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Review

The quality of life of older adults with epilepsy: A systematic review

Charlotte J. Baranowski*

Department of Neuropsychology, Epilepsy Society, Chalfont St. Peter, Buckinghamshire, UK

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ABSTRACT

The aim of this systematic review is to identify and synthesise the current literature on the quality of life (QoL) of older adults with epilepsy. Studies were included if they (1) assessed the QoL of older adults (2) had a minimum of one population group of people with epilepsy aged 60 and older and (3) used a standardised QoL measure. Databases searched were PubMed, Scopus, Cochrane Library and PubPsych. A total of 201 abstracts were screened, of which 10 articles met the criteria. A 17-item standardised checklist was used to analyse the methodological quality of the studies. This checklist was derived from other systematic reviews which analysed the QoL of those with other health conditions and modified to suit the purpose of this review. The findings were synthesised to compare the overall QoL of older adults in comparison to younger age groups and to identify which QoL factors were the most and least negatively impacted by the presence of epilepsy and old age. Predictors of QoL were identified from findings that used a regression analysis and were rated regarding their strength of evidence. No clear differences for overall QoL were found between older and younger people with epilepsy. Participants reported energy/fatigue to be the most negatively impacted factor. Seizure frequency was a strong predictor of QoL, and comorbidity and depression were moderate predictors. The modest number of studies available for synthesis is a reflection of the gap in current literature on this topic. Future research needs to include more variables within their regression analysis to identify more predictors of QoL, and needs to compare QoL changes over the trajectory of older age.

1. Introduction

1.1. Quality of life

The life expectancy of the population has increased due to improvements in medicine, public health, nutrition, income, education, and migration [1]. Between 2015 and 2030, "The number of people in the world aged 60 and over is expected to grow by 56%, from 901 million to 1.4 billion" [2]. Consequently, long-term care and age-related chronic illness increases in addition to treatment of disease, resulting in longer life expectancy. The quality of a persons' life has been shown to be of equal importance to life expectancy [3,4].

Providing holistic, patient-centred treatment and understanding of disease outcomes requires the use of quality of life (QoL) measures. The World Health Organisation (WHO) defined QoL as, "A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [5]. QoL is a multifaceted concept dependent on a variety of factors. While this differs between which measure is used, components typically include: physical health, psychological well-being, level of independence, social relationships, environment and spirituality/religion/personal beliefs [5].

1.2. Epilepsy, age and quality of life

The impact of epilepsy will differ depending on an individual's age related stage of life, i.e. childhood, adolescence, adulthood and late adulthood. Extensive literature has examined the impacts of having epilepsy during childhood and adolescence. Stevanovic, Tadic and Novakovic conducted a systematic review on children and adolescents with epilepsy and examined how this impacted their QoL [6]. Their systematic review gathered 44 studies, with the results showing that strong predictors of QoL were age at epilepsy onset, number of anti-epileptic medications and parental depression. Moderate predictors included attentional problems, intelligence, family structure, and parental anxiety.

Examining QoL and its determinants with adults who have epilepsy has been explored. Taylor, Sander, Taylor and Baker [7] found in a systematic review of 93 studies that an increase in seizure frequency, seizure severity, level of depression and anxiety, and the presence of a co-morbid condition were strongly associated with a reduced health related quality of life (HRQoL).

At the other end of the age spectrum are older adults. The chronological age of older adults varies in literature, with some stating > 60

* Correspondence to: Epilepsy Society Research Centre, Department of Neuropsychology, Epilepsy Society, Chalfont St. Peter, Buckinghamshire, SL9 0RJ, UK.
E-mail address: charlotte.baranowski1@nhs.net.

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and some > 65. This is the result of researchers using the medical definition of 'older adults' or using other factors, such as retirement age.

Older adults have different characteristics of epilepsy in comparison to other age groups. Cerebrovascular disease, neurodegenerative disorders, brain tumours, and traumatic brain injury are some of the most common causes for epilepsy onset in older adults [8]. The presentation of epilepsy in old age is often less specific. One-third results from a cryptogenic diagnosis [9] which could be due to atypical features [10]. Memory problems, confusion, falls, or sensory changes are often regarded as symptoms of ageing, but could be epileptic [11]. Treatment is challenging as older adults are more likely to experience side effects from anti-epileptic medication [12] and greater drug interactions due to multiple drug therapy and increased physical sensitivity [13]. Physical sensitivity refers to the body being sensitive to changes or influences which may result in an increased likelihood of negative reactions or injuries.

Life experiences change with age, with older adults more likely to experience isolation. It is estimated that 17% of older adults are in contact with their family, friends, and neighbours less than once a week, and virtually half of all people aged 75 and over live alone [14]. The capability to mobilise oneself reduces due to physical changes and losing the ability to drive a vehicle. Participation in daily activity, employment, and income can be reduced. Factors linked with ageing in addition to a diagnosis of epilepsy can result in older adults with epilepsy being a vulnerable population group.

There is one systematic review that analysed the HRQoL of older adults with epilepsy. However, the purpose of this research was specific to analysing randomised clinical trials (RCT) on anti-epileptic medication effects and how this impacted HRQoL. Their results showed that no formal QoL outcome measures were performed in any of the RCT's that included older adults. They concluded that there was little empirical guidance available and virtually no information on preferences and goals for epilepsy treatment [15]. There is currently no review of note that systematically addresses literature on the global QoL of older adults with epilepsy.

There is a demand for patient centred outcomes and patient preferences in the development of interventions aimed at older adults [16]. The identification of patient centred outcomes and preferences can be derived from QoL measures. The desired outcomes of younger adults with epilepsy may not be completely applicable to older adults with epilepsy given the uniqueness of this population, as discussed above. In order to develop suitable interventions, research needs to look at the needs of older adults in separation to younger adults.

This review was organised with the aim of identifying, in a systematic way, the current literature addressing the QoL of older adults with epilepsy. Because this review is interested in a certain age group, the results will be synthesised to address the differences in overall QoL between older and younger adults with epilepsy, identify which QoL factors are most negatively impacted by epilepsy and old age and which QoL factors predict overall QoL. For this review, the age criterion will be > 60, in order to account for the different definitions of 'older adults'.

2. Materials and method

2.1. Search strategy

Articles and review papers were checked from the following databases: PubMed, PubPsych, Scopus and Cochrane Library. Grey literature was not included. The following search term was created for titles/abstracts:

Epilepsy AND ("quality of life" OR "value of life" OR "quality of wellbeing" OR HRQOL OR "health related quality of life" OR "health quality of life" OR SF12 OR SF36 OR QOLIE) AND (elderly OR senior OR "older adult" OR geriatric).

2.2. Study selection

The abstracts of all the results were screened for inclusion. If the abstract missed inclusion details then the method paper of the study was screened. Inclusion criteria were studies that had (1) assessed the QoL of older adults, (2) had a minimum of one population group of people with epilepsy aged 60 and older, (3) and used at least one standardised QoL measure (either specific to epilepsy or general). The types of study designs included for review were randomised controlled trials (RCT), cohort, cross-sectional, observational and case reports. An exclusion criterion was applied to languages other than English. Fig. 1 shows the process of selecting studies for this review.

2.3. Quality of evidence assessment

The methodological quality of all 10 selected studies was determined using a 17- item standardised checklist of predefined criteria (see Table 1) that is based on theoretical considerations and methodological aspects described by Altman [17]. The checklist does not penalise studies for having different designs, for example, a cross sectional study may not gain points from criteria L and P, but it can still gain enough points to be rated as having a high methodological quality. This checklist was modified for this review to suit its purpose. This checklist has been used in previous systematic reviews on the quality of life of people with different health conditions [6,18–20]. One point was assigned to items that met the criteria. When an item was absent, was described insufficiently, or did not meet the criteria, no point was assigned. Studies scoring 12 or more points (70% or more) were labelled as "high quality", studies scoring 8–11 points (between 50–70%) were labelled as "moderate quality", and studies scoring lower than 7 points (lower than 50%) were labelled as "low quality" studies. The author of this study was the only rater involved in determining the methodological quality of studies included in this review.

2.4. Data extraction and synthesis

QoL questionnaires quantify several different aspects and predictors that can affect the overall QoL score. For the interpretation and comparison of results, a variety of QoL domains were considered: physical, psychological, social relationships, level of independence, environment and spirituality/religion/personal beliefs (derived from the WHO model of QoL) [5] and demographic and epilepsy specific. Initially, the findings were synthesised to identify differences between age groups. Further synthesis was to identify which QoL factors were the most and least affected by the presence of epilepsy and old age, this was done by comparing studies that used the same QoL instrument.

Predictors of QoL were identified from the synthesis of consistent findings from studies that used a regression analysis to evaluate the determinants of QoL. The analyses of predictors were considered consistent if ≥75% of the studies showed the same direction of the association. Five levels of evidence, also shown in Stevanovic et al (2011) study [6], were used to show how strong/weak the evidence is (see Table 2).

3. Results

3.1. Study characteristics

Of the 10 studies, eight were cross-sectional, one was a follow-up and one was an RCT. One study compared the results of older adults with epilepsy to a matched healthy control group [21], three compared the results to the general epilepsy population from which their choice of questionnaire was standardised [22–24], four compared the results to younger age group(s) [25–28], and two studies had no comparison groups [29,30]. Two studies looked at if treatment affected QoL [29,30]. The majority of the studies considered adults as 'older' if

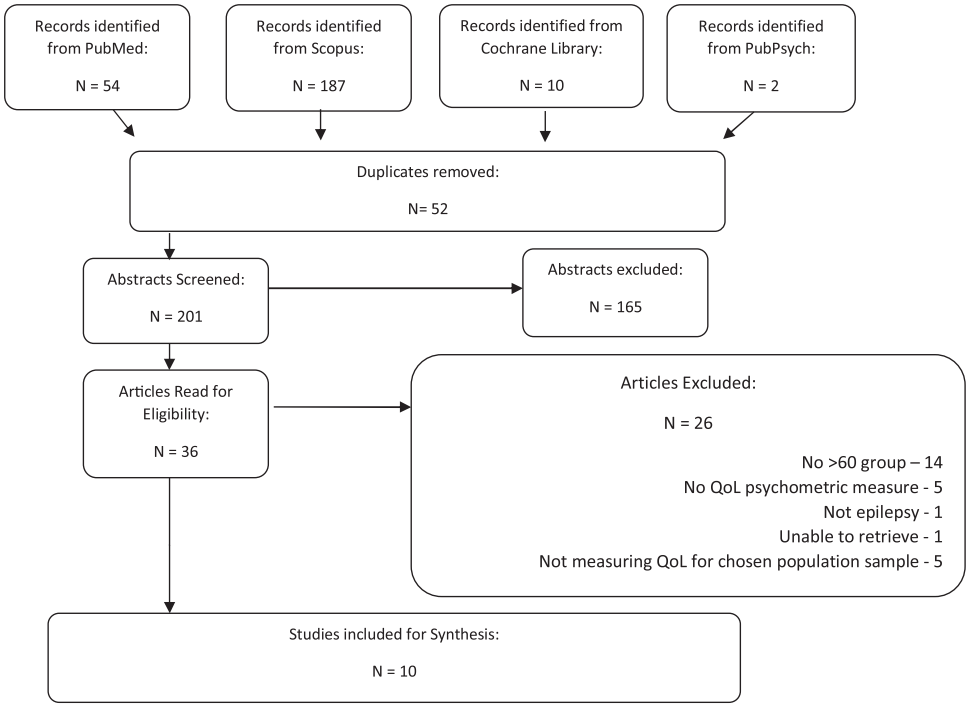

Fig. 1. A PRISMA flow diagram showing the process of collecting studies based on inclusion and exclusion criteria.

Table 1
List of criteria assessing the methodological quality of studies.

QOL Assessment:	
A	A standardised or valid quality of life questionnaire is used.
B	A reason is given for choosing a certain questionnaire.
Study Population:	
C	A description is given of the sample's socio-demographic data (at least age, gender and educational status).
D	Description of epilepsy variables (at least type, age of onset, duration and treatment) is given.
E	Information is given about the ratio of non-responders versus to responders.
F	Participation and response rates for patient groups have to be described and be more than 75%.
G	Inclusion and/or exclusion criteria are considered (at least age and relevant co-morbidity).
H	The setting of requirement is given (i.e. general practice, hospital, occupational setting, nursing home, etc).
I	The process of data collection is described (e.g. interview or self-assessment, etc).
Study Design:	
J	The study size consists of at least 50 persons.
K	The data are prospectively gathered.
L	The follow-up period is at least six months.
M	Drop-out/loss to follow up $< 20\%$.
QOL Results:	
N	The results are reported for overall and for specific QoL domains (at least mean and standard deviation).
O	The results compared are between two groups or more (e.g. health population, groups with different severity of epilepsy or age).
P	The results are compared with at least two time points (e.g. longitudinally or pre-versus post treatment).
Q	Predictors are described using regression analyses or structural modelling.

aged > 60, with the exception of Pugh et al. (2005), May et al. (2015), and Saetre et al. (2010) who classified it as > 65 [25,26,29]. One study classified their participants as 'older' based on their gender and retirement age, with women being > 60 years and men being > 65 years [27].

Table 2
Level of evidence for predictors.

Strong	Consistent findings (≥75%) in at least two high-quality studies or one high-quality study and at least two moderate studies.
Moderate	Consistent findings (≥75%) in one high-quality study and one moderate or low-quality study or at least three moderate studies.
Weak	Findings of one high-quality study or consistent findings of two moderate studies or at least three low-quality studies.
Inconclusive	Inconsistent findings or less than three low-quality studies.

3.2. Methodological quality

The quality of the scores ranged from 7 to 14 (mean = 10), with one study considered low, eight considered moderate and one considered high quality. Criteria C, D, E, K, L and P (see Table 1) were the main methodological limitations, due to studies not providing the details, giving inadequate explanations or what was not part of the study design. See Table 3 for list of studies included and their overall methodological scores.

3.3. Overall quality of life comparison

Two studies found that older people with epilepsy had worse overall QoL scores in comparison to "the general epilepsy population"; which was data derived from which the QOLIE-31 was standardised [22,23], one study contradicted this ($p = 0.001$) [24]. Unsurprisingly, in comparison to healthy controls of the same age, those with epilepsy had a lower overall QoL score [21].

Overall QoL was found to be poorer for older adults with long-standing epilepsy in comparison to younger people ($p = 0.01$) [25] whilst another suggested that middle aged adults, particularly those with new-onset epilepsy, had lower scores (meaning more disability) on all six QoL domains of the VR-36 in comparison to older adults ($p = < 0.01$) [26]. One study found no significant difference between younger vs older age groups (no p value given) [28]. The study by May et al. scored highly in terms of its methodological quality and had an

Table 3
Included studies for synthesis.

Main Author	Year	Participants[a]	Intervention/Comparison (measures/design)	Main Outcomes	Quality Score
May et al. [25]	2015	N = 91 Older adults split into 2 groups; group A1 = late onset epilepsy and A2 = early onset epilepsy. Mean age: A1 = 74.9 and A2 = 69.6. Epilepsy Type: Focal (Symptomatic & Cryptogenic), Generalised (Idiopathic) and Other.	Cross-sectional design – Germany. Older adults compared to younger adults (age 18-50) N = 41. QoL measures: PESOS (PErformance, SOciodemographic aspects and Subjective Estimation). Restrictions due to epilepsy and global QoL were assessed using corresponding items from the PESOS and the QOLIE-31, respectively.	• Young adults reported highest QoL. • Older adults with late onset and early onset epilepsy overall QoL did not differ. • Epilepsy related fears were higher in A2 group. • Seizure related variables, tolerability of AEDs and comorbidity have stronger impact on QoL.	14
McLaughlin, Pachana and Mcfarland [21].	2008	N = 64 Mean age = 67.59 Epilepsy Type: No details of specific type. All types.	Cross-sectional design – Australia. Older adults compared to controlled group (60 and older and from the "general community") N = 60. Main QoL measure: QOLIE-31. Other measures used: MMSE (mini mental state exam), WPSO (Washington Psychosocial Seizure Inventory) and a stigma scale.	• HRQoL in older adults was significantly impaired in comparison to controls. • Stigma and frequent seizures related to poorer QoL.	11
Canuet et al [28].	2009	N = 45 Mean age = 66.5 Epilepsy Type: Symptomatic and cryptogenic.	Cross sectional design – Japan. Older adults compared to younger adults (age 18-57) N = 69. Main QoL measure: QOLIE-31. Other measures used: BDI-II (The Beck Depression Inventory-II).	• No difference in QoL scores between older and younger people with epilepsy. • BDI-II and seizure frequency were the best predictors of overall QoL. • Older adults adapt better to their chronic health problem.	11
Saetre et al [29].	2010	N = 167 (CBZ 83 + LTG 84)* Mean Age = CBZ group (73.0) and LTG group (74.1). Epilepsy Type: Idiopathic, symptomatic and cryptogenic. * CBZ = carbamazepine and LTG = Lamotrigine.	40 week randomised double blind study – over 29 centres in Croatia, Finland, France, Italy and Norway. No control group. QoL measure: SEALS inventory (Side Effect and Life Satisfaction) and AEP (the Liverpool Adverse Events Profile).	• After 40 weeks of therapeutic doses, CBZ and LTG caused no significant changes to HRQoL.	11
McLaughlin, Pachana and Mcfarlan [23].	2010	N = 64 Mean Age = 67.59 Epilepsy Type: No details of specific type. All types.	Cross sectional design – Australia. Older adults compared to the "general epilepsy population", which is data derived from the development of the QOLIE-31 inventory. QoL measure: QOLIE-31. Other measure used: CIDI (Composite International Diagnostic Interview).	• Overall QoL for older adults was lower than general epilepsy population scores. • Depression, dysthymia and more frequent seizures predicted HRQoL. The strongest being dysthymia.	10
Baker et al [27].	2001	N = 155 Median Age (mean not given) = 70 Older adults split into 2 groups for further analysis; 2a (onset before older age) and 2b (onset after older age). Epilepsy Type: No details of specific type. All types.	Cross sectional design – UK. Older adults compared to younger adults; men aged < 65 and women aged < 60, N = 514. QoL measures used: The Impact of Epilepsy scale, AEP (The Adverse Drug Events Profile), HAD (The Hospital and Anxiety Depression scale), the Stigma scale and the Terrible-Delighted Faces measure.	• Younger people more likely to report feeling stigmatised. • Older people diagnosed in later life were more anxious and depressed in comparison to older people diagnosed earlier. • Overall QoL worse for those diagnosed later in life. • Older people do not necessarily experience poorer QoL.	9
Laccheo et al [22].	2008	N = 23 Mean age = 66 Epilepsy Type: No details on specific type. All types.	Cross sectional design – USA. Older adults compared to "general epilepsy population" which was data derived from which the QOLIE-31 was standardised. QoL measure: QOLIE-31 and SF-36 (the Short Form 36 Health Survey).	• Seniors did not have poorer HRQoL compared to general epilepsy populations. • Compared to the general population without epilepsy, older adults with epilepsy had a poorer HRQoL.	9

(*continued on next page*)

Table 3 (*continued*)

Main Author	Year	Participants[a]	Intervention/Comparison (measures/design)	Main Outcomes	Quality Score
Witt et al [24].	2014	N = 257 Mean Age = 71.5 Epilepsy Type: Focal, Symptomatic and Cryptogenic.	Report examined RCT baseline data only – Germany, Switzerland and Austria. Older adults compared to the norm patients with epilepsy presented in the QOLIE-31 scoring manual. QoL measure: QOLIE-31. Other measures used: EpiTrack (tests cognitive effects of anti-epileptic medication) and PNS (The Portland Neurotoxicity Scale).	• Relatively high QoL, low rate of subjective impairment but high incidence of objective executive deficits in untreated older adult patients with new-onset epilepsy.	9
Stefan et al [30].	2008	N = 107 Mean age = 69 Epilepsy type: Idiopathic, Cryptogenic, Symptomatic and Unknown.	Follow up clinical trial – Germany. No comparison group. QoL measure used: QOLIE-31 and CGI (Clinical Global Impression).	• As seizure frequency decreased, QoL increased in in all domains except emotional wellbeing and energy/fatigue.	9
Pugh et al [26].	2005	N = 252,854 Mean Age = No mean age given. Epilepsy type: No details of types.	Cross sectional design – USA. Older adults compared to younger adults who were split into 2 groups; 18-40 (N = 31,162) and 41-64 (N = 225,285). QoL measure used: VR-36 (Veterans Rand 36 Item Health Survey).	• Older adults appeared to cope better. Middle-aged participants scored lowest in all QoL domains (age 41-64 years).	7

[a] Description of older adult participant group.

older adult sample size of 91 and a younger adult sample size of 41 [25]. In comparison, Canuet et al's (2009) study had an older adult sample size of 45, a younger adult sample size of 69 and a moderate methodological quality of research [25]. Both used the QOLIE-31 for measuring global QoL. However, only one study split their age ranges into three categories of younger, middle aged and older adults [21]. These differences could explain some of the differences in results.

The inconsistency of the results between age groups could implicate that other factors rather than age, such as age of onset, impacted QoL scores. One study found that older adults diagnosed post-retirement more often indicated a negative QoL ($p = < 0.05$) [27], this was only significant in comparison to older adults diagnosed with epilepsy pre-retirement, not in comparison to younger adults. Similarly, Pugh et al (2005) found that older adults with new-onset epilepsy, in comparison to older adults with long-standing epilepsy, tended to score poorer on QoL domains ($p = < 0.01$) [26].

3.4. QoL factors affected

The most popular choice of QoL measure was the QOLIE-31 instrument; five out of the six studies that did use this measure suggested that older adults found that epilepsy had a larger negative impact on energy/fatigue levels [21–24,30], whilst another study found that seizure worry was the most affected factor [28]. In contrast, social functioning [21–23], seizure worry [22] and medication effects [30] were found to be the least affected factors.

3.5. Predictors of QoL

Table 4

4. Discussion

This review was organised with the aim of identifying, in a systematic way, the current literature addressing the QoL of older adults with epilepsy. The results were synthesised to address the differences in overall QoL between older and younger adults with epilepsy, to identify which QoL factors were the most negatively impacted by the presence of older age and epilepsy and which QoL factors predicted overall QoL. Overall, a limited number of studies used a regression analysis, making it difficult to identify a broader range of potential predictors.

Older adults with epilepsy typically reported a poorer overall QoL and within QoL domains: physical, psychological, social and level of independence. Noticeably the instruments used addressed the majority of the domains within the WHO conceptual model [5] excluding direct reference to spirituality/religious domains. However, the chosen QoL measures did vary, with the majority using the QOLIE. This questionnaire looks at the QoL of those with epilepsy, but it does not include age specific questions or variables. For example, the WHOQOL-old has questions relating to sensory abilities, autonomy, past, present and future achievements, use of time, social participation and attitudes towards death and dying [31].

The results were weak or inconclusive when identifying if older adults have a worse or better QoL in comparison to younger adults, and the results illustrated that age of onset could be a contributing factor to influencing perceived QoL. In adults, age of onset has been shown to impact QoL scores [32,33], but conflicting results argue that age and duration are more influential factors [34]. The limited studies in this review that compared age groups in combination with age of onset found that those more recently diagnosed with epilepsy had poorer scores on QoL domains [26,27]. It could be argued that those more recently diagnosed with epilepsy have had less time to adjust and develop effective coping mechanisms. With older adults, the development of epilepsy is likely secondary to the presence of another comorbid condition (symptomatic epilepsy) [35]. The primary comorbid condition might be potentially more incapacitating than the subsequent

Table 4
Predictors of QoL in older adults with epilepsy.

Strong Evidence	Moderate Evidence	Weak Evidence	Inconsistent
Seizure frequency (May et al.; Mclaughlin et al.; Canuet et al.) [21–23,28].	Co-morbidity (May et al.; Witt et al.) and depressive symptoms (McLaughlin et al.; Canuet et al.) [23–25,28].	Unsatisfying AED tolerability, when dependent on help (May et al.) and stigma (MacLaughlin et al.) [21,25].	Epilepsy duration (Canuet et al.). Gender (Witt et al.) [24,28].

epilepsy [26]. Both points combined might explain why older adults with new-onset epilepsy had a lower QoL.

The energy/fatigue domain tended to have the worst scores within the QOLIE-31 questionnaire [21–24,30]. An individual's energy levels can decrease due to seizures occurring in sleep [36] and adverse effects of antiepileptic medication [37]. The reason for this result is difficult to determine. If it was the result of medication effects, only two studies illustrated the number and type of medications, but there was no regression analysis to investigate this further [21,23]. It could be the result of the types of seizures, or whether they were nocturnal, but again no studies investigated this further. Energy levels can decrease with age and this symptom could be exacerbated with the presence of seizures.

Seizure frequency was found as a strong predictor in this review [21–23,28]. Seizure frequency has been shown to affect QoL in studies of adults [38–40]. It was an inconsistent predictor for children and adolescents in Stevanovic et al. study [6]. The impact and consequences of seizures can be worse for older adults. Physical sensitivity increases with age, which can lead to further injuries and complications. Postictal confusion can become more prolonged in older adults; this in combination with a higher seizure frequency could have significant impact on performing daily activities. Fear and apprehension of having a seizure is enough to limit someone's activities and consequently reduce QoL [23] and infrequent seizures still place limitations on activities of daily living [40,41]. The amount and intensity of complications and consequences during or after seizures might explain seizure frequency as a strong predictor.

Moderate evidence showed that comorbidity was a predictor of QoL [24,25]. The comorbid conditions were grouped into neurologic, cardiovascular and psychiatric. A systematic review in adults with epilepsy found that the presence of a comorbid condition is associated with a poorer HRQoL [7]. However, in Stevanovic et al. study, comorbidity was an inconsistent predictor [6]. The likelihood of developing comorbid conditions with epilepsy in older adults has been documented [8–10]. Implications of comorbid conditions can include further complicated drug therapy regimes, an increase in adverse effects, cognitive deficits and an impact on daily activities. Authors of research in this review tended to join psychiatric and physical comorbid conditions together within their regression analysis or when describing their demographic characteristics. This made it difficult to identify potential differences between comorbidities.

Depressive symptoms were a moderate predictor of QoL [23,28]. Depression is known to be prevalent with those who have epilepsy [42–45]. Potential older adult related life changes, such as increased isolation, could worsen depressive symptoms. The fact that seizure frequency and comorbidity were also predictors might explain why depressive symptoms were also a predictor. Higher seizure frequency and comorbid conditions can negatively impact an individual's well-being and mental health.

Interestingly, the participants from studies in this review were not gathered from nursing homes. However, the prevalence of epilepsy in older adults living in nursing homes is higher compared to community-dwelling older adults [46]. Birmbaun found that nursing home residents with epilepsy had poorer scores for activities of daily living, cognition and comorbidity burden. They were also more likely to have severe outcomes from a seizure [47]. Future research should compare differences in the QoL between community-dwelling and nursing home residents and how this impacts treatment pathways within a nursing home setting.

The majority of the studies, when comparing age cohorts, grouped their participants into younger and older adults. QoL issues may vary within older age cohorts; 60–70 years, 70–80 years and so forth. One study examined the trajectory of QoL among older adults and explored factors influencing change over time [48]. They found that QoL declined more rapidly with age and overall QoL was worse for older than younger respondents (participants were aged 50 years and older). Some differences were found within older cohorts. For 65–74-year-olds, the frequency of contact with their children and family members significantly reduced their overall QoL. Whereas, older adults aged > 75 were negatively impacted by being retired and looking after their home [48]. Additionally, QoL levels increased from the age of 50 and peaked at age 68, levels then started to reduce and hit the same level at the age of 50 when the respondent was at the age of 86. Future research should investigate QoL changes, including its predictors, over the trajectory of older age.

Older adults are more likely to experience complex partial seizures [49]. One study in this review found that seizure type was an insignificant predictor [28]. The majority of included studies did not include seizure type in their regression analysis. Out of the studies that provided details of seizure type, half contained participants with the majority experiencing generalised seizures [23,27,28] and the other half contained participants where the majority experienced focal seizures [24,25,30]. There is evidence to suggest that the type of seizure is a predictor of QoL. Both complex partial and generalised seizures negatively affected all domains of QoL, whereas simple partial seizure only negatively affected a few domains [50]. The frequency of a more severe seizure type was associated with a poorer QoL. However, contradictory results show no significant differences in QoL between those who have partial and generalised seizures [51]. Future research should examine if seizure type is a predictor of QoL in older adults.

Evidence synthesised from this review issues implications for improving treatment pathways and clinical practice for older people with epilepsy. Understanding and identifying predictors of QoL is essential in the development of treatments/interventions to make sure they fulfil older adult's desired outcomes and support them with self-management of their condition. It is unsurprising that seizure frequency was a predictor of QoL and understandably seizure freedom is the primary goal of interventions. However, for some with epilepsy, seizure freedom is not possible. A qualitative study revealed that older adults wished for interventions to allow them to continue with their normal lives, and this was more important than seizure freedom [52]. Health professionals should remember that older adults are likely to have other conditions including epilepsy and therefore interventions should address if and how comorbid conditions are affecting their epilepsy management. As depression was a predictor, service users should be screened for depression at an early stage. This is particularly important as older adults tend to be undiagnosed with depression.

This main limitation of this systematic review was the limited amount of research on this topic, this restricted the conclusions that could be made. The modest number of studies reviewed poses the problem of increased type II error when analysing the results. This is further exacerbated due to the different QoL measures used, each of which focuses on different QoL domains. It could be argued that a meta-analysis should be performed in order to understand the significance of

the results: however, due to the different types of study design, methodology, type of analysis, QoL measures, and modest number of included studies, this made the prospect problematic.

There is an apparent gap in research for this topic. Future research should investigate the QoL of older adults with epilepsy, while providing details of all epileptic variables that should be included in a regression analysis to identify potential predictors. For example, the age of onset, seizure frequency, amount of medication, seizure types, type of epilepsy and duration of epilepsy. A regression analysis is able to help identify predictors of QoL, but future qualitative research should address how these predictors are affecting QoL. More follow-up studies need to investigate how quality of life changes over time and concerning different treatments and interventions.

5. Conclusions

It is integral to understand how epilepsy affects older adults in order to improve their care and treatment. Even though older adults with epilepsy are shown to be a unique and a vulnerable population group, there is still limited literature on their QoL. The reason for this is unclear: it could be due to the perception that results from the younger adult population are adequate to account for older adults. Seizure frequency was a strong predictor and comorbidity and depression were moderate predictors. The results illustrate internal factors (both physical and mental) to be affected and be predictors of QoL. The predictors outlined could be specific to older adults, as they are not considered predictors in children and adolescents in Stevanovic et al. systematic review [6]. However, a systematic review on adults with epilepsy found that predictors of QoL were seizure frequency, seizure severity, level of depression and level of anxiety and presence of comorbidity [7]. The predictors found were the same as this review, reiterating the notion that there may not be significant differences between older and younger adults. As there was a limited amount of high quality studies, caution should be given when interpreting the results.

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