



Enhanced long-latency somatosensory potentials in major depressive disorder

Thomas Dietl*, Gerhard Dirlich, Luise Vogl, Thomas Nickel, Annette Sonntag, Friedrich Strian, Christian Lechner

Max Planck Institute of Psychiatry, Kraepelinstrasse 10, D-80804 Munich, Germany

Received 8 September 2000; received in revised form 23 November 2000; accepted 8 December 2000

Abstract

Bodily misperceptions are a frequent symptom in major depressive disorder. A reduced ability to deflect attention from somatosensory stimuli may contribute to the generation of unpleasant bodily sensations and co-occur with altered habituation of the brain electric reactions to somatosensory stimuli. The aim of the present study was to explore whether attention-related components of somatosensory evoked potentials (SSEP) and the habituation of these components are altered in major depression. Fifteen patients with major depressive disorder were compared to an age- and gender-matched group of 15 healthy controls. A series of identical, intrusive but not painful electric stimuli were applied to the left index finger for 48 min. Averaged SSEP were computed from multichannel EEG recordings for consecutive recording blocks of the experiment, each block containing 162 stimuli. Based on these data the habituation process of late components of the SSEP was analysed in two latency intervals (50–150, 170–370 ms). Patients showed significantly enhanced reactions throughout the entire experiment. The persistence of enhanced SSEP components throughout the habituation process may be caused by a deficit in reducing the activity of attention-related brain processes concerned with intrusive, yet behaviourally irrelevant, continued stimulation in the state of major depression. © 2001 Elsevier Science Ltd. All rights reserved.

Keywords: Habituation; Major depression; Somatosensory evoked potential; Somatosensory amplification; Attention

1. Introduction

The state of major depression involves changes in cognitive processes as revealed by clinical observations, neuropsychological testing and electrophysiological studies (Mialet et al., 1996; Elliot, 1998). One of the most basic cognitive processes is habituation, which is the decrease of reactivity with stimulus repetition. It is a basic learning mechanism preventing the organism from overreacting to behaviourally irrelevant, recurrent sensory stimulation (Thompson and Spencer, 1966; Christofferson, 1997). Habituation is critically involved in the adaptation to external and internal stimuli and is modulated by the internal state of the organism such as attention and arousal. Early studies on habituation in depression using galvanic skin responses as an indicator

of habituation reported slower habituation in subgroups of depressed patients compared to healthy controls (Lader and Wing, 1969).

The present study is concerned with somatosensory evoked potentials (SSEP). SSEP are EEG components occurring time-locked to somatosensory stimuli. They indicate the brain electric activity related to the processing of the somatosensory stimuli (Colon and de Weerd, 1986). SSEP decay habituation-like under recurrent stimulation. The present study is focused on the temporal dynamics of the decay of SSEP in the late latency range reflecting the allocation of attention (Miltner et al., 1989). The basic assumption is that the ability to relegate intrusive somatosensory stimuli to the non-attended background is reflected by the progressive suppression of stimulus-evoked brain electric activity. The rapid attainment of a low and stable level of brain electric reactions is considered a successful adaptation to the challenge of recurrent intrusive somatosensory stimulation.

* Corresponding author. Tel.: +49-89-30622-226; fax: +49-89-30622-605.

E-mail address: dirlich@mippsykl.mpg.de (T. Dietl).

We report on a comparison of the habituation process of the late components of SSEP in clinically depressed patients and healthy subjects. The working hypothesis was that the brain electric reactions of the MDD patients remain more pronounced throughout continued stimulation.

Considering the frequency of unpleasant bodily sensations and pain syndromes in major depression (Barsky, 1979; v. Korff and Simon, 1996; Simon et al., 1999), impaired habituation to somatosensory stimulation might be a relevant factor facilitating the formation or the persistence of somatic misperceptions and may thus contribute to the shaping of the clinical syndrome of major depression.

2. Materials and methods

Fifteen patients suffering from major depressive disorder (MDD) according to DSM IV criteria (American Psychiatric Association, 1994) formed the test group. The patients were diagnosed independently by two experienced psychiatrists. The group mean of the Beck depression score was 24.9 (S.D. = 9.9; Beck et al., 1961) and the group mean of the Hamilton depression score was 26.8 (S.D. = 4.1; Hamilton, 1960). Normal results of a neurological examination, magnetic resonance imaging, EEG and routine blood tests were required for the MDD patients. The patients had been free of psychotropic medication (only chloralhydrat was allowed at night) for at least four days prior to the experiment. Fifteen healthy subjects formed the control group. The controls had been interviewed by a physician to screen for medical diseases and psychiatric disorders. The test and control groups were age- and gender-matched (Table 1). All subjects gave informed consent prior to the experiment. The control subjects were paid for their participation. The study had been approved by the local ethics committee.

The experiments took place in an electrically- and sound-shielded laboratory. During the experiment the subjects were seated in a chair and instructed to watch a movie on a small television screen 1.5 m in front of them, in order to reduce the amplitude of eye movements.

Table 1
Basic statistics of major depressive disorder (MDD) and control group

	<i>n</i>	Male	Female	Age (years)	Threshold (mA)
MDD	15	7	8	45.4 (10.2)	2.56 (0.52)
Controls	15	7	8	44.9 (10.2)	2.22 (0.54)
<i>t</i> -test: <i>T</i>				0.139	1.761
<i>t</i> -test: <i>P</i>				0.891	0.089

The movies were carefully selected for not inducing intense (positive or negative) emotions.

Electrostimuli (square wave, 0.2 ms duration) were applied to the left index finger. The sensory threshold was determined individually (Table 1) and the experimental stimuli were set to 2.5 times the individual threshold in order to control for individual differences in somatosensory perception.

Stimuli (1296) were organised as a series of 48 cycles, each cycle consisting of a stimulus train of 30 s with 27 stimuli recurring at a frequency of 0.9 Hz followed by a stimulus-free break of 30 s. The experiment was divided into eight consecutive recording blocks of 6 min duration, each block containing six stimulus trains with altogether 162 stimuli.

Twenty-six EEG channels were set up according to an augmented 10–20 schema. EEG data were collected by a DC-recording system (Schwind Medizintechnik, Erlangen, Germany) at a sampling rate of 500 Hz with an amplitude resolution of 0.3 μ V. The originally Cz-referenced EEG signals were computationally re-referenced to the averaged earlobe electrodes. The data were visually screened for movement and muscle artefacts. Time intervals with artefacts were excluded from the analysis. Eyeblink and DC drift artefacts were detected and corrected computationally (Gratton et al., 1983). Since a detailed description of the topography of SSEP is not in the focus of the present study the presentation of the results is restricted to a cluster of nine electrode locations centred around Cz (F3, Fz, F4, C3, Cz, C4, P3, Pz, P4).

Individual SSEP were computed by averaging: (1) all artefact-free sweeps of the experiment (max $n = 1296$, SSEP_{all} in the following); and (2) the artefact-free sweeps of each recording block (max $n = 162$, SSEP₁ to SSEP₈ in the following). The SSEP were band-pass filtered (0.5–40.0 Hz). Two analysis intervals from 50 to 150 ms and from 170 to 370 ms were defined. Both analysis intervals were positioned in the long latency range in order to capture long latency potential components. Since the study was focused on habituation small and even lacking evoked reactions had to be expected particularly in the later recording blocks.

Reliable measurements of peak amplitudes and latencies of evoked components appeared not to be feasible in the individual SSEP of the eight recording blocks due to the low signal-to-noise ratio. Therefore, only the grand average SSEP waveforms are presented. Due to the lack of individual amplitude and latency information an additional approach was needed to obtain quantitative data on the stimulus-induced brain electric reactions which met the requirements of the statistical analysis. Assuming that stronger reactions cause larger positive and/or negative deflections of the SSEP increasing the dispersion of the potential amplitude values, we used the square root of the variance (i.e. the

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