Epilepsy & Behavior 41 (2014) 203–207

Contents lists available at ScienceDirect

Epilepsy & Behavior

journal homepage: www.elsevier.com/locate/yebeh

Autistic characteristics in adults with epilepsy

SallyAnn Wakeford [a,*], Neal Hinvest [a], Howard Ring [b], Mark Brosnan [a]

[a] Department of Psychology, University of Bath, Bath, UK
[b] Department of Psychiatry, University of Cambridge, Cambridge, UK

ARTICLE INFO

Article history:
Received 6 July 2014
Revised 11 September 2014
Accepted 12 September 2014
Available online 30 October 2014

Keywords:
Epilepsy
Autism
Autistic traits
Autism spectrum disorders
Comorbidity
Asperger condition
Asperger disorder
Empathizing
Systemizing

ABSTRACT

Introduction: The reported prevalence of autism spectrum disorders in people with epilepsy ranges from 15% to 47%. Despite the high comorbidity, there has been a lack of systematic studies of autistic characteristics in epilepsy. Little is known about the relationship of epilepsy to the core characteristics of autism. The aim of this research was to measure autistic traits and characteristics in adults with epilepsy who do not have a diagnosis of any autism disorder.
Method: We investigated autistic characteristics in adults with epilepsy and those without epilepsy employing the Autism Spectrum Quotient (group with epilepsy, $n = 40$; control group, $n = 38$) and systemizing and empathizing abilities employing the Intuitive Physics test and the Adult Eyes Task—Revised (group with epilepsy, $n = 19$; control group, $n = 23$).
Results: Significantly more autistic behavioral traits, as measured by the AQ, were related to having epilepsy, but intact systemizing and empathizing abilities in these adults suggest that, in adults with epilepsy, autism-like symptoms may be present in the absence of wider cognitive profiles characteristic of autism.
Conclusion: Increased autistic characteristics found in adults with epilepsy without an ASD diagnosis suggest that epilepsy syndromes may incorporate behavioral aspects of autism in the absence of some of its core cognitive features.

1. Introduction

There is evidence that comorbidity of epilepsy and autism spectrum disorders (ASDs) occurs at higher rates than would be expected by chance, with prevalence rates for ASDs in people with epilepsy ranging from 15% to 47% [1–3]. In addition, while it is unclear if ASDs are underdiagnosed in adults, high rates of underdiagnosis have been found in children with epilepsy [1,4,5], and childhood-onset epilepsy is considered to be a significant factor for ASDs [6,7]. Several researchers have suggested that current assessment methods fail to detect autistic characteristics in epilepsy, and Steffenberg suggests that ASDs may be overlooked because of a lack of sensitive instruments to assess ASDs in epilepsy [4]. Matsuo and colleagues state that it is important to suspect ASDs in every patient with epilepsy [3]. Notably, Berg and colleagues have recently proposed mandatory ASD screening in all children with epilepsy [8].

Despite the high comorbidity, according to Spence and Schneider, little is known about the relationship of epilepsy to the core features of autism [9]. A high rate of epileptic discharges (85.8%) has recently been identified in a study examining 1014 individuals with ASDs, and earlier research has related these discharges to severity of their ASD [10]. During a review of the use of antiepileptic drugs (AEDs) for the treatment of ASDs, Di Martino and Tuchman found that antiepileptic drugs were a significant factor for improving deficits in two of the three core characteristics of autism, communication and socialization, which occurred regardless of seizure control [11]. These improvements suggest that AEDs significantly reduce autistic characteristics and may mask autistic characteristics in research and clinical contexts.

The primary aim of this study was to investigate behavioral autistic traits in adults with epilepsy. In addition, the presence in this population of characteristics that have been proposed to relate to an underlying neurocognitive basis for autism, a deficit in empathizing abilities and intact or enhanced systemizing abilities, as proposed by the empathizing–systemizing [E–S] theory [12], was also investigated.

According to Baron-Cohen, systemizing is defined by the drive to analyze or construct a system or variables in a system and rules or laws that govern the behavior of a system to enable prediction of how the system will behave [13]. However, there is a lack of research investigating systemizing abilities in adults with epilepsy, and despite the high comorbidity, it is unknown whether adults with epilepsy who do not also have autism have enhanced systemizing abilities.

In terms of assessment of empathizing ability, a well-established measure of this is recognition of facial emotion. While individuals with ASDs can have impairment in detecting basic emotions in the whole face, they have most impairment in recognizing mental states from the eyes alone [14]. In relation to this observation, the Adult Eyes

* Corresponding author.
E-mail address: s.wakeford@bath.edu (S. Wakeford).

http://dx.doi.org/10.1016/j.yebeh.2014.09.045
1525-5050/

Test assesses the ability to discriminate emotions from expressions in the eyes [15].

There is also a growing body of evidence that adults with epilepsy have impairments of facial emotion recognition. Adults with frontal lobe epilepsy have a specific impairment in their ability to perceive emotion from the eyes [16], and permanent deficits in facial emotion recognition ability found in adults with temporal lobe epilepsy have been reported to be related to early insult and right medial temporal structures [17,18]. Interestingly, male gender in epilepsy has been related to both these factors, suggesting that males may be especially vulnerable to facial emotion recognition impairment [19,20].

In this research, we, therefore, aimed to measure the presence of behavioral autistic traits in adults with epilepsy without an additional diagnosis of autism and then to assess the extent to which such traits were associated with autism-related cognitive profiles of systemizing and empathizing abilities. We hypothesized that, across the participants with epilepsy, there would be an increase in autistic traits together with either similar or increased systemizing ability and with decreased empathizing ability compared with a typically developed comparison group with neither epilepsy nor an ASD.

2. Method

2.1. Study design

Two groups of adults were recruited in these experiments: a control group without epilepsy and a heterogeneous group with epilepsy. Experiment 1 investigated the extent of autistic traits in epilepsy. It employed the Autism Spectrum Quotient (AQ), which is designed to measure the degree to which an adult with normal intelligence in the general population has autistic traits [21]. The AQ assessed social skills, attention switching, imagination, attention to detail, and communication. Experiment 2a aimed to be the first study to measure systemizing abilities in adults with epilepsy by employing the Intuitive Physics test [22]. Experiment 2b employed the Adult Eyes Task—Revised, which was originally developed to test emotion recognition and empathizing ability in people with autism [15].

2.1.1. Experiment 1

2.1.1.1. Participants

2.1.1.1.1. Method of recruitment. This experiment mainly used an event sampling method and included epilepsy charity conferences and University of Bath [UoB] home webpage adverts. Participants without epilepsy were recruited from students at the UoB or were known to the participants with epilepsy, e.g., an unrelated friend or partner.

2.1.1.1.2. Exclusion criteria. Participants with epilepsy were excluded if they had a diagnosis of an ASD or did not meet the criteria for active epilepsy. Active epilepsy, taken from the Engel Class, was defined as one or more seizures in the preceding 12 months with or without antiepileptic drug discontinuation and is a conservative adaption of Engel IC. Participants without epilepsy were excluded if they had a diagnosis of an ASD or any seizure disorder. Only adults (≥18 years) participated. No participant throughout this research had an autism–epilepsy syndrome, e.g., Dravet's Syndrome. Participants self-reported their epilepsy type.

2.1.1.1.3. Participant samples. Respondents were participants who provided some or all of their personal details, along with the AQ, on the SurveyMonkey website. For those without online access, they provided their personal details in paper format ($n = 2$). The total number of respondents with epilepsy was $n = 77$, but only $n = 40$ of them completed the task, with a high dropout rate during the task of 48%. For the control group, the total number of respondents was $n = 38$ (see Tables 1 and 2).

2.1.1.1.4. Missing data. The data revealed that all participants with epilepsy who omitted 3 or more responses within the first 10 questions of the AQ failed to complete the questionnaire. There were no participants with epilepsy who completed the AQ but omitted more than 2 responses. Hence, if ≥3 responses were left blank, a participant's response was considered incomplete, and they were excluded. By comparison, this is less than that of other studies employing the AQ. For example, Hoekstra and colleagues used 5 omitted responses (10% for one condition) for an exclusion threshold [23]. Missing data values (<3 omitted responses) were replaced by the median value for each item.

2.1.1.1.5. Onset of epilepsy. Participants with epilepsy self-reported their epilepsy onset as follows: childhood-onset epilepsy, $n = 8$; adulthood-onset epilepsy, $n = 24$; and unknown, $n = 8$.

Table 1
Demographics.

	Controls ($n = 38$)			Epilepsy ($n = 40$)		
	Female ($n = 27$); male ($n = 11$)			Female ($n = 25$); male ($n = 15$)		
	Mean	SD	Range	Mean	SD	Range
Age	42.1	(13.2)	22.4–70.9	40.6	(14.7)	19.3–71.2

2.1.2. Experiments 2a and 2b

2.1.2.1. Participants

2.1.2.1.1. Method of recruitment. This sample was recruited predominantly from the sample for Experiment 1 [group with epilepsy, $n = 19$; control group, $n = 23$]. Additional participants were recruited from the following: epilepsy charity conferences, UoB website, and adverts through University Psychology Departments. Participants without epilepsy were recruited from students at UoB.

2.1.2.1.2. Exclusion criteria. Exclusion criteria were the same as those employed in Experiment 1. In addition, three participants with epilepsy were excluded: one had prior knowledge of the tests, one did not correctly follow the instructions, and one participant did not return the Adult Eyes Task—Revised. Participants from Experiment 1 were rechecked to ensure that they met the criteria for 'active epilepsy' defined in Experiment 1 when they participated later in Experiments 2a and 2b.

2.1.2.1.3. Participant sample. The sample comprised $n = 42$ adults: the control group, $n = 23$, and the group with epilepsy, $n = 19$ (see Tables 3 and 4).

2.2. Assessment of features of ASDs

2.2.1. Experiment 1

The Autism Spectrum Quotient (AQ) was provided in paper format and digital format. Participants were provided with the following: i) personal details form, ii) AQ and instructions or AQ (epilepsy-specific) and instructions, and iii) a feedback form.

2.2.1.1. The Autism Spectrum Quotient. The AQ is a structured questionnaire developed to assess autistic traits in adults with normal intelligence [21]. It has good screening properties at a threshold score of 26 [24]. Participants self-rated their responses on a 4-point Likert

Table 2
Classification of epilepsy type.

Primary type of epilepsy	Epilepsy	%
Temporal lobe epilepsy	12	30.0
Other focal epilepsy	5	12.5
Absence epilepsy	5	12.5
Myoclonic epilepsy	3	7.5
Idiopathic generalized epilepsy	4	10.0
Unknown	11	27.5
Total	40	100.0

Epilepsy classification was self-reported by participants; primary epilepsy type at diagnosis was used for classification of epilepsy type.