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Robert Barry

University of Wollongong, rbarry@uow.edu.au

Frances M. De Blasio

University of Wollongong, francesd@uow.edu.au

Adele E. Cave

University of Wollongong, aec236@uowmail.edu.au

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Abstract

Abstract presented at the 17th World Congress of Psychophysiology (IOP2014) of the International Organization of Psychophysiology (IOP) Hiroshima, Japan, September 23rd to 27th, 2014

Keywords

closed, vs, open, eeg, young, eyes, older, adults

Disciplines

Education | Social and Behavioral Sciences

Publication Details

Barry, R. J., De Blasio, F. M. & Cave, A. E. (2014). Eyes-closed vs. eyes-open EEG in young and older adults. *International Journal Of Psychophysiology*, 94 (2), 236.

Eyes-closed vs. eyes-open EEG in young and older adults

Robert J. Barry,

Frances M. De Blasio,

Adele E. Cave

University of Wollongong, Australia

Our recent work on eyes-closed (EC) and eyes-open (EO) resting state electroencephalographic (EEG) activity in young adults and children has confirmed that the EC resting state is one of low arousal, and that the change to EO primarily involves an increase in arousal. This is evidenced by an increase in electrodermal skin conductance level, and a global decrease in alpha level. We now extend this analysis to explore the EC/EO differences in the EEG of normally-functioning young and older adults.

Continuous EEG activity was recorded from a young and a well-functioning older adult sample during 2 resting conditions, eyes-closed followed by eyes-open, each of 3 min duration. The young sample included 22 university students (all right-handed; 5 male/17 female) with a mean age of 20.3 years (range 18.8–24.5). The older group consisted of 22 gender- and handedness-matched independent-living adults with mean age 68.3 years (range 59.8–74.8). After EOG correction, 90 sequential 2 s epochs were extracted for each condition (EC, EO), and trials with residual EEG artifact were removed. In each condition, the young and older adult groups retained similar numbers of 2 s epochs for FFT analysis, contributing a minimum of 73, and 78, respectively.

Across conditions, the older group displayed significantly reduced amplitudes in the delta and theta bands, and increased beta amplitudes. A reduction in alpha in the older group was not significant. Opening the eyes significantly reduced theta, alpha and beta; a reduction in delta was not significant. The mean change across the scalp was significantly smaller in the older group in delta and alpha. Also, there was topographic evidence of increases in delta and beta amplitudes in frontotemporal regions with opening the eyes.

These results are discussed in relation to normal aging, concepts of resting state, and the EEG correlates of the Default Mode Network.