



Short Communication

Feelings of control restore distorted time perception of emotionally charged events

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ABSTRACT

Humans perceive time with millisecond precision. However, when experiencing negative or fearful events, time appears to slow down and aversive events are judged to last longer than neutral or positive events of equal duration. Feelings of control have been shown to attenuate increases in arousal triggered by anxiety-provoking events. Here, we tested whether feelings of control can go as far as influencing people's perception of the world, by modulating the perceived duration of aversive events. Observers judged the duration of images depicting positive or negative content, and we manipulated the amount of control experienced by participants. Crucially, participants never had any real control over events. All control was illusory. Results showed that when participants experienced low levels of control, negative images were judged as lasting longer than positive images. However, when participants illusorily experienced high levels of control, they no longer experienced aversive negative images as lasting longer than positive images.

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1. Introduction

Time seems to slow down when experiencing a negative event; that is, aversive or fearful events are typically judged to last longer than neutral or positive events of the same duration (Angrilli, Cherubini, Pavese, & Manfredini, 1997; Droit-Volet, Brunot, & Niedenthal, 2004; Grommet et al., 2010; Langer, Wapner, & Werner, 1961; Stetson, Fiesta, & Eagleman, 2007; Thayer & Schiff, 1975; Tipples, 2008; see Droit-Volet & Meck, 2007 for a review). Yet, recent evidence suggests that observers' desires can alter their perception of the world to fit with those desires (e.g., making a glass of water appear closer, when thirsty, see Balci & Dunning, 2010). Thus, it is difficult to understand why it is that time, being a principal component of our perceptual experience, should behave differently: Why would, presumably undesirable, aversive events be perceived as lasting longer than positive events? This observation led us to ask the question: How can we reverse this trend? What factors may allow us to better see the world, when faced with highly arousing, negative events? Here we show that perceived control, even when illusory,¹ is one such factor: Observers who are deceived into thinking that they control the valence (positive or negative) of the events that they will experience do not overestimate the duration of negative events, whereas those who are meant to feel powerless over the same events do.

1.1. Perceived duration of emotional events

Humans can perceive time with millisecond precision, as demonstrated by our ability to dance and walk (see Buhusi & Meck, 2005) and to perform and enjoy music (for a review see Repp, 2005). Yet, there can be a remarkable discrepancy

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E-mail address: stef.mereu@gmail.com (S. Mereu).¹ To us, illusory control is not fundamentally different from the concept of instrumental control (Miller, 1979), defined as "the belief that one has at one's disposal a response that can influence the aversiveness of an event" (Miller, 1979, p. 89).

between physical and psychological timing. Using a time bisection task, in which observers have to judge whether a stimulus' duration is more similar to a short or a long standard, several studies (Droit-Volet et al., 2004; Effron, Niedenthal, Gil, & Droit-Volet, 2006; Tipples, 2008) have shown that angry faces are judged as lasting longer than happy faces, which in turn are judged as lasting longer than faces expressing a neutral emotion.

Previously, these types of time distortion effects have been linked to changes in arousal (Droit-Volet & Meck, 2007), in line with time perception models that propose that time is perceived by counting the ticks of an internal clock (e.g., Gibbon, 1977; Treisman, 1963; Zakay & Block, 1997): As arousal increases in response to the emotionality of events, so does the ticking rate of the internal clock. As a result, more ticks will be counted while perceiving arousing events and these events will appear to last longer than events of identical physical duration but that are low arousing (see Grondin, 2010 for a review).

The most direct demonstration of the link between increases in arousal and time expansion comes from psychopharmacological studies, which report time overestimation after administration of methamphetamine (e.g. Maricq, Roberts, & Church, 1981). Studies linking time overestimation to fear also support the arousal hypothesis. In a seminal study, Langer et al. (1961) asked participants to judge when 5 s elapsed, while standing on a mobile platform moving either toward a stairwell precipice (fearful) or away from it (non-fearful). Participants overestimated time in the fearful event, but not in the non-fearful one. Grommet et al. (2010) observed that fear provoking stimuli were judged as lasting longer than neutral stimuli. Furthermore, Bar-Haim, Kerem, Lamy, and Zakay (2010) showed that anxious individuals overestimated the duration of fearful stimuli, at shorter (2 s) but not at longer (4 s–8 s) durations, in a time reproduction task,² also suggesting that increases in arousal have a transient effect on time perception. However, time perception is not driven by arousal alone: Angrilli et al. (1997) showed that high arousing, negative images (from the IAPS inventory, Bradley & Lang, 2007) are judged as lasting longer than equally arousing though positively-valenced images.

1.2. Perceived control and aversive events

Barlow (e.g., 1988) hypothesized a role of feelings of uncontrollability over life events in the genesis of anxiety and panic disorders. Furthermore, uncontrollability is a common characteristic associated with phobic objects (Armfield and Jason, 1996). Conversely, perceived control has been shown to have positive effects on people's reaction to aversive stimulation (Ludwick-Rosenthal & Neufeld, 1988; Miller, 1979; Thompson, 1981), especially during noxious medical procedures (Fernandez, 1986). For example, people prefer to have some control over the administration of a painful stimulation (Pervin, 1963). The belief—even if illusory—that one can escape a painful stimulation has been shown to increase pain tolerance for the intensity of electric shocks³ (Bowers, 1968). Also, the belief that one has control over termination of an aversive stimulation (i.e., cold pressor) extends the time over which that stimulus is tolerated (Litt, 1988). Perhaps more importantly, perceived control over an aversive event has been shown to reduce the psychophysiological arousal response to that event (Corah & Boffa, 1970; Geer, Davison, & Gatchel, 1970; Geer & Maisel, 1972).

Taken together, these results suggest that feelings of control increase the tolerance for the aversive stimulation and reduce the autonomic response to the experience of pain. However, to our knowledge, the effect of control on the subjective perception of the aversive stimulus has never been investigated. That is, does perceived control affect our perceptual experience of anxiety provoking events? If it does, it might provide a mechanistic explanation to partly account for the effects of control on anxiety: Perhaps control reduces anxiety responses to aversive stimuli by changing the very way in which we perceive those events. Alternatively, it is possible that the sense of agency induced under conditions of high perceived control allows people to dissociate (buffer) their emotional reactions to stimuli from their cognitive assessments of those stimuli. According to this view, one's emotions might very well respond to an emotional event (i.e., one may become aroused by an arousing event), but the manner in which we cognitively process and react to that event may be less driven by the induced emotion and more actively determined by our cognitive system (see Leotti, Iyengar, & Ochsner, 2010).

The goal of this study was to evaluate the effect of illusory control on the apparent duration of aversive visual events. We expected that restoring a sense of control over the stimulation would reverse the time distortions usually associated with highly arousing negative events, allowing participants to more veridically experience the duration of such events by either reducing the emotional response to images or by shielding the cognitive system from the influence of those emotions.

Forty-five observers judged the duration of positive and negative images, displayed on a computer monitor. Two thirds of the participants were deceptively informed of the possibility to control the images' content by choosing one of two buttons at the start of each trial. They were instructed to maximize, if possible, the occurrence of positive images in the experiment. However, participants had no actual control over the content of the images and they viewed either a low or a high rate of positive images, in a predetermined fashion. Crucially, it is well known that under these circumstances (when events in the world are independent of our actions), the frequency of desired outcomes predicts perceived control: When the desired outcome in an experiment rarely occurs, then participants feel little-to-no control over those outcomes; whereas when the desired outcome occurs often, participants report feeling a sense of control over this outcome (Jenkins & Ward, 1965). This phenomenon is a form of "illusion of control" (Alloy & Abramson, 1979). Thus, we anticipated that participants in the group where positive images occurred often would experience higher levels of control than those where positive images occurred

² In time reproductions tasks observers are asked to perform an action—i.e., holding a button pressed—for the same duration as a standard event.

³ Results regarding perceived pain and control are mixed. Corah and Boffa (1970) found a small decrease in reported pain when participants had increased levels of control, whereas Pervin (1963) did not. Litt (1988) even showed an increase in perceived pain (Litt, 1988).

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