Abstract

Objectives: To measure depressive severity of 85 Thai adolescents by using the Beck Depression Inventory-II and the Patient Health Questionnaire-9 and to record the resting-state EEG of these participants.

Data description: The current data note provides raw data of behavioral (i.e., group, BDI-II score, and PHQ-9 score) and electrophysiological parameters (i.e., absolute and relative EEG powers over 64 electrode sites) of 30, 27, and 28 participants with minimal, mild, and moderate depression, respectively. These data are especially useful to investigate the behavioral and electrophysiological markers of adolescents with subclinical depression. It can also be utilized in comparative analysis among age groups, and races.

Keywords: Eyes-closed and-open resting conditions, Adolescents with depressive symptoms, Absolute and relative EEG powers, Patient Health Questionnaire-9, Beck Depression Inventory-II

Objective

The 2019 global burden of disease study investigated 369 diseases and injuries, 286 causes of death, and 87 risk factors across 204 countries revealed depressive disorders were one of the six common causes of health loss in teenage years [1]. Further, subclinical or subthreshold depression in adolescent is rising notably and under-investigated [2]. Several studies had investigated electrophysiological markers of depressive symptoms and suggested that electroencephalography (EEG) seems promising for detecting depression-related symptoms [3]. Resting-state EEG recording is administered during the absence of any kind of stimulus or activities [4]. Specifically, participants are not required to perform any specific task, except eyes-closed and -open instructions. The resting-state EEG has been employed in many studies and this technique is effective in detecting and predicting depressive disorders, more comfortable, and also easy to record in clinical and research settings [5, 6].

Nonetheless, the extant literature on the resting-state EEG and adolescents with subclinical depression (mild, minimal and moderate) is notably scarce [7]. Accordingly, the main objective was to measure depressive symptoms via two standardized tools, that is, the Beck Depression Inventory-II (BDI-II) [8] and the Patient Health Questionnaire-9 (PHQ-9) [9] and to record the resting-state EEG of 85 Thai adolescents. The current dataset is valuable because it contains behavioral and electrophysiological markers of adolescents with subthreshold depression. Researchers may use these parameters to compare among several ages groups, races and genders. A part of the findings based on this EEG dataset was published in Research Methodology & Cognitive Science [10].

Data description

The data collection was divided into two phases. First, all eligible participants (N = 85) were adolescents (aged between 13 and 22) with depressive symptoms who did not meet the criteria for major depressive disorder after a clinical evaluation by using the Structured
Clinical Interview for DSM-5 (SCID-5). The BDI-II and the PHQ-9 were used by experienced psychiatrists to assess levels of depressive symptoms of participants at a local health promoting hospital from 2017–2018. The BDI-II is a self-report inventory that contains 21 items with a range of score from 0 to 63 and widely used to assess the severity of depression symptomatology [8]. The PHQ-9 is a 9-question depression scale with the range of score from 0 to 27 and used to screen for depressive symptoms in patients [9].

Thus, three groups of participants were identified in the current study, that is, 30 participants with minimal (the BDI-II for scores ranging from 0 to 13 and the PHQ-9 for scores ranging from 1 to 6), 27 participants with mild (the BDI-II for scores ranging from 14 to 19 and the PHQ-9 for scores ranging from 7 to 13), and 28 participants with moderate (the BDI-II for scores ranging from 20 to 28 and the PHQ-9 for scores ranging from 14 to 19) depression [8]. The participants were agreed to take part and they completed the consent forms as approved by the College of Research Methodology and Cognitive Science’s Human Research Ethics Committee (RMCS 005/2560).

Second, the resting-state EEG recorded in the current dataset was part of a larger study protocol. The EEG resting state was measured during eyes-closed and -open sessions with each session lasting 30 s. Continuous EEG recordings were made on a Neuroscan Synamps2/RT amplifier (Compumedics Neuroscan, USA) and 10–20 layout 64-channel Quik-cap electrode system. The ground electrode was at AFz with the reference electrodes located at the left and right mastoid (M1 and M2). The electrode impedance was kept below 5 KΩ. All signals were filtered between 0.05 and 100 Hz online bandpass and sampled at 1000 Hz/channel. Further data preprocessing and processing were performed and extracted from the raw EEG signals using Curry 7 software (Neuroscan Inc., USA). The preprocessing pipeline included 1–40 Hz offline filtering, baseline correction, and Independent Component Analysis (ICA) removal of ocular and muscle artifacts. In addition, the EEG recordings were visually inspected to remove other artifacts. The continuous EEG data were segmented into epochs of 2 s non-overlapping Hanning-windowed epochs. The segmented and accepted EEG epochs absolute (uV2) data were smoothed using Fast Fourier Transform (FFT) and averaged over five frequency bands: delta (1–4 Hz), theta (4–8 Hz), lower alpha (8–10 Hz), upper alpha (10–12 Hz), and beta (13–30 Hz). The absolute and relative EEG powers for five frequency bands were calculated. Accordingly, the current dataset contains two main information, that is, participant characteristics (i.e., group, gender, BDI-II score, and PHQ-9 score) and the absolute and relative EEG powers during eyes-closed and -open sessions over 64 electrode sites from 85 adolescents as can be seen in Data file 1–3 (Table 1).

Limitations
The current dataset aggregated the behavioral and electrophysiological data from adolescents with subclinical depression which is limited in generalizability. Additionally, the EEG dataset includes a large sample, but there were substantially more women than men (65% vs 35%). Thus, caution is needed in analyzing and interpreting results.

Abbreviations
EEG: Electroencephalogram; BDI-II: Beck Depression Inventory-2nd edition; PHQ-9: Patient Health Questionnaire-9; ICA: Independent Component Analysis; FFT: Fast Fourier Transform.

Acknowledgements
Not applicable.

Authors’ contributions
SR and PW conceived and designed the experiment. SR conducted the data collection. SR and PW performed the data analysis. SR and PW drafted the manuscript. Both authors read and approved the final manuscript.

Funding
This study was supported by the National Research Council of Thailand (NRCT).

Availability of data and materials
The data described in this data note can be freely and openly accessed via the Open Science Framework (OSF) (https://doi.org/10.17605/OSFIO/4HQ3Y). Please see Table 1 for details of the links to the data.

Declarations
Ethics approval and consent to participate
This study was approved by the College of Research Methodology and Cognitive Science’s Human Research Ethics Committee (RMCS 005/2560). All the participant agreed to participate and signed a consent form.
Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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Received: 19 January 2021 Accepted: 24 June 2021
Published online: 02 July 2021

References
1. Vos T, Lim SS, Abbafati C, Abbas KM, Abbasifard M, Abbasi M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. The Lancet. 2020;396(10258):1204–22.
2. Crockett MA, Martínez V, Jiménez-Molina Á. Subthreshold depression in adolescence: gender differences in prevalence, clinical features, and associated factors. J Affect Disord. 2020;272:269–76.
3. de Aguiar Neto FS, Rosa JLG. Depression biomarkers using non-invasive EEG: a review. Neurosci Biobehav Rev. 2019;105:83–93.
4. Kan DPX, Croarkin PE, Phang CK, Lee PF. EEG differences between eyes-closed and eyes-open conditions at the resting stage for euthymic participants. Neurophysiology. 2017;49(6):432–40.
5. Koshiyama D, Kirihara K, Usui K, Tada M, Fujikawa M, Morita S, et al. Resting-state EEG beta band power predicts quality of life outcomes in patients with depressive disorders: a longitudinal investigation. J Affect Disord. 2020;265:416–22.
6. Leuchter AF, Cook JA, Hunter AM, Cai C, Horvath S. Resting-state quantitative electroencephalography reveals increased neurophysiologic connectivity in depression. PLoS ONE. 2012;7(2):e32508.
7. Zimmerman M, Martinez JH, Dalrymple K, Chelminski I, Young D. “Subthreshold” depression: is the distinction between depressive disorder not otherwise specified and adjustment disorder valid? J Clin Psychiatry. 2013;74(5):470–6.
8. Beck AT, Steer RA, Ball R, Ranieri WF. Comparison of Beck Depression Inventories-I and-II in Psychiatric Outpatients. J Pers Assess. 1996;67(3):588–97.
9. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. J Gen Intern Med. 2001;16(9):606–13.
10. Rachamanee S, Kompetpanee S, Wongupparaj P. Development of multitask computer program for assessing depression with electroencephalogram measurements in Thai adolescents. Research Methodol Cogn Sci. 2018;16(1):122–37.
11. Wongupparaj P. Resting-state EEG of adolescents with minimal, mild, and moderate depression. 2021. Open Science Framework. https://doi.org/10.17605/OSFIO4HQ2Y.

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