Electroencephalographic Assessment of Human Reliability on Visual Response Task

Sheng–Bou Yen1, Shyh–Yueh Cheng1,*, Hsiao–Yu Lee2
1 Department of Occupational Safety and Health, Chia Nan University of Pharmacy and Science, 2Department of Management Information System, Far East University,
* Corresponding author: Dr. Shyh–Yueh Cheng, Associate Professor, Department of Occupational Safety and Health, Chia Nan University of Pharmacy and Science, 60, Er–Jen Rd., Sec 1, Jen–Te, Tainan 717, Taiwan, ROC
E–mail: csy5066@mail.chna.edu.tw (S. Y. Cheng).

Abstract

Electrophysiological correlates of human reliability in visual response tasks were investigated in sixteen healthy subjects using electroencephalographic (EEG) spectral power and event–related potentials (ERP). Human reliability was first determined by calculating individual reaction accuracy in order to split the entire group into high reliability (HR) and low reliability (LR) subgroups, each with 8 subjects. The EEG activities of testing subjects were measured at rest condition for 5 min, and during a modified Eriksen flanker task. Artifact–free EEG segments were used to compute the distribution of EEG at varied frequency bands as well as to detect peak and latency of ERPs of flanker task. Our results showed that subjects with LR exhibited higher alpha band EEG power at frontal recording site. Additionally, LR group revealed lower P300 amplitude and predominantly longer P300 latency at centro–parietal recording site than those of HR group. These findings implied that higher alpha band EEG power at frontal and smaller amplitude, longer latency P300 component of ERP measures at centro–parietal might reveal the trait of lower reliability in healthy controls during visual talks.

Keywords: Human reliability; Electroencephalography (EEG); Event–related potential (ERP); P300