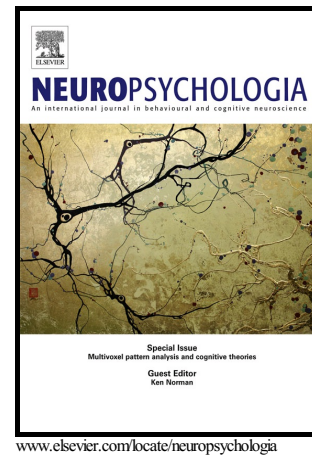


Author's Accepted Manuscript

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PII: S0028-3932(18)30540-2

DOI: <https://doi.org/10.1016/j.neuropsychologia.2018.08.028>

Reference: NSY6901

To appear in: *Neuropsychologia*

Received date: 4 January 2018

Revised date: 20 August 2018

Accepted date: 29 August 2018

Cite this article as: Daniel Reznik, Shiri Simon and Roy Mukamel, Predicted sensory consequences of voluntary actions modulate amplitude of preceding readiness potentials, *Neuropsychologia*, <https://doi.org/10.1016/j.neuropsychologia.2018.08.028>

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Predicted sensory consequences of voluntary actions modulate amplitude of preceding readiness potentials

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Highlights

- Sensory outcomes are represented in brain activity preceding voluntary actions
- Amplitude of readiness potential (RP) is greater for actions with auditory outcomes
- Greater RP amplitude is not related to differences in sensory expectation

Abstract

Self-generated, voluntary actions, are preceded by a slow negativity in the scalp electroencephalography (EEG) signal recorded from frontal regions (termed ‘readiness potential’; RP). This signal, and its lateralized subcomponent (LRP), is mainly regarded as preparatory motor activity associated with the forthcoming voluntary motor act. However, it is not clear whether this neural signature is associated with preparatory motor activity, expectation of its associated sensory consequences, or both. Here we recorded EEG data from 14 healthy subjects while they performed self-paced button presses with their right index and middle fingers. Button-presses with one finger triggered a sound (motor+sound condition), while button-presses with the other finger did not (motor-only condition). Additionally, subjects listened to externally-generated sounds delivered in expected timings (sound-only condition). We found that the RP amplitude (locked to time of button press) was significantly more negative in the motor+sound compared with motor-only conditions. Importantly, no signal negativity was observed prior to expected sound delivery in the sound-only condition. Thus, the differences in RP amplitude between motor+sound and motor-only conditions are beyond differences in mere expectation of a forthcoming auditory sound. Our results suggest that information regarding expected auditory consequences is represented in the RP preceding voluntary action execution.

Keywords

EEG; Readiness Potential; Auditory Processing; Sensory Consequences

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