

Impaired facial expression recognition in children with temporal lobe epilepsy: Impact of early seizure onset on fear recognition

Nathalie Golouboff^a, Nicole Fiori^a, Olivier Delalande^b, Martine Fohlen^b,
Georges Dellatolas^a, Isabelle Jambaqué^{a,b,*}

^a Université Paris Descartes, Laboratoire de Psychologie et Neurosciences Cognitives,
CNRS FRE 2987, Boulogne Billancourt, F-92 100, France

^b Fondation Rothschild, Unité de Neurochirurgie Pédiatrique, Paris, F-75 019, France

Received 17 July 2007; received in revised form 17 December 2007; accepted 19 December 2007

Available online 28 December 2007

Abstract

The amygdala has been implicated in the recognition of facial emotions, especially fearful expressions, in adults with early-onset right temporal lobe epilepsy (TLE). The present study investigates the recognition of facial emotions in children and adolescents, 8–16 years old, with epilepsy. Twenty-nine subjects had TLE (13 right, 16 left) and eight had fronto-central epilepsy (FCE). Each was matched on age and gender with a control subject. Subjects were asked to label the emotions expressed in pictures of children's faces miming five basic emotions (happiness, sadness, fear, disgust and anger) or neutrality (no emotion). All groups of children with epilepsy performed less well than controls. Patterns of impairment differed according to the topography of the epilepsy: the left-TLE (LTLE) group was impaired in recognizing fear and neutrality, the right-TLE (RTLE) group was impaired in recognizing disgust and, the FCE group was impaired in recognizing happiness. We clearly demonstrated that early seizure onset is associated with poor recognition of facial expression of emotion in TLE group, particularly for fear. Although right-TLE and left-TLE subjects were both impaired in the recognition of facial emotion, their psychosocial adjustment, as measured by the CBCL questionnaire [Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist and Youth Self-report*. Burlington, VT: University of Vermont Department of Psychiatry], showed that poor recognition of fearful expressions was related to behavioral disorders only in children with right-TLE. Our study demonstrates for the first time that early-onset TLE can compromise the development of recognizing facial expressions of emotion in children and adolescents and suggests a link between impaired fear recognition and behavioral disorders.

© 2008 Elsevier Ltd. All rights reserved.

Keywords: Children; Temporal lobe epilepsy; Facial emotion recognition; Behavior; Hemispheric specialization

1. Introduction

Children with refractory epilepsy often display academic difficulties and behavioral problems. Recent research in the neuropsychology of childhood epilepsy has provided evidence of specific cognitive profiles according to the localization of the epileptic process (Elger, Helmstaedter, & Kurthen, 2004; Jambaqué, Lassoche, & Dulac, 2001). Temporal lobe epilepsy (TLE) has been associated with language and memory impair-

ments in adults (Helmstaedter, Lehnertz, Grunwald, Gleissner, & Elger, 1997; Jones-Gotman, 1986; Saykin, Gur, Sussman, O'Conner, & Gur, 1989), and more recently in children as well, both before and after surgery (Gleissner, Sassen, Schramm, Elger, & Helmstaedter, 2005; Jambaqué et al., 2007; Lendt, Helmstaedter, & Elger, 1999). Some children studies reported an effect of the side of epilepsy, with impairment of verbal functions in left temporal lobe epilepsy (LTLE) and of nonverbal functions in right temporal lobe epilepsy (RTLE) (Beardsworth & Zaidel, 1994; Fedio & Mirsky, 1969; Gadian et al., 1996; Jambaqué, Dellatolas, Dulac, Ponsot, & Signoret, 1993; Jambaqué et al., 2007; Szabo et al., 1998). Other studies failed to find this effect or found it to be less pronounced than in adults, which suggests that the effect of lateralization of the epileptic focus on specific cognitive functions

* Corresponding author at: Université Paris Descartes, Laboratoire de Psychologie et Neurosciences Cognitives, CNRS FRE 2987, 71 avenue Edouard Vaillant 92 774 Boulogne Billancourt Cedex, France. Tel.: +33 1 55 20 59 51; fax: +33 1 55 20 59 85.

E-mail address: isabelle.jambaque@univ-paris5.fr (I. Jambaqué).

is less relevant in children than in adults, particularly after temporal lobe surgery (Gonzalez, Anderson, Wood, Mitchell, & Harvey, 2007; Lendt et al., 1999; Mabbott & Smith, 2003).

On the other hand, children with TLE have high rates of psychopathology, such as mood and personality disorders, hyperactivity, conduct disorders and social difficulties or autism-like behaviors (Besag, 2004; Caplan et al., 2004; Carracedo et al., 1995; Deonna, Ziegler, Moura-Serra, & Innocenti, 1993; Kaminer, Apter, Aviv, Lerman, & Tyano, 1988; Neville et al., 1997; SBarra, Rimm-Kaufman, & Pianta, 2002). An important factor in determining the severity of the effect of epilepsy on cognitive and behavioral disorders is age of onset (Caplan et al., 2004; Cavazzuti & Nalin, 1990; Nolan et al., 2003; Saykin et al., 1989). Improvement of cognitive abilities, behavior, and quality of life has been reported after temporal lobe resection in children which argues in favor of early surgical intervention (Costa da Costa, 2002; Danielsson, Rydenhag, Uvebrant, Nordborg, & Olsson, 2002; Gleissner et al., 2005; Lendt, Helmstaedter, Kuczaty, Schramm, & Elger, 2000; Lendt et al., 1999; Lewis et al., 1996; Sinclair et al., 2003; Smith, Elliott, & Lach, 2004).

Since children with TLE display cognitive and psychosocial difficulties, neuropsychological investigations should assess both cognitive functions and socio-emotional abilities as well. Facial expressions are nonverbal cues that allow us to express and communicate our own emotions. They also allow us to recognize the emotions of others, which helps us to gauge the effects of our behavior on others and to adjust it accordingly. Recognizing emotions in the faces of others is an important social skill that facilitates appropriate interpersonal interactions (Harrigan, 1984) and, thus, justifies using facial photographs in research studies of emotion processing in children, adolescents, and adults (Ekman & Friesen, 1976; Herba & Phillips, 2004; McClure, 2000). Deficits of emotion processing are usually detected in brain-damaged and emotionally disturbed adults using *Pictures of Facial Affect* (Ekman & Friesen, 1976); a set of pictures of adult faces expressing six innate, universal emotions (happiness, sadness, anger, disgust, fear, and surprise), the so-called 'basic' emotions (Ekman, 1992; Ekman & Friesen, 1971).

Neural networks underlying facial emotion recognition involve a distributed set of structures that include the visual cortices, the amygdala, the orbitofrontal cortex, and additional cerebral regions, such as the insula, the basal ganglia, and the prefrontal cortex (Adolphs, 2002). The amygdala, which is often damaged with the hippocampus in patients with TLE (Miller, McLachlan, Bouwer, Hudson, & Munoz, 1994; Pitkänen, Tuunanen, Kälviäinen, Partanen, & Salmenperä, 1998), has been identified as an important structure for evaluating emotional stimuli, particularly potentially threatening and dangerous stimuli, and for regulating social and emotional behavior (Aggleton, 1992; LeDoux, 1992, 2000). In the mature monkey, bilateral damage of the amygdala produces an inability to evaluate the social and emotional meaning of visual stimuli and generates a lack of fear responses to inanimate objects and a "socially uninhibited" pattern of behavior (Amaral et al.,

2003; Klüver & Bucy, 1939; Meunier, Bachevalier, Murray, Malkova, & Mishikin, 1999; Weiskrantz, 1956). In humans, there is evidence that bilateral lesions to the amygdala impair the recognition of emotions in facial expressions, fear particularly (Adolphs, Tranel, Damasio, & Damasio, 1994; Adolphs, Tranel, Damasio, & Damasio, 1995; Broks et al., 1998; Calder et al., 1996; Sprenglenmeyer et al., 1999). Severe impairment in recognizing fear can be included into a larger impairment in recognizing emotions of negative valence (Adolphs et al., 1999; Broks et al., 1998; Calder et al., 1996; Sato et al., 2002; Schmolck & Squire, 2001; Sprenglenmeyer et al., 1999). Similar or more subtle deficits in recognizing fear were reported in adults with TLE after right temporal lobe resection (Adolphs, Tranel, & Damasio, 2001; Adolphs, Baron-Cohen, & Tranel, 2002; Anderson, Spencer, Fulbright, & Phelps, 2000; Brierley, Medford, Shaw, & David, 2004; McClelland et al., 2006). However, these deficits are not related to the surgery exclusively, but also to the pre-existing epileptogenic lesion. A recent facial emotion recognition study of patients with RTLE indicated that their impairment in fear recognition existed before surgery (Melletti et al., 2003) and a functional magnetic resonance imaging study indicated that patients with RTLE, but not those with LTLE, failed to activate right temporal lobe structures during implicit processing of fearful expressions (Benuzzi et al., 2004).

Nevertheless, some adult patients with RTLE or bilateral amygdala damage perform normally in face-emotion recognition tasks (Adolphs et al., 1995; Adolphs et al., 2001; Anderson et al., 2000; Brierley et al., 2004; Hamann & Adolphs, 1999). The effect of a damaged amygdala on fear recognition may depend on the state of maturation of the amygdala when the damage occurs. Indeed, impaired fear recognition is observed in patients suffering from congenital disease or early-acquired bilateral amygdala damage (Calder et al., 1996; Hamann et al., 1996; Hamann & Adolphs, 1999) and in adults with RTLE whose seizures began early in childhood, especially before the age of 5–7 (Anderson et al., 2000; Adolphs et al., 2001; Benuzzi et al., 2004; McClelland et al., 2006; Melletti et al., 2003). These findings suggest that an early epileptic focus situated in the right mesial temporal lobe regions might delay or disturb or preclude the functional maturation of the neural networks mediating the processing and the interpretation of fear conveyed by facial expressions. This suggestion is consistent with the hypothesis that the right hemisphere is dominant for the perception of emotions both in adults (Adolphs, Damasio, Tranel, & Damasio, 1996; Borod et al., 1998; Bowers, Bauer, & Heiman, 1993) and children (Saxby & Bryden, 1985).

In normal development, neural networks for the processing of facial emotions mature progressively from early childhood until the end of adolescence (Batty & Taylor, 2006; Taylor, McCarthy, Saliba, & Degiovanni, 1999). Functional imaging studies indicate a functional maturation of the amygdala occurs during adolescence (Monk et al., 2003; Nelson et al., 2004) and that amygdala responses occur during the processing of fearful expressions in children and adolescents (Baird et al., 1999; Killgore, Oki, & Yurgelun-Todd, 2001; Lobaugh, Bibson, & Taylor, 2006; McClure et al., 2004; Thomas, Drevets, Whalen

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات