Research Article

Correlation between Depressive Syndrome and Dopamine Transporter (DAT) Serum Level with Smartphone Addiction among Medical Students of Universitas Sumatera Utara

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Abstract

Smart phone is the most widely used telecommunication device worldwide that is accessible by nearly all people from various background. This in turn leads to increased prevalence of smartphone addiction. Addiction is manifested in tolerance, withdrawal, and dependency, which is accompanied by social dysfunction. Dopamine transporter (DAT) is a plasma membrane protein which actively incorporates extracellular dopamine into presynaptic neurons and is known to be related to addiction.

Objective: This study is to investigate the correlation between depressive syndrome and DAT serum level with smartphone addiction among medical students of Universitas Sumatera Utara.

Method: This analytic study is cross sectionally designed, involving 48 medical students from Universitas Sumatera Utara. These eligible subjects were then given an online questionnaire which was distributed through Google Form. Saphiro Wilk was used to test the normality of the data due to small number of sample size (n<50). Linearity was also assessed by using scatter plot prior to the application of Pearson correlation.

Results: It is found that DAT and smartphone addiction scale (SAS) is significantly correlated (p= 0.001) with Pearson correlation coefficient of -0.465. This shows that both appear to have a negative medium correlation.

Conclusion: There is a correlation between depressive syndrome and SAS score with DAT level. DAT level is shown to be negatively correlated which means that decreased DAT level is related to more profound smartphone addiction.

1. Introduction

Addiction is manifested in tolerance, withdrawal, and dependency, accompanied by social dysfunction which previously limited to the use of certain medications or substances. Currently, addiction is also used in other behaviours, such as gambling, internet, gaming, and smartphone usage. Smartphone addiction is also known in other various names, such as *'problematic mobile phone usage', 'habitual mobile phone usage' dan 'compulsive mobile phone usage'*. Smartphone Addiction Scale (SAS) is defined as persistent and repetitive use of smart phone that commonly relates to defect and clinical pressure. Individuals with smartphone addiction poses a compulsive behaviour of smartphone usage, loose other interests in daily life, and admit to experience trouble and difficulty in their academics or job due to much less time available as most of the time is occupied by using smartphone [1-3]. This individual will also experience withdrawal symptoms when being asked to stay away from their phone [4-6].

2. Methods

This analytic study is cross sectionally designed, involving 48 medical students from Universitas Sumatera Utara. It has gained approval of Health and Medical Research committee (Number 833/TGL/KEPK FK USU-RSUPHAM/2019) before being conducted further. These eligible subjects were then given an informed consent prior to online questionnaire using Patient Health Questionnaire-9 (PHQ-9) which was distributed through Google Form. Inclusion criteria for this study is medical students of Universitas Sumatera Utara that are 18 – 24 years of age, own smartphone, with minimal length of use is three hours per day (outside the use of phone during online class/study), and with smartphone addiction scale greater or equal to 32. In the other hand, exclusion criteria consists of subjects which do not complete the questionnaire, and have history of alcohol and addictive substance use.

In order to correspond with our subjects, we obtained their phone numbers from official faculty data. Medical students that participant in the study are those actively registered in the faculty or have ongoing clinical rotation in USU or Haji Medan affiliated teaching hospital. Subjects with questionnaire score above normal value will be personally approached and suggested to have appointed consultation therapy session. Blood pressure is then measured and 3ml blood samples were drawn in order to assess DAT serum level at 03.00 PM straight. Blood samples were carried to faculty laboratory and ELISA Kit was used to measure the DAT serum. All data were then statistically analysed by using SPSS.

3. Results

Table 1: Demographic characteristics.

	Respondents characteristics	N	(%)
Age (years)	17 – 20	43	(89.6)
	21 – 25	5	(10.4)
Gender	Male	2	(4.2) (95.8)
	Female	46	
Housing status	Family house	36	(75.0)
	Rented house or *indekost*	12	(25.0)
Phone attachment frequency per week	Every day	18	(37.5)
	Nearly every day	30	(62.5)
	Only at week end	0	(0)
Phone attachment frequency per day	3 – 5 hours	8	(16.7)
	5 – 7 hours	21	(43.8)
	≥7 hours	19	(39.6)

Table 1 shows that vast majority of our respondents belong to age group of 20 -30 years of age (n=43, 89.6%), 46 are male (95.8%) and 36 of our respondents (75%) live with their family. 62.5% (n=30) admitted to get attached to their phones everyday with 5-7 hours spent (n=21, 43.8%).

Table 2: Smartphone Addiction Scale scores.

	Median (Minimum-Maximum)
SAS score	39 (30-51)
	n = 48

Table 2 indicates that median SAS score is 39 with minimum score of 30 and maximum score of 51.

Table 3: Depressive syndrome score.

	N	Mean ± S.D
PHQ-9 score	48	8.83 ± 2.36

Table 4: DAT (dopamine transporter) serum level.

	N	Mean ± S.D
DAT level	48	3.62 ± 1.78

Table 5: Pearson correlation between SAS and PHQ-9 score.

	PHQ-9 score
SAS score	r = 0,638
	p<0.001
	n = 48

Table 5 indicates the correlation between depressive syndrome score assessed with PHQ-9 with SAS score. Normality test was conducted prior to Pearson correlation test by using Saphiro Wilk test as our sample size is less than 50 (n=48) that resulted in our data being abnormally distributed. Linearity was also examined by using scatter plot. P value of less than 0.001 was obtained, hence indicating that there is a statistically significant correlation between SAS and PHQ-9. Pearson correlation coefficient was found to be 0.638 that refers to strong positive correlation.

Table 6: Pearson correlation between SAS and DAT.

	DAT level
SAS score	r = - 0,465
	p = 0.001
	n = 48

It is found that DAT and smartphone addiction scale (SAS) is significantly correlated (p= 0.001) with Pearson correlation coefficient of -0.465. This shows that both appear to have a negative medium correlation as show in Table 6.

4. Discussion

This cross sectional analytical study is aimed to assess the correlation of DAT level and SAS among medical students of Universitas Sumatera Utara. Vast majority of our respondents belong to age group of 20 -30 years of age (n=43, 89.6%), 46 are male (95.8%) and 36 of our respondents (75%) live with their family. 62.5% (n=30) admitted to get attached to their phones everyday with 5-7 hours spent (n=21, 43.8%). This is in line with another study from Dalia et al. in Egypt in 2019 which found that among 1513 participants, more were female that are 16 – 29 years of age [7].

21 participants (n=62.4%) reported to get attached to their phone every day and spend 5-7 hours (43.8%). According to one study in Egypt from Dalia in 2019, students tend to use their smartphone over 4 hours, approximately 7 to 15 hours per day7. Another study from Kim in Korea also found that smartphone usage is even more frequent and intense among women and mostly is used for entertainment or informative purpose. Female students are also using smart phones to engage with their built social media account or to use instant messaging service in their leisure time [8].

Dopamine (DA), serotonin (5-HT) play an important role in the occurrence of substance addiction, mainly thorough the mediation of dopamine reward and withdrawal symptoms. Consistently with alcohol and substance addiction, smartphone addiction also results in the down regulation of dopamine D2 receptors availability in striatal region, followed by the decrease of DAT as mentioned in the study of Weinsten in 2017.6 Our study found that DAT and SAS is significantly correlated (p<0.001) with Pearson coefficient correlation of -0.465, thus indicating a negative medium correlation that translates to less DAT present in the serum as SAS score elevates. This is also supported by a study from Hou et.al. that also found extensive decrease of DAT level in striatal region in those with internet addiction [9].

5. Conclusion
There is a correlation between depressive syndrome and SAS score with DAT level. DAT level is shown to be negatively correlated which means that decreased DAT level is related to more profound smartphone addiction.

6. Acknowledgement

7. Conflict of Interest
The authors declare that there is no conflict of interest.

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