).

To assess the agreement between the 8 HCPs upon the estimated probability (0 to 10, integers) of individual participants of having FM, the same agreement measures were calculated, but as weighted analyses. Custom weights were: no difference between integer scores: weight=1; 1 point difference: weight=0.7; 2 points difference: weight=0.4; 3 points difference: weight=0.2; ≥4 points difference: weight=0.

Interpretation of agreement coefficients is according to Landis-Koch, re-

Table II. Twenty item sets selected by each of the 8 health care providers (HCPs), with power to discriminate fibromyalgia*.

HCP	Item numbers** of NEO Personality Inventory - Revised questionnaire	AU ROC curve	95% CI AU ROC curve	p-value	% correctly predicted
HCP A	r1, 66, r71, 86, 91, 100, 101, 135, 160, 165, 167, r176, 191, 195, 200, 201, 207, 216, 230, r236	0.81	0.76-0.86	0.0000	75
HCP B	r1, r11, 15, 21, 26, 42, r47, r61, r71, 91, r107, 120, 148, 161, r177, 179, 186, 191, 205, 221	0.74	0.67-0.79	0.0000	65
HCP C	r6, 15, r26, 41, 55, r66, 80, 86, 87, 91, r130, r136, 146, 151, 161, r187, 191, r205, 220, r229	0.76	0.70-0.82	0.0000	68
HCP D	6, r10, r11, r12, 15, 26, 27, r43, r59, 91, 100, r116, r121, 161, 165, 194, 200, 216, 224, 225	0.74	0.67-0.79	0.0000	64
HCP E	r1, 15, 42, 54, r56, 64, 79, r94, 104, 115, 120, 137, 140, 151, r177, r190, 191, 213, 222, 235	0.77	0.70-0.82	0.0000	68
HCP F	6, 15, 16, 26, 41, 64, 79, 86, 91, 101, 131, 136, 151, 160, 161, 186, 191, 216, 221, 224	0.80	0.74-0.84	0.0000	71
HCP G	r1, 6, 41, r61, 64, 86, 91, r107, r121, 126, 137, 160, r190, 200, 216, 220, 222, 224, 225, r236	0.79	0.73-0.84	0.0000	73
HCP H	6, r11, r36, 42, r61, 70, r71, 90, 115, r121, 130, 131, r141, 160, 171, 186, 191, 197, 204, 225	0.71	0.64-0.77	0.0000	65

*results of binary logistic regression for each of the 20 item sets, dependent variable: fibromyalgia / non-fibromyalgia, independent variables: each 20-item set. AU ROC curve: area under the receiver operating characteristic curve; 95%CI: 95% confidence interval.
**The contents of items preceded by "r" are negatively associated with fibromyalgia according to each HCP.

Table III. Questionnaire items classed for statistically significant differences or not between fibromyalgia patients and controls *versus* selection or not by the 8 health care providers (HCPs).

Testing scores of fibromyalgia patients *versus* controls	Selected at least by one of the 8 HCPs	Not selected by any of the 8 HCPs
Statistically significant different	n=37: 1, 6, 11, 26, 36, 41, 42, 61, 64, 70, 71, 86, 87, 91, 115, 116, 121, 126, 136, 137, 146, 151, 167, 176, 177, 186, 187, 190, 191, 201, 211, 216, 221, 222, 229, 230, 236	n=32: 18, 28, 31, 32, 40, 67, 68, 81, 83, 96, 103, 106, 108, 110, 113, 123, 125, 127, 128, 133, 143, 144, 145, 147, 150, 155, 156, 162, 180, 181, 232, 238
Not statistically significant different	n=45: 10, 12, 15, 16, 21, 27, 43, 47, 54, 55, 56, 59, 66, 79, 80, 90, 94, 100, 101, 104, 107, 120, 130, 131, 135, 140, 141, 148, 160, 161, 165, 171, 179, 194, 195, 197, 200, 204, 205, 207, 213, 220, 224, 225, 235	n=126 all other items

Fisher's exact test: p=0.0001.

sulting in 6 classes of agreement: poor, slight, fair, moderate, substantial and almost perfect agreement, respectively (30, 31).

All tests were two-sided; p<0.05 was considered statistically significant; no correction for multiple testing was applied. For analyses, SPSS v. 22 (IBM, New York, USA), NCSS 9 Statistical Software (NCSS, LLC. Kaysville, Utah, USA), and AgreeStat 2015.4 (Advanced Analytics, LLC, Maryland, USA) were used.

Results

Table I shows participants' main characteristics. The 8 sets of 20-items selected by the HCPs are shown in Table II, with their ability to discriminate FM, expressed as percentages of correctly predicted diagnosis and AU ROC curves, all ≥0.70 and statistically significant. Plotted AU ROC curves for each HCP are shown in supplementary file Fig. S5. The Portuguese HCPs did not perform better or worse than the Dutch HCPs, although the population under study was from Portugal. The performances of rheumatologists and psychologists were similar.

Taken together, the eight item-sets elected by HCPs included 82 of the 240 NEO-PI-R items as potentially discriminating between FM and controls (Table III). Out of these, 37 were statistically significantly different between the two groups and 45 were not. From the 152 items not selected by any of the HCPs, the scores of 38 of them actually proved to be statistically significantly different between FM patients and controls. This distribution is different from chance alone (p=0.0001), indicating a positive association between selection and discriminatory property.

Table IV shows the numbers of participants for each probability score for FM, and the percentages of correct classifications by the HCPs. The performance of the HCPs in terms of correctness of predicted diagnosis increased with their degree of certainty, *i.e.* when the estimated probability of FM approached 0 (highest certainty the participant does not have FM) or 10 (highest certainty the participant has FM). The percentages of correct classifications reached 75 to 100% for most HCPs for probabilities of 0.80 or higher (δ3, δ4, δ5). The HCPs only expressed absolute uncertainty (δ0) in relatively small percentages of participants (8-23%).

The items selected by at least 3 of the 8 HCPs as being discriminatory for FM are shown in Table 5, with the results of statistical testing. The domain neuroticism is by far the most represented: 15 neuroticism items were chosen by ≥3 HCPs and for all these items but one, the scores were statistically significantly higher in the FM group. These items represent 4 facets of neuroticism: depression (5 items), anxiety (5 items), angry hostility (3 items), and vulnerability (2 items). Other statistically significantly differentiating and repeatedly chosen items belong to the

Table IV. Numbers of participants for each score, percentages correct classification and AU ROC curve*.

Presumed certainty	HCP A	HCP B	HCP C	HCP D	HCP E	HCP F	HCP G	HCP H
δ5	9 (78)	4 (75)	28 (64)	24 (96)[8]	32 (75)[2]	2 (100)	0 (na)	28 (89)[7]
δ4	21 (76)[1]	13 (85)[1]	26 (65)	26 (69)	45 (51)	5 (100)	19 (100)[8]	48 (67)[1]
δ3	45 (78)[5]	23 (65)	55 (76)[5]	44 (70)[2]	56 (61)	28 (79)[3]	55 (71)[3]	42 (69)[1]
δ2	67 (61)	63 (57)	58 (60)	54 (46)	57 (65)[1]	68 (59)	49 (63)	57 (51)
δ1	76 (59)	95 (57)	67 (58)	70 (61)	45 (76)[4]	100 (50)	102 (61)[1]	52 (46)
δ0	38 (na)	58 (na)	22 (na)	38 (na)	21 (na)	53 (na)	31 (na)	29 (na)
AU ROC (95% CI)	0.69[6] (0.62-0.75)	0.62[5] (0.55-0.69)	0.67[6] (0.60-0.73)	0.68[6] (0.61-0.73)	0.66[6] (0.59-0.72)	0.66[6] (0.60-0.72)	0.70[6] (0.63-0.76)	0.65[6] (0.58-0.71)

*Numbers of participants for each score as result of each health care provider scoring the 256 individuals for the probability of having fibromyalgia or not (0-10), here expressed as the deviation in absolute figures from score 5. Delta 0 (δ0), absolute score 5, reflects maximal uncertainty about classification; δ5, absolute score 10 or 0 reflects maximal presumed certainty. Between brackets, the percentages correct classification. AU ROC curve: area under the receiver operating characteristic curve; na: not applicable.

[1]p<0.05; [2]p<0.01; [3]p<0.005; [4]p<0.001; [5]p<0.0005; [6]p<0.0001; [7]p<0.00005; [8]p<0.00001.

Table V. The NEO-PI-R items selected by at least three of the 8 health care providers are presented, together with their selection frequency, NEO-PI-R facet and domain, statistical significance level of the median difference between scores of fibromyalgia patients and scores of controls on that item, and direction of the difference (Dd)[#].

Item number	Selection frequency	Facet of item	Domain of item	*p*-value	Dd
91	6	Anxiety	Neuroticism	0.0000	+
191	6	Depression	Neuroticism	0.002	+
6	5	Angry Hostility	Neuroticism	0.0004	+
15	5	Dutifulness	Conscientiousness	0.30	NS
26	4	Vulnerability	Neuroticism	0.04	+
86	4	Vulnerability	Neuroticism	0.0001	+
160	4	Order	Conscientiousness	0.11	NS
161	4	Depression	Neuroticism	0.054	NS
216	4	Angry Hostility	Neuroticism	0.0001	+
1	4	Anxiety	Neuroticism	0.006*	+
11	3	Depression	Neuroticism	0.0003	+
41	3	Depression	Neuroticism	0.004	+
42	3	Assertiveness	Extraversion	0.046*	-
61	3	Anxiety	Neuroticism	0.0001	+
64	3	Trust	Agreeableness	0.002	-
71	3	Depression	Neuroticism	0.003	+
121	3	Anxiety	Neuroticism	0.03*	+
151	3	Anxiety	Neuroticism	0.0002	+
186	3	Angry Hostility	Neuroticism	0.004	+
200	3	Achieving Striving	Conscientiousness	0.12	NS
224	3	Altruism	Agreeableness	0.80	NS
225	3	Dutifulness	Conscientiousness	0.44	NS

[#]Direction of the difference (Dd): + statistically significantly higher score in fibromyalgia; - statistically significantly lower score in fibromyalgia; NS: no statistically significant difference.
*When corrected for age, not statistically significantly different anymore.

facet assertiveness (1 item) and trust (1 item), both with lower scores for FM. Scores on 6 of the 22 items selected by ≥3 HCPs were not statistically significantly different between FM and controls, of which 4 items belonging to 3 facets of the domain conscientiousness. Items of conscientiousness were often chosen by at least 1 HCP (see Supplementary file Table S2), but their scores mostly did not differentiate between the FM and control group. When the results of Table 5 were corrected for age, 19 of 22 items remained unchanged regarding (non)significance of the difference between groups, but the items 1, 121 (anxiety) and 121 (assertiveness) were not statistically significantly different anymore.

Supplementary file Table S3 shows agreement measures and percentage of agreement for the 8 HCPs, regarding their choice of 20 out of 240 items. All but one of these measures reveal statistically significant rates of agreement. Interpretations of the agreement coefficients range from poor agreement (1 coefficient) to almost perfect agreement (2 coefficients), with 3 other coefficients' ratings in between.

In supplementary file Table S4, the weighted chance-corrected agreement measures for the 8 HCPs regarding the estimated probability of FM for each of the 256 participants are presented. All results are statistically significant, with interpretations of agreement coefficients ranging from slight agreement (3 coefficients) to moderate agreement (1 coefficient), with 2 coefficients with fair agreement in between.

Discussion

Rheumatologists and psychologists with experience of FM can select out of a full personality questionnaire a limited set of personality items that is significantly associated with FM, with AU ROC curves ranging from 0.71 to 0.81. This performance is similar to that of rheumatoid factor and only moderately inferior to that of anti-citrullinated protein antibodies in the diagnosis of rheumatoid arthritis (32, 33).

There was diversity in the item sets selected by the HCPs; they selected 82 different items as potentially discriminant between FM and controls. Nevertheless, the measures of agreement showed coherence underlying the apparently diverse choices of items. Furthermore, most items chosen were of the domain neuroticism, also indicating consistency between the chosen item sets.

Based on the items selected by ≥3 HCPs, the personality they consider associated with FM is characterised mostly by high levels of neuroticism, which is in agreement with some studies describing higher levels of neuroticism at the group level (14, 34-37). The anticipated and confirmed low scores on the facet trust indicate that besides high vulnerability, low resilience is considered characteristic for FM. The HCPs' expectation, in agreement with a previous observation (38), that FM would be associated with aspects of conscientiousness, was in general not confirmed, however.

HCPs' individual participant estimates for the probability of FM performed significantly better than chance. Correctness of classification as FM patient or control increased with the degree of certainty of the estimates, reaching 65 to 100% correct classifications for the higher probability scores. Thus, although personality traits are not 1-to-1 linked to individual patients with FM, HCPs appear able to distinguish patients with a FM diagnosis from controls.

This demonstrates that a relationship between FM and personality exists. Personality is generally considered as being very stable through adult life (39), and neuroticism has been shown to precede and predict joint pain even over 23 years (40). The other way round, there seem to be links between the history and intensity of chronic pain, structural and functional cerebral changes, and changes in personality (41-44). Finally, variables such as sensitivity of similar cerebral structures (*e.g.* the anterior cingulate cortex and amygdala) influence both proneness to psychological distress and sensitivity to somatic symptoms (45, 46). Mechanisms for - probably bidirectional - interactions between personality and the FM spectrum of symptoms are plentiful. Personality operates as a

modulating factor between life events and their psychological impact on the individual. Similar external realities are experienced differently, depending on one's personality. Certain personality traits (*e.g.* high levels of neuroticism) make people vulnerable to stressors, whereas others (*e.g.* trust) may operate as resilience factors against stress. The experience of pain and other symptoms will also be modulated by personality factors, resulting in variable levels of amplifying or soothing feedback. Personality is also associated with specific behaviours such as avoidance of physical activity, which, in FM, have been associated to physical deconditioning and persistence of symptoms. It cannot be ruled out, however, that personality traits associated with FM are consequences of chronic pain and suffering (41, 47, 48), or that there are bidirectional relations between personality traits and FM manifestations. In patients with FM, subthreshold depressive symptom scores assessed by applying the Mood Spectrum-Self Report were higher compared to those in patients with RA (49). Mood disorder, FM, and personality characteristics such as harm avoidance (which is similar to neuroticism) are associated: in a case-control study, after adjusting for depression and anxiety, FM patients (n=78) only presented decreased novelty seeking compared to the controls (n=78), while the differences in other personality traits such as harm avoidance were no longer statistically significant (50).

Our study results may have far-reaching implications, not only for the current understanding of FM, but also for research in FM, as the study results stress the importance of continuing research into the psychological basis of maintaining factors and treatment of FM. Previous conflicting results on a specific FM personality may have contributed to the drifting of FM research away from neuropsychological grounds to neurophysiological mechanistic investigations (51-53). This trend may be seen as negative in face of the promising results of psychotherapy (54), its potential development in the future, and because psychological and neurophysiological mechanisms are inherently linked.

Weaknesses of the study include the small difference in age between the FM and control cohorts; however when controlling for age, our main results did not change. HCPs were selected for their experience of FM; results are not necessarily generalisable to all HCPs treating FM. Personality traits identified as associated with FM might not be specific for FM, but in general associated with conditions causing chronic pain and suffering. However, a recent study including women with FM, rheumatoid arthritis, spondyloarthritis or Sjögren's syndrome highlighted the specificity of a FM personality (15). It cannot be excluded that some of our results reflect participants' momentary affective states, which were not controlled. However, the relationship between momentary affect and personality domains is strong (55), so that this possibility does not question the proof of concept provided by this study: that HCPs can distinguish FM patients on the basis of personality items.

The strengths of our study are the novel design, looking from another angle at a possible FM personality, compared to studies with statistical analyses of average scores on a questionnaire, and the fact that the HCPs in two different scientific fields were recruited from two countries, reducing professional and cultural bias.

Conclusion

HCPs can distinguish patients with FM from healthy controls, with a statistically significant probability, based on a limited set of items from a personality questionnaire. In general, the HCPs' expectation that personality in FM patients is associated with higher levels for aspects of neuroticism (proneness to psychological distress) and lower scores for aspects of trust, proved to be correct. Their expectations of higher scores on items of conscientiousness were mostly not confirmed.

Key messages

- Health care providers can, by assessing several personality scores, distinguish fibromyalgia patients from pain-free controls.
- These discriminating personality items reflect mainly aspects of neuroticism.

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