



# Diurnal autonomic variations and emotional reactivity

Pascal Hot<sup>a,b,\*</sup>, Pierre Leconte<sup>c</sup>, Henrique Sequeira<sup>a</sup>

<sup>a</sup>*Neurosciences Cognitives, SN4.1, Université de Lille I, 59 655 Villeneuve d'Ascq, France*

<sup>b</sup>*Sleep Research Center, Ashikaga Institute of Technology, 268-1, Oomae-choo, Ashikaga-shi, Tochigi-ken 326-8558, Japan*

<sup>c</sup>*Laboratoire Travail et Cognition, UMR 5551, Université de Toulouse-le-Mirail, Toulouse, France*

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## Abstract

Diurnal temporal variations of emotional reactivity were investigated in relationship with fluctuations of psychophysiological state, evaluated by tonic autonomic activity. Neutral and unpleasant pictures, selected to constitute seven matched sets, were evaluated by 12 participants during seven sessions in the course of daytime. Skin conductance level (SCL) was recorded at the beginning of each session, whereas skin conductance responses (SCRs), affective evaluation and emotional experience were measured during or after each session. Data show significant temporal variations for SCL, SCRs and emotional experience which follow similar patterns during the daytime. Discussion highlights the role of temporal patterns of autonomic activity as an interesting basis to better understand the emotional regulation and affective disorders.

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## 1. Introduction

Emotions are not a single response but rather a collection of responses including physiological activation, subjective experience and behavioral expressions. The emotional reactivity has been considered as an affective style referring to a consistent individual

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\* Corresponding author. Tel.: +33 3 20 43 69 29; fax: +33 3 20 43 46 02.

*E-mail address:* [kutaifr@yahoo.fr](mailto:kutaifr@yahoo.fr) (P. Hot).

pattern of responses to emotional stimuli (Cacioppo et al., 1992; Wheeler et al., 1993). However, some authors (Cacioppo and Gardner, 1999) emphasized that in similar conditions, the same individual is able to emotionally react in different ways. This intra-individual variability could proceed from both personal life events and spontaneous temporal variations of physiological systems allowing emotional manifestations. Indeed, classical data have shown that changes in autonomic activation or cognitive states preceding the onset of a stimulus, could modulate emotional responses in normal (Schachter and Singer, 1962; Lazarus, 1985) and in brain injured subjects (Damasio, 1994). In animals, Poirel (1995) reported rhythms in both somatic and autonomic components of emotional behavior, supporting the hypothesis of two asynchronous circadian systems implicated in emotional reactivity. In addition, Poirel (1974) found out, in depressed and schizophrenic patients, similar temporal variations in emotional reactivity and vigilance, comparable to those of circadian rhythms reported some years later (Okawa et al., 1984).

In spite of that, no systematic studies of the temporal organization of emotions have been performed in healthy subjects. However, several authors showed diurnal variations on tonic and phasic psychophysiological components implicated in emotional reactivity. Thus, the hypothesis of a diurnal variability of tonic emotional states is supported by an extensive body of research on mood (Thayer, 1989; Kerkhof and Van Dongen, 1996; Owens et al., 2000). Focusing on physiological components of emotional reactivity, several authors reported spontaneous diurnal fluctuations of autonomic variables (Werntz et al., 1983; Shannahoff-Khalsa, 1991), considered as major physiological signatures of emotional reactivity. The electrodermal activity (EDA), a largely used tonic and phasic autonomic marker of arousal dimension of emotions, presents reliable circadian periodicity throughout childhood, only few days after birth (Hellbrügge et al., 1964). Concerning the tonic EDA, usually recorded as skin conductance level (SCL), two patterns of diurnal variations have been reported in healthy adults. The former, corresponds to an increase during the morning until a peak between 1:00 p.m. and 3:00 p.m. (Venables and Christie, 1973). The latter, described by Hellbrügge et al. (1964) and more recently by Hot et al. (1999, 2000), corresponds to a monotonous increase during the daytime until a peak at the evening. These data on diurnal variations of EDA raise the question about temporal relationships between the psychophysiological state sustaining the emotional activation and other indices of emotional reactivity. This view is consistent with the somatic marker hypothesis (Damasio, 1994) that emphasizes interactions between autonomic changes and emotional experience. In this frame, mood disorders have been considered as the consequence of temporal dysregulations of physiological systems allowing the tonic expression of emotions (Wirz-Justice and Van den Hoofdakker, 1999). Then, the research of temporal patterning between components of emotional reactivity in healthy subjects could have a particular relevance in the comprehension of affective disorders.

The aim of this study was to investigate diurnal organization of emotional reactivity components, and to assess its relationships with diurnal variations of tonic psychophysiological state. To this end, electrodermal activity, affective evaluation and emotional experience were recorded before or during the presentation of emotional pictures through several sessions in the course of daytime.

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