Explanatory Style in Patients with Rheumatoid Arthritis: An Unrecognized Predictor of Mortality

Aaron D. Crowson, Robert C. Colligan, Eric L. Matteson, John M. Davis III, and Cynthia S. Crowson

ABSTRACT. ***Objective.*** To determine whether pessimistic explanatory style altered the risk for and mortality of patients with rheumatoid arthritis (RA).

Methods. The study included subjects from a population-based cohort with incident RA and a non-RA comparison cohort who completed the Minnesota Multiphasic Personality Inventory.

Results. Among 148 RA and 135 non-RA subjects, pessimism was associated with development of rheumatoid factor (RF)–positive RA. Pessimism was associated with an increased risk of mortality [HR 2.88 with similar magnitude to RF+ (HR 2.28)].

Conclusion. Pessimistic explanatory style was associated with an increased risk of developing RA and increased mortality rate in patients with RA. (First Release November 15 2016; J Rheumatol 2017;44:170–3; doi:10.3899/jrheum.160026)

Key Indexing Terms:
RHEUMATOID ARTHRITIS MORTALITY PSYCHOSOCIAL
PESSIMISM MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

The contribution of psychosocial factors to healthcare outcomes is widely appreciated and likely to play an even greater role as efforts toward integrated healthcare are pursued. Evidence suggests that personality traits can affect disease course and even mortality.

Explanatory style is a personality trait known to affect health and to result in poor health outcomes[1,2]. For example, a pessimistic explanatory style was associated with poorer survival in patients with lung cancer[3]. Pessimists had significantly more pain and lower physical activity after knee replacement surgery compared to non-pessimists[4].

Rheumatoid arthritis (RA) is a debilitating disease characterized by chronic pain and poorer outcomes, including increased risk of mortality[5]. Psychosocial factors, including depression and anxiety, are associated with adverse outcomes of RA[6,7], but little is known about the association between personality traits and RA. The aim of our study was to examine the relationship between pessimism and both the risk for developing RA and mortality rates among patients with RA.

MATERIALS AND METHODS

Study subjects. This is a retrospective study of Olmsted County, Minnesota, USA, residents with incident diagnosis of RA from 1955 to 2007 who completed the Minnesota Multiphasic Personality Inventory (MMPI). The study cohorts were assembled, following approval by institutional review boards of the Mayo Clinic (15-007631) and the Olmsted Medical Center (001-OMC-16), using the Rochester Epidemiology Project, a unique medical record linkage system that makes population-based epidemiologic research possible by providing access to comprehensive (inpatient as well as outpatient) medical records for all Olmsted County residents at any local provider[8].

The RA cohort included all residents of Rochester (the central city of Olmsted County) who were ≥ 18 years of age when fulfilling American College of Rheumatology 1987 classification criteria for RA from 1955 to 1979 and all Olmsted County residents fulfilling the criteria from 1980 to 2007[9,10]. RA incidence was defined as the date of first fulfillment of the criteria. A comparison cohort of residents without RA was obtained by randomly selecting a subject of similar sex and birth year for each patient with RA. The comparison subjects were assigned an index date corresponding to the RA incidence date of their matched patient. All study subjects were followed until death, migration, or January 1, 2015.

Smoking status and obesity (i.e., body mass index ≥ 30 kg/m^2) at incidence/index date were collected previously. History of depression prior to RA incidence/index date was obtained using diagnostic codes. The Charlson comorbidity index was calculated without the rheumatologic component[11].

We used patients who completed the MMPI at the Mayo Clinic at least once prior to the RA incidence/index date. The MMPI registry included those completed for medical evaluation and for research purposes. The original MMPI was composed of 550 unique true/false items regarding physical and emotional symptoms, attitudes, feelings, thoughts, and life experiences[12]. MMPI completed prior to age 18 years and those with > 100 missing

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responses were excluded. For patients with multiple MMPI, the earliest MMPI was used.

The Optimism-Pessimism (PSM) scale of the MMPI was developed from Seligman's theory of explanatory style. This theory postulates that people who attribute the cause of negative life events internally (to themselves), globally (affecting other aspects of their life), and with stability (continually happening), are at risk of disturbing their cognitive and emotional function, along with their physical health[3,13]. This validated scale, derived from 298 items, yields normalized T scores with a mean of 50 and SD of 10, with higher scores indicating pessimism. PSM scores were categorized using a cutpoint of 1 SD above the mean (i.e., PSM ≥ 60 defines pessimism)[1,2,3]. The MMPI Depression Scale 2 and item 51 ("I am in just as good physical health as most of my friends") were also examined[12].

Statistical analysis. Cohorts were compared using chi-squared and rank sum tests. Logistic regression was used to examine the association between pessimism and RA, with adjustment for age, sex, smoking, and obesity. Cox models, adjusted for age, sex, smoking, obesity, and Charlson index, were used to examine the association between pessimism and mortality in RA. The interaction between RF positivity (RF+) and pessimism was also examined. Kaplan-Meier methods were used to estimate mortality. Survival curves adjusted to the whole RA population were computed by averaging individual predictions from the Cox models. Analyses were performed using SAS version 9.4 (SAS Institute) and R 3.1.1 (R Foundation for Statistical Computing).

RESULTS

The study population included 148 patients with RA and 135 non-RA subjects who completed the MMPI before incidence/index date. Among 86 RA and non-RA subjects who completed many MMPI, only 12 (14%) changed from pessimistic to non-pessimistic and 5 (6%) changed from non-pessimistic to pessimistic. In addition, no difference was found in mean PSM scores between those who completed the MMPI before RA diagnosis (n = 148; mean PSM score 55.8) and those who took the MMPI after RA diagnosis (n = 53; mean PSM score 54.9; p = 0.56).

The MMPI were completed on average 13.7 years before incidence date for patients with RA and 14.2 years before index date for the non-RA subjects (Table 1). Only 9 patients with RA completed the MMPI between symptom onset and RA diagnosis. Patients with RA had higher Charlson index values at RA incidence/index date than non-RA subjects.

Pessimism was somewhat more common in RA (39%) than non-RA (31%; p = 0.19; Table 1). Among patients with RA, pessimism was more frequent in those with RF+ RA (44%) than in non-RA subjects (31%; p = 0.049). There was no difference in pessimism between RF– RA and non-RA groups (29% vs 31%; p = 0.76). After adjustment for known RA risk factors (age, sex, smoking, and obesity), the association between pessimism and RF+ RA persisted (OR 1.74; 95% CI 0.99–3.04; p = 0.053).

Among the 148 patients with RA, 64 died during a median of 13.5 years of followup. In a multivariable model adjusted for age, sex, calendar year, smoking, obesity, and Charlson index, RF+ patients had twice the risk of mortality as RF– patients (HR 2.28; 95% CI 1.10–4.73; Table 2) and pessimism increased the risk of mortality nearly 3-fold (HR 2.88; 95% CI 1.02-8.14). A significant interaction between RF positivity and pessimism (p = 0.037) demonstrated patients with both RF+ and pessimism did not have a higher risk of mortality than those with either. Ten-year survival was highest for RF– RA non-pessimists (93%) and was similar for the other 3 groups (73% RF+ RA non-pessimists, 77% RF– RA pessimists, and 84% RF+ RA pessimists; Figure 1). The MMPI depression scale (p = 0.88) and history of depression diagnosis (p = 0.32) were not significantly associated with mortality and did not change the association between pessimism and mortality (HR of pessimism for mortality: 2.97 following adjustment for MMPI depression scale and 3.00 following adjustment for history of depression).

DISCUSSION

Pessimism is associated with a higher likelihood of developing RF+ RA. Among patients with RA, pessimism was associated with a substantially increased risk of mortality.

Table 1. Characteristics of patients with and without rheumatoid arthritis (RA) who completed the Minnesota Multiphasic Personality Inventory (MMPI).

Characteristics	Non-RA, n = 135	RA, n = 148	p
Age, years, mean (± SD)	55.4 (± 12.9)	56.5 (± 12.9)	0.33
Sex, female	92 (68%)	112 (76%)	0.16
Year of index date, mean (± SD)	1995.5 (± 9.1)	1994.5 (± 9.8)	0.42
Time from MMPI to index date, yrs, mean (± SD)	14.2 (± 9.0)	13.7 (± 9.1)	0.71
MMPI Item 51: Health similar to peers (% true)	102 (77%)	106 (74%)	0.55
Pessimistic explanatory style*	42 (31%)	57 (39%)	0.19
MMPI Depression scale, mean (± SD)	58.4 (± 10.7)	58.7 (± 11.2)	0.83
Rheumatoid factor positivity	—	96 (65%)	
Sedimentation rate, median (25th percentile, 75th percentile)	—	23.0 (10, 40)	
Obesity (body mass index ≥ 30 kg/m^2)	46 (34%)	56 (38%)	0.51
Smoking status			0.13
Never	68 (50%)	60 (41%)	
Current	20 (15%)	34 (23%)	
Former	47 (35%)	54 (36%)	
Charlson comorbidity index, mean (± SD)	0.9 (± 2.2)	1.3 (± 1.9)	< 0.001
History of depression diagnosis	76 (58%)	84 (57%)	0.88

* Defined using the MMPI Optimism-Pessimism scale (≥ 60 classified as pessimistic).

Table 2. Multivariable model of mortality among patients with rheumatoid arthritis (RA) who completed the Minnesota Multiphasic Personality Inventory prior to RA incidence.

Characteristics	HR (95% CI)
Age, yrs	1.09 (1.06–1.12)
Sex, male	0.89 (0.50–1.60)
Calendar year of RA incidence	1.00 (0.97–1.03)
Current smoker	2.34 (1.17–4.67)
Former smoker	1.08 (0.55–2.12)
Charlson comorbidity index	1.10 (0.97–1.24)
RF and pessimism	
RF– and not pessimistic	1.0 (reference)
RF+ and not pessimistic	2.28 (1.10–4.73)
RF– and pessimistic	2.88 (1.02–8.14)
RF+ and pessimistic	1.67 (0.77–3.62)

RF: rheumatoid factor.

This increased mortality in patients with RA is consistent with that from studies of other chronic diseases, demonstrating that pessimism is associated with an increase in all-cause mortality[3,14]. Similarly, a study of lung cancer showed that pessimistic patients died on average 6 months earlier than non-pessimists[3].

Pessimism has also been associated with other poor health outcomes. A study of knee replacement surgery reported that patients who were classified as pessimistic had higher levels of reported pain and less physical activity 2 years after the surgery[4]. Similarly, after heart transplant, patients who were pessimistic showed more depressive symptoms, while those considered optimistic reported better overall quality of life[15].

The effect and biology of pessimism in RA is poorly studied. An association between poor positive affect (i.e., less optimism) and elevated interleukin 6 levels (a biomarker of inflammation) may partially explain why pessimism could affect RA[16]. A negative outlook (conceptualized by anxiety, depression, and pessimism) increased the chances of developing cardiovascular disease (CVD), also known to be influenced by inflammation, in patients with RA[6]. Others reported that depressive, anxious, or pessimistic outlooks led to increased rates of CVD and mortality in the general population[17,18].

Strengths of our study include its population-based design with extensive followup, and that most MMPI were completed years before the patients developed RA. The PSM scale has repeatedly shown reliability and validity[1,14], and explanatory style has demonstrated stability across many years of adult life[19]. The MMPI-2 and PSM-R are contemporary versions with the same properties that reduce respondent burden[20]. Some limitations to our study are its retrospective design, and that the MMPI were administered for a variety of reasons and not to all possible candidates, potentially resulting in a selection bias. Also, the small sample size limited statistical power to detect differences. Finally, the Olmsted County population is predominately white; therefore our results may not be generalizable to more diverse populations.

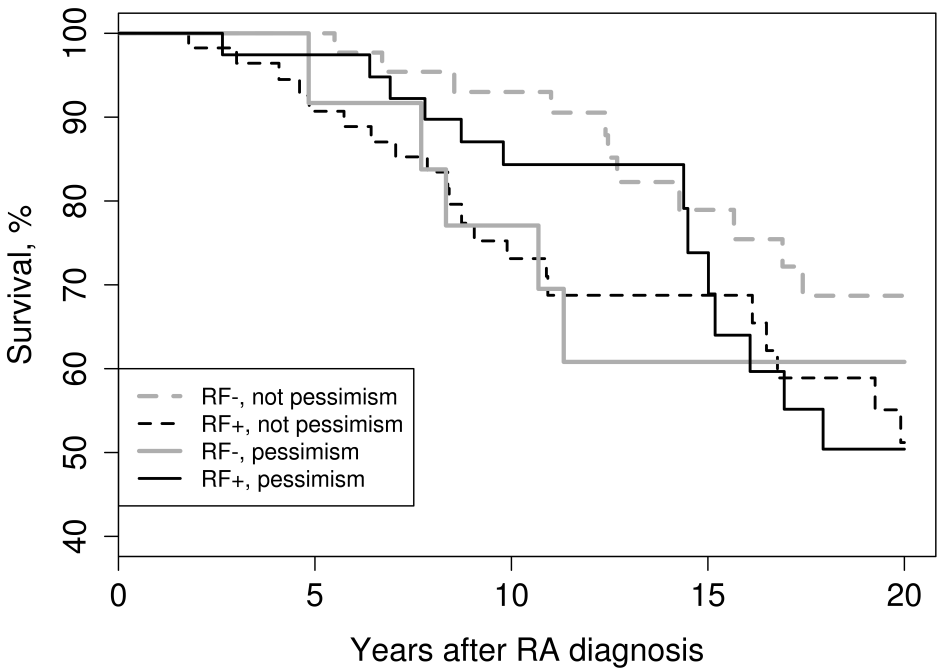

Figure 1. Survival curves for patients with rheumatoid arthritis (RA) who took the Minnesota Multiphasic Personality Inventory prior to RA diagnosis according to rheumatoid factor status (RF positive/negative) and pessimistic explanatory style (no/yes) adjusted for age, sex, calendar year of RA diagnosis, smoking status, and Charlson comorbidity index.

A pessimistic explanatory style was associated with an increased risk of developing RA and rates of mortality among patients with existing RA. Our results suggest that personality traits may influence how patients perceive and manage illness, as well as their global outcomes. Patients who learn and have techniques to counter consequences of pessimistic explanatory style may be able to achieve better outcomes of RA. Therefore, understanding personality traits is an important step in the holistic management of disease and a vital component of integrated care.

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