Archives of Epilepsy

Original Article

Health-related Quality of Life in Adults with Epilepsy in a Turkish Population

Mazide Karakurt, İrem Fatma Uludağ

University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital, Clinic of Neurology, İzmir, Türkiye

Mazide Karakurt MD,

Cite this article as: Karakurt M, Uludağ İF. Health-related quality of life in adults with epilepsy in a Turkish population. *Arch Epilepsy*. [Epub Ahead of Print]

Corresponding Author: İrem Fatma Uludağ, Prof. MD, University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital, Department of Neurology, İzmir, Türkiye, **E-mail:** fatmairem@yahoo.com

Received: 31.03.2026 **Accepted:** 20.07.2026 **Epub:** 03.08.2026

DOI: 10.4274/ArchEpilepsy.2026.26254

Abstract

Objective: Epilepsy is a chronic neurological disorder that affects not only seizure control but also multiple psychosocial domains of patients' lives. Health-related quality of life (HRQOL) has therefore become an essential outcome measure in epilepsy research. The Quality of Life in Epilepsy Inventory-31 (QOLIE-31) is one of the most widely used epilepsy-specific instruments for assessing HRQOL. Our objective was to evaluate the HRQOL of adults with epilepsy using the QOLIE-31 and to investigate the demographic and clinical factors associated with overall QOL.

Methods: This cross-sectional study included 90 adult patients with epilepsy (36 males, 54 females; mean age 38.03±11.95 years) followed at a tertiary epilepsy outpatient clinic. HRQOL was assessed using the validated Turkish version of QOLIE-31. Composite QOL scores were calculated as the mean of the seven domain scores. Associations between composite QOL scores and demographic/clinical variables were analyzed using appropriate parametric tests.

Results: The mean composite QOL score was 65.02±16.30. The lowest domain scores were observed for energy/fatigue and emotional well-being, whereas cognitive functioning and overall QOL showed relatively higher scores. Seizure frequency was strongly associated with composite QOL ($p<0.001$), with patients experiencing ≥24 seizures per year having significantly lower scores compared to other groups. The number of antiseizure medications was also significantly associated with QOL ($p=0.017$). Female sex was associated with lower composite QOL scores ($p=0.008$). Age, educational level, and seizure type were not significantly associated with overall QOL.

Conclusion: Seizure frequency remains the most important clinical determinant of HRQOL in patients with epilepsy. Medication burden and female sex were also associated with lower QOL scores. These findings emphasize the importance of optimizing seizure control and addressing psychosocial factors to improve patient-reported outcomes.

Keywords: Epilepsy, health-related quality of life, QOLIE-31

INTRODUCTION

Epilepsy is one of the most common chronic neurological disorders worldwide and is characterized not only by recurrent seizures but also by a broad spectrum of psychosocial consequences.[1] Although advances in diagnostic techniques and antiepileptic treatments have improved seizure control in many patients, a substantial proportion continue to experience seizures and impaired quality of life.[1]

Health-related quality of life (HRQOL) has emerged as a critical outcome measure in epilepsy research, complementing traditional clinical endpoints such as seizure frequency.[2] The concept of HRQOL encompasses physical, emotional, cognitive, and social dimensions of well-being, all of which may be affected in patients with epilepsy.[1] Studies consistently demonstrate that people with epilepsy report significantly poorer HRQOL compared with the general population and with individuals with other chronic illnesses.[1]

Among the various determinants of HRQOL in epilepsy, seizure frequency has been identified as the most consistent and robust clinical predictor.[3-5] However, seizure frequency alone does not fully explain variability in QOL. Several studies have highlighted the influence of depression, anxiety, medication burden, and social functioning on HRQOL.[6,7]

Despite the growing body of international literature, data on HRQOL in Turkish patients with epilepsy remain limited. The Quality of Life in Epilepsy Inventory-31 (QOLIE-31) scale, developed by Cramer et al.,[2] is a validated and reliable epilepsy-specific instrument, and its Turkish version has demonstrated good psychometric properties.[8] Nevertheless, further evaluation of demographic and clinical determinants of HRQOL in different cultural and healthcare contexts is warranted.

The present study aimed to assess the quality of life of adult patients with epilepsy using the QOLIE-31 and to examine the relationship between composite QOL scores and key demographic and clinical variables, including age, sex, educational level, seizure type, seizure frequency, and number of antiseizure medications.

METHODS

This cross-sectional study was conducted at the Neurology Clinic of the University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital. Ethical approval was obtained from the University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital Non-interventional Research Ethics Committee (approval no: 2026/02-17, date: 05.03.2026) prior to study initiation. All procedures were performed in accordance with the Declaration of Helsinki.[9]

Adult patients diagnosed with epilepsy who attended routine outpatient follow-up visits at the epilepsy clinic were screened for eligibility. Patients who voluntarily agreed to participate were included in the study after providing written informed consent.

A total of 90 patients (36 males and 54 females) were enrolled. The mean age of the participants was 38.03±11.95 years (range: 18-61).

Patients with neurological or psychiatric conditions that could interfere with questionnaire completion, such as intellectual disability or aphasia, were excluded from the study.

HRQOL was assessed using the QOLIE-31, a validated epilepsy-specific health-related quality of life instrument.[2] The Turkish version of the QOLIE-31 has been previously validated and shown to be reliable for use in Turkish patients with epilepsy.[8]

The composite QOL score was computed as the unweighted mean of the seven QOLIE-31 domain scores, consistent with the approach used in the Turkish validation study of the instrument.[8] Although the original QOLIE-31 scoring algorithm employs a patient-derived weighted composite, the unweighted mean has been used in several published cross-cultural studies and was adopted here to ensure methodological consistency with the validated Turkish version.[2]

The questionnaire was administered face-to-face by the same investigator to ensure consistency in data collection. Domain scores were calculated according to the standard scoring approach. A composite QOL score was computed as the unweighted mean of the seven QOLIE-31 domain scores. Item 31 (global self-rated QOL) was analyzed separately and was not included in the composite score.

MAIN POINTS

- The mean composite the Quality of Life in Epilepsy Inventory-31 (QOLIE-31) score in this Turkish adult epilepsy cohort was 65.02±16.30, indicating a moderate level of health-related quality of life.
- Seizure frequency was the strongest clinical determinant of quality of life, with ≥24 seizures per year significantly reducing QOL scores.
- Treatment burden, reflected by the use of three or more antiseizure medications, was associated with lower composite QOL scores.
- Female sex was associated with poorer health-related quality of life.
- Seizure type and educational level were not significantly associated with overall QOL in this cohort.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic and clinical characteristics. Continuous variables were expressed as mean ± standard deviation, and categorical variables were presented as frequencies and percentages.

The normality of the distribution of continuous variables was assessed using the Shapiro-Wilk test. The relationship between age and composite QOL scores was evaluated using Pearson correlation analysis. Comparisons between two groups (sex) were performed using the independent samples t-test. Differences among three or more groups (educational level, seizure type, seizure frequency, and number of antiseizure medications) were analyzed using one-way analysis of variance (ANOVA). Homogeneity of variances was assessed using Levene's test. When significant differences were detected, post hoc comparisons were conducted using Tukey's HSD test.

A two-tailed p-value of <0.05 was considered statistically significant. Effect sizes were calculated for all primary comparisons: Cohen's d for the independent-samples t-test, and eta-squared (η^2) and Cohen's f for one-way ANOVA.

RESULTS

Demographic and Clinical Characteristics

A total of 90 patients with epilepsy were included in the study. The mean age was 38.03±11.95 years (range: 18-61). Fifty-four patients (60.0%) were female, and 36 patients (40.0%) were male.

Regarding educational status, 47 patients (52.2%) had completed primary school, 29 (32.2%) had graduated from high school, and 14 (15.6%) had a university degree. Most participants were married (58.9%), while 35.6% were single and 5.6% were widowed.

Of the patients, 42 (46.7%) were employed, 37 (41.1%) were unemployed, and 11 (12.2%) were retired.

The majority of patients had generalized seizures (62.2%), followed by focal seizures (28.9%), and combined focal and generalized seizures (8.9%).

Regarding seizure frequency, 51.1% of patients reported experiencing fewer than one seizure per year, while 17.8% reported experiencing more than two seizures per month. Eighteen patients (20.0%) had a history of hospitalization for seizures.

More than half of the patients (53.3%) were receiving monotherapy, whereas 35.6% were receiving dual therapy, and 11.1% were receiving three or more antiseizure medications.

The demographic and clinical characteristics of the study population are presented in Table 1.

Quality of Life Findings

The mean composite QOL score was 65.02±16.30 (range: 17.43-96.86). Among the QOLIE-31 domains, the lowest mean scores were observed in energy/fatigue (56.03±21.77) and emotional well-being (58.56±20.64). The highest domain scores were found in cognitive functioning (70.04±23.32) and overall QOL (71.28±24.51).

The mean global self-rated QOL score (Item 31) was 71.25±21.37.

The QOLIE-31 domain scores and composite QOL scores are presented in Table 2.

Factors Associated with Composite Quality of Life

The relationship between demographic and clinical variables and the composite QOL scores was further analyzed (Table 3). No significant correlation was found between age and composite QOL score.

Table 1. Demographic and clinical characteristics of the study population (n=90)

Variable	n (%) or mean ± SD
Age (years)	38.03±11.95 (18-61)
Sex (female/male)	54/36
Education level	
Primary school	47 (52.2%)
High school	29 (32.2%)
University degree	14 (15.6%)
Marital status	
Single	32 (35.6%)
Married	53 (58.9%)
Widowed	5 (5.6%)
Employment status	
Unemployed	37 (41.1%)
Employed	42 (46.7%)
Retired	11 (12.2%)
Seizure type	
Focal	26 (28.9%)
Generalized	56 (62.2%)
Focal and generalized	8 (8.9%)
Seizure frequency	
<1/year	46 (51.1%)
1-12/year	17 (18.9%)
12-24/year	11 (12.2%)
≥24/year	16 (17.8%)
History of hospitalization due to seizures (yes/no)	18/72
Number of antiseizure medications	
1	48 (53.3%)
2	32 (35.6%)
3	9 (10.0%)
4	1 (1.1%)

SD: Standard deviation

A statistically significant difference was observed between the sexes, with female patients demonstrating lower composite QOL scores than male patients (p=0.008). Composite QOL scores did not significantly differ by educational level. Similarly, no significant differences in composite QOL scores were found across seizure types.

In contrast, seizure frequency was strongly associated with QOL (p<0.001). Post-hoc analysis revealed that patients experiencing more than 24 seizures per year had significantly lower QOL scores than all other groups (p<0.001 vs. <1/year; p=0.018 vs. 1-12/year; p=0.006 vs. 12-24/year). No significant differences were observed among the remaining groups.

The number of antiseizure medications was also significantly associated with composite QOL scores (p=0.017). Patients receiving three or more medications had markedly lower QOL scores than those receiving monotherapy or dual therapy.

DISCUSSION

In the present study, the mean composite QOL score of patients with epilepsy was 65.02±16.30, indicating a moderate level of HRQOL.

Among the QOLIE-31 domains, the lowest scores were observed in energy/fatigue and emotional well-being, whereas cognitive functioning and overall QOL had relatively higher scores. This domain distribution is consistent with previous international studies showing that emotional and vitality-related domains are particularly vulnerable in epilepsy populations.[1,10]

The most prominent finding of our study was the strong association between seizure frequency and composite QOL scores. Patients who experienced more than 24 seizures per year had significantly lower QOL scores than those in all other groups. Seizure frequency has consistently been reported as the most important clinical determinant of quality of life across different populations and cultural settings.[1,3-5] In the Russian cohort, seizure frequency was the strongest predictor of QOLIE-31 total score in both newly diagnosed and previously treated patients.[4] Similarly, in the Georgian study, higher seizure frequency strongly predicted lower QOLIE-31 total and subscale scores.[3] Our findings further confirm

Table 2. QOLIE-31 total and subscale scores (n=90)

Domain	Mean ± SD	Minimum-maximum
Seizure worry	67.03±25.24	0-100
Emotional well-being	58.56±20.64	10-100
Energy/fatigue	56.03±21.77	0-97.5
Social functioning	66.49±25.43	0-100
Cognitive functioning	70.04±23.32	0-100
Medication effects	65.77±31.38	0-100
Overall quality of life (Items 1&14 mean)	71.28±24.51	0-100
Composite QOL*	65.02±16.30	17.43-96.86
Global self-rated QOL (Item 31)	71.25±21.37	5-100

*: Composite QOL score was calculated as the unweighted mean of the seven QOLIE-31 domain scores. Item 31 was analyzed separately and was not included in the composite score. QOLIE-31: Quality of Life in Epilepsy Inventory-31, SD: Standard deviation

that seizure control remains the cornerstone for improving patient-reported outcomes in epilepsy.

While seizure frequency was the dominant determinant, seizure type was not significantly associated with QOL in our cohort. This is in line with several studies indicating that the frequency and severity of seizures exert a greater impact on QOL than seizure classification itself.[3,5] These results emphasize that achieving seizure reduction or remission may be more relevant to patients' perceived well-being than seizure semiology.

Another important finding was the association between the number of antiseizure medications and quality of life. Patients receiving three or more medications had significantly lower composite QOL scores than those receiving monotherapy or dual therapy. Although some studies have failed to demonstrate a significant difference between mono- and polytherapy regimens,[4] others have suggested that medication burden and adverse effects negatively influence QOL.[1,5,6] Notably, Siebenbrodt et al.,[11] in a multicenter German study of 476 adults using multivariate regression, found that medication-related adverse events, as measured by the Liverpool Adverse Events Profile, were the single strongest predictor of poor QOLIE-31 scores, surpassing even seizure frequency. Importantly, the number of anti-seizure medications was not significantly associated with QOL, suggesting that the tolerability of medications rather than their number drives QOL impairment.[11] Polytherapy may reflect more severe or refractory epilepsy, but it may also contribute to cognitive and fatigue-related complaints, which were among the lowest-scoring domains in our cohort.

Female patients in our study demonstrated significantly lower composite QOL scores than male patients. Sex-related differences in QOL have been inconsistently reported in the literature. The Georgian study identified female sex as a predictor of lower seizure worry scores, while other European studies reported poorer mental health and vitality scores in women with epilepsy.[3] Biological factors, hormonal influences, and psychosocial stressors may partially explain this vulnerability. Our findings suggest that female patients may require closer psychosocial evaluation and support.

In contrast to some international data, we did not observe a significant association between educational level and composite QOL scores. In the Georgian study, lower education was one of the strongest predictors of poor QOL,[3] and education was also significantly associated with cognitive and social functioning scores. Differences between studies may be explained by sociocultural and socioeconomic variability. In some settings, educational attainment may serve as a proxy for socioeconomic status, employment opportunities, and access to healthcare resources. In our cohort, seizure-related clinical variables appeared to outweigh demographic predictors.

Age was not significantly associated with composite QOL scores in our study. However, other studies have reported that advanced age may negatively influence specific domains such as energy/fatigue and cognitive functioning.[3,6] The lack of association in our cohort may be related to the relatively young mean age of the sample or to the cross-sectional design.

Beyond clinical variables, psychosocial determinants of HRQOL in epilepsy have been extensively documented. In the biopsychosocial model proposed by Suurmeijer et al.,[12] psychological distress, loneliness, adjustment, and perceived stigma were stronger predictors of overall quality of life judgments than were clinical variables. Although psychosocial variables were not directly assessed in our study, the low scores in the emotional well-being and energy/fatigue domains suggest that psychological factors likely contribute substantially to perceived QOL. Previous studies have demonstrated that depression is one of the most powerful predictors of poor QOL in epilepsy, often exceeding the impact of seizure frequency.[7,13] In a Middle Eastern cohort from the United Arab Emirates, Alsaadi et al.[14] found that depression was the

Table 3. Factors associated with composite quality of life in patients with epilepsy

Variable	Categories	Mean composite QOL (± SD)	Effect size	p-value
Sex	Male	70.1±11.5	Cohen's d=0.54 (medium)	0.008
	Female	61.6±18.1		
Educational level	Primary	64.2±16.5	η^2=0.008, f=0.09 (small)	0.7
	High school	67.1±16.5		
	University	63.5±15.4		
Seizure type	Focal	63.1±15.5	η^2=0.04, f=0.21 (small-medium)	0.15
	Generalized	67.1±15.2		
	Combined	55.8±23.4		
Seizure frequency	<1/year	70.6±13.8	η^2=0.25, f=0.58 (large)	<0.001
	1-12/year	63.5±12.6		
	12-24/year	67.5±13.7		
	≥24/year	48.5±17.7		
Number of ASMs	1	67.6±15.0	η^2=0.09, f=0.32 (medium)	0.017
	2	65.8±14.6		
	3	50.8±21.7		
	4	43.9±16.2		

Effect sizes: Cohen's d for t-test; eta-squared (η^2) and Cohen's f for one-way ANOVA. ASM: Anti-seizure medication, QOL: Quality of life, SD: Standard deviation, ANOVA: Analysis of variance

strongest independent predictor of HRQOL, outweighing seizure freedom and all other clinical variables. Similarly, Gonzalez-Martinez et al.[15] reported that both anxiety and depression scores were independently associated with lower QOLIE-31-P total scores in a Spanish refractory epilepsy cohort, with female sex also emerging as a significant independent predictor of worse QOL, a finding that closely mirrors our own results. Therefore, seizure control alone may not be sufficient to ensure optimal quality of life.

International comparisons demonstrate notable variability in QOLIE-31 total scores across different populations. In the Russian cohort reported by Guekht et al.,[4] the mean total score was relatively low (42.13±4.14). Likewise, Cramer et al.[2] indicated that QOLIE-31 total scores in adult epilepsy populations commonly range from 40 to 60 points. European multicenter studies have generally reported mean total scores within the mid-range of this spectrum, although considerable inter-country variability was observed.[1,10] A global comparison of QOLIE-31 scores across 31 countries and 7,255 individuals, reported by Saadi et al.,[16] found a mean total score of 59.8, with substantial variation across world regions and country income levels, ranging from 42.1 in Russia to 82.0 in Canada. More recently, a large multicenter study from Germany involving 476 adults reported a mean QOLIE-31 score of 61.7, with medication-related adverse effects and depressive symptoms emerging as the strongest determinants of poor QOL.[11] In contrast, our cohort demonstrated a mean composite QOL score of 65.02±16.30, which lies above the global mean reported by Saadi et al.[16] and is broadly consistent with scores from high-income European populations. Such differences may reflect variations in healthcare infrastructure, access to specialized epilepsy services, cultural perceptions of illness, socioeconomic context, and sample characteristics. These findings underscore the importance of interpreting QOLIE-31 scores within their sociocultural and healthcare context rather than in isolation.

The strengths of our study include the use of a validated disease-specific instrument (QOLIE-31), standardized data collection by a single investigator, and detailed subgroup analyses according to seizure frequency and treatment burden.[2,8]

Study Limitations

However, several limitations should be acknowledged. First, the cross-sectional design precludes causal inference. Second, psychosocial variables such as depression, anxiety, stigma, and social support were not formally measured, limiting our ability to explore mediating pathways. Furthermore, the absence of validated depression and anxiety screening instruments, a standardised adverse effect scale, data on epilepsy syndrome and aetiology, disease duration, and formal assessment of employment-related and stigma-related variables is a notable methodological limitation. As depression is among the strongest predictors of poor QOL in epilepsy, future studies should incorporate formal psychiatric screening to allow appropriate adjustment in multivariable analyses. Additionally, the relatively small overall sample size and the unequal distribution of patients across subgroups limit the reliability of subgroup comparisons and preclude conducting a multivariate analysis; future studies with larger cohorts are warranted to disentangle the independent contributions of seizure frequency, medication burden, and sex on QOL.

CONCLUSION

Our findings demonstrate that seizure frequency and treatment burden are the primary clinical determinants of HRQOL in adults with epilepsy. While demographic factors appear to play a secondary role in our cohort, psychosocial variables likely contribute substantially to patient-reported outcomes. Optimal management of epilepsy should therefore combine effective seizure control with systematic screening for psychological distress and individualized supportive interventions.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the University of Health Sciences Türkiye, İzmir Tepecik Education and Research Hospital Non-interventional Research Ethics Committee (approval no: 2026/02-17, date: 05.03.2026) prior to study initiation.

Informed Consent: Patients who voluntarily agreed to participate were included in the study after providing written informed consent.

Footnotes

Author Contributions: Surgical and Medical Practices: M.K., Design: İ.F.U., Data Collection or Processing: M.K., Analysis or Interpretation: M.K., İ.F.U., Literature Search: İ.F.U., Writing: M.K., İ.F.U.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Baker GA, Jacoby A, Buck D, Stalgis C, Monnet D. Quality of life of people with epilepsy: a European study. *Epilepsia.* 1997;38(3):353-362. [Crossref]
2. Cramer JA, Perrine K, Devinsky O, Bryant-Comstock L, Meador K, Hermann B. Development and cross-cultural translations of a 31-item quality of life in epilepsy inventory. *Epilepsia.* 1998;39(1):81-88. [Crossref]
3. Djibuti M, Shakarishvili R. Influence of clinical, demographic, and socioeconomic variables on quality of life in patients with epilepsy: findings from Georgian study. *J Neurol Neurosurg Psychiatry.* 2003;74(5):570-573. [Crossref]
4. Guekht AB, Mitrokhina TV, Lebedeva AV, et al. Factors influencing on quality of life in people with epilepsy. *Seizure.* 2007;16(2):128-133. [Crossref]
5. Leidy NK, Elixhauser A, Vickrey B, Means E, Willian MK. Seizure frequency and the health-related quality of life of adults with epilepsy. *Neurology.* 1999;53(1):162-166. [Crossref]
6. Edefonti V, Bravi F, Turner K, et al. Health-related quality of life in adults with epilepsy: the effect of age, age at onset and duration of epilepsy in a multicentre Italian study. *BMC Neurol.* 2011;11:33. [Crossref]
7. Choi-Kwon S, Chung C, Kim H, et al. Factors affecting the quality of life in patients with epilepsy in Seoul, South Korea. *Acta Neurol Scand.* 2003;108(6):428-434. [Crossref]
8. Mollaoğlu M, Durna Z, Bolayir E. Validity and reliability of the quality of life in epilepsy inventory (QOLIE-31) for Turkey. *Noro Psikiyatr Ars.* 2015;52(3):289-295. [Crossref]
9. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA.* 2013;310(20):2191-2194. [Crossref]
10. Buck D, Jacoby A, Baker GA, Ley H, Steen N. Cross-cultural differences in health-related quality of life of people with epilepsy: findings from a European study. *Qual Life Res.* 1999;8(8):675-685. [Crossref]

11. Siebenbrodt K, Willems LM, von Podewils F, et al. Determinants of quality of life in adults with epilepsy: a multicenter, cross-sectional study from Germany. *Neurol Res Pract.* 2023;5(1):41. **[Crossref]**
12. Suurmeijer TP, Reuvekamp MF, Aldenkamp BP. Social functioning, psychological functioning, and quality of life in epilepsy. *Epilepsia.* 2001;42(9):1160-1168. **[Crossref]**
13. Boylan LS, Flint LA, Labovitz DL, Jackson SC, Starner K, Devinsky O. Depression but not seizure frequency predicts quality of life in treatment-resistant epilepsy. *Neurology.* 2004;62(2):258-261. **[Crossref]**
14. Alsaadi T, Kassie S, El Hammasi K, et al. Potential factors impacting health-related quality of life among patients with epilepsy: results from the United Arab Emirates. *Seizure.* 2017;53:13-17. **[Crossref]**
15. Gonzalez-Martinez A, Planchuelo-Gómez Á, Vieira Campos A, Martínez-Dubarbie F, Vivancos J, De Toledo-Heras M. Perceived quality of life (QOLIE-31-P), depression (NDDI-E), anxiety (GAD-7), and insomnia in patients with epilepsy attended at a refractory epilepsy unit in real-life clinical practice. *Neurol Sci.* 2022;43(3):1955-1964. **[Crossref]**
16. Saadi A, Patenaude B, Mateen FJ. Quality of life in epilepsy-31 inventory (QOLIE-31) scores: a global comparison. *Epilepsy Behav.* 2016;65:13-17. **[Crossref]**