The correlation between resting EEG power and nonattachment scale

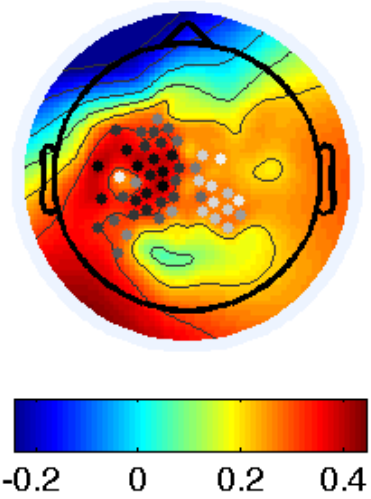
Presented During: Poster Session
Thursday, June 18, 2015: 12:45 PM - 02:45 PM

Stand-By Time
Thursday, June 18, 2015: 12:45 PM - 2:45 PM
Poster Number:
4453
Submission Type:
Abstract Submission
On Display:
Wednesday, June 17 & Thursday, June 18
Authors:
Jicong Fan[1], Junling Gao[1,2], Bonnie W. Y. Wu[1], Ao Tan[3], Hinhung Sik[1]
Institutions:
[1]Centre of Buddhist Studies, The University of Hong Kong, Hong Kong, China,
[2]Alzheimer's Disease Research Network, The University of Hong Kong, Hong Kong, China,
[3]Department of Electronic & Electrical Engineering, The University of Hong Kong, Hong Kong, China

Introduction:
Psychological activity is supported by the brain electronic activity, to some extent, recorded by electroencephalography (EEG) (Davidson, et al., 2000). Therefore, it is plausible that some psychological measurements could be correlated with EEG measurements. For example, previous studies have shown that patterns of the frontal and posterior alpha-wave can predict basic dimensions of personality, extraversion and neuroticism (Schmidtke and Heller, 2004). In this paper, we aimed to study the correlations between resting-state EEG and four popular psychological self-reported measures: Orientation to Life Questionnaire (SOC-13), Nonattachment Scale (NAS), Perceived Stress Scale (PSS-10), and General Health Questionnaire (GHQ-12) (Bergomi, et al., 2013; Sahdra, et al., 2010)
Methods:
Sixty heathy adults (40 females) with age of 47±8 years old attended in this study. We measured their scores of SOC, NAS, PSS, and GHQ. Their EEG data were obtained by EGI™ 128-channels EEG system. The participants were asked to sit quietly, then eye-closed normal resting state EEG were recorded for 8 minutes. The raw EEG data were firstly filtered by a bandpass of 0.5~100Hz and notched with 48~52Hz. Artifical noises such as eye blink and muscular activity, were removed by independent component analysis. Finally, the EEG data were rereferenced by the average of all channles. EEG power in different frequency bands (delta 1~4 Hz , theta 4~8 Hz, alpha 8~12 Hz, beta 12~30 Hz, and gamma 30~80 Hz) (Zietsch, et al., 2007) were calculated. As the psychological measurements and EEG may have some intrinsic correlation with age, we propose to calculate the linear partial correlation coefficients (LPCC) (Brown and Hendrix, 2005) between the EEG power and the four measurements with the effect of age removed.
Results:
We computed LPCC between the four measurements and EEG power of 108 channels. A significant correlation was set at LPCC>0.1 and p-value<0.05, at least 5 channels. Firstly, as shown in Figure 1, the EEG beta power had strong correlation with age. This indicated that controlling age's effect was necessary. Figure 2(b) showed that the delta power of EEG in the frontal region had significant correlation with NAS. Figure 2(c) gave a linear

regression between NAS and the average delta power of EEG channels with significant LPCC, where the linear correlation coefficient was r=0.27 with p-value = 0.034. As shown in Figure 3, the beta power of EEG in the right temporal-occiptial regions also had significant correlation with NAS. A linear regression between NAS and the average beta power of EEG channels with significant LPCC was given by Figure 3(c), with the correlation coefficient r=0.35 and p-value= 0.006. No significant correlation was found between EEG band power and SOC/PSS/GHQ.

Figure 1. Linear correlation coefficient between EEG beta power and age (a small dot notes a channel with significant correlation and darker dot indicates stronger significance); elder subject has higher beta power



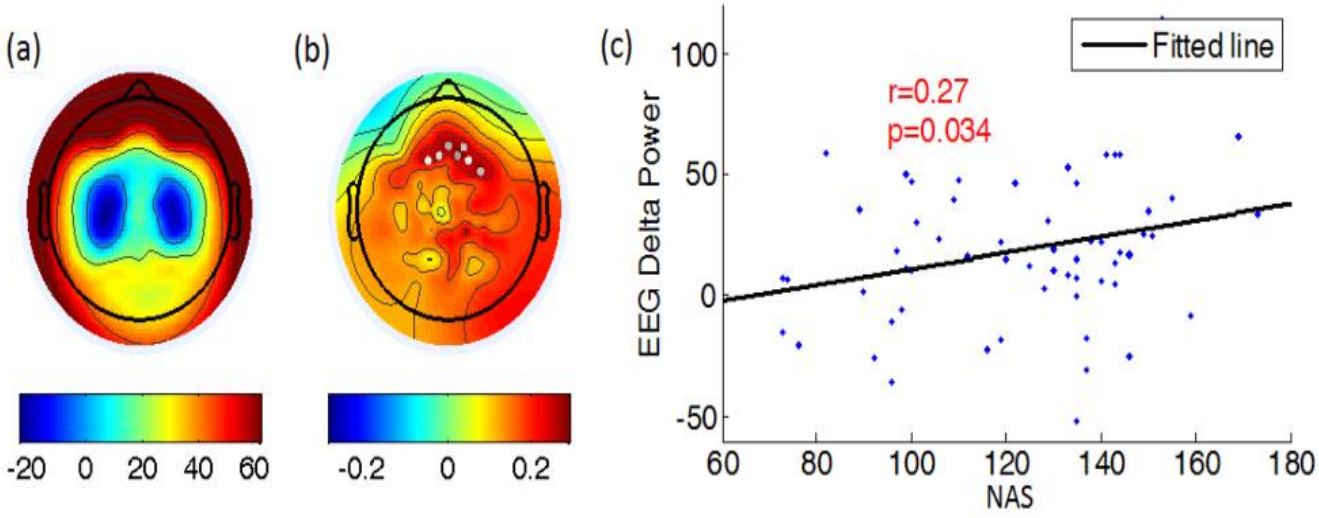


Figure 2. Correlation between EEG delta power and NAS: (a) EEG delta power; (b) LPCC between delta power and NAS (a small dot notes a channel with significant LPCC and darker dot indicates stronger significance); (c) Linear regression between average delta power of multiple channels and NAS; subject with higher NAS score has higher delta power.

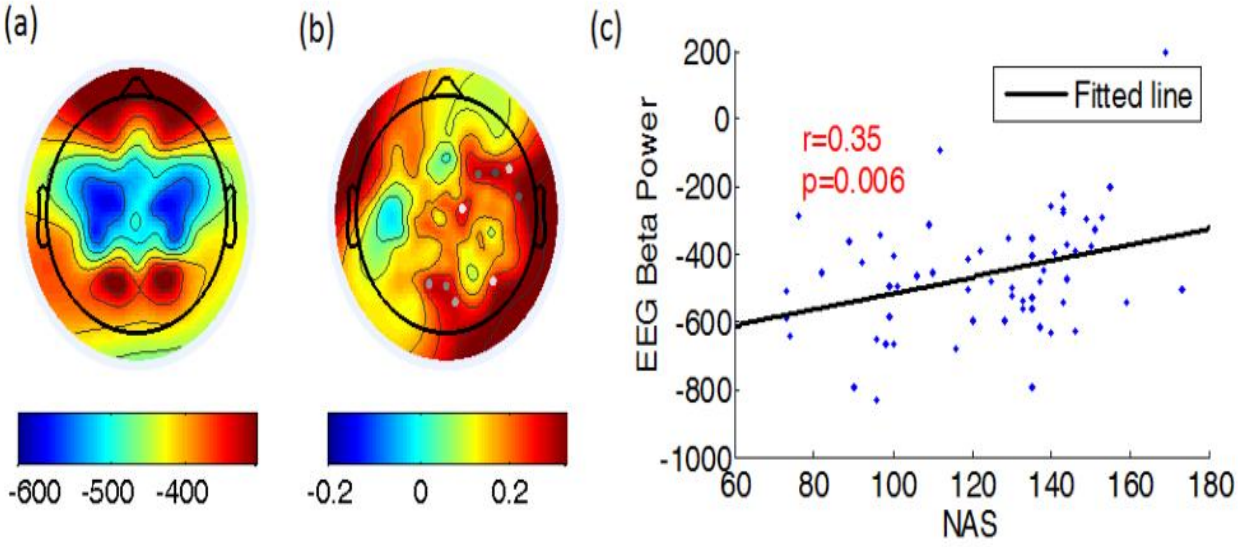


Figure 3. Correlation between EEG beta power and NAS: (a) EEG beta power; (b) LPCC between delta power and NAS (a small dot notes a channel with significant LPCC and darker dot indicates stronger significance); (c) Linear regression between average beta power of multiple channels and NAS; subject with higher NAS score has higher beta power.

Conclusions:
The current findings are in line with other studies that correlations between EEG measurements and psychological measurements are possible (Creutzfeldt, et al., 1976; Marosi, et al., 1999). NAS was positively correlated with EEG delta wave in the central-frontal region. The higher the NAS score, the less attachment one has. It indicates that less attachment to daily issues was correlated with higher delta wave in the frontal lobe. In addition, beta power in the right temporal-occiptial regions has significant positive correlation with NAS. Beta wave was associated with a heightened state of alertness and critical reasoning and it increases when muscle movement was voluntarily suppressed or resisted. The suppression of movement is common in rest or meditation therefore NAS may have some influence on the related functions of this part of the brain, for example, face recognition etc. (Gainotti and Marra, 2011). To sum up, EEG delta power and EEG beta power have positive correlations with NAS, while no correlations can be found between EEG band power and SOC/PSS/GHQ.

Imaging Methods:
EEG [2]

Social Neuroscience:
Social Neuroscience Other [1]

Poster Session:
Poster Session - Thursday

Keywords:
Electroencephaolography (EEG)
Other - resting state, nonattachment scale

[1|2]*Indicates the priority used for review*

Would you accept an oral presentation if your abstract is selected for an oral session?

No

Please indicate below if your study was a "resting state" or "task-activation" study.

Resting state

Healthy subjects only or patients (note that patient studies may also involve healthy subjects):

Healthy subjects

Internal Review Board (IRB) or Animal Use and Care Committee (AUCC) Approval. Please indicate approval below. Please note: Failure to have IRB or AUCC approval, if applicable will lead to automatic rejection of abstract.

Yes, I have IRB or AUCC approval

Please indicate which methods were used in your research:

EEG/ERP

Other, Please specify - psychological measurements

Provide references in author date format

Bergomi, C., Tschacher, W., Kupper, Z. (2013) The Assessment of Mindfulness with Self-Report Measures: Existing Scales and Open Issues. Mindfulness, 4:191-202.

Brown, B.L., Hendrix, S.B. (2005) Partial Correlation Coefficients. Encyclopedia of Statistics in Behavioral Science: John Wiley & Sons, Ltd.

Creutzfeldt, O.D., Arnold, P.M., Becker, D., Langenstein, S., Tirsch, W., Wilhelm, H., Wuttke, W. (1976) EEG Changes during Spontaneous and Controlled Menstrual Cycles and Their Correlation with Psychological Performance. Electroen Clin Neuro, 40:113-131.

Davidson, R.J., Jackson, D.C., Larson, C.L. (2000) Human electroencephalography. In: Cacioppo, J.T., Tassinary, L.G., Berntson, G.G., editors. Handbook of psychophysiology (2nd ed.). New York, NY, US: Cambridge University Press. p 27-52.

Gainotti, G., Marra, C. (2011) Differential contribution of right and left temporo-occipital and anterior temporal lesions to face recognition disorders. Front Hum Neurosci, 5.

Marosi, E., Rodriguez, H., Harmony, T., Yanez, G., Rodriguez, M., Bernal, J., Fernandez, T., Silva, J., Reyes, A., Guerrero, V. (1999) Broad band spectral EEG parameters correlated with different IQ measurements. Int J Neurosci, 97:17-27.

Sahdra, B.K., Shaver, P.R., Brown, K.W. (2010) A Scale to Measure Nonattachment: A Buddhist Complement to Western Research on Attachment and Adaptive Functioning. Journal of Personality Assessment, 92:116-127.

Schmidtke, J.I., Heller, W. (2004) Personality, affect and EEG: predicting patterns of regional brain activity related to extraversion and neuroticism. Pers Indiv Differ, 36:717-732.

Zietsch, B.P., Hansen, J.L., Hansell, N.K., Geffen, G.M., Martin, N.G., Wright, M.J. (2007) Common and specific genetic influences on EEG power bands delta, theta, alpha, and beta. Biological Psychology, 75:154-164.