Testing the affective resonnance theory : 3D motion capture to study the effects of affective inductions on spontaneous motor tempo and the time spent in motor synchrony during a dyadic pedaling task

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Résumé

Interpersonal motor synchronization is a continuous, observable, and quantifiable phenomenon that emerges during social interaction. Its prominent role in social dynamics is well documented. However, only few studies have examined how affective states modulate it. This study investigated the effects of induced affective states on spontaneous motor synchronization in human dyads. We also aimed to test experimentally the affective resonnance theory (Mühlhoff, 2015) that suggest that affective contagion is possible only if two individuals are in a similar (congruent) affective state of emotion.

A total of thirty-four participants (17 dyads) performed a free pedaling task on a home trainer after being exposed to affective inductions varying in energy level (happy for high arousal vs. sad for low arousal induction). A combination of autobiographical audio scenarios and musical excerpts was used. The affect grid was used to confirm the success of the induction procedure (Russel, 1980). We also implemeted a neutral condition during which no induction was done. Motor synchronization was measured using markerless 3D motion capture technology (Qualysis) and data were modeled with the Kuramoto order parameter (Kuramoto, 1975). There were a total of four experimental conditions : congruent no-induction, congruent high arousal, congruent low arousal and an non-congruent condition for which high and low arousal inductions were given within the same dyad.

When cycling alone, results showed that the inductions influenced significantly the perceived affective changes (Affect Grid), which validated the method of induction used in the present study. The affective states modulated significantly mean spontaneous motor tempo in all participants : the pedaling frequency was highest in the high arousal condition ; mean frequency was faster in the high arousal than in the low arousal condition.

*Intervenant

When cycling together, the experimental manipulation also revealed an impact of affective inductions on the mean time spent in synchrony by the dyads. More time was spent in synchrony in the congruent no-induction than in all other conditions. Both the congruent high and low arousal conditions revealed more time spent in synchrony than what was observed in the non-congruent condition.

These findings demonstrate experimentally that affective states modulate motor activation through the spontaneous motor tempo. Spontaneous interpersonal synchronization can also be modulated by the affective states of the partners but to do so, affective congruency is necessary. Our results confirm the few studies reporting the impact of affective states on social synchrony (Smykovskyi et al., 2024 ; Tschacher et al., 2014). They also indicate that affective induction reduces significantly the time spent in synchrony in a dyadic motor task ; This effect may be due to a decrease in attention allocation to the other while music is playing the background. Finally, if confirmed in future studies, our fingings provide a first support to the theoretical model of affective resonnance theory developped by Mühlhoff (2015).

With the use of 3D markerless motion capture and physiological measures, we offer a better understanding of the relationship between affect and social synchrony adopting the embodied perspective of cognitive psychology. With the add-on of brain imaging techniques (fNIRS), our future work will seek to report on the neural correlates of the affective resonnance phenomenon.

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