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The relationship between the Neuro-Quality of Life Depression and Anxiety Measures and the Personality Assessment Inventory in persons with epilepsy

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ABSTRACT

Background: To investigate the associations between the Neuro-Quality of Life (NQOL) Depression and Anxiety measures with an objective emotional inventory (Personality Assessment Inventory; PAI), and demonstrate the clinical utility of the NQOL as screening measures for depression and anxiety in persons with epilepsy (PWE).
Methods: PWE (N = 72) were concurrently administered the NQOL Depression and Anxiety measures and the PAI. Pearson product moment correlations were used to determine the relationships between the NQOL measures and the respective PAI scales (i.e., depression, anxiety). One-way ANOVAs were conducted comparing NQOL scores between patients with elevated levels of depression and anxiety (T-score ≥ 65 on the PAI) to profiles that were within normal limits. Using sensitivity and specificity analyses, optimal cut-scores on the NQOL measures were determined.
Results: Participants were primarily Caucasian (89%), female (60%), and ~35 years old. The NQOL Depression measure was significantly correlated with the PAI Depression total score ($r = .747$; $p < 0.001$) and its subscales (p's < 0.001). Similarly, the NQOL Anxiety measure was significantly correlated with the PAI Anxiety total score ($r = .750$; $p < 0.001$) and its subscales (p's < 0.001). Compared to profiles that were within normal limits, individuals with elevated depressive symptoms on the PAI had significantly higher NQOL Depression scores ($F(1,71) = 48.2$, $p < 0.001$, $d = 1.6$). Similarly, those who endorsed elevated anxiety on the PAI had significantly higher NQOL Anxiety scores ($F(1,71) = 32.2$, $p < 0.001$, $d = 1.5$). Cut-off scores of 19 on the NQOL Depression and 24 on the NQOL Anxiety measures adequately detected depression (sensitivity = 0.67; specificity = 0.93; PPV = 0.91; NPV = 0.74) and anxiety symptoms (sensitivity = 0.77; specificity = 0.82; PPV = 0.81; NPV = 0.78) in PWE.
Conclusions: The NQOL Depression and Anxiety measures evidenced strong associations with the PAI Depression and Anxiety scales and may be effective in detecting depressive and anxiety symptoms in PWE using the provided cut-scores.

1. Introduction

It is well-documented that epilepsy is associated with a higher prevalence of psychological disorders relative to the general population [1]. Depression and anxiety are the two most common psychological comorbidities in persons with epilepsy (PWE), with reported prevalence rates ranging between 10–50% and 5–60%, respectively, depending on sample selection and other methodological factors [2]. Given the clinical and psychosocial implications of psychiatric comorbidities observed in epilepsy [3–5], there has been a demand for screening measures that can assist epileptologists in quickly, but accurately, identifying psychiatric/psychological symptoms in PWE.

While numerous scales have been validated to identify depressive symptoms, including the Neurological Disorders Depression Inventory for Epilepsy (NDDI-E) [6,7] and its pediatric counterpart (NDDI-E-Y) [8], the Hospital Anxiety and Depression Scale (HADS) [7,9], and the Patient Health Questionnaire (PHQ-9) [9], there has been less focus on

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validating screening measures for anxiety in PWE [10]. Two studies examining the validity of the anxiety subscale of the HADS in PWE found mixed results [11,12], calling into question its utility in this population [10]. The Generalized Anxiety Disorder-7 (GAD-7), a measure designed to assess symptoms limited to Generalized Anxiety Disorder [13], was validated on Chinese, Korean, and French PWE [14–16].

The Neuro-Quality of Life system (NQOL) is a set of self-report measures that assess the health-related quality of life (e.g. depression, anxiety, stigma, and sleep) of individuals diagnosed with various neurological disorders [17]. The purpose of this study was to examine the associations between the NQOL Depression and Anxiety measures with an objective measure of emotional functioning (Personality Assessment Inventory, PAI) in PWE. Second, we sought to determine the optimal cut-off scores for the NQOL Depression and Anxiety measures, so that providers can make empirically-supported, yet rapid, decisions as to whether a patient's emotional functioning requires further assessment and/or treatment.

2. Methods

All data were gathered in accordance with the ethical principles of the American Psychological Association, and materials and procedures were subjected to initial and ongoing review by the University of Virginia (UVA) Institutional Review Board following expedited regulatory approval. This was a retrospective study utilizing de-identified clinical data obtained from an IRB-approved data repository. As such, patient consent was neither required nor obtained.

2.1. Participants

Persons with epilepsy (N = 72) were administered the NQOL Depression and Anxiety measures and the PAI as part of a comprehensive neuropsychological evaluation conducted at the UVA Neurocognitive Assessment Lab. The sample consisted of patients who were referred for neuropsychological evaluations as part of their clinical care. Data were obtained from an IRB-approved clinical data repository, allowing for future analysis. Inclusion criteria were English speaking adults (ages 18 +) with a confirmed diagnosis of epilepsy who successfully completed the aforementioned assessments/measures. Participants were not included in the analysis if intellectual quotients were ≤70 on a standardized measure or if they did not complete at least eight years of education.

2.2. Assessments and procedures

Demographic information (e.g. age, education, gender, and ethnicity), seizure characteristics (e.g. onset and type), emotional symptoms (e.g. depression and anxiety), and currently prescribed antiepileptic drugs (AEDs) were obtained during the clinical interview. Intellectual functioning was assessed, via the Wechsler Adult Intelligence Scales, Fourth Edition (WAIS-IV), the Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II) [18,19], or the Test of Premorbid Functioning (TOPF) [20] for the majority of the sample (N = 70).

2.2.1. Personality Assessment Inventory (PAI)

The PAI [21,22] is an objective, multi-scale, self-report questionnaire measuring an array of psychological and interpersonal domains. It contains 344 items that employ a 4-point Likert scale (*False*, *Slightly True*, *Mainly True*, *Very True*) measuring 11 core clinical domains, including symptoms of anxiety and depression. Subscale scores are also provided assessing various cognitive, affective, and physiological symptoms of anxiety and depression. Research on the PAI has been promising in terms of its underlying psychometric properties [21–26] and all scales are scored using reference data from the U.S. general population [21,22]. Internal consistency alphas for the Anxiety and Depression scales across samples are, .89–.94 and .87–.93, respectively [22]. Initial validation studies demonstrated that the measure exhibited strong convergent validity with other measures of anxiety (.62 and higher) and depression (.66 and higher) [22]. In an international survey of neuropsychologists within epilepsy centers, the PAI was among the most commonly used measures of personality functioning [27] and has been used to compare personality traits between persons with frontal and temporal lobe epilepsies [28]. The measure also has been useful in effectively detecting elevated depressive symptoms in PWE and classifying individuals with nonepileptic psychogenic seizures [8,29,30]. Raw scores are transformed into *T*-scores, where scores between 50 and 70 are considered within normal limits and scores above 70 suggest underlying psychological distress. While *T*-scores above 70 suggest underlying psychological distress, a more conservative cutoff (*T*-score ≥ 65) was utilized in our analysis in order to reduce the possibility of false negatives.

2.2.2. Quality of Life in Neurological Disorders; Neuro-QOL system (NQOL)

The NQOL Measurement System [17] comprises a set of 14 self-report instruments of health-related quality of life for adults and children with neurological disorders. These measures are available as item banks for computer adaptive tests and as fixed-length forms. We administered and currently report on two of the short-form measures, assessing eight common symptoms of anxiety and eight common symptoms of depression over the past 7 days. These measures are scored on a 5-point scale (1 = Never; 5 = Always) with a total score range of 8–40. The short-form NQOL measures have demonstrated both strong reliability and validity with the longer counterpart forms. While the NQOL manual recommends the conversion of raw scores into age-based *T*-scores, given that our objective was to evaluate the effectiveness as rapid screening measures to be used in clinic (i.e., not for diagnostic purposes), we maintained the total raw score as our outcome measure.

2.3. Statistical analysis

Descriptive statistics were compiled for demographic variables and other sample characteristics. Pearson product moment correlations were utilized to assess the relationship between NQOL Depression and Anxiety measures and the PAI (total and subscale scores). One-way

Table 1
Sample characteristics.

	N = 72		N = 72
Age (years)	35.3 ± 1.5	Total number of AEDs	2.0 ± 0.1
Education (years)	13.5 ± 0.3	Anxiety symptoms (PAI)[b]	
IQ (n = 70)	96.63 ± 1.57	Total	58.2 ± 1.5
Gender		Cognitive	57.3 ± 1.3
Males	29 (40.3%)	Affective	57.5 ± 1.7
Females	43 (59.7%)	Physiological	57.6 ± 1.4
Race		Depression symptoms (PAI)[b]	
Caucasian	64 (88.9%)	Total	61.2 ± 1.5
African-American	8 (11.1%)	Cognitive	61.1 ± 1.7
Seizure onset (years)	15.5 ± 1.5	Affective	57.2 ± 1.6
Seizure type[a]		Physiological	60.1 ± 1.1
GTC	40 (55.5%)	Elevated anxiety/depression (PAI)[c]	
Complex partial	28 (38.9%)	Elevated anxiety	22 (30.6%)
Simple partial	15 (20.9%)	Elevated depression	27 (37.5%)
Myoclonic	10 (13.9%)	Neuro-QOL[d]	
Absence	9 (12.5%)	Anxiety	20.6 ± 0.8
		Depression	15.8 ± 0.8

Values represent n (percentage of sample) or Mean ± SEM.
[a] Participants could provide multiple responses.
[b] *t*-scores.
[c] Elevated symptoms represented by PAI, *t* ≥ 65; 16 individuals (22.2%) had elevated symptoms of *both* Anxiety and Depression.
[d] Raw scores.