Published in final edited form as:

Epilepsy Behav. 2017 April ; 69: 110–115. doi:10.1016/j.yebeh.2017.01.028.

Stable psychological functioning after surgery for epilepsy: an informant-based perspective

Marcie L. King^a and Daniel Tranel^{a,b}

^aUniversity of Iowa, Department of Psychological and Brain Sciences, W311 Seashore Hall, Iowa City, IA 52242, USA

^bUniversity of Iowa Carver College of Medicine, Department of Neurology, 2007 Roy Carver Pavilion, 200 Hawkins Drive, Iowa City, IA, 52242, USA

Abstract

Objective—Psychological adjustment following surgery for epilepsy has been assessed primarily with self-report measures. In the current work, we investigated pre- to postoperative changes in various dimensions of personality and behavior from the perspective of a well-known family member or friend, for 27 patients operated on for medically intractable epilepsy.

Methods—For each patient, a close family member or friend (“informant”) provided pre- and postoperative ratings on five dimensions of personality and behavior. All ratings were collected during the chronic epoch of recovery, when personality and behavior of the patients are relatively stable. Self-report measures were also used to examine the relation between self-report and informant-report assessment of psychological adjustment. Lastly, the relation between seizure outcomes and psychological adjustment was investigated.

Results—Personality and behavior characteristics, as rated by an informant, remained stable and within a normal range of functioning following surgery for epilepsy. There were no significant differences between pre- and postoperative levels of executive functioning, social behavior, hypo-emotionality, irascibility, or distress. Informant-ratings on levels of current depression and overall current psychological functioning were significantly related to patient reports of current depression and global personality characteristics derived from the MMPI-2 (e.g., psychasthenia, schizophrenia, hypomania, psychopathic deviation, social introversion). There was no significant relationship between seizure outcome and psychological adjustment.

Significance—Informant-reports on psychological adjustment following surgery for epilepsy provide a unique perspective on important aspects of the success of the intervention. Assessing outcomes beyond seizure status is important for developing a comprehensive understanding of the

Corresponding author: Marcie L. King, Department of Psychological and Brain Sciences, W311 Seashore Hall, Iowa City, IA 52242, Phone Number: 319-335-2881, Fax Number: 319-335-0191, Marcie-king@uiowa.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Conflict of interest

None of the authors has any conflict of interest to disclose. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

potential consequences of surgery for epilepsy. Based on the current work, personality and behavior seem to be stable following surgery for epilepsy, and our study provides a unique informant-based perspective on this encouraging result.

Keywords

Psychological adjustment; epilepsy; surgery; informant-report

1. Introduction

Surgery is a well-established and effective treatment for intractable epilepsy, with more than half of patients showing long-term seizure freedom [1]. While measuring outcomes of surgery for epilepsy at a pathophysiological level (e.g. seizure frequency) is obviously paramount to evaluating the success of the treatment, it is also important to assess other aspects of outcomes of surgery for epilepsy, for example, psychological adjustment, cognitive functioning, and quality of life.

Psychological adjustment is particularly relevant. Understanding what factors may contribute to declines, improvements or stability in psychological adjustment following surgery is important for communicating to patients the best information about treatment and prognosis [2]. A substantial number of studies have addressed psychological outcomes following surgery for epilepsy. By and large, research shows that depression, anxiety, and overall psychological adjustment in patients with intractable epilepsy significantly improves or does not change following surgery [3]. Seizure freedom following surgery and presurgical psychiatric history are the main predictors of psychiatric functioning following surgery for epilepsy. Not surprisingly, many studies have demonstrated a relationship between improved seizure control or seizure freedom following surgery and improved psychological adjustment [4–6].

Despite the growing number of studies examining psychological adjustment following surgery for epilepsy, most conclusions are limited to what can be gleaned from patient self-reported outcomes. Changes in psychological adjustment following surgery for epilepsy have been assessed almost entirely with self-report measures. While self-report provides important and useful information [7–8], it is also important to collect information from other-raters, here called informants, when evaluating psychological adjustment. Informant-ratings, especially ratings from a well-known family member or friend, can provide information that yields predictive validities incremental to and often substantially greater than self-reports, and may help elucidate predictors of psychological adjustment following surgery for epilepsy [9–13].

Moreover, in the case of neurological patients with brain lesions (such as patients who have undergone surgery for epilepsy), gathering information about changes in various aspects of behavior and personality from an informant's perspective may be particularly important. Not only are informant-report measures strong predictors of patient behavior [9], but they also help address a possible lack of insight that may limit the ecological validity of self-report measures from patients with brain lesions [14]. Therefore, comprehensive investigation of

psychological adjustment following surgery for epilepsy may benefit considerably from including an informant perspective.

While past work has used both family and patient perspectives obtained with clinical interviews to examine psychological adjustment following surgery for epilepsy, no studies to our knowledge have taken a detailed and systematic informant approach to investigating psychological adjustment following surgery for epilepsy. The current study builds on the existing understanding of psychological adjustment following surgical intervention for epilepsy, using an informant-report measure to investigate psychological functioning following epilepsy surgery. Each informant knew the patient well before and after the surgery, allowing for a comparison to be made on various dimensions of personality and behavior pre- and post-surgery for each patient. This offers a unique perspective on psychological adjustment following surgical intervention for epilepsy.

2. Materials and methods

2.1. Participants

Participants were 27 patients (6 men and 21 women) who underwent neurosurgery for medically intractable epilepsy at our institution between 1994 and 2008. These patients are enrolled in the Iowa Neurological Patient Registry of the Division of Cognitive Neuroscience at the University of Iowa. Extensive neuropsychological and neuroanatomical data have been collected for these patients, using the standard protocols of the Benton Neuropsychology Laboratory and the Laboratory of Brain Imaging and Cognitive Neuroscience [15]. Various medical characteristics were also examined for each participant. Demographic, cognitive, and medical characteristics are provided in Table 1. The study was approved by the University of Iowa Institutional Review Board and all participants gave written informed consent at the time of their enrollment in the Iowa Neurological Patient Registry.

2.2. Procedures

All data used in this study were obtained in the chronic epoch (at least 3 months post onset of lesion). The timing of data collection is of obvious importance in our study, and thus we provide relevant details in the following sections.

Iowa Scales of Personality Change—The Iowa Scales of Personality Change (ISPC) was used to assess psychological adjustment from an informant perspective [14,16]. The ISPC provides a standardized assessment of 26 personality and behavioral characteristics that may change following a neurological event. Of these 26 characteristics, 22 items are collapsed into five dimensions of psychological functioning (based on principal components analysis): executive functioning, social behavior, hypo-emotionality, irascibility, and distress [14]. The ISPC items assessed in the current study are enumerated in Table 2. Three items on the ISPC (“*lack of stamina*,” “*suspiciousness*,” “*obsessiveness*”) were not assessed because they do not load onto any of the five dimensions of psychological functioning on the ISPC [14]. One item, “*lack of insight*,” was examined separately because it only pertains to current functioning, rather than changes in functioning from before to after a neurological

event. The ISPC is a revised version of the Iowa Rating Scales of Personality Change, which has been shown to be reliable (e.g., interrater agreement ranging from 0.80 – 0.96) and valid [14,16].

To complete the ISPC, informants, who were all close family members or friends of the patients, rated patients on each item, assessing the person's personality characteristics and behavior prior to surgery ("Before" rating) and the person's personality characteristics and behavior following surgery ("Now" rating). The "Before" rating requires informants to think back to how the patient was before surgery, whereas the "Now" rating requires informants to assess the patient's current personality and behavior. Ratings were made on a 7-point scale, with 3 reflecting the average or usual amount of the characteristic for a typical normal adult. Higher ratings indicate an increasing degree of disturbance in that characteristic [17]. In the current study, informants for the 27 target participants were 14 spouses, 9 parents, 3 friends, and 1 sibling. On average, at the time of the ratings, informants knew patients for 29 years ($SD = 11.06$; $min = 10$ years, $max = 61$ years). All informants reported knowing the patient well both before and after surgery.

ISPC ratings were collected between 6.70 months and 188.80 months after surgery for epilepsy ($M = 77.90$, $SD = 58.36$). Importantly, nearly all (25/27 patient cases) of time-since-lesion-onset time points are more than 12-months post-surgery. This is a reasonable time period for patients to have stabilized and settled into reliable patterns of behavior and personality after their surgery. As noted, the shortest period between surgery and ISPC collection was more than a half year (6.7 months).

Other Measures—In addition to the ISPC, several self-report measures were used to examine psychological functioning following surgery for epilepsy. Again, it is important to underscore that these measures were all obtained in the chronic epoch of recovery. In the majority of cases, self-report measures were collected a year or more after surgery. The Beck Depression Inventory-II (BDI-II), a measure of depression, was obtained in all participants. The BDI-II data were collected in relatively close temporal proximity to the ISPC ($M = 7.73$ months before or after ISPC, $SD = 13.01$ months; median = 1.50 months before or after ISPC; mode = 0 months before or after ISPC). For 24 patients, the Minnesota Multiphasic Personality Inventory-2 (MMPI-2), a measure of personality, was administered. The MMPI-2 scores were also collected in relatively close temporal proximity to the ISPC ($M = 17.01$ months before or after ISPC, $SD = 27.12$; median = 5.35 months before or after ISPC; mode = 0 months before or after ISPC).

Seizure Status—To characterize patient seizure status, patients were categorized using the International League Against Epilepsy (ILAE) seizure outcome classification system [18]. Information regarding seizure status (contemporaneous with ISPC administration) was available for 26 patients. Updated records regarding seizure status at the time of ISPC administration were unavailable for one patient. Patients were classified as follows: 1) completely seizure free, no auras; 2) only auras, no other seizures; 3) one to three seizure days per year, $\pm$ auras; 4) four seizure days per year to 50% reduction of baseline seizure days, $\pm$ auras; 5) less than 50% reduction of baseline seizure days to 100% increase of baseline seizure days, $\pm$ auras; 6) more than 100% increase of baseline seizure days, $\pm$ auras.

Lesion Analysis—26 patients underwent standard temporal lobectomies and 1 patient underwent a dorsolateral prefrontal lobectomy. Specifically, there were 19 patients with left ATL, 7 patients with right ATL, and 1 patient with a right dorsolateral prefrontal lobectomy. All procedures were performed as treatment for intractable epilepsy.

2.3. Statistical analyses

To examine changes in psychological adjustment from before surgery to after surgery, within-subjects t-tests were used to contrast the 5 dimensions of the ISPC (executive functioning, social behavior, hypo-emotionality, irascibility, distress). Appropriate corrections for multiple comparisons were implemented. Pearson correlations were used to examine the relation between psychological adjustment and other variables of interest, such as the relation between self-report psychological outcome measures and informant-report measures and the relation between seizure status and psychological adjustment.

3. Results

3.1. Changes in psychological adjustment on the ISPC

Personality and behavior characteristics remained stable following surgery for epilepsy. Average changes on the ISPC are provided in Table 3. There were no significant differences between informant ratings pre- and post-surgery on levels of executive functioning ($t(26) = -0.69$, $p = 0.49$; $\eta_p^2 = 0.02$), social behavior ($t(26) = -0.51$, $p = 0.62$; $\eta_p^2 = 0.01$), hypo-emotionality ($t(26) = 0.45$, $p = 0.65$; $\eta_p^2 = 0.01$), irascibility ($t(26) = -1.40$, $p = 0.17$; $\eta_p^2 = 0.07$), or distress ($t(26) = -0.60$, $p = 0.56$; $\eta_p^2 = 0.01$). Figure 1 illustrates the stability of each dimension of personality and behavior. As seen in Figure 1, patients were rated as falling within a normal range of functioning ($M < 4$) before surgery and after surgery on all five scales.

3.2. Relationship between informant and self-report measures

Average scores on the BDI-II and MMPI-2 are provided in Table 4. Informant-ratings on the ISPC were significantly related to various aspects of self-reported psychological functioning and personality characteristics. Specifically, informant ratings of current patient depression on the ISPC ($M = 3.48$, $SD = 1.45$) were significantly associated with self-reported depression scores on the BDI-II ($r(25) = 0.40$, $p = 0.04$). Furthermore, overall ratings of current personality and behavior on the ISPC ($M = 3.40$, $SD = 1.01$) were significantly related to self-reported levels of depression ($r(22) = 0.48$, $p = 0.02$), psychasthenia ($r(22) = 0.66$, $p < 0.001$), schizophrenia ($r(22) = 0.67$, $p < 0.001$), hypomania ($r(22) = 0.42$, $p = 0.04$), psychopathic deviation ($r(22) = 0.42$, $p = 0.04$), and social introversion ($r(22) = 0.48$, $p = 0.02$), as measured by the MMPI-2.

3.3. Relationship between levels of insight and informant-rated psychological adjustment

Informant-ratings of patient lack of insight were significantly related to poorer outcomes in personality and behavior overall. Specifically, there was a significant relationship between informant-reports of poor insight, meaning the extent to which the patient underestimates or is unaware of problems which have developed or which have gotten worse since surgery, and current personality and behavior problems. Higher ratings of patient lack of insight were

significantly related to poorer executive functioning ($r(25) = 0.46, p = 0.02$), poorer social behavior ($r(25) = 0.62, p = 0.001$), increased levels of hypo-emotionality ($r(25) = 0.40, p = 0.04$), increased levels of irascibility ($r(25) = .48, p = 0.01$), and increased levels of distress ($r(25) = 0.40, p = 0.05$).

3.4. Relationship between seizure characteristics and informant-rated psychological adjustment

At the time of ISPC data collection, ILAE ratings averaged 1.89 (SD= 1.22), indicating good seizure outcomes following surgery for epilepsy. Seizure characteristics (age of patient at time of seizure onset: $r(25) = 0.24, p = 0.23$; age at time of surgery: $r(25) = 0.22, p = 0.28$), medication status (medication pre-surgery: $r(25) = -0.14, p = 0.48$; medication post-surgery: $r(25) = 0.20, p = 0.31$), and ILAE ratings ($r(25) = -0.04, p = 0.83$) were not significantly related to overall ratings of changes in personality and behavior on the ISPC.

4. Discussion

Our study suggests that personality and behavior characteristics that make up the dimensions of executive functioning, social behavior, hypo-emotionality, irascibility, and distress, remain stable following surgery for epilepsy. In using an informant perspective on psychological outcomes following surgery for epilepsy, this study makes a unique contribution to the existing literature on psychological adjustment following surgical intervention for epilepsy.

Research shows that outcomes following surgery for epilepsy can be heterogeneous in various global domains of functioning [7]. For example, numerous studies have examined cognitive outcomes in areas of general intellectual functioning, language, executive functioning, and memory following epilepsy surgery [19]. Factors such as the extent of brain tissue removed, side of lesion, length of time since surgery, and degree of seizure frequency reduction following surgery are associated with varying degrees of cognitive changes following surgery. In general, research on cognitive outcomes following surgery for epilepsy shows mixed results, with some patients showing cognitive declines, some showing improvement, and some showing no changes [19–20].

More nuanced measurements of outcomes following surgery for epilepsy reflect both individual variability in functioning following surgery and variability in outcome assessment [19–20]. For example, while pooled estimates of the rates of losses and gains in neuropsychological functions following epilepsy surgery suggest that IQ, executive functioning, and attention generally remain stable [20], these estimates are typically based on a composite IQ score and may mask various changes in sub-domains of cognitive functioning [19]. Specifically, research shows that verbal memory and naming are susceptible to loss, particularly in patients who undergo left-sided temporal lobe surgery [19–20]. In contrast, verbal fluency is susceptible to gains, especially with left-sided temporal lobe surgery [20]. Similarly, while most individuals do not experience postoperative changes in memory, there is evidence that up to 25% of people experience improvements in memory following surgery whereas some 33% of people experience deficits in memory following surgery [19].

In addition to cognitive neuropsychological outcomes, outcomes in health related quality of life (HRQOL) following surgery for epilepsy are also nuanced. HRQOL consists of multiple domains, including physical, psychological, social, vocational, and economic. Not surprisingly, research shows that improvements in HRQOL following surgery for epilepsy are most strongly predicted by seizure freedom following surgery [2]. Studies comparing patients after surgery to medically managed patients or to patients awaiting surgery consistently show better HRQOL, satisfaction, overall psychosocial well-being, and functional status in patients who underwent surgery [2]. In a large prospective study, Spencer and colleagues (2007) found that HRQOL improves early after surgery, regardless of seizure outcome, but subsequent HRQOL improvements over time are sensitive to seizure-free and aura-free status, and seem to stabilize 2 years post-surgery [21]. Moreover, in a study examining quality of life outcomes in patients who underwent extratemporal resections, all patients reported improved HRQOL compared to pre-surgery, but seizure-free patients showed better HRQOL than those patients who continued to have seizures [22].

Although a large body of work suggests that the degree of neuropsychological improvement or deficit following surgery is related to the reduction of seizures [23], we did not find a correlation between seizure characteristics or ILAE ratings and psychological adjustment following surgery. This may be because most of the patients in the current study had low ILAE ratings (i.e. good seizure outcomes) and all assessments were conducted in the chronic epoch following surgery, when lesions and outcomes are fairly stable. Furthermore, research shows that even despite early difficulties with post-surgical adjustment, overall, surgery for epilepsy leads to good outcomes [7].

Many variables contribute to outcomes following surgery for epilepsy, making research in this area complex. While much work has focused on predictors of outcomes following surgery such as seizure frequency, lesion laterality, gender, and age, far fewer studies have examined other potentially important outcome predictors including, but not limited to, levels of social support, family history, and current stress [3]. Furthermore, the majority of studies examining global outcomes following surgery for epilepsy use neuropsychological test scores, which may mask more nuanced cognitive changes, or self-report measures, which may lack ecological validity (e.g., due to poor insight). More comprehensive pre- and postoperative assessment for epilepsy surgery includes systematically gathering information from a broader range of sources.

The current work adds to our understanding of psychological adjustment following surgery for epilepsy, contributing an informant perspective to the literature. Our findings suggest that based on an informant perspective, psychological functioning pre- and post-surgery for epilepsy remains stable and within a normal range. These results may be clinically relevant in considering possible consequences of surgery. Consistent with evidence that surgery for epilepsy largely leads to good outcomes [7], the current work suggests stable psychological adjustment in the chronic epoch of recovery following epilepsy surgery.

Despite the unique contribution of this work, there are some limitations that should be noted. One possible limitation of informant-reports is that there can be a strong relationship between informant levels of stress and anxiety and symptoms reported about the patient [24–

25]. This can potentially lead to informant-reports not accurately reflecting patient outcomes (e.g. Obonsawin et al., 2007) [26]. In the current study, however, informant reports seem to be an accurate reflection of patient psychological adjustment. Specifically, informant-reports on current depression using the ISPC were significantly associated with patient self-reports of depression. Furthermore, overall psychological adjustment as rated on the ISPC was significantly associated with various dimensions of self-reported personality characteristics.

Arguably, information provided by informants is particularly important in neurological patients following brain surgery because insight may be limited in this population. We found that informant-ratings on levels of current insight were significantly related to current personality and behavior characteristics. Poorer levels of informant-rated patient insight were significantly related to poorer psychological adjustment.

One limitation of this study is that not all measures were obtained contemporaneously. We addressed this limitation to the best of our ability given the dataset, using measures available closest to the date of ISPC administration.

Future work could examine psychological adjustment following surgery for epilepsy from an informant perspective on a larger scale. The current work suggests that personality and behavior characteristics remain stable following surgery for epilepsy. This finding is consistent with the generally good outcomes following surgery for epilepsy reported in the literature. This work provides initial evidence that, from an informant perspective, psychological adjustment following surgery for epilepsy is relatively good. More work on a larger scale is needed, however, to further understand how informant-reports can contribute to our knowledge of psychological adjustment following surgical intervention for epilepsy.

Acknowledgments

None.

Funding

This work was supported by the McDonnell Foundation Collaborative Action Award (220020387) to Dr. Daniel Tranel and the National Institutes of Health Predoctoral Training Grant (T32-GM108540) to Dr. Daniel Tranel for trainee Marcie King.

References

1. Moshe SL, Perucca E, Ryvlin P, Tomson T. Epilepsy: new advances. *Lancet*. 2015; 385:884–98. [PubMed: 25260236]
2. Spencer S, Huh L. Outcomes of epilepsy surgery in adults and children. *Lancet Neurol*. 2008; 7:525–37. [PubMed: 18485316]
3. Macrodimitris S, Sherman EM, Forde S, Tellez-Zenteno JF, Metcalfe A, Hernandez-Ronquillo L, Wiebe S, Jette N. Psychiatric outcomes of epilepsy surgery: a systematic review. *Epilepsia*. 2011; 52:880–90. [PubMed: 21426324]
4. Devinsky O, Barr WB, Vickrey BG, Berg AT, Bazil CW, Pacia SV, Langfitt JT, Walczak TS, Sperling MR, Shinnar S, Spencer SS. Changes in depression and anxiety after resective surgery for epilepsy. *Neurology*. 2005; 65:1744–9. [PubMed: 16344516]
5. Reuber M, Andersen B, Elger CE, Helmstaedter C. Depression and anxiety before and after temporal lobe epilepsy surgery. *Seizure*. 2004; 13:129–35. [PubMed: 15129842]

6. Hermann BP, Wyler AR, Ackerman B, Rosenthal T. Short-term psychological outcome of anterior temporal lobectomy. *J Neurosurg.* 1989; 71:327–34. [PubMed: 2769384]
7. Wilson SJ, Bladin PF, Saling MM, Pattison PE. Characterizing psychosocial outcome trajectories following seizure surgery. *Epilepsy Behav.* 2005; 6:570–80. [PubMed: 15907751]
8. Wilson SJ, Wrench JM, McIntosh AM, Bladin PF, Berkovic SF. Personality development in the context of intractable epilepsy. *Arch Neurol.* 2009; 66:68–72. [PubMed: 19139301]
9. Connelly BS, Ones DS. An other perspective on personality: meta-analytic integration of observers' accuracy and predictive validity. *Psychol Bull.* 2010; 136:1092–122. [PubMed: 21038940]
10. Achenbach TM, Krukowski RA, Dumenci L, Ivanova MY. Assessment of adult psychopathology: meta-analyses and implications of cross-informant correlations. *Psychol Bull.* 2005; 131:361–82. [PubMed: 15869333]
11. Kendler KS, Roy MA. Validity of a diagnosis of lifetime major depression obtained by personal interview versus family history. *Am J Psychiatry.* 1995; 152:1608–14. [PubMed: 7485623]
12. Klein DN. Patients' versus informants' reports of personality disorders in predicting 7 1/2-year outcome in outpatients with depressive disorders. *Psychol Assess.* 2003; 15:216–22. [PubMed: 12847782]
13. Lara ME, Ferro T, Klein DN. Family history assessment of personality disorders: II Association with measures of psychosocial functioning in direct evaluations with relatives. *J Pers Disord.* 1997; 11:137–45. [PubMed: 9203108]
14. Barrash J, Asp E, Markon K, Manzel K, Anderson SW, Tranel D. Dimensions of personality disturbance after focal brain damage: Investigation with the Iowa Scales of Personality Change. *Journal of clinical and experimental neuropsychology.* 2011; 33:833–852. [PubMed: 21500116]
15. Tranel D. The Iowa-Benton school of neuropsychological assessment. *Neuropsychological assessment of neuropsychiatric and neuromedical disorders.* 2009:66–83.
16. Barrash J, Anderson S, Jones R, Tranel D. The Iowa rating scales of personality change: reliability and validity. *Journal of the International Neuropsychological Society.* 1997; 3:27–28.
17. Barrash J, Tranel D, Anderson SW. Acquired personality disturbances associated with bilateral damage to the ventromedial prefrontal region. *Developmental neuropsychology.* 2000; 18:355–381. [PubMed: 11385830]
18. Wieser HG, Blume WT, Fish D, Goldensohn E, Hufnagel A, King D, Sperling MR, Luders H, Pedley TA. ILAE Commission Report. Proposal for a new classification of outcome with respect to epileptic seizures following epilepsy surgery. *Epilepsia.* 2001; 42:282–6. [PubMed: 11240604]
19. Baxendale S. The impact of epilepsy surgery on cognition and behavior. *Epilepsy Behav.* 2008; 12:592–9. [PubMed: 18299253]
20. Sherman EM, Wiebe S, Fay-McClymont TB, Tellez-Zenteno J, Metcalfe A, Hernandez-Ronquillo L, Hader WJ, Jette N. Neuropsychological outcomes after epilepsy surgery: systematic review and pooled estimates. *Epilepsia.* 2011; 52:857–69. [PubMed: 21426331]
21. Spencer SS, Berg AT, Vickrey BG, Sperling MR, Bazil CW, Haut S, Langfitt JT, Walczak TS, Devinsky O. Health-related quality of life over time since resective epilepsy surgery. *Ann Neurol.* 2007; 62:327–34. [PubMed: 17567854]
22. Tanriverdi T, Olivier NP, Olivier A. Quality of life after extratemporal epilepsy surgery: a prospective clinical study. *Clin Neurol Neurosurg.* 2008; 110:30–7. [PubMed: 17919811]
23. Wachi M, Tomikawa M, Fukuda M, Kameyama S, Kasahara K, Sasagawa M, Shirane S, Kanazawa O, Yoshino M, Aoki S, Sohma Y. Neuropsychological changes after surgical treatment for temporal lobe epilepsy. *Epilepsia.* 2001; 42(Suppl 6):4–8.
24. Hellawell DJ, Taylor R, Pentland B. Persisting symptoms and carers' views of outcome after subarachnoid haemorrhage. *Clinical rehabilitation.* 1999; 13:333–340. [PubMed: 10460121]
25. Stone J, Townend E, Kwan J, Haga K, Dennis M, Sharpe M. Personality change after stroke: some preliminary observations. *Journal of Neurology, Neurosurgery & Psychiatry.* 2004; 75:1708–1713.
26. Obonsawin MC, Jefferis S, Lowe R, Crawford JR, Fernandes J, Holland L, Woldt K, Worthington E, Bowie G. A model of personality change after traumatic brain injury and the development of the Brain Injury Personality Scales. *J Neurol Neurosurg Psychiatry.* 2007; 78:1239–47. [PubMed: 17259352]

Highlights

- Informant perspectives elucidate psychological adjustment after epilepsy surgery
- Personality and behavior in 5 domains remain stable following epilepsy surgery
- Detailed and systematic investigation of informant-rated outcomes may be very useful in the standard assessment of surgery for epilepsy

Figure 1.

A. Average “Before” compared to “Now” ratings for executive functioning. Levels of executive function remained stable: “Before” ratings ($M = 3.19$, $SD = 1.12$), “Now” ratings ($M = 3.39$, $SD = 1.28$); B. Average “Before” compared to “Now” ratings for social behavior. Levels of social behavior remained stable: “Before” ratings ($M = 2.79$, $SD = 1.11$), “Now” ratings ($M = 2.92$, $SD = 1.34$); C. Average “Before” compared to “Now” ratings for hypo-emotionality. Levels of hypo-emotionality remained stable: “Before” ratings ($M = 3.26$, $SD = 1.10$), “Now” ratings ($M = 3.15$, $SD = 1.21$); D. Average “Before” compared to “Now” ratings for irascibility. Levels of irascibility remained stable: “Before” ratings ($M = 3.36$, $SD = 1.16$), “Now” ratings ($M = 3.75$, $SD = 1.38$); E. Average “Before” compared to “Now”

ratings for distress. Levels of distress remained stable: “Before” ratings ($M = 3.39$, $SD = 1.26$), “Now” ratings ($M = 3.60$, $SD = 1.31$).

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1

Demographic, Cognitive, and Medical Characteristics

	M(SD)	Min	Max
Age (years) *	44.67 (11.80)	28.00	62.00
Education (years)	14.07 (2.07)	10.00	18.00
WAIS-III FSIQ **	98.69 (11.69)	78.00	123.00
Age of seizure onset (years)	13.00 (12.15)	0.25	47.00
Age at time of surgery (years)	38.57 (11.55)	23.00	60.20
Medication pre-surgery	1.67 (0.73)	1.00	3.00
Medication post-surgery	1.15 (0.66)	0.00	3.00
ILAE rating post-surgery	1.89 (1.22)	1.00	5.00

* Age at time of ISPC data collection

** N=26; data not available for 1 patient

Table 2

Iowa Scales of Personality Change Items Assessed, by Domain

Executive Functioning	Social Behavior	Hypo-emotionality	Irascibility	Distress
Lack of initiative	Insensitivity	Blunted affect	Irritability	Depression
Perseveration	Social Inappropriateness	Social Withdrawal	Lability	Anxiety
Impulsivity	Aggression	Apathy	Inflexibility	Dependency
Lack of persistence	Inappropriate affect		Impatience	Vulnerability to pressure
Lack of planning				
Poor judgment				
Indecisiveness				

Table 3

Average Pre- to Post-Operative Change on ISPC, by Domain

Domain	M(SD)
Overall change	0.16 (1.28)
Executive functioning	0.20 (1.47)
Social behavior	0.13 (1.29)
Hypo-emotionality	−0.11 (1.27)
Irascibility	0.38 (1.42)
Distress	0.20 (1.77)

Table 4

Average Scores on BDI-II and MMPI-2

BDI-II	M(SD)	MMPI-2 Scales [*]	M(SD)
Overall	8.67 (9.14)	Hypochondriasis	59.00 (13.38)
		Depression	61.63 (15.95)
		Hysteria	56.25 (12.06)
		Psychopathic Deviate	55.54 (13.01)
		Masculinity/Femininity	51.96 (10.23)
		Paranoia	58.54 (11.66)
		Psychasthenia	59.29 (17.88)
		Schizophrenia	62.91 (17.13)
		Hypomania	56.13 (10.67)
		Social Introversion	56.50 (12.57)

^{*} N=24; data not available for 3 patients