Effects of music on central motor command activity during exercise: An EEG study

Bigliassi, M.[1], Karageorghis, C.I.[1], Wright, M.J.[1], Orgs, G.[2], & Nowicky, A.V.[1]

[1]Brunel University London, UK
[2]Goldsmiths, University of London, UK

Auditory stimuli have been used in sport and exercise settings to assuage the effects of fatigue-related symptoms and render a given activity more pleasant than under normal circumstances. The brain mechanisms that underlie the effects of auditory stimuli on psychophysiological parameters during exercise are hitherto under-researched. The present study attempted to further understanding of the brain mechanisms that underlie the effects of auditory stimuli on affective, perceptual, and visceral responses during whole-body modes of exercise. With institutional ethical approval, 20 participants (9 female and 11 male; mean age: 25.2 ± 4.1 years) engaged in light-to-moderate intensity bouts of physical activity performed on a cycle ergometer. Two experimental conditions (music [MU] and audiobook [AB]) and a control (CO) were administered in order to identify the effects of different auditory stimuli on electrical activity in the brain and psychophysiological responses to exercise. The application of AB was expected to reveal the brain electrical response that is associated with the use of auditory stimuli that are devoid of musical features. Wireless techniques were used to identify the electrical activity in the brain, heart and muscle throughout the experiment. Affective and perceptual measures were taken at various time points during the exercise bout to gauge the effects of the experimental conditions on objective and subjective indices. Results indicated that music reallocated attentional focus towards auditory pathways, increased the use of dissociative thoughts, and lowered participants' perceived effort. Participants also experienced more positive affective responses in the presence of music in comparison to CO and AB. The musical stimulus reduced the frequency of neural outputs discharged from the central motor command that control the working muscles. Reduced focal awareness, induced by music, rendered more autonomous control of movements and enabled participants to experience more positive affective and perceptual responses than CO and AB. Interpretation of interoceptive sensory cues up-modulated fatigue-related sensations and required neural resynchronisation to sustain the imposed exercise intensity. Music caused a distractive effect and reduced the frequency of neural signals that command the musculature. A compensatory mechanism was manifest that served to produce the predetermined power output (i.e. an increase in the recruitment of motor units). Output of higher frequencies to control the working muscles might have been coupled with efference copies discharged from the central motor command to frontal and post-central regions of the cortex.