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# Paroxysmal atrial fibrillation, quality of life and neuroticism

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## ABSTRACT

**Background:** Paroxysmal atrial fibrillation (AF) is associated with significant impairment of quality of life (QoL), which is to a large extent independent of objective measures of disease severity. We sought to investigate the potential role of neuroticism in the impairment of QoL in patients with paroxysmal AF.

**Methods:** The study group (AF group) comprised 73 patients with paroxysmal AF (mean age 55.5 ± 13.3 years, 50 males). On average, patients had a three-year history of one symptomatic paroxysm a week lasting two hours. QoL was assessed using the Medical Outcomes Study Short Form (SF-36) and neuroticism was assessed using the short-scale Eysenck Personality Questionnaire (EPQ).

**Results:** The degree of neuroticism in the AF patient group did not differ from the degree of neuroticism in a group of age- and sex-matched controls (mean EPQ score on neuroticism 4.1 ± 3.0 and 3.9 ± 3.1, respectively; p=NS). Within the AF group, multivariate regression analyses showed that QoL in the physical domain (SF-36 physical functioning, physical role function, vitality and pain subscales) was not related the degree of neuroticism. In contrast, significant inverse relations were observed between scores on the mental health and social functioning subscales and the degree of neuroticism ( $\beta$  coefficients  $p < .05$ ), independent of age, sex and symptoms.

**Conclusion:** Based on the present study, patients with paroxysmal AF appear to have on average a degree of neuroticism similar to age- and sex-matched controls. However, the impairment of QoL in these patients, in particular regarding social functioning and mental health, seems to be related to a relatively high degree of neuroticism, independent of age and sex.

## KEYWORDS

Atrial fibrillation, neuroticism, quality of life

## INTRODUCTION

Atrial fibrillation (AF) is a very common arrhythmia, and its prevalence is still increasing. Two studies have recently been published with a primary focus on the impact of paroxysmal AF on quality of life (QoL);<sup>1,2</sup> both studies used the Medical Outcomes Study Short Form (SF-36). The two studies were consistent: patients with paroxysmal AF were characterised by rather low QoL across all domains (physical and social functioning, and mental health) compared with healthy controls. Of interest is that in both studies QoL only marginally depended on objective measures of disease severity (New York Heart Association functional class, left ventricular function) and even arrhythmia burden (frequency and duration of paroxysms, as based on the history) played a minor role. Instead, it was shown that the presence of cardiac symptoms associated with paroxysms of AF was predictive for impaired QoL.<sup>2</sup> For instance, chest pain and dizziness were associated with a low score on the physical role function subscale, which is probably not surprising. On the other hand, although loss of QoL is greater in severely symptomatic patients, even mildly symptomatic AF patients have a lower overall perception of well-being ('global life satisfaction').<sup>3</sup> In conclusion, the impairment of QoL in patients with AF is still only partly explained, and other factors should be considered. We hypothesised that neuroticism might be implicated in the impairment of QoL in patients with AF. Neuroticism is a stable personality trait, which gives an

indication of the emotional stability of a person. Persons with high scores on neuroticism scales tend to be anxious and to have more worries in general, and neuroticism has proved to be an important predictor of psychological distress, both in the presence and the absence of stressful circumstances.<sup>4</sup> More specifically, persons with a high degree of neuroticism often have vague complaints about their health, which are not readily attributable to objective somatic disease,<sup>5</sup> but which may nonetheless have a negative impact on their QoL. The aim of the present study was to investigate the potential role of neuroticism in the impairment of QoL in patients with paroxysmal AF.

## MATERIALS AND METHODS

### Patient selection and study design

The study group consisted of patients who had participated in a previous study on QoL.<sup>2</sup> Briefly, all consecutive patients from the outpatient clinic with paroxysmal AF, aged >18 years, were considered eligible for the study. Paroxysmal AF was defined as proposed by Gallagher and Camm:<sup>6</sup> paroxysms had to terminate either spontaneously or after treatment with an antiarrhythmic drug. The presence of AF was based on electrocardiographic evidence, including ambulatory (Holter) monitoring. Lone AF was inferred when routine cardiac investigations (echocardiogram, ergometry) did not reveal structural heart disease. Patients with hypertension were considered to have structural heart disease. In the first study<sup>2</sup> a set of questionnaires was administered to the patients, including questionnaires on QoL, symptomatology and personality. Data thus collected were entered into a database, and in the present study we used this database focussing on personality, that is, neuroticism. The study was performed in accordance with the Declaration of Helsinki and approved by the institutional ethics committee. Informed consent was obtained from all patients.

### Quality of life and symptomatology

Details have been described previously.<sup>2</sup> Briefly, QoL was measured by the SF-36,<sup>7</sup> which is a widely used, thoroughly validated, standardised, generic health survey, consisting of eight subscales that measure physical functioning, bodily pain, role limitations due to physical or emotional problems, social functioning, as well as sense of vitality, mental health and general health. These scales together cover the three major domains of QoL, i.e. physical and social functioning, and mental health. Scores of each subscale are transformed to a scale ranging from 0 to 100, with lower scores representing a lower QoL. The following symptoms were incorporated in the analysis: palpitations, dyspnoea, dizziness and chest pain. Patients were asked to rate these symptoms as they occurred during AF according to severity; none-to-mild or moderate-to-severe.

### Neuroticism

Neuroticism was assessed using the revised, short-scale Eysenck Personality Questionnaire (EPQ), with a validated Dutch translation (table 1).<sup>8,9</sup> Neuroticism is quantified using a set of 12 questions, to be answered with yes or no. The total score thus ranges from 0 to 12, a higher score signifying a higher degree of neuroticism.

**Table 1**

*Eysenck personality questionnaire (revised, short scale)*

Does your mood often go up and down?	Yes	No
Do you ever feel 'just miserable' for no reason?	Yes	No
Are you an irritable person?	Yes	No
Are your feelings easily hurt?	Yes	No
Do you often feel 'fed-up'?	Yes	No
Would you call yourself a nervous person?	Yes	No
Are you a worrier?	Yes	No
Would you call yourself tense or 'highly-strung'?	Yes	No
Do you worry too long after an embarrassing experience?	Yes	No
Do you suffer from 'nerves'?	Yes	No
Do you often feel lonely?	Yes	No
Are you often troubled about feelings of guilt?	Yes	No

Yes = 1; No = 0. Total score is calculated by adding the scores on the individual questions.

### Data analysis

First, in order to determine the relative degree of neuroticism in the AF patients, the EPQ scores on neuroticism were compared with scores in controls individually matched for age and sex, using t-tests for independent samples. The control subjects were taken from a previously established control group consisting of 849 randomly selected adults.<sup>9</sup> The analyses were performed for the two groups as a whole, as well as for subgroups according to age and sex. Second, in order to determine whether (impaired) QoL was related to the degree of neuroticism, multivariate regression analyses were performed. For each of the four symptoms, the independent contributions of the particular symptom and neuroticism to the QoL scores on any of the eight subscales were examined, thereby controlling for age and sex. Mean values  $\pm$  the standard deviation were calculated for normally distributed variables and median values with range were used for non-normal distributions. A p value <0.05 was considered statistically significant.

## RESULTS

### Patient characteristics

The study group comprised 73 patients. Clinical characteristics are given in table 2. Most patients were male and in

the majority no structural heart disease was apparent (lone AF). Almost half of the patients with structural heart disease had hypertension. None of the patients had congestive heart failure. Mean echo parameters were within the normal range. Self-reported arrhythmia burden in terms of the duration of the paroxysms ranged from 15 minutes to two days, whereas the frequency ranged from two paroxysms a year to five a week. On average, patients had a three-year history of one paroxysm a week lasting two hours. Most patients (70%) were on an antiarrhythmic agent to suppress their arrhythmia ('rhythm control'),

whereas the remaining patients (30%) were not taking any medications or only medication for control of ventricular rate during AF ('rate control').

### Neuroticism

All patients fully completed and returned the questionnaires. Mean total score in the AF group was  $4.1 \pm 3.0$  and mean total score in the control group was  $3.9 \pm 3.1$ , the difference not being statistically significant. Also in the subgroups according to mean age and sex no statistically significant differences were found between the AF group and the control group. These data imply that the degree of neuroticism in the AF patients was similar to that in the controls.

**Table 2**

#### Clinical characteristics

N	73
Age (years) $\pm$ SD	55.5 $\pm$ 13.3
<b>Sex</b>	
Male (%)	50 (68)
Female (%)	23 (32)
<b>Underlying heart disease</b>	
Ischaemic heart disease (%)	12 (16)
Valvular heart disease (%)	7 (10)
Hypertension (%)	11 (15)
Lone atrial fibrillation (%)	43 (59)
<b>Arrhythmia burden</b>	
Total duration (years) (range)	3.0 (0.2-30)
Frequency of paroxysms/week (range)	1.00 (0.04-5)
Duration of paroxysms (hours) (range)	2.00 (0.15-48)
<b>Echo parameters</b>	
Left ventricular end-diastolic dimension (mm)	47 $\pm$ 5
Left ventricular end-systolic dimension (mm)	32 $\pm$ 6
Left atrial dimension, parasternal (mm)	35 $\pm$ 6
Left atrial dimension, apical (mm)	54 $\pm$ 7
<b>Medication</b>	
Class I antiarrhythmics (%)	27 (37)
Class III antiarrhythmics (%)	24 (33)
Beta-blockers (%)	25 (34)
Digoxin (%)	7 (10)
No medication (%)	17 (23)

### Symptoms, neuroticism and quality of life

Regression coefficients indicating the independent relation between symptoms and neuroticism on the one hand and the eight QoL scales on the other, for each symptom separately, are presented in table 3. In the physical domain (physical functioning, physical role function, vitality and pain subscales) impaired QoL was significantly related to symptom severity for almost all symptoms ( $\beta$  coefficients  $p < 0.05$ ), but not to the degree of neuroticism. For example, scores on physical functioning were lower in the patients with moderate-to-severe palpitations as opposed to patients with none-to-mild palpitations ( $\beta$  coefficient  $-0.26$ ,  $p = 0.01$ ), whereas the degree of neuroticism did not play a role ( $\beta$  coefficient  $-0.03$ ,  $p = 0.81$ ). In contrast, significant inverse relations were observed between scores on the mental health and social functioning subscales and the degree of neuroticism ( $\beta$  coefficients  $p < 0.05$ ), whereas in this instance QoL was not related the severity of any of the symptoms. For example, scores on mental health did not differ in the patients with moderate-to-severe palpitations as opposed to patients with none-to-mild palpitations ( $\beta$  coefficient  $-0.01$ ,  $p = 0.95$ ). Instead, scores on mental health were significantly

**Table 3**

#### Relation of QoL with symptoms and neuroticism

		PHYSICAL FUNCTIONING		SOCIAL FUNCTIONING		PHYSICAL ROLE FUNCTION		EMOTIONAL ROLE FUNCTION		MENTAL HEALTH		VITALITY		PAIN		GENERAL HEALTH	
		$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P	$\beta$	P
Palpitations	Neuroticism	-.03	.81	-.39	<.01	-.07	.53	-.19	.12	-.74	<.01	-.02	.89	.06	.59	-.09	.44
	Palpitations	-.26	.01	.05	.69	-.27	.02	-.17	.17	-.01	.95	-.38	.07	-.18	.13	-.08	.48
Dyspnoea	Neuroticism	-.09	.36	-.39	<.01	-.16	.15	-.23	.06	-.74	<.01	-.28	0.2	.01	.92	-.12	.30
	Dyspnoea	-.26	.01	-.07	.55	-.43	<.01	-.12	.31	-.07	.43	-.32	<.01	-.28	.02	-.16	.16
Dizziness	Neuroticism	-.02	.86	-.35	<.01	-.06	.61	-.18	.14	-.70	<.01	-.25	.04	.06	.59	-.07	.56
	Dizziness	-.26	.02	-.16	.17	-.31	<.01	-.20	.10	-.19	.03	-.16	.18	-.18	.12	-.19	.10
Chest pain	Neuroticism	-.04	.68	-.21	.12	-.10	.41	-.20	.10	-.58	<.01	-.25	.04	.08	.48	-.09	.43
	Chest pain	-.33	<.01	.10	.59	-.28	.02	-.21	.09	.19	.16	-.25	.04	-.39	<.01	-.16	.17

Each symptom was dichotomised according to severity (none-to-mild or moderate-to-severe).  $\beta = \beta$  coefficient;  $p = p$  value.

lower when the degree of neuroticism was higher ( $\beta$  coefficient  $-0.74$ ,  $p < 0.01$ ). Regarding the emotional role function subscale, the results varied, both symptoms and neuroticism being implicated in some but not all instances. Finally, no relation was observed between general health and neuroticism nor between general health and symptoms.

## DISCUSSION

### Main findings

In the present study, patients with paroxysmal AF were found to have on average a degree of neuroticism similar to age- and sex-matched controls. However, within the group of AF patients, impairment of QoL, in particular regarding social functioning and mental health, was related to a higher degree of neuroticism, independent of age and sex.

### Atrial fibrillation and personality

The role of personality in patients with coronary artery disease is an issue of ongoing debate.<sup>10,11</sup> However, studies regarding personality and cardiac disorders other than coronary artery disease are scarce. In particular, to our knowledge no data are available on neuroticism in patients with AF, despite the fact that AF is rapidly becoming a major health problem associated with substantial morbidity and mortality. Perhaps based on clinical experience with individual patients one might intuitively surmise that patients with paroxysmal AF have on average a higher degree of neuroticism than other persons. However, the results of our study clearly indicate that this is not the case; although the EPQ scores on neuroticism differed among the individual patients, including some patients with high scores, mean score in the group as a whole was similar to the mean score in the group of age- and sex-matched controls. In other words, patients with paroxysmal AF would on average appear to have a 'normal' degree of neuroticism.

### Quality of life and neuroticism

Notwithstanding the observation that patients with paroxysmal AF have on average a normal degree of neuroticism, it would be conceivable that patients with paroxysmal AF with a higher degree of neuroticism suffer from an even lower QoL than patients with a lower degree of neuroticism. Unlike the more physical domain of QoL, in the domains of social functioning and mental health a high degree of neuroticism was indeed found to be related to a low QoL. In more practical terms this finding implies that patients with a high degree of neuroticism experience poor social functioning and mental health, irrespective of the presence of the physical symptoms associated with their arrhythmia.

In other words, whether or not the patient suffers from palpitations (or other symptoms), social functioning and mental health are likely to be poor if the patient has a high degree of neuroticism. Extending this concept even further, it may even be surmised that the presence or absence of AF as such is irrelevant, patients with a high degree of neuroticism experience poor social functioning and mental health anyway. Our study also provides a likely explanation for the finding in a previous study on QoL in patients with AF by Paquette *et al.*<sup>12</sup> By using the Barsky Somatosensory Amplification Scale, they investigated the tendency of AF patients to somatise, i.e. to amplify benign bodily sensations, and they showed that a high tendency to somatise predicted a poor QoL. Since the tendency to somatise is one of the established features of neuroticism,<sup>5</sup> it is readily conceivable that neuroticism was the actual underlying personality disorder in these patients.

### Methodological considerations

In the present study we assessed the relation between neuroticism and QoL. The analysis was corrected for age and sex, but we did not incorporate measures on structural heart disease and arrhythmia burden. Also, medication (in particular antiarrhythmic agents) was not incorporated in the analysis. However, these factors have previously been shown to have only a minor effect (at the most) on QoL.<sup>1,2</sup> Another consideration concerns the possibility that personality was affected by paroxysmal AF. In particular, it is intuitively conceivable that the degree of neuroticism would increase over time, secondary to the illness. However, as a constitutional entity, personality is stable over time, and life events (including somatic disease) do not significantly affect personality.<sup>13</sup> Moreover, the fact that the degree of neuroticism in patients with AF was not higher than in controls argues against such an effect. Finally, this study was not designed to determine whether the patients were 'neurotic' in terms of a psychiatric disorder. Instead, the concept of neuroticism was used to describe a normal variant of human personality, and the results of our study merely indicate that the impairment of QoL in patients with paroxysmal AF is related to the relative degree of neuroticism, patients with a relatively high degree of neuroticism suffering from a lower QoL than patients with a lower degree of neuroticism.

### Possible implications

Previous studies have shown that treatment of patients with paroxysmal AF, either with medication<sup>14</sup> or ablation techniques<sup>15,16</sup> leads to improvement of QoL. However, despite significant reduction of arrhythmia burden, not all patients obtained benefit from treatment in terms of QoL. Given the results of our study, it is conceivable that differences in the degree of neuroticism between the

patients played a critical role in this connection, patients with a high degree of neuroticism benefiting less from treatment. As a practical implication, our findings suggest that when treating patients with paroxysmal AF one should take into consideration whether the patient has a high degree of neuroticism or not. If so, the goal of treatment in terms of improvement of QoL should probably be not too high, at least not regarding social functioning and mental health.

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