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The conscious awareness of time distortions regulates the effect of emotion on the perception of time

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ABSTRACT

This study examined how the awareness of emotion-related time distortions modifies the effect of emotion on time perception. Before performing a temporal bisection task with stimulus durations presented in the form of neutral or emotional facial expressions (angry, disgusted and ashamed faces), some of the participants read a scientific text providing either correct or incorrect information on the emotion–time relationship. Other participants did not receive any information. The results showed that the declarative knowledge allowed the participants to regulate (decrease) the intensity of emotional effects on the perception of time, but did not trigger temporal effects when the emotional stimuli did not automatically induce emotional reactions that distorted time.

1. Introduction

The last decade has seen a huge growth in research into the effect of emotions on the perception of time, and especially that of the emotional facial expressions currently used for measuring people's emotions (for a recent review, see Droit-Volet, Fayolle, Lamotte, & Gil, 2013). Most of the studies that have used facial expressions as emotional stimuli have employed the temporal bisection task (e.g., Doi & Shinohara, 2009; Droit-Volet, Brunot, & Niedenthal, 2004; Gil, Niedenthal, & Droit-Volet, 2007; Tipples, 2008, 2011). In this task, participants are trained to recognize a short and a long standard duration. They are then presented with comparison durations, including the two standards and intermediate stimulus durations. Their task is to judge whether these comparison durations are more similar to the short or the long anchor duration. However, in studies involving emotions, the standard durations are presented in the form of a neutral stimulus (pink oval), while the comparison durations are presented as emotional stimuli, namely faces expressing different emotions. The results systematically show that the bisection functions shift toward the left, with a lowering of the bisection point (BP) (i.e., point of subjective equality), for faces expressing high-arousal emotions (i.e., anger, fear) compared to neutral faces, with the result that participants respond long more often for emotional facial expressions than for neutral expressions, even though both are presented for the same duration. Consequently, the perception of negative high-arousal emotional stimuli has been demonstrated to produce distortions in time judgment consistent with a lengthening effect.

This lengthening effect has been explained in terms of the perception of negative high-arousal emotional stimuli which increases the level of activation of the central nervous system and thus causes a speeding up of the internal clock system underlying the representation of time. According to the internal clock models, which are the models most frequently invoked

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in order to account for behavioral data (Gibbon, 1977; Gibbon, Church, & Meck, 1984; Treisman, 1963), the subjective measurement of durations depends on the number of pulses emitted by a pacemaker-like clock system and accumulated during the stimulus duration to be timed. When the clock runs faster, more pulses are accumulated and time is judged to last longer. The speeding-up of the internal clock system in threatening conditions would result from an automatic survival mechanism which prepares the organism to act as quickly as possible when confronted with a potential danger, e.g. to attack or flee when faced with an aggressive person (Droit-Volet & Meck, 2007). Indeed, there is ample evidence that threatening situations automatically trigger innate defense responses in both humans and animals (LeDoux, 1998, 2000). In threatening conditions, individuals are therefore ready to act quickly because their internal clock runs faster and they experience the passage of time as lasting longer than normal. However, human time judgments in an emotional context cannot be reduced to an automatic process of action readiness. As suggested by theories of the appraisal of emotion, the behavioral expression of emotions also depends on people's cognitive appraisal of their emotional state and of the events that have induced this emotional state (Lazarus, 1991; Scherer, 2001). Introspective awareness of an emotional reaction that is too intense for a given situation can, for example, lead individuals to reduce the behavioral expression of emotion (Sanders & Scherer, 2009).

The aim of the present study was to examine how the declarative knowledge of emotion-related time distortions modulates the effect of emotional stimuli on time perception. No study of the role of individual awareness of emotion-related time distortions has investigated the effect of emotion on the judgment of time. However, a recent study has examined how subjects' awareness of the fluctuation of the passage of time in their everyday lives affects their time judgments in a laboratory situation (Lamotte, Izaute, & Droit-Volet, 2012). In this study, the participants were required to estimate stimulus durations in a single temporal task and a dual-task in which they had to process both temporal and non-temporal information. The results replicated those found in numerous studies and showed that the stimulus durations were judged shorter in the dual-task than in the single temporal task (e.g., Coull, Vidal, Nazarian, & Macar, 2004; Fortin, Rousseau, Bourque, & Kirouac, 1993; Macar, Grondin, & Casini, 1994). However, the extent of this shortening effect was smaller in the participants who were more conscious of being subject to time distortions in their everyday lives. In this study, the degree of consciousness was assessed through subjects' responses to the statement "the more I focus attention on time, the slower time goes". The results thus revealed a significant correlation between agreement with this statement and temporal accuracy: The more the participants agreed with the statement, the smaller the distortion of their time judgments in the dual-task was. Based on metacognitive studies, the authors argued that the participants' individual knowledge of time distortion caused them to monitor the attentional resources they allocated to time processing. The participants thus developed a cognitive control strategy allowing them to compensate for their tendency to shorten time when they performed a secondary non-temporal task. In conclusion, people's individual consciousness of their temporal abilities also contributes to their time judgments.

In the emotion-related domain, no studies have investigated the effect of individual knowledge on the perception of time. Using an extensive series of questions, Lamotte, Chakroun, Droit-Volet, and Izaute (2014) assessed individuals' explicit knowledge and beliefs about factors that may affect how time is perceived. Factorial analyses allowed the authors to extract two discriminant factors: one related to attention and the other to emotion. However, as far as emotion was concerned, there was individual variability in the consciousness of time distortions in the presence of happiness and sadness, but not in response to the high-arousal emotions of anger or fear, even though these emotions have a considerable impact on time perception. As reported above, this may be due to the temporal effects produced by these basic emotions, which derive directly from automatic unconscious mechanisms. Consequently, to examine the effect of individual knowledge of emotion-related time distortions, we decided to compare angry faces and neutral faces, and to manipulate the knowledge provided to the participants before they performed the temporal bisection task. To do this, we provided some of the participants with a text which they had to read before performing the temporal task and which contained either correct or incorrect information about the effect of emotion on time perception. More specifically, the text stated that the perception of an angry face produces a lengthening of time (true information) or a shortening of time (false information) compared to that of a neutral face. Certain other participants did not receive any information. Our hypothesis was that declarative knowledge of emotion-related time distortions would modulate the basic effects of emotional stimuli on the perception of time in bisection.

2. Experiment 1

2.1. Method

2.1.1. Participants

Fifty-two women students (M = 19.35, SD = 1.37) from Blaise Pascal University (Clermont-Ferrand, France) took part in this study in return for course credits after signing a consent form to participate in the experiment.

2.1.2. Materials

The participants were tested individually in a quiet room in the laboratory of the Psychology department. They were seated in front of a PC computer that controlled the experiment and recorded the data via an E-prime program (1.2. Psychology Software Tools, Pittsburgh, PA). They gave their responses by pressing the D ("*Short*") and K ("*Long*") keys on the computer keyboard and the button-press assignment was counterbalanced across subjects. The stimuli to be timed were an oval with a mottled texture (white, gray, black) in the training phase and the faces of 3 different women in the testing

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