

# The dynamic experience of architecture influences the perception of emotional body postures at an early stage: an ERP study in virtual reality

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Built environments represent the surrounding stage of our everyday social interactions. Though in recent years researchers showed that different architectural elements modulate individuals' inner states [1], less is known about the influence of architecture on the perception of others' affective states. To this aim, we recorded event-related brain potential (ERPs) to characterize the time course of emotional body postures processing modulated by a dynamic architectural experience. Two architectures were designed to generate different arousing states according to specific variations of Forms (Low, High arousing) [2]. Textures were provided in two Colors (Cold, Warm). Emotional Body postures were represented by virtual avatars conveying three possible arousal levels (Low, Middle, High) [3]. The electroencephalographic activity of twenty-five subjects was recorded while they made a dynamic architectural experience in virtual reality. Each trial started with a virtual promenade within the architecture. Afterwards, an avatar appeared, and subjects were asked to judge the arousal level conveyed by the body posture. Subjective ratings were analyzed through 2x2x3 repeated measure ANOVA, with within factors Form, Color, and Body. ERPs waveforms were firstly analyzed in two separate time windows [0-400ms; 300-1000ms] using a factorial mass univariate analysis with a permutation-based clustering correction. Then, we identified significant electrodes within restricted time windows and performed a cluster mass permutation test on mean difference wave amplitude. Subjective ratings on avatars' bodily arousal were higher in the low arousing architecture ( $F(1,24)=8.183$ ,  $p=0.008$ ). The ERPs analysis returned a higher (negative) N190 amplitude over occipital electrodes for avatars presented within high arousing architectures compared to low arousing ones ( $p=0.029$ ). Also, a higher P200 amplitude emerged over centro-parietal electrodes for avatars presented within low arousing architectures compared to high arousing ones ( $p=0.001$ ). Finally, the amplitude of the Late Positive Potential was modulated by the arousal level of the avatar (high>middle  $p=0.021$ ; high>low  $p=0.001$ ; middle>low  $p=0.021$ ). Overall, we found that the dynamic architectural experience influenced the early stages of body processing. The N190 amplitude increased in high arousing architectures highlighting that the emotional intensity of the architecture affected such body-related ERP component. The higher P200 amplitude in low arousing architectures reflected a higher attention level towards emotional bodies, possibly pointing to broad attentional resources due to the dynamic experience of relaxing architectures. Such findings could guide the design of transient environments that connect inhabitants to spaces where social activities are supposed to occur, where it is fundamental the perception of others' affective states.

## References:

G. Vecchiato, G. Tieri, A. Jelic, F. De Matteis, A. G. Maglione, e F. Babiloni, «Electroencephalographic Correlates of Sensorimotor Integration and Embodiment during the Appreciation of Virtual Architectural Environments», *Front. Psychol.*, vol. 6, 2015, doi: 10.3389/fpsyg.2015.01944

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P. Presti, D. Ruzzon, G.M. Galasso, P. Avanzini, F. Caruana, e G. Vecchiato, Â«The avatar's gist: how to transfer affective components from dynamic walking to static body posturesÂ», Front. Neuroscience., 27 aprile 2022.

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