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Influence of personality on sexual quality of life in epilepsy

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ABSTRACT – We prospectively investigated the effect of personality on sexual quality of life (SQOL) in 49 epilepsy patients (23 women). Fifteen patients had generalised epilepsy and 34 had focal epilepsy. SQOL was determined using the Derogatis Interview for Sexual Function - Self Report Inventory (DISF-SR) and personality was studied using the NEO five-factor inventory (NEO-FFI). Lower extraversion and female sex were factors associated with decreased SQOL, accounting for 22% of SQOL variance. Our results suggest that particularly introverted women with epilepsy may have an elevated risk of decreased SQOL.

Key words: sexual dysfunction, sexual quality of life, Derogatis Interview for Sexual Function (DISF), personality, life satisfaction, extraversion, NEO-FFI

Epilepsy is associated with an increased rate of sexual dysfunction in women and men (Morrell *et al.*, 1994; Morrell and Guldner, 1996; Herzog *et al.*, 2005). The aetiology of sexual dysfunction in epilepsy is probably multifactorial (Morrell, 1991), based on endocrinological, neurological, pharmacological, psychological, and social factors (Baird *et al.*, 2003; Devinsky, 2005; De Souza *et al.*, 2000; Morrell *et al.*, 2005; Harden, 2002; Lambert, 2001). While endocrinological and pharmaceutical correlates have frequently been studied, studies focusing on psychological influences are far less reported (Talbot *et al.*, 2008). The present study investigated the influence of personality on sexual dysfunction in epilepsy patients.

The term "sexual dysfunction" may refer to different aspects such as erectile dysfunction or decrease in libido. In the present study we documented sexual well-being using a comprehensive questionnaire covering several sexual functions and aspects in women and men (Derogatis *et al.*, 1991; Derogatis, 1997). We have used the term sexual quality of life (SQOL) (Arrington *et al.*, 2004) which encompasses five to six different domains which include: (a) interest, desire, and libido, (b) satisfaction with or quality of sexual experiences such as ejaculation or orgasm and pain or discomfort with sex, (c) sufficient excitement and arousal, for example, as shown by sufficient erection or lubrication for intercourse, (d) the ability to achieve an orgasm, (e)

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attitudes or behaviours, for example, feelings of avoidance or embarrassment and fluctuation in the frequency of sexual intercourse, and (f) the impact of sexual functioning on the relationship (Derogatis, 1997; Arrington *et al.*, 2004).

Personality has an influence on quality of life in healthy adults (Ramanaiah *et al.*, 1997). An influential model of personality is the five-factor model (*e.g.* Costa and McCrae, 1992) which distinguishes between openness to new experiences, conscientiousness, extraversion, agreeableness, and neuroticism. Epilepsy is often related to accentuated personality traits (Rose *et al.*, 1996), and a substantial number of epilepsy patients suffer from low quality of life. Thus, personality changes due to epilepsy may have a negative impact on the patient's quality of life. For example, increased neuroticism in epilepsy patients correlates with depression and anxiety and is inversely related to quality of life (Swinkels *et al.*, 2003). Moreover, low quality of life and depression (with or without antidepressant medication) is frequently related to decreased libido (Mathew and Weinman, 1982). Accordingly, epilepsy patients with symptoms of depression and anxiety frequently also suffer from sexual dysfunction (De Souza *et al.*, 2000; Morrell *et al.*, 2005; Talbot *et al.*, 2008). In the present study, we hypothesized that accentuated personality traits in epilepsy patients may have a negative influence on their SQOL.

It is known that certain personality traits may have a positive or negative influence on sexual quality of life. For example, in patients with sexual problems, elevated neuroticism is correlated with dysphoric symptoms, negative body image, and lowered sexual satisfaction. On the other hand, more extraverted patients with sexual problems report more sexual drive and experience a more positive body image, and more positive affects in relation to sexuality than patients with low extraversion (Costa *et al.*, 1992). Furthermore, openness to new experiences is positively correlated with the range of sexual experiences, a liberal attitude towards sex, and sexual drive and fantasy (Costa *et al.*, 1992). In the present study we hypothesised that while extraversion and openness could have a positive effect, neuroticism could have a negative effect on SQOL in epilepsy patients.

SQOL and its determinants may differ between the sexes. Interestingly, sexual dysfunction is related to psychological and social problems in women, but to self-reported physical problems in men (Harris *et al.*, 2008; Dunn *et al.*, 1999). In order to study SQOL in both women and men with epilepsy, the DISF-SR (Derogatis *et al.*, 1991; Derogatis, 1997; Derogatis, 1996) was selected as a questionnaire to determine sexual quality of life. This inventory includes almost identical versions for women and men, but at the same time still carefully considers important differences between the sexes in relation to arousal and orgasm.

Methods

Patients

This study received prior approval from the hospital's ethics committee and has been performed in accordance with the ethical standards laid down in the Declaration of Helsinki of 1975, as revised in 1983. Each participant gave informed consent to the study. Forty-nine patients were included in the present study (23 women and 26 men). Fifteen patients had generalised epilepsy and 34 patients had focal epilepsy. In order to compare the patients' results with healthy individuals, we report norm scores for the different questionnaires in addition to the raw scores. The patient sample reported in this study is part of an ongoing research project (see Mölleken *et al.*, 2009). The criteria for inclusion were age, between 18 and 65 years, and fluency in German. Exclusion criteria were psychiatric diagnoses other than depression or anxiety disorder, a verbal intelligence quotient below 75, and the intake of enzyme-inducing AEDs. Crystallized verbal intelligence quotient (IQ) was estimated using the German vocabulary test "Wortschatztest" (Schmidt and Metzler, 1992). Patients with diseases other than epilepsy (*e.g.* hypothyroidism, sleep disorder) or receiving medication other than AEDs (*e.g.* antidepressants) were also excluded from this study.

Procedures

All patients admitted to the clinic between February 2006 and March 2007 were asked to participate in the study if they met the inclusion criteria. Sixty-two of 199 patients (31%) refused to take part or did not return the questionnaires. Of these patients, three had generalised epilepsy, 34 had focal epilepsy, 12 patients had a psychiatric diagnosis, nine had diagnoses other than epilepsy or psychiatric illness, two patients had epilepsy of unclear aetiology, and in two patients the diagnosis remained unclear even after intensive video-EEG-monitoring. Thirty patients were women and 32 were men. The mean age was 37 years (n = 62; SD = 12).

Of the remaining 137 patients, we further excluded 88 patients based on the following (many patients had two or more reasons leading to their exclusion): 48 patients had a psychiatric co-morbidity other than self-reported depression or anxiety disorder (mostly substance abuse or alcohol abuse); patients with organic amnesic syndrome were also excluded, as we felt that these patients may not have been able to reflect on their past experiences well enough to fill out the questionnaires validly; 23 patients had a neurological co-morbidity other than epilepsy (*e.g.* severe head injury, stroke); 14 patients had internal co-morbidities (*e.g.* urological diagnoses, thyroid disease, heart disease); 13 patients received a primary diagnosis other than epilepsy (*e.g.* sleep disturbance, syncope due to non-neurological reasons); 12 epilepsy patients took enzyme-inducing antiepileptic

drugs known to influence SQOL (Mölleken *et al.*, 2009). In addition, five patients otherwise suited to the study did not complete all three questionnaires relating to SQOL, life satisfaction, and personality (see below), and were thus also excluded. Patients received the questionnaires during the first three days of their stay, as the questionnaires related to the preceding four weeks.

Assessment of SQOL

We employed the German version of the DISF-SR (Derogatis *et al.*, 1991; Derogatis, 1997; Derogatis, 1996). The inventory includes versions for women and men, each composed of 25 items assessing five SQOL domains: cognition and fantasy (abbreviated to "fantasy"; five items), arousal (five items), behaviour and experience ("experience"; five items), orgasm (six items), and drive and relationship ("drive"; four items). The domains "fantasy", "experience", and "drive" use identical items for both versions. In the domain "arousal" both of the two items differ between the two versions. In total, of the 25 items, seven are different between the two versions. Items are answered on either five- or nine-point scales. The five-point scale ranges from "not at all" to "very much so" and questions, for example, the quality of orgasm. One nine-point scale ranges from "not at all" to "four times a day or more often" and questions, for example, the frequency of sexual arousal. The other nine-point scale ranges from "could not be worse" to "could not be better" and questions, for example, overall sexual drive. The DISF-SR has proven reliability (internal consistency, test-retest and inter-rater reliability) and construct validity (Derogatis, 1997). Higher scores represent better SQOL. In addition to the raw scores, we report T-scores for women and men for the five subscales and the overall score (mean = 50; SD = 10). The norms are based on community populations (n = 277). In the DISF-SR, women require ten raw score points less than men in the overall score (73 *versus* 83) to reach a gender-keyed T-value of 50 and nine raw score points less in the sub-scale "fantasy" (16 *versus* 25). This means the gender-keyed norm scores adjust for generally less frequent sexual fantasies in women than in men. The raw score, to reach a T-value of 50, is very similar or identical between women and men in the sub-scales relating to arousal (13 *versus* 13), experiences (14 *versus* 14), orgasm (16 *versus* 17), and drive (15 *versus* 15). It is important to note that even when all items differ between women and men in the sub-scale relating to arousal, the relationship of raw and norm scores is identical in women and men.

Assessment of personality

The NEO-FFI was used to assess neuroticism, extraversion, openness, agreeableness, and conscientiousness (Costa and McCrae, 1992; Borkenau and Ostendorf, 1993). It contains 60 items on a five-point scale, ranging from "strongly agree" to "strongly disagree". The NEO-FFI has proven reliability (internal consistency, test-retest reliability) and construct validity (Borkenau and Ostendorf, 1993). We report gender-keyed T scores (mean = 0; SD = 1). The norms are based on a representative sample of 2,112 adult healthy individuals.

Assessment of general life satisfaction, depression, and trait anxiety

As a control measure, general life satisfaction was assessed using the Life Satisfaction Questionnaire (Fahrenberg *et al.*, 2000). This inventory covers ten areas of life (health, professional life, financial situation, leisure and hobbies, marriage and partnership, relationship to own children, self-esteem, sexuality, social life and living situation). Each domain includes seven items, rated on a seven-point scale from "very unhappy" to "very content". An overall score is calculated from seven domains (excluding professional life, marriage and partnership, and relationship to own children). The Life Satisfaction Questionnaire has proven reliability (internal consistency) and construct validity (Fahrenberg *et al.*, 2000). We report the overall raw score and the respective gender-keyed and age-corrected norm-score on a nine-point standard scale (mean = 5; SD = 2). The norms were based on a representative sample of 2,780 healthy individuals. As a further control measure, we quantified depressive symptoms with the Beck Depression Inventory (BDI; Hautzinger *et al.*, 1993). Anxiety symptoms were quantified by the "trait" sub-scale of the State Trait Anxiety Inventory (STAI; Laux *et al.*, 1981). We report age-corrected, gender-keyed percentile scores for women and men.

Diagnostic work-up

All patients underwent a diagnostic workup with 24- to 72-hour video-EEG-monitoring, and structural magnetic resonance imaging studies. Focal epilepsy diagnosis was based on seizure semiology and interictal or ictal EEG abnormalities. Auras and seizure semiology were documented as reported by either the patient, witnesses, or during video-telemetry or video-EEG monitoring (Lüders *et al.*, 1998; Manford, 2001; Rosenow *et al.*, 2001). Idiopathic generalised epilepsy was defined by typical semiology of juvenile myoclonic epilepsy, absence seizures, or primary generalised tonic-clonic seizures and generalised EEG patterns during video/EEG monitoring. Patients taking more than one antiepileptic drug (AED) were classified as receiving "polytherapy". Patients receiving phenytoin, carbamazepine, or primidone were classified as "taking an enzyme-inducing AED".

Statistical methods

We analyzed the influence of personality on SQOL by stepwise backward multiple linear regression analysis

with an exclusion criterion of $F < 3$. We used both raw and norm scores for these analyses. The DISF-SR overall score was used as the dependent variable, and the five NEO-FFI personality factor scores were used as independent variables. Overall life satisfaction and sex were used as control variables (for further detail see "results" section below).

Results

The demographic and clinical description of the patient sample is described in *table 1*. Mean values for the DISF-SR scores, the NEO-FFI scores and the further control scores are given in *table 2*. In order to depict a decrease of SQOL in our sample, we report the mean

Table 1. Demographic and clinical description of the patient sample.

Variable	n = 49	Men	Women
Sex (women/men)	23/26		
Age (years; mean, SD)	34 (11)	34 (11)	34 (11)
Verbal IQ	98 (12)	100 (12)	98 (12)
Partnership (marriage or partnership vs. single)	34/15	16/10	18/5
Duration of partnership (n = 34; median, quartiles)	7 (2;15)	6 (2;16)	8 (2;14)
Body Mass Index (mean, SD)	27 (6)	28 (5)	27 (7)
Focal epilepsy/generalised epilepsy	34/15	18/8	16/7
Duration of epilepsy (years; median; quartiles)	11 (3;25)	15 (4;23)	10 (1;28)
Seizure frequency (none/rare/often/very often)	3/9/18/19	2/7/10/7	1/2/8/12
Poly-/Monotherapy/No AEDs	15/22/12	9/12/5	6/10/7
BDI (sum score; median, quartiles)	9 (2;14)	8.5 (2;15)	10 (2;12)
STAI (percentiles; mean = 50; SD = 34)		69.5 (29.7)	63.9 (29.0)
Life satisfaction (raw score)	237 (41)	230 (45)	245 (35)
Life satisfaction (Stanine; mean = 5; SD = 2)		3.7 (2.3)	4.5 (1.9)

Table 2. Mean DISF and NEO FFI scores for women and men, and for the overall group.

Scale	n = 49	Men	Women
DISF fantasy, raw score	21 (11)	27.0 (7.9)	14.2 (9.9)
T-score (mean = 50, SD =10)		53.4 (9.2)	45.6 (12.3)
DISF arousal, raw score	14 (9)	17.3 (10.0)	9.4 (6.6)
T-score		56 (19.4)	40.1 (15.0)
DISF experience, raw score	11 (8)	12.5 (8.3)	10.3 (7.5)
T-score		45.9 (15.3)	43.4 (14.8)
DISF orgasm, raw score	13 (8)	15.4 (7.6)	10.6 (7.9)
T-score		46.3 (16.3)	40.7 (13.8)
DISF drive, raw score	13 (5)	14.8 (4.5)	11.8 (5.5)
T-score		47.8 (12.0)	42.0 (14.0)
DISF overall score	71 (34)	84.9 (28.8)	56.3 (32.5)
T-score		50.8 (15.9)	40.0 (17.2)
NEO-FFI Extraversion, raw score	2.2 (0.5)	2.1 (0.6)	2.2 (0.5)
T-score (mean = 0; SD =1)		-0.5 (1.0)	-0.3 (0.9)
NEO-FFI Neuroticism, raw score	2.0 (0.6)	1.9 (0.7)	2.0 (0.5)
T-score		0.4 (1.0)	0.1 (0.7)
NEO-FFI Openness, raw score	2.3 (0.5)	2.2 (0.5)	2.4 (0.4)
T-score		-0.9 (0.9)	-0.7 (0.8)
NEO-FFI Agreeableness, raw score	2.5 (0.5)	2.5 (0.4)	2.5 (0.5)
T-score		0.2 (0.9)	0.0 (1.2)
NEO-FFI Conscientiousness, raw score	2.7 (0.5)	2.8 (0.6)	2.5 (0.5)
T-score		0.3 (0.9)	0.0 (0.7)

norm values of the DISF-SR for women and men as provided by the questionnaire manuals with the mean T-score in the healthy norm sample. As can be seen in *table 2*, lower DISF scores were reported in women than men, visible in all raw and norm scores. Also, women's DISF overall score was one standard deviation below the expected mean, while men showed normal SQOL in comparison with the norm values given in the manual. In contrast, men showed relatively low life satisfaction. Women and men did not differ with respect to symptoms of anxiety and depression as tested by BDI and STAI. Moreover, our sample did not show elevated symptoms of depression or anxiety *(table 1)*. Both women and men exhibited low norm scores in extraversion and openness to new experiences, and high norm scores in neuroticism *(table 2)*. Agreeableness and conscientiousness did not differ from the mean of the norm population.

To test the hypothesis of the present study, *i.e.* whether personality traits influence SQOL in epilepsy patients, we calculated a regression analysis with the DISF-SR overall score as the dependent variable, and the five personality factor scores, sex, and the life satisfaction score as independent variables (n = 49). DISF-SR overall T-score was predicted by sex (t (46) = - 2.7, beta = - 0.36, p = 0.007) and the T-score for extraversion (t (46) = 3.1, beta = 0.39, p = 0.003). This model explained 22% of the variance (corrected $R^2 = 0.22$, F (2,46) = 7.8, p = 0.001). The effect of extraversion on DISF-SR overall T-score is illustrated in *figure 1*. When using raw scores from the questionnaires instead of the norm scores, we received a very similar result. DISF-SR overall raw score was predicted by sex (t (46) = - 3.9, beta = - 0.48, $p < 0.001$) and extraversion (t (46) = 3.0, beta = 0.37, p = 0.004). The model explained 29% of the variance (corrected $R^2 = 0.29$, F (2,46) = 10.7, $p < 0.001$).

We subsequently explored the more fine-grained influence of sex, the five personality factors, and life satisfaction on the different SQOL sub-scales. We calculated five regression analyses with the different DISF-SR sub-scores as the dependent variable, and the five personality factor scores, sex, and the life satisfaction score as independent variables (n = 49). Employing the norms scores, we obtained the following results:

1) **DISF-SR fantasy** was predicted by sex (t (45) = - 3.6, beta = - 0.44, $p < 0.001$), extraversion (t (45) = 3.7, beta = 0.46, $p < 0.001$), and conscientiousness (t (45) = - 2.2, beta = - 0.28, p = 0.03). The model explained 31% of variance (corrected R^2, F (3,45) = 8.1, $p < 0.001$);

2) **DISF-SR arousal** was predicted by sex (t (47) = - 3.0, beta = - 0.40, p = 0.003). The model explained 15% of variance (corrected R^2, F (1,47) = 9.2, p = 0.004);

3) **DISF-SR experience** was predicted by extraversion (t (47) = 2.9, beta = 0.39, p = 0.006). The model explained 13% of variance (corrected R^2, F (1,47) = 8.2, p = 0.006);

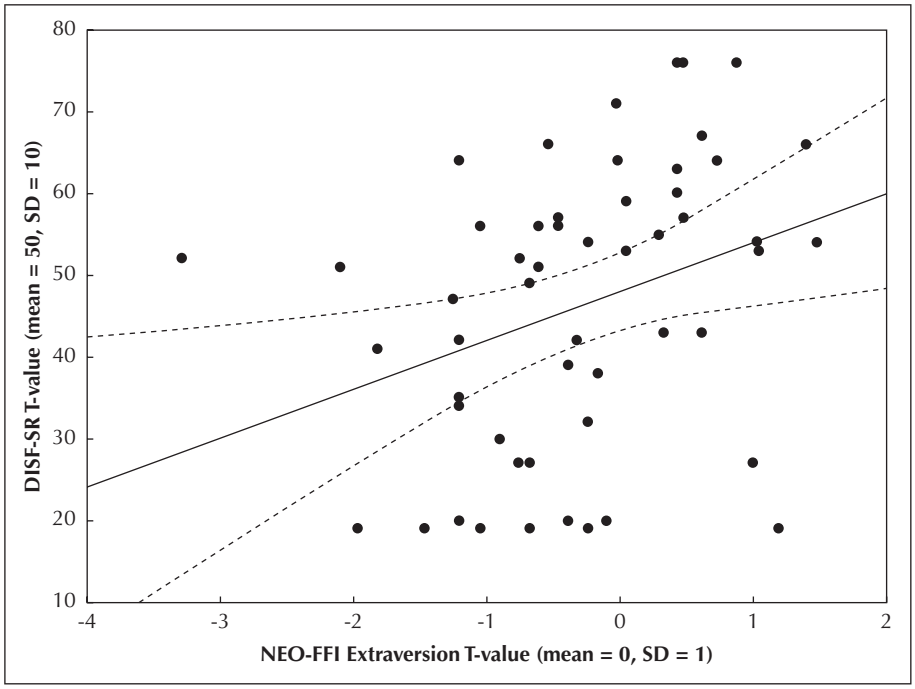

Figure 1. Correlation between NEO-FFI subscale extraversion T-score and SQOL overall T-score.

4) **DISF-SR orgasm** was predicted by sex (t (45) = - 2.4, beta = - 0.32, $p < 0.02$), agreeableness (t (45) = - 2.8, beta = - 0.41, $p = 0.006$), and life satisfaction (t (45) = 3.4, beta = 0.49, $p = 0.001$). The model explained 21% of variance (corrected R^2, F (3,45) = 5.3, $p = 0.003$);

5) **DISF-SR drive** was predicted by sex (t (44) = - 3.2, beta = - 0.43, $p = 0.003$), agreeableness (t (44) = - 2.6, beta = - 0.36, $p = 0.01$), conscientiousness (t (44) = - 1.9, beta = - 0.27, $p = 0.06$), and life satisfaction (t (44) = 4.0, beta = 0.62, $p < 0.001$). The model explained 25% of variance (corrected R^2, F (4,44) = 5.0, $p = 0.002$).

We also re-calculated the five latter analyses with raw scores instead of norm scores. This lead to very similar results when the identical variables were included in the respective regression models, and only minor changes in the beta scores, or the amount of variance explained by the models. It is important to note that we did not correct these post-hoc analyses for multiple significance tests, and the alpha error of the reported significances may thus be inflated. However, the resulting regression models remain significant even when the significance level was raised to $p < 0.01$.

As a side result of the present study, we further tested correlations between the five personality factors and life satisfaction in our patient sample (n = 49). Using raw scores, life satisfaction correlated negatively with neuroticism ($r = - 0.58$; $p < 0.001$), and positively with extraversion ($r = 0.57$; $p < 0.001$), agreeableness ($r = 0.44$; $p = 0.04$), and conscientiousness ($r = 0.40$; $p = 0.04$).

Discussion

In the present study, low extraversion and female sex were associated with decreased SQOL in epilepsy patients. Our results suggest that, in particular, introverted women with epilepsy may have an elevated risk of a decreased SQOL. This result is in line with our initial hypothesis that accentuated personality traits may negatively influence SQOL in epilepsy patients.

To our knowledge, the negative influence of low extraversion on SQOL has not previously been reported in epilepsy patients. In our study, extraversion was related to the frequency of sexual fantasies and sexual experiences, and to overall SQOL. In an earlier study in patients with sexual problems but without epilepsy, higher extraversion was related to increased drive, more sexual experience, a positive body image, and more positive affects in relation to sexuality (Costa *et al.*, 1992). The effect of extraversion on the frequency of sexual experiences found in this earlier study has therefore been replicated in our study. In addition, we observed that extraversion was only moderately decreased in men and women with epilepsy when compared with the norm value, as provided by the NEO-FFI manual. Future studies should analyse causes of lower extraversion in epilepsy. We also found low openness to new experiences and high neuroticism in epilepsy patients. However, in contrast to an earlier study, we found no correlation with overall SQOL (Costa *et al.*, 1992).

In the present study, women with epilepsy had less frequent sexual fantasies and sexual arousal, lower orgasm quality, and lower sexual drive than men with epilepsy. The effect of sex on SQOL in epilepsy in the present paper became evident based on both raw scores and gender-keyed norm scores. Moreover, lower DISF-SR scores were reported for women than men with epilepsy, again visible in all raw and norm scores. Also, the DISF-SR overall score of women was one standard deviation below the expected mean as provided by the test manual, while men showed normal SQOL. Thus, although the DISF-SR versions for men and women may differ in some respects, the lower SQOL we report for women cannot be attributed to the differences in the inventories for women and men in some of the sub-scales (see "methods" section). Also, the lower DISF-SR overall score in women is not explained by more severe depression or lower life satisfaction in women than in men with epilepsy. We conclude that women with epilepsy have a decreased SQOL compared to the expected SQOL in healthy women *(table 2)* and in comparison to men with epilepsy. To our knowledge, this is the first study to directly compare SQOL in women and men. However, future studies comparing SQOL in women and men with epilepsy should include healthy participants in their analysis, to further validate this interpretation.

In contrast to earlier studies (*e.g.* Herzog *et al.*, 2005), we observed that men with epilepsy had normal SQOL. In a recent related paper, we reported that enzyme-inducing antiepileptic drugs negatively influence SQOL in men, but not in women (Mölleken *et al.*, 2009). In the present study, we excluded twelve patients taking enzyme-inducing antiepileptic drugs and this may explain why we could not observe a decrease of SQOL in men, and may account for differences of SQOL in epilepsy reported elsewhere.

Based on the present study, we cannot determine whether the correlation between extraversion and SQOL is causal, or merely an association. For example, epilepsy and psychosocial responses to the disease may lead to reduced quality of life that in turn might result in a change of personality. However, former longitudinal studies on the influence of personality on quality of life in epilepsy patients were able to show a causal influence of pre-operative personality on post-operative psychosocial adjustment and health-related quality of life (Rose *et al.*, 1996). Also, extraversion has been shown to be very stable throughout life (Srivastava *et al.*, 2003). In contrast, sexual quality of life can be sensitive to changes in relation to life circumstances (Arrington *et al.*, 2004).

It is plausible therefore that this asymmetry of extraversion and SQOL reflects a causal influence of extraversion on SQOL in this study, and not vice versa.

As mentioned in the introduction, certain personality traits in epilepsy patients are associated with depression and anxiety (Swinkels *et al.*, 2003). On the other hand, depression and anxiety are frequently associated with reduced sexual quality of life (De Souza *et al.*, 2000; Morrell *et al.*, 2005; Talbot *et al.*, 2008). This raises the question as to whether personality is directly associated with SQOL or whether the reported association between extraversion and SQOL is mediated by depression and anxiety. The lack of significant depression and anxiety in our sample suggests that mediation is not the answer.

One theoretical implication of the present research is the need for future studies on SQOL in epilepsy to recognise the influence of extraversion and sex on SQOL. As a clinical implication, personality traits and especially extraversion should be investigated using appropriate questionnaires, together with inventories of sexual quality of life, especially for women with epilepsy. Furthermore, our results raise the possibility that decreased SQOL in epilepsy patients due to introversion may be overcome by strengthening self-confidence by means of social skills training in adolescents (*e.g.* Cheng and Furnham, 2002). Our research underlines the view that the decrease in SQOL in epilepsy is multifactorial and calls for a multidisciplinary approach to ensure appropriate treatment (Morrell, 1991; Harden, 2002; Talbot *et al.*, 2008). □

Disclosure.

None of the authors has any conflict of interest to disclose.

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