Distortions of Time Perception during Critical Situations

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Humans are good at estimating durations of time. The person's time perception is affected by emotion (Eiser, 2009). To allow for these predictions, an internal signal that provides the organism with a sense of time has to exist. An information-processing model of Scalar Expectancy Theory (SET) and its evolution into the neurobiologically plausible Striatal Beat-Frequency (SBF) theory, contemporaneously are the most accepted to explain this ability to perceive time (van Rijn, Gu & Meck, 2014). According to this theory initially developed by Gibbon et al, the "internal clock" is comprised of a pacemaker that emits pulses at a regular rate and a switch controls how many pulses enter into an accumulator, which stores the number of pulses during the event to be timed. With longer stimulus duration, more pulses are accumulated and consequently the higher the value of the time (Weber's law) (Gibbon, 1977).

The information-processing model of SET also states that temporal judgements rely on memory and decision stages. In this way, whenever the organism wants to respond simultaneously with the onset of an upcoming event, it retrieves a random sample from memory. The sample is associated with previous experiences by the individual and compared with a previously encoded duration to make a decision (Wittmann, 2013). This information-processing is changed in critical situations when arousal mechanisms are automatically activated. A mental mobilization system allows that the individual to deal with danger in an optimal way ensuring his survival. The afferent stimulus of threat is interpreted and compared with previous situations, then the response to the stimulus is given (Dyregrov, Solomon & Bassøe, 2000).

Unfortunately, much more is studied about the psychological consequences of trauma than about the mental processes that occur during the critical situations. Subjects commonly report that time seems to have moved in slow motion during a critical event (such as a car accident) as if there was an ability to perceive events with higher temporal resolution (Tamm, Uusberg, Allik & Kreegipuu, 2014). Effects emotional arousal and affective attention on internal clock can influence on temporal judgments and contribute to emotional distortions of time perception. The arousal causes an increase in the speed of the pacemaker and emotional stimuli may cause the switch to close faster or open later than usual (Lake, LaBar & Mack, 2016).

Recent studies show that emotional information affects the perception of time at different time points (Yoo & Lee, 2015). The influence of emotion on time perception is a real-time process. Dynamic emotional expressions starting with a neutral expression will present a lesser effect than dynamic emotional expressions starting with a positive or negative expression, because a positive or negative expression will capture attention and influence the internal clock processes immediately (Li & Yuen, 2015). Another aspect of the time perception of time in critical situations is that this may influence the outcome of the treatment of severe mental disorders. A study provided empirical support that time perspective plays an important role in persons with Severe Mental Illness (SMI). Its evaluation in patients with severe conditions may favor actions that lead to a Balanced Time Perspective (BTP) profile and may lead to better quality of life. Thus, the way that the person with SMI estimates a time period gives information on his/her health status and attitude towards life (Oyanadel & Buela-Casal, 2014).

However, increase in temporal resolution is not a single entity that speeds or slows, but instead is composed of separable subcomponents. The time-slowing is a function of recollection, not perception: a richer encoding of memory may cause a salient event to appear, retrospectively, as though it lasted longer. Maybe the amygdala is involved in memory capacity to make dilated time trials retrospectively due to a richer coding, and perhaps secondary memories (Stetson, Fiesta & Eagleman, 2007; Sato, Kochiyama & Uono, 2015). Furthermore, it is known that the amygdala, thalamus, and cerebellum are subcortical structures that assist the process of selecting a course of action from among 2 or more alternatives by considering the potential outcomes of selecting each option and estimating its consequences in the short, medium and long term. This process also includes cortical structures, such as the dorsolateral prefrontal cortex, orbitofrontal cortex, anterior cingulate cortex (Broche-Pérez, Jiménezm & Omar-Martínez, 2015).

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