Rockin' in rhythm: Attention in rhythmic contexts

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Our environment is full of rhythms, which have an important predictive value as cues for the preparation and temporal orienting of attention. At the neurocognitive level, rhythms promote attentional entrainment, concentrating higher levels of attention at the moments in which the appearance of a critical event is more likely. This strategic use of attention improves performance on several cognitive tasks. It yields both perceptual and motor benefits, respectively allowing a greater stimulus processing capacity and a greater opportunity to prepare complex responses.

Every day we are exposed to multiple situations that have a regular and predictable sequence. We can find rhythms in nature (in the sea waves or the sound of the wind), in technology (in the upward and downward movement of the elevators), or social contexts (in music or language). Our brain is sensitive to all these patterns and can contextually adapt behavior to make it faster and more effective (Henry & Herrmann, 2014; Jones, 1976). We may even experience some anxiety with unpredictable environments that make it difficult to anticipate the events (Herry et al., 2007).

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One of the mechanisms through which rhythms influence us is by affecting the focus of attention. An extensive literature has shown that rhythmic patterns (e.g., a sequence of sounds equidistant in time) can serve as a cue for preparation and temporal orienting of attention (see Triviño, Arnedo, Lupiáñez, & Correa, 2012,

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http://www.cienciacognitiva.org/?p=569). In this way, rhythms focus attention on the moments in which the sequence predicts the occurrence of an event and, consequently, improves performance in tasks with a periodic structure. For example, in the case of a dancing couple, the first bars serve to extract the rhythm and attend to the pulse of the song, which help them to start on time and prepare each movement in advance.

The synchronization of attention with rhythm has proven to be more marked in sequences with greater temporal regularity, that is, in those stable rhythms in which the pulse is more evident (Henry & Herrmann, 2014). Moreover, such attentional entrainment is an automatic process that occurs even when the rhythm is ignored or irrelevant to the task (Cutanda, Sanabria, & Correa, 2019). Along with the behavioral evidence, recent neurophysiological findings also confirm attentional entrainment (Chang, Bosnyak, & Trainor, 2019). Those studies suggest that adaptation to a rhythm not only improves performance but also reduces metabolic consumption by inducing a rhythmic brain processing mode instead of one in which attention is homogeneously distributed over all time points (Henry & Herrmann, 2014).

However, our environment is constantly changing and also the rhythms that surround us. If the changes consist of alterations in the speed of the rhythm or its regularity (e.g., a section of the dance song speeds up), attentional entrainment is updated immediately (Jones, 1976). Another possibility is that the rhythm disappears completely (e.g., music stops or all musical voices start producing long notes without clear evidence of a pulse). In this case, one important question is whether the effects of entrainment can extend beyond the moment when the rhythmic context is interrupted (will the couple continue to dance in time and coordinated?). Recent evidence suggests that synchronization may be maintained internally for some minutes (Trapp, Havlicek, Schirmer, & Keller, 2020).

This result opens the door for future research that investigates the benefits of endogenous maintenance of the rhythms once they have already disappeared. In the study by Trapp and collaborators, the period of exposure to the rhythmic context was brief (approximately four minutes), but sufficient to generate benefits while it was present and two minutes after it ceased. It may be relevant to inquire whether repeated exposure to the same rhythmic structure, for days or even years, such as in dance or music professionals, may allow the attentional entrainment to be extended endogenously over longer periods. Also, it is worth investigating the impact of strategies such as the use of self-generated rhythms. Perhaps the couple will continue dancing in the absence of music if they mentally reproduce the song, thus keeping the pulse in mind. In general, the strategic use of attention facilitated by the rhythmic entrainment allows supporting higher levels of demand at critical moments (e.g., processing more difficult stimuli or preparing more complex motor responses) as well as carrying out alternative operations in the periods when no event is expected to occur (Henry & Herrmann, 2014).

We are beings immersed in rhythms, from the sound of our steps when walking to the transition between days and nights. Furthermore, these vital melodies contain meaning: they inform about the course of a process ("it is getting dark") and help predicting its future ("it will soon be night"). It should come as no surprise that life has taken many forms to adapt to the information that the rhythms carry.

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