The influence of type D personality on psychological well-heing, quality of life and disease activity in patients with rheumatoid arthritis : a prospective follow-up study

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Abstract

In other patient groups Type D personality has been found to influence psychological well-being and quality of life and to be related to levels of pro-inflammatory cytokines. The aim of the study was to investigate the association of Type D personality with these outcomes in rheumatoid arthritis patients. Eighty-two participants between 22 and 77 years of age, were included in the study. After explanation of the study by the rheumatologist, patients were asked to complete a questionnaire at baseline and after six months measuring the independent variable Type D personality and the dependent variables quality of life, health status, and psychological well-being. Disease activity was assessed by the disease activity score which consists of the amount of swollen and tender joints, the level of erythrocyte sedimentation in the blood and a VAS score. After controlling for potentially confounding variables, repeated measures multivariate analyses of covariance showed an association of Type D personality with a lower quality of life (p=0.01), a lower psychological well being (p=0.003), but not with disease activity (p=0.89). The results of this study show the potential importance of Type D personality in RA patients. More future research is needed in order to confirm these findings.

1. Introduction

Rheumatoid Arthritis (RA) is the most common chronic inflammatory disease.[1-3] The incidence of rheumatoid arthritis (RA) is approximately 3 cases per 10,000 people, whereas the prevalence rate is approximately 1%, thus making RA a common condition.[4] The significant public health impact of arthritis is reflected in a variety of measures. First, arthritis is the leading cause of disability.[2] Second, according to Healthy People 2010, health related quality of life measures show consistently low values for persons with arthritis.[4] Rheumatoid arthritis is persistent and characterized by pain, joint and/or muscle stiffness, and fatigue. In addition, people with this condition constantly live with unpredictable periods of symptom remission and exacerbation.[1-4] Disability significantly predicts depression and anxiety measured concurrently. Functional impairment has been consistently related to increased risk of mortality in RA patients over intervals from 5 to 25 years.[3] The life of RA patients after their diagnosis will be different and for that reason RA patients have to change their way of living.[5] Furthermore, RA patients experience psychological distress more often in comparison to the general population.[6] RA should be regarded as a long term stressor. The disease requires adaptation and involves many future uncertainties because it cannot be cured.[7] Therefore, quality of life in this population is found to be a very important treatment outcome.[8] The evaluation of this quality depends not only on the disease activity. Individuals show great variation in their psychological adaptation to the disease which is not often explained by variations in the inflammatory activity.[8,9] RA patients with a comparable disease activity differ greatly in their evaluation of

quality of life.[8] As a result it is clear that not only medical variables are responsible for the difference in quality of life. A possible explanation for individual differences in quality of life and physical functioning in RA patients involves relatively stable individual personality dispositions.

It is, however, only in recent years that a possible relation between personality and the individual differences in quality of life and physical functioning in rheumatoid arthritis patients has been investigated. An example is optimism, which has been found to be associated with better physiological and psychological well-being in RA patients. In contrast, patients with negative affectivity (one of the criteria for Type D personality) tend to experience a lower quality of life.[1O] One factor of the big five model, neuroticism, which is largely overlapping with negative affectivity, has been studied among RA patients. First, the prevalence of neuroticism is higher in the RA population than in the general population. People who tend to score high on this personality trait experience higher levels of anxiety and depression. As a result of that RA patients perceive a lower psychological well-being and quality of life. [11,12]

Personality may be an important cause of differences in functioning among patients with chronic illness. Neuroticism, for example, is an independent predictor of increased mortality in patients with cardiovascular disease.[13] A high score on two stable personality traits, negative affectivity and social inhibition defines patients with Type D personality.[14] Type D patients tend to experience increased negative emotions, generally feel sad and have a gloomy view of life (i.e. high negative affectivity).[15] They also have the tendency not to share these emotions with others

due to fears of how others may react (i.e. high social inhibition).[15] Only those patients who score high on both traits (the Type Ds) form a high-risk group. Type D personality is associated with a high risk of cardiac events, such as myocardial infarction and a threefold increased risk of a cardiac death in cardiac patients.[16-18] Studies have shown that Type D personality predicts adverse clinical outcomes, when adjusted statistically for anxiety and depression.[19] Furthermore, patients with a Type D personality have an increased risk of psychological distress and impaired quality of life.[20,21] Studies have also shown that differences in cytokine levels may play a significant role in mediating poor outcome in Type D patients with cardiovascular disease. According to Conraads et al. Type D personality was independently associated with increased circulating levels of TNF-α and sTNFR2 in CHF patients.[22] Denollet et al. examined the relation of Type D personality with TNF-α, sTNFR1, and sTNFR2 in 42 elderly men with CHF. Circulating levels of TNF-α, sTNFR1, and sTNFR2 were significantly higher in Type D patients as compared to non-Type D patients. The study suggests that individual differences in personality may contribute to the psychoneuroimmunological aspects of cardiovascular disease. Thus Type D personality has been found to be associated with enhanced levels of pro-inflammatory cytokines TNF-α and its receptors, which are important parameters in RA.[22-24]

In conclusion, while the role of personality in some medical patients has been found, the role of such characteristics in rheumatoid arthritis patients is not clearly understood. Type D personality has been found to be important in other chronic disease populations and may also be of importance to the RA population.

Rheumatoid arthritis is a chronic disease in which quality of life and inflammation play an important role. In other patient groups Type D personality has been found to influence psychological well-being and quality of life and to be related to levels of pro-inflammatory cytokines. As a consequence, these characteristics may be of great importance to psychological well-being, quality of life, and disease activity in patients with RA.

The benefits of this study are potentially very important. When the influences of personality on quality of life, psychological well-being and physical functioning are well understood, one may adjust treatment of RA patients to psychological profiles of patients with enhanced or decreased risk, ameliorating our care. Therefore, the aim of the study is to investigate the association of Type D personality with psychological well-being, quality of life and disease activity in rheumatoid arthritis patients. The hypotheses are a) Type D patients report a lower psychological well-being and quality of life; b) Type D patients show more severe disease activity. It is also of importance to see if this effect remains stable over time after a follow-up period of six months.

2. Method

Participants and procedure

Participants were recruited from the Maxima Medisch Centrum Eindhoven and were provided with information about the study by the rheumatologist. Inclusion criteria were a diagnosis of rheumatoid arthritis; starting treatment with methotrexate or a TNF-α antagonist and sufficient understanding of written and

spoken Dutch language. The exclusion criteria were age ≥ 80; chronic severe psychiatric conditions (e.g. psychosis or a personality disorder) and any infections during last week. If the latter condition was the case, but was very temporary (such as common cold), we aimed to postpone the inclusion by one or two weeks, depending on the duration of the condition.

The research design was a prospective follow-up study. The study time is 3 years. During the first two years patients will be included into the study. Hereafter, a one-year follow up is included. After explanation of the study, patients were asked to complete a questionnaire at home (T0). Follow-up moments for every patient are six (Ti) and twelve (T2) months after baseline. In the case of refusal it was requested to complete a short questionnaire with general variables such as gender, age, marital status, level of education and time since diagnosis. This thesis involves data gathered at T0 and Ti only.

The aim was to include a total of 200 individuals. This is based on our wish to detect a medium sized effect (a standardized β coefficient of .20 or an R^2 of .04 in the regression analysis). When α is set at the conventional level of .05 and power at .80 (two tailed), this results in a total of 195 patients.

All responders completed the questionnaires. In addition, the disease activity score was measured by the rheumatologist. Within a month before and a month after the other components were measured the erythrocyte sedimentation score (part of the disease activity score, see below) had to be completed.

Instruments

The personality variable that was measured is Type D personality and the medical independent variable was the treatment with methotrexate or TNF-α antagonist. The association of medication was examined in an exploratory way. The endpoints in this study were psychological well-being, quality of life and disease activity. The questionnaires were all self-report instruments. The Dutch versions are used. Besides these questionnaires the disease activity score (DAS) was measured.

Independent variables

Type D personality was measured with the 14-items Type D questionnaire (DS14).[25] This questionnaire consists of two subscales, negative affectivity and social inhibition. The two scales, consist of seven items each. Items are scored on a five-point Likert scale ranging from 0 (false) to 4 (true). Two items are contraindicative. The scores can be scored as continuous variables ranging from 0 to 28 on both scales. A cut-off score of ≥10 on both scales is used to classify subjects on Type D personality. In previous research the test-retest reliability over a 3-month period was 0.72 and 0.82 for negative affectivity and social inhibition respectively and there has been found a good internal consistency with Chronbach's α of 0.88 and 0.86 respectively for the subscales. Also the validity was confirmed.[25]

Outcomes

Quality of life was measured with the Health Assessment Questionnaire (HAQ) [26] and the Satisfaction with Life Scale (SWLS) [27]. The HAQ has been validated in a group of patients with a wide variety of rheumatic diseases, including rheumatoid arthritis and measures actually health status. The questionnaire consists of 20 items in 8 categories which represent a comprehensive set of functional activities (dressing and grooming; arising; eating; walking; hygiene; reach; grip and common daily activities). The set of each item asks over the past week "Are you able to..." perform a particular task. The responses are scored on a four-point Likert scale ranging from 0 (without any difficulty) to 3 (unable to do).[26] This questionnaire had a good reliability. Chronbach's α was between 0.85 and 0.95 in previous research.[27]

The SWLS is a brief questionnaire consisting of 5 items using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). It measures how satisfied patients are with their present life. The sum scores ranging from 5 to 35 with a higher score for more satisfaction with life. This questionnaire has a good validity and internal consistency (Chronbach's α of 0.87 in previous research).[27]

Psychological well-being was also measured with two scales. The Global Mood Scale (GMS)[28] and the Symptoms of Anxiety and Depression (SAD)[29]. The GMS consists of 10 positive and 10 negative mood terms. The patients have to answer on a five-point Likert scale ranging from 0 (not at all) to 4 (extremely) the extent to which he/she has experienced each mood state lately. The scores on both subscales range from 0 to 40 with a higher score for more positive or negative affect. This

questionnaire had a good validity and a good internal consistency in previous research (Chronbach's α of 0.90).[28]

The SAD consists of 4 items which are scored on a five-point Likert scale ranging from 0 (not at all) to 4 (very much). The sum scores are ranging from 0 to 16 with a higher score for more mixed anxiety-depression symptoms. The questionnaire is a reliable and brief index of mixed anxiety-depression symptoms. In previous research the scale had a good internal consistency (Chronbach's α of 0.86) and a good validity.[29]

The disease activity score (DAS) indicates how active the rheumatoid arthritis is at a certain moment.[30] The DAS consists of four parts: (a) the amount of swollen joints and (b) the amount of tender joints as determined by the rheumatologist (c) a general health assessment on a visual analogue scale (VAS) (from 1-100) obtained from the patient on self-evaluated disease severity, and (d) erythrocyte sedimentation in the blood. The DAS score can be calculated using the formula; DAS = 0.54($\sqrt{}$ number of tender joints)+0.065 (number of swollen joints)+0.33 erythrocyte sedimentation)+0.0072 (general health status). This total score is a number between 0 and 10. Patients with a higher score on the DAS have more disease activity than patients with a lower score. This composite measure has shown adequate validity.[30,31]

Covariates

Finally there were some covariates. First of all, a questionnaire was employed for assessing different socio-demographic and medical control variables, such as age, gender, education level, marital status, co morbidity and time since diagnosis.

In addition, social desirability was measured as a covariate. The short form of the Marlowe-Crowne Social Desirability Scale (MC-SDS)[32], which will be added to measure socially desirable answer tendencies consists of 15 items with 5 contraindicative items. The items are answered with false (0) or true (1). The total sum score is between 0 and 15. This original questionnaire has a sufficient internal consistency (Chronbach's α is 0.88) and a good validity[32], while the data regarding the Dutch short form are adequate[33] .

Statistic analyses

All analyses were performed using SPSS software. First responders and non-responders were compared on age, gender, education, marital status and time since diagnosis using independent sample t-tests or chi-square tests. For the responders, chi-square tests, independent sample t-tests and Pearsons correlations were used to examine the association of the covariates with the values for the independent variables Type D / non-Type D and also for the treatment with methotrexate (MTX) or TNF-c antagonist. Disease activity was also measured as a covariate in the analysis with quality of life and psychological well-being as dependent variables.

With regard to the hypotheses, repeated measures multivariate analyses of covariance (MANCOVA) was used to compare Type D / non-Type D and patients

treated with MTX or TNF-α antagonist in terms of their means on the three groups of dependent variables (quality of life with two variables, well-being with three variables, and disease activity with four variables) over the two measurement times. Therefore, three separate analyses were performed, for each group of dependent variables one. In this way, both hypotheses, the association between Type D personality and outcome variables, and the stability of this association over time, could be tested at once.

All analyses were controlled for age, gender and treatment condition. In addition, the covariates which were (nearly) significant ($p < .10$) for both the dependent and the independent variables in the analysis were controlled for.

3. Results

Responders appeared to tend to have a higher education level (at least high professional education) than individuals who did not complete the whole questionnaire at baseline; 60 % versus 20 %; χ^2 [1]= 8.56, p=0.003. The non-responders did not differ from responders regarding age, gender, marital status, treatment and time since diagnosis (p's > 0.10). Demographic characteristics of all participants are presented in Table 1.

Covariates and independent variables

An association between Type D status and social desirability was found (t [135]= 2.50, p= 0.01), indicating that Type D patients showed lower scores on this scale.

There were no significant association of Type D personality with other covariates; gender, education, marital status, age, time since diagnoses and all the parts of the DAS score (all $p>0.10$).

There were no significant differences in scores between treatment with MTX and treatment with TNF-α ($p>0.10$) for any of the covariates in this study.

Covariates and dependent variables

The VAS correlated significantly with the total disability score ($r=0.50$, $p=0.01$), the erythrocyte sedimentation in the blood ($r=0.24$, $p=0.01$) and also with a greater physical disability ($r=0.26$, $p=0.01$). There were no significant correlations between the VAS and life satisfaction and also no correlations were found between the VAS and positive or negative affect ($p> 0.10$).

High education level was associated with lower scores on physical disability ($t[134]=2.05$, $p=0.04$). No associations of education with the other dependent variables were found ($p> 0.10$).

Marital status is significantly related to satisfaction with life; being alone is associated with a lower satisfaction with life ($t[131]=-2.57$, $p=0.01$).

A significant positive correlation emerged between social desirability and satisfaction with life ($r=0.18$, $p=0.04$). In addition, there was a tendency which showed social desirability to be moderately correlated with negative affect ($r= -0.16$, $p< 0.06$) and positive affect ($r=0.16$, $p=0.07$). There were no significant results for the correlations between social desirability and the other subscales of the dependent variables.

Type D and Quality of Life

A statistically significant difference emerged between Type D patients and non Type D patients on the omnibus test of the combined dependent variables of quality of life (F[2,63]=4.60, p=0.01).

Patients with a Type D personality reported a lower life satisfaction than non-Type D patients across both time points (F[1,64]=9.27, p=0.003). However, no effect of type D personality on health status was found (F[1,64]=0.48, p=0.49). The covariates gender (F[2,63]=4.69, p=0.01) and age (F[2,63]=5.60, p=0.006) significant in this analysis. Women and older people experienced a lower quality of life then males and younger people. No main effect of time was found.

The effect of Type D personality remains stable over time after a follow-up period of six months as no interaction effect with time was obtained (Table 2).

Type D and Psychological Well-being

A significant difference between Type D patients and non Type D patients on the omnibus test of the combined dependent variables of psychological well-being was found (F[3,61]=5.30, p=0.003).

Type D personality was associated with more symptoms of anxiety and depression across both times (F[1,63]=12.46, p=0.001). In addition, Type D patients reported significantly lower positive affect (F[1,63]=7.40, p=0.008). There was no significant association of Type D status with negative affect (F[1,63]=2.10, p=0.15).

A higher age was also significantly related to more symptoms of anxiety and depression (F[1,63]=4.34, p=0.04).

No interaction of time with Type D personality was found (F[3,61]=0.34, p=0.79), which means the relationship between Type D and psychological well-being remains stable after a follow up period of six months (Table 2).

Type D and Disease Activity

No significant difference was found between Type D patients and non Type D patients on the combined dependent variables of disease activity (F[5,37]=0.33, p= 0.89).

There was no significant association of Type D with the total DAS score (F[1,41]=0.16, p=0.68). In addition, there was no difference between Type D and non-Type D patients on the erythrocyte sedimentation, swollen joints, tender joints or VAS (p>0.10). Older people showed higher levels of erythrocyte sedimentation in the blood (F[1,41]=10.99, p=0.002), a higher amount of tender joints (F[1,41]=4.31, p=0.04) and a higher total disease activity (F[1,41]=11.83, p=0.001) (Table 2).

Treatment condition and the dependent variables

There were no statistically significant differences between patients treated with MTX or TNF-α medication on any of the subscales of psychological well-being, quality of life or disease activity

4. Discussion

The aim of the present study was to examine the association of Type D personality with quality of life, psychological well-being and the disease activity in rheumatoid arthritis (RA) patients. In multivariate analyses, Type D patients reported lower life satisfaction but there was no association of Type D personality with the health status of patients. A relation between Type D personality and psychological well-being was found. Type D patients reported more symptoms of anxiety and depression and lower positive affect but there was no difference in negative affect. The effect of Type D personality on quality of life and psychological well-being remained stable after a follow up period of six months.

Regarding the first hypothesis an association of Type D with quality of life in RA patients was found. The association between Type D and quality of life has been found earlier in patients with cardiovascular disease.[16,21] Furthermore, the relation between negative affectivity (one of the aspects of Type D personality) and lower satisfaction with life scores in RA patients was reported in previous studies.[34] The association between Type D personality and health status has been found in earlier research in cardiovascular patients[14,35] but was not confirmed for RA patients in the current study.

The association of Type D personality with psychological well-being, found in this study, confirmed findings from earlier studies with cardiovascular patients.[16] In earlier studies a relation was found between Type D personality and enhanced levels of pro-inflammatory cytokines in the blood of patients with heart disease.[36] These patients also reported more self-evaluated cardiac symptoms than non-Type D patients.[18,21] However, in this study Type D patients with RA did not rate more disease activity symptoms and inflammation than non-Type D patients. This study provides some evidence to date that chronic emotional distress may not be associated with immune activation in rheumatoid arthritis. However, there is evidence on Type D suggesting that Type D may affect health through higher subjective feelings of stress.[37] Stress in RA patients stimulates pro-inflammatory mechanisms due to the defect of stress response systems (for example, the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis). Among other mechanisms, the loss of sympathetic nerve fibers in inflamed tissue and inadequate cortisol secretion in relation to inflammation leads to an enhanced pro-inflammatory load in RA. Stress and the subsequent stimulation of inflammation (systemic and local) leads to increased sensitization of pain and further defects of stress response systems (vicious cycle of stress, pain, and inflammation).[38] In conclusion, the effects of type D personality on disease activity in patients with rheumatoid arthritis may be mediated by stress. More research is needed to examine the mediating role of stress. Furthermore, in this study conclusions about the effect of type D personality on disease activity in RA patients have to be drawn with care because of several limitations (design, measuring instruments, sample

size) listed below. For example, a longer follow up period would give us more information about long term effects of type D personality on disease activity.

This study has a number of limitations which must be considered. First, the number of participants in this study was relatively small. According to a power analysis, our aim was to include a total of 195 RA patients. In this study 82 patients were included. Therefore the conclusions have to be drawn with care. Second, only baseline and follow up after six months were analyzed. To be better able to draw conclusions regarding the effect of Type D personality in RA patients further research is needed. Our aim is to include more RA patients and a one-year follow up period. Third, nearly all variables were measured with self-reported questionnaires. Fourth, there were missing values in the disease activity score and the erythrocyte sedimentation of this score was measured at different time points, ranging from 19 days before to 20 days after the questionnaire completion. Besides these limitations an advantage of the study is the high response rate. Ninety percent of patients asked to participate completed the questionnaires. In addition, this is the first study examining the association between Type D personality and psychological and physical well-being in RA patients.

In conclusion, this study showed an association of Type D personality with aspects of quality of life and psychological well-being in RA patients, but not with disease activity. Future research with larger sample size and a one-year follow is needed to be able to draw definite conclusions. The results of this study show the potential importance of Type D personality in RA patients. When future studies confirm these findings we are able to adjust our treatment to psychological profiles

of patients with enhanced or decreased risk for psychological disturbance. Psychological assessment and intervention - in addition to medical interventions - may be the only means with which to increase quality of life and psychological well-being in rheumatoid arthritis patients. Consequently, future intervention studies should investigate the possibility of reducing the impact of type D personality, since this taxonomy has been associated with a lower quality of life and psychological well-being. In addition, the type D scale (DS-14) could serve as a screening instrument for patients at risk in clinical practice.

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Table1 Demographiccharacteristicsof the entry population

	Total	Responders	Non-responders
Number			
Baseline	155 (100%)	140 (90%)	15 (10%)
Follow up (1/2 y)	85 (100%)	82 (96%)	3 (4%)
Average age (years)	57.26 (11.46)	57.27 (11.40)	57,20 (11.17)
Average time since diagnose (months)	52.27 (103.83)	53,38 (102.41)	42.43 (89.44)
Gender			
Male	70 (45%)	65 (46%)	5 (33,3%)
Female	85 (55%)	75 (54%)	10 (66.6%)
Education*			
High	87 (56%)	84 (60%)	3 (20%)
Low	68 (44%)	56 (40%)	12 (80%)
Marital status			
Alone	33 (21%)	30 (21%)	3 (20%)
Partner	122 (79%)	110 (79%)	12 (80%)
Treatment			
Methotrexate	119 (79%)	109 (73%)	10 (66.6%)
TNF-a	36 (21%)	31 (27%)	5 (33.3%)
Type D			
Yes	44 (31%)	44 (31%)	NA
No	96 (69%)	96 (69%)	NA

Note. High education defined as mid-level (vocational) education; low education level defined as lower (vocational) education.
NA= Not Assessed. * significant difference between responders and non-responders at $p < .05$

Table 2 Means and standard deviations of quality of life, psychological well-being and disease activity in Type D and non-Type D patients.

Baseline (n=140)	Type D patients	Non-Type D patients
Quality of life		
Satisfaction with life (SWLS)	21.95 (7.02)**	27.76 (5.28)**
Health Status (HAQ)	9.05 (5.18)	8.56 (5.77)
Psychological well-being		
Positive affect (GMS)	16.26 (6.39)*	22.27 (7.60)*
Negative affect (GMS)	16.53 (6.69)	10.99 (8.56)
Anxiety and depression (SAD)	4.95 (2.59)**	2.72 (2.75)**
Disease activity		
Swollen joints	7.10 (3.18)	8.47 (5.66)
Tender joints	6.60 (3.72)	7.42 (4.80)
VAS	57.70 (22.74)	53.32 (27.46)
Erythrocyte sedimentation	24.60 (15.54)	32.05 (22.65)
Total disease activity	4.91 (1.02)	5.07 (1.31)
Follow up after 6 months (n= 82)	Type D patients	Non-Type D patients
Quality of life		
Satisfaction with life (SWLS)	20.43 (7.21)**	27.76 (5.28)**
Health Status (HAQ)	7.95 (4.64)	6.08 (5.02)
Psychological well-being		
Positive affect (GMS)	16.63 (6.48)*	23.46 (8.07)*
Negative affect (GMS)	14.05 (5.41)	8.49 (6.87)
Anxiety and depression (SAD)	4.74 (3.49)**	2.02 (2.29)**
Disease activity		
Swollen joints	2.40 (2.91)	1.58 (3.30)
Tender joints	1.80 (2.62)	1.76 (2.98)
VAS	25.90 (25.25)	21.55 (20.78)
Erythrocyte sedimentation	14.90 (15.55)	19.66 (17.49)
Total disease activity	2.66 (1.49)	2.80 (1.40)

Note. α level of 0.05 was used for a significant result; * $p<0.05$. ** $p<0.01$. Main effects across time points are displayed.