Symptoms of anxiety and depression in school-aged children with active epilepsy: A population-based study

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Abstract

Methods: Children (5–15 years) with active epilepsy were screened using the parent-report (n = 69) and self-report (n = 48) versions of the Spence Children’s Anxiety Scale (SCAS) and the self-report version of the Children’s Depression Inventory (CDI) (n = 48) in a population-based sample.

Results: A total of 32.2% of children (self-report) and 15.2% of children (parent-report) scored ≥1 SD above the mean on the SCAS total score. The subscales where most difficulty were reported on parent-report were Physical Injury and Separation Anxiety. There was less variation on self-report. On the CDI, 20.9% of young people scored ≥1 SD above the mean. Children reported significantly more symptoms of anxiety on the SCAS total score and three of the subscales (p < .05). There was a significant effect on the SCAS total score of respondents by seizure type interaction, suggesting higher scores on SCAS for children with generalized seizures on self- but not parent-report. Higher CDI scores were significantly associated with generalized seizures (p < .05).

Summary: Symptoms of anxiety were more common based on self-report compared with parent-report. Children with generalized seizures reported more symptoms of depression and anxiety.

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1. Introduction

In addition to epileptic seizures, there is a high association with cognitive, psychiatric, motor and academic achievement difficulties in childhood epilepsy [1,2]. Children with epilepsy have higher rates of neurodevelopmental and psychiatric difficulties compared with the general pediatric population and children with other non-neurological chronic conditions based on diagnostic interviews, parent report of diagnoses, and self-report checklists [3–5]. The strongest predictors of decreased quality of life in childhood epilepsy are often psychiatric difficulties [6,7], particularly depression and anxiety [8,9]. Therefore, identification of the extent and nature of symptoms of depression and anxiety would seem crucial with respect to promoting quality of life in childhood epilepsy. However, neurodevelopmental and psychiatric difficulties are often not identified or treated [1,10].

Population-based studies indicate that both depression and anxiety are more common in childhood epilepsy than in the general pediatric population [3,4] and in children with diabetes [4]. There is a lack of population-based data on profiles of symptoms of anxiety [11] and depression in childhood epilepsy. Knowledge of profiles (i.e., what types of symptoms of anxiety and depression) may be important not only with respect to treatment but also with respect to understanding possible contributors to the symptoms. With respect to the role of epilepsy/seizure variables in symptoms of depression and anxiety, findings have been mixed. Seizure type has not been associated with symptoms of anxiety [11] and depression [7,21]. In most studies [12], but an increased risk has been noted in two studies [13,14]. With regard to seizure frequency or severity, an increased risk of symptoms of anxiety and/or depression has been noted in some [15,16], but not all, studies [17]. It has been suggested that in most studies of adolescents with epilepsy, antiepileptic drug (AED) use and type of AED have not been found to be consistent predictors of depression [18]. However, polytherapy (being on more than one AED) has been associated with increased symptoms of depression [19–21] and anxiety [21]. Furthermore, there is a paucity of evidence of the impact of specific AEDs on emotional symptoms. Increased duration of epilepsy has not been associated with symptoms of anxiety or depression [20,22]. With regard to informants, it is important that where possible, children and adolescents are asked about symptoms of...
depression and anxiety, as given the internalizing nature of symptoms of the conditions, informants such as parents and teachers may not be aware of depressive and anxiety symptoms the children are experiencing [14,23].

In summary, there is a lack of population-based data on profiles of symptoms of anxiety and depression in childhood epilepsy and the role of epilepsy/seizure variables. Population-based studies are important in epilepsy since studies from specialized centers are likely to be biased in terms of severity and not representative. Many of the previous studies of depression and anxiety in children with epilepsy have focused on children with refractory epilepsy and/or children attending tertiary epilepsy centers. The Children with Epilepsy in Sussex School (CHESS) study is a population-based study focused on the learning and behavioral difficulties of school-aged children with active epilepsy (on AEDs and/or had a seizure in the last year). We have previously described this group with respect to DSM-IV-TR diagnoses [1]. We reported that 13% (n = 11) met DSM-IV-TR criteria for any anxiety disorder, and 7% (n = 6) met DSM-IV-TR criteria for depression. Only one child who met criteria for an anxiety disorder and one who met criteria for depression had previously been diagnosed. On univariable and multivariable analyses, none of the epilepsy factors were significantly associated with diagnoses of depression or anxiety. The aim of the current study was to report on the profile of symptoms on self-reported and parent-reported measures of anxiety and on a self-reported measure of depression. A further aim was to compare child and parent responses on a measure of anxiety. The final aims were to assess the contribution of seizure-related variables to symptoms of anxiety and see if they differed between respondents and to assess the role of seizure-related variables on self-reported symptoms of depression.

2. Materials and methods

The CHESS study involved the identification of children with epilepsy born between 1995 and 2007 and resident in the RH10 to RH13 postcode districts in the south of England between March 31st 2011 and September 30th 2012 (for a detailed description of ascertainment, see Reilly et al. 2014 [9]). The children were identified via a computerized database and liaison with local pediatricians. The prevalence of lifetime (a history of 2 or more unprovoked epileptic seizures) and active epilepsy in the study area was calculated by using the mid-2010 population estimates of 4- to 15-year-olds (32,212) and 5- to 16-year-olds (32,617) provided by the Office of National Statistics (total mid-2010 population 202,919). The prevalence of lifetime epilepsy was 6.1 (95% confidence interval [CI]: 5.2–6.9) per 1000 (1 in 175), and the prevalence of active epilepsy was 3.5 (95% CI: 3.0–4.3) per 1000 (1 in 286).

The parents/guardians of children with active epilepsy were approached by the researchers (sent a letter and/or asked in person) and asked to complete an interest form if they wished to find out about the study. All parents who returned a form were met in the child’s school or home by the study psychologist to discuss their child’s participation. At this informed consent meeting, the study was described in detail, and parents were asked for written consent for entry of their child into the study. Children, where developmentally appropriate (children 7 years or older who did not have intellectual disability), were also asked to provide assent. Parents and children (where developmentally appropriate) were given information sheets describing the purpose of the study. Parents or participants did not receive payment for participating. Of those who were eligible, 85 (74%) parents consented for their child to participate in the study. The 85 children underwent comprehensive psychological assessment between April 1st 2011 and November 30th 2012. All 85 children completed the study. Assessment included measures of cognition, behavior, emotional functioning, and motor functioning (see Reilly et al. 2014 [9]). Levels of global cognitive functioning and subsequent classification of intellectual disability (IQ < 70) were determined by full-scale IQ scores on standardized tests of cognitive functioning.

Fig. 1. Assessment of anxiety and depression in the CHESS study. SCAS-PR = Spence Children Anxiety Scale — Parent-Report, SCAS-SR = Spence Children Anxiety Scale — Self-Report, CDI = Children’s Depression Inventory.
child experiences symptoms of anxiety in six areas: generalized anxiety disorder, separation anxiety, social phobia, panic disorder and agoraphobia, obsessive–compulsive disorder, and fears of physical injury. It has good reliability, internal consistency, and validity [27]. The accompanying parent version (SCAS-P [24]) allows for comparisons between child and parent ratings of the same symptoms. Both versions of the SCAS are based on a four-point Likert-type response scale: ‘never’, ‘sometimes’, ‘often’, and ‘always’. The parent version contains 38 items, and the child version contains the same 38 items plus six filler items, which are not included in the final scoring. Norms are available for children 8–15 years of age, but norms are not available for children 7 years of age and younger. In this study, we used the norms for 8–year-olds for children 7 years of age and younger as agreed with SCAS authors (Hearn, 2013, personal correspondence).

The CDI [26] is a commonly used self-report measure of depressive symptoms for children 7–17 years of age. The scale comprises 27 items dealing with sadness, self-blame, insomnia, loss of appetite, interpersonal relationships, and school adjustment. Children’s Depression Inventory items are rated on a three-point scale (0 = not true, 1 = somewhat true, 2 = very true), reflecting the degree of symptoms of depression over the past 2 weeks. A total CDI score can be calculated by adding the responses of all items. Internal consistency, moderate retest reliability, and convergent validity of the CDI have been demonstrated [28,29].

2.1. Statistical analysis

All analyses were done with IBM SPSS version 21.0 (Armonk, NY, USA). Descriptive statistics were used to indicate the distribution of symptoms on the SCAS and CDI. On the CDI and SCAS, scores were categorized into 1 SD, 1–2 SD, and 2 SD above the mean based on comparison with published norms (http://www.scaswebsite.com and Kovacs [26]). Paired-sample two-tailed t-tests were used to compare parent-report and self-report total SCAS scores. Results for the paired samples t-tests are reported before and after Bonferroni correction (adjusted alpha p < .007 for t-tests). Reliability analysis for the SCAS and CDI is based on Cronbach’s alpha.

Multiple regression applying generalized estimating equation modeling was used to identify epilepsy-related factors associated with child and parent responses on the SCAS total score. The predictors in the model were respondent (child vs. parent), seizure frequency (weekly/more often vs. less frequent/none), predominant seizure type (generalized vs. focal), duration (less than 4 years vs. greater than 4 years), AEDs (monotherapy vs. polytherapy), gender (male vs. female), and age (<11 or ≥11 years). In the first instance, all predictors and all possible respondent × seizure factor interactions were tested first to see if any were significant at the .05 level. Factors and interactions significant at the p < .05 level in initial modeling were subsequently included in model 1, and model 2 shows the regression estimates of the predictors of SCAS scores that were significant at the .05 level in model 1.

Univariable linear regression analyses were done to identify factors associated with the CDI total score. The factors in the model were the same as in the model for the SCAS (i.e., gender, age, seizure frequency, AEDs, duration, and predominant seizure type) with the exception of respondent. Multivariable analysis was carried out via backward regression with all predictors entered into the model to identify factors independently associated with the outcome variable. Residual analyses revealed that assumptions for the linear regression model were met. The alpha level for univariable and multivariable analyses was p < .05.

2.2. Ethics

The study was approved by the Brighton and Sussex Research Ethics Committee and was also registered with the collaborating hospital primary care organization — The Sussex Community NHS Trust. Informed consent was obtained from parents of all participating children.

3. Results

3.1. Child characteristics

Table 1 shows the characteristics of the children who underwent assessment of symptoms of anxiety and depression.

3.2. Scores on the Spence Children’s Anxiety Scale (SCAS)

Cronbach’s alpha values for the SCAS were 0.898 (child report) and 0.907 (parent report). Table 2 shows the categorizations on the SCAS for the total score and the subscale scores (parent-/caregiver-report (n = 69) and self-report (n = 48)) based on normal, between 1–2 SD and 2 SD above the mean.

On the total score, 31% of self-report and 15% of parent scores were 1 SD (84th percentile) or more above the mean. On self-report, the subscales where most children were above 1 SD cutoff were Panic (39.6%) and Physical Injury (39.6%). Social Phobia was the subscale where the least children were ≥1 SD above the mean. On parent report, Physical Injury (37.9%) and Separation Anxiety (31.8%) were the subscales with most children ≥1 SD above the mean, whereas the OCD subscale (9.1%) was the area where the fewest children were in the at-risk category. The two items with the highest mean scores on the parent measure were ‘my child worries’ and ‘my child is scared’. On the self-report measure, the two items with the highest mean scores were ‘When I have a problem, my heart beats really fast’ and ‘I have to keep checking that I have done things correct’.

Paired sample t-tests were conducted to compare self-report and parent-report responses on SCAS where both parent and child responses were available for the same child (n = 48). The mean scores, standard deviations, p-values, and effect sizes are shown in Supplemental Table 1 (Supplementary material A). Self-report scores were significantly higher (at least p < .05) based on paired samples t-test for the

Table 1

<table>
<thead>
<tr>
<th>Sample (n = 69)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex: male/female</td>
</tr>
<tr>
<td>Ethnicity: white/nonwhite</td>
</tr>
<tr>
<td>Primary school/secondary school</td>
</tr>
<tr>
<td>Duration of epilepsy</td>
</tr>
<tr>
<td>Mean age at the time of psychological assessment</td>
</tr>
<tr>
<td>Under 11 years of age</td>
</tr>
<tr>
<td>11 years or older</td>
</tr>
<tr>
<td>Seizure frequency</td>
</tr>
<tr>
<td>Less frequent or none</td>
</tr>
<tr>
<td>Monotherapy/polytherapy/none</td>
</tr>
<tr>
<td>Types of AEDs</td>
</tr>
<tr>
<td>Lamotrigine</td>
</tr>
<tr>
<td>Levetiracetam</td>
</tr>
<tr>
<td>Topiramate</td>
</tr>
<tr>
<td>Ethosuximide</td>
</tr>
<tr>
<td>Clonazepam</td>
</tr>
<tr>
<td>Carbamazepine</td>
</tr>
<tr>
<td>Rufinamide</td>
</tr>
<tr>
<td>Oxcarbazepine</td>
</tr>
<tr>
<td>Zonisamide</td>
</tr>
<tr>
<td>Clobazam</td>
</tr>
<tr>
<td>Stripectol</td>
</tr>
</tbody>
</table>

ILAE = International League Against Epilepsy.

a All data based on a review of medical notes unless otherwise indicated.
b Data based on parental reports.
c Based on consensus classification by two pediatric neurologists.
Seizure type was the only factor significantly associated (p < 0.05) with the total score on the CDI on univariable and multivariable analyses, with generalized seizures being associated with higher scores on the CDI.

4. Discussion

The CHESS study is the first population-based study to report on profiles of symptoms of anxiety and depression on standardized instruments in childhood epilepsy. Previous population-based studies of children with epilepsy have not described profiles in detail and/or have focused on children who meet diagnostic criteria for depression and anxiety. Understanding the profile of symptoms of anxiety and depression may be important with respect to treatment and also possible contributory factors. Symptom checklists can provide information on subsyndromal symptoms and allow identification of children who are at risk of significant impairment who with support may not develop a clinically significant disorder. Compared with published norms, which come from a large community sample of Australian children (http://www.scaswebsite.com), the current study suggests that children with epilepsy experience more symptoms of anxiety than would be expected based on self-report but not on parent-report. Symptoms of depression experienced by the children would not appear to be as common as symptoms of anxiety but are slightly above published norms, which come from a community-based sample of school children in the US [26].

With respect to subscales on a measure of anxiety, variation between subscales in the proportion of children scoring in the abnormal range was more marked on the parent-report scale compared with the self-report scale. On parent-report, 30%+ of children scored in the abnormal range on the Physical Injury and Separation Anxiety subscales, whereas only 5% of children were in the abnormal range on the OCD subscale. A possible explanation is that parents are more aware of anxieties around physical injury and separation anxiety but less aware of obsessions and compulsions. Elevated symptoms of separation anxiety in childhood epilepsy may result from both parents and children fearing the child being alone in the event of an epileptic seizure. Furthermore, parents and children may fear that if they are not together, other adults may not know how to manage a seizure. In relation to anxiety about physical injury, parents and children may fear that a seizure could result in physical injury and, as a result, are more anxious about this than would be the case for children without epilepsy. A previous study of parent-reported symptoms of anxiety in children with epilepsy noted that the areas where most children scored above at-risk cutoffs were specific phobia, obsessions, and post-traumatic stress disorder [17]. Much fewer children scored in the at-risk range of generalized anxiety disorder, separation anxiety, and social phobia [17]. Jones et al. [30] reported the prevalence rates of several subtypes of DSM-IV anxiety disorders including OCD (11%), specific phobia (8%), social phobia (8%), overanxious disorder (6%), separation disorder (2%), and PTSD (2%). Differences between the current study and previous studies likely reflect the instruments/diagnostic methods used and the populations sampled. These previous studies, although larger with respect to sample size than the current study, were not population-based and, thus, may not be as representative.

Previous population-based research has identified that children with epilepsy are at high risk of symptoms of anxiety, but the findings of the current study show that parents and children can differ significantly with respect to reporting of symptoms. This is important to note, given that it has been recommended that children with epilepsy be...
resulting in increased symptoms of depression and anxiety. Other seizures are associated with de...

In the current study, age category was significantly associated with scores on the SCAS, with older children being more at risk of symptoms of anxiety than young children as has been noted in previous studies [21,32]. This may reflect a greater awareness of the psychosocial impact of epilepsy with age and other psychosocial and biological factors. The nature of the association between duration and SCAS scores indicates that while parent ratings of their child’s anxiety decreases over time, the child’s ratings remain more stable. This might reflect increased parental stress and anxiety at the time of diagnosis or better coping, but measures of parental anxiety and coping would be needed to verify this. In relation to the significant respondent x seizure type relationship, generalized seizures contributed more to increased levels of anxiety compared with focal seizures but only on self-report. It is possible that generalized seizures, which are likely to be more visible and involve a loss of consciousness, may impact very significantly on the child’s level of anxiety but less so on parents’ perceptions of their child’s anxiety. The significant impact of seizure type on depression scores may also reflect an increased awareness among children of these types of seizures. Furthermore, we have previously reported that generalized seizures are associated with deficits in working memory in this sample [33], which may contribute to difficulties in school and everyday life resulting in increased symptoms of depression and anxiety. Other factors such as seizure frequency, AED usage, and gender were not significantly associated with scores on measures of depression and anxiety unlike some previous studies. This may reflect the fact that the current study was population-based and the measures we employed.

There is accumulating evidence that symptoms of both depression [34,35] and anxiety [36] can be successfully treated in children with epilepsy although larger-scale studies are needed. A pilot study suggests that cognitive behavioral therapy (CBT) may be useful in treating children with epilepsy and social anxiety [37], and there is a need for more studies focusing on specific types of depression and anxiety in childhood epilepsy. Psychoeducation programs for children with epilepsy and their parents should highlight the risks of both depression and anxiety in childhood epilepsy. Such programs should also indicate to children and parents that there is an expanding evidence base for CBT in childhood epilepsy. Childhood epilepsy services will benefit from the development of clear pathways for children with epilepsy who screen positive for depression and/or anxiety disorder, including the provision of CBT where appropriate. It has been suggested that all children with epilepsy be screened for symptoms of behavioral and emotional disorders [1]. Instruments focusing on a broad range of behavioral and emotional difficulties may be useful at initial screening to indicate problematic functioning [38], whereas instruments such as the SCAS may be useful as a second stage screener, to identify disorder specific symptoms.

### 4.1. Limitations

A number of limitations need to be noted in interpreting the study findings. The sample size is relatively small, and there is a need for further studies with larger sample sizes. We used the parent version of the SCAS with children 7 years of age and younger, despite the absence of published norms, and this may have impacted on the proportion of children identified as at-risk. We did not use the parent report version of the CDI to measure depression which would have been informative. We considered a relatively limited range of possible contributory factors to symptoms of depression and anxiety, and other factors such as parental well-being and other behavioral/psychiatric disorders would have been informative. We were not able to assess the contribution of individual AEDs to symptoms of depression and anxiety because of the small sample size, and seizure frequency was based on parent reports.

### Table 5

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Univariable B (95% CI)</th>
<th>p</th>
<th>Multivariable B (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>3.97 (−1.19 to 9.11)</td>
<td>.128</td>
<td>3.91 (−0.54 to 8.36)</td>
<td>.083</td>
</tr>
<tr>
<td>Age category</td>
<td>7.259 (−1.86 to 8.51)</td>
<td>.203</td>
<td>4.252 (−0.37 to 8.87)</td>
<td>.070</td>
</tr>
<tr>
<td>AED usage</td>
<td>1.41 (−4.98 to 7.79)</td>
<td>.659</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Seizure frequency</td>
<td>−1.7 (−7.58 to 4.24)</td>
<td>.572</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Seizure type</td>
<td>−10.219 (−15.71 to −4.73)</td>
<td>.900</td>
<td>−12.80 (−18.39 to −7.20)</td>
<td>.000</td>
</tr>
<tr>
<td>Seizure duration</td>
<td>0.972 (−5.11 to 7.052)</td>
<td>.740</td>
<td>5.65 (−0.39 to 10.49)</td>
<td>.068</td>
</tr>
</tbody>
</table>

n/a as not in final model.
We did not have a control group with which to compare the prevalence and nature of symptoms of anxiety and depression. Assessing symptoms of anxiety and depression in children with epilepsy and intellectual disability presents significant assessment difficulties [12]. We were not able to assess self-reported symptoms of depression and anxiety in children with intellectual disability or parent-reported symptoms of anxiety in children with an IQ below 35. Despite difficulties in assessment of emotional symptoms in children with intellectual disability, it would have been useful to use measures of emotional functioning suitable for children with this level of cognitive ability.

5. Conclusions

In summary, symptoms of self-reported anxiety and depression appear to be elevated in community-based children with epilepsy, highlighting the need for screening in this group. Furthermore, given that the majority of children who reached diagnostic criteria were often not identified, there is a need to investigate possible reasons for this underrecognition. The fact that parents often report fewer symptoms of anxiety and depression highlights the need to garner the views of the children themselves where possible. Symptoms of anxiety were more common than symptoms of depression, and there is a need for further exploration of why this is including an exploration of both environmental and biological contributors.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jybx.2015.09.004.

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Conflicts of interest

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

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Websites