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Assessing the influence of ten levels of activity using PCA**

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Abstract

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Keywords

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Prestimulus EEG-ERP determinants in the equiprobable auditory Go/NoGo: Assessing the influence of ten levels of activity using PCA

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Aims: We have recently mapped the empirically testable EEG–ERP relationships in the uncued equiprobable auditory Go/NoGo paradigm for two levels of immediately-prestimulus EEG. Here we utilise PCA to extend our investigation to assess the nature of these relationships across ten levels of prestimulus EEG band activity. **Method:** Continuous EEG was recorded at 19 sites while twenty-four university undergraduates completed an uncued equiprobable auditory Go/NoGo task. Separately for each traditional EEG band, and for Go and NoGo responses, the accepted trials were sorted evenly into ten bins according to their level of prestimulus EEG activity, and average ERPs were computed. An unrestricted PCA was computed for the grand mean accepted Go and NoGo trials, and separate unrestricted PCAs were conducted for each prestimulus EEG band (x4) and level (x10). Each PCA involved Varimax-rotation of all 250 factors. **Results:** Five ERP components were consistently identified across the PCA solutions, accounting for 58.6 – 91.3% of the variance: N1-1, PN, P2, P3, and classic SW. Prestimulus delta had a curvilinear (U) effect on the magnitude of the PN, and a positive linear effect on P3. Theta modulated the overall positivity of the SW, producing a curvilinear (inverted-U) pattern. Prestimulus alpha level had a quadratic (inverted-U) effect on the positivity of the P3 and SW amplitudes. Quadratic Level × Stimulus interactions were also found between prestimulus alpha level and the PN, P2, and P3 amplitudes. In beta, an inverse linear effect in N1-1, and a quadratic Level × Stimulus interaction in the SW, each approached significance. **Conclusions:** As expected, the pattern of prestimulus EEG-ERP relationships differed across the traditional bands, and ERP components. This pattern of results supports and extends prior findings, providing a more comprehensive understanding of the relationships, and incorporating ERP subcomponents that were not able to be assessed previously.

Keywords: EEG-ERPs, delta, theta, alpha, beta, Principal Components Analysis (PCA)

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