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Association of Screen time with Depression, Anxiety and Stress for Young People (Age Group 14-25) amid Covid-19 Pandemic: A Case Study in Odisha

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Abstract

Background: In COVID-19 pandemic period, it is seen that the general adults spare more times in screen than in usual days. The increase in screen time is subsequently growing problems among the adults in relation to health behaviours and health outcomes.

Objective: The aim of the present study is to explore the plausible association between the screen time vs. depression, stress and anxiety for the adults (age group 14-25) and also to study their mental condition during the COVID-19 pandemic period.

Method: An 18-item screen-time questionnaire was used to quantify the use of commonly used screen devices (e.g., televisions, smartphone, tablet) for different time points during the week e.g., weekday, weeknight, and weekend. The test-rate reliability was assessed through intra-class correlation coefficients (ICCs) and standard error of measurement (SEM). The questionnaire was delivered online using Google form via Whatsapp, Gmail, and Facebook.

Result: Basing on the completed Google forms, there are 304 adults from Odisha were included in the final analyses. All items in the screen time questionnaire showed fair to excellent relative reliability (ICCs = 0.50–0.90; all < 0.000), except for the item inquiring about the use of smartphone during an average weeknight day (ICC = 0.49, p = 0.069). The SEM values were large for all screen types across the different periods under study.

Conclusion: The result from this study suggests that the self-administered questionnaire can be used successfully to classify individuals into different categories of screen time user e.g., high vs. low. It was observed that high proportion of adolescents use screens for more than the recommended screen time amid COVID-19 pandemic. We also believe that there should be a recommendation for maximum screen time separately for developing countries like India.

Keywords: depression; stress; anxiety; intra-class correlation coefficient; standard error measurement

Introduction

COVID-19 pandemic probably started from Wuhan, Hubli, China while the World Health Organization (WHO) got information about it on December 31, 2020. They received information about on unidentified ethology. The epidemic was officially named COVID-19 on February 11, 2020. It was acknowledging as an infectious disease which resulting in public health emergency, it quickly spread with in China and after spreading in China it moves to further 24 countries which are situated geographically between 42.937084^0N-75.6107^0E (Anderson et al,2020).

In this new learning paradigm, teachers are working as content curators, and parents also stepping in as proctors for learning of children. Parents have a crucial role in the education of school children since it can be perplexing for those who are using online learning platforms for the first time. The success of virtual schooling considerably depends upon the self-motivation of the student, and parents' engagement with the children. Parents support the child by building the learning and encourage them during online learning. In a developing country like India, all the children do not have the required skills and resources to cope up with this digital shift. This sudden shift from the classroom has given rise to many concerns such as, for how long will these online modes of teaching and learning will continue and what will be the impact of

such a shift on children's as well as parent's mental, physical and social health (Gavin et al. 2020). While certain people are of the belief that the impromptu and swift move to online learning, with insufficient training and less preparation, may aggregate poor growth of a child thereby resulting in various kinds of physical as well as mental health issues and challenges, others think that this new way of education will surface, with significant benefits (Bhat et al. 2020; Raiet al. 2004; Kumari et al. 2020).

Several reports during the lockdown suggest that mental illness is on the rise since the outbreak of this malignant virus. Experts from the Psychiatric Society of Goa reported anxiety, depression, stress and other mental health issues were common during the lockdown (PTI, 2020). A recent survey conducted by the Indian Psychiatry Society indicates 20% rise in patients suffering from mental illness (Lolwal, 2020). Like all other non-essential establishments, liquor and wine shops were remained to be closed. Those used to alcohol consumption experienced withdrawal symptoms. Suicide rates too were on the rise espepcially among those addicted to alcohol or other substance due to non-availability following lockdown (ABP News Bureau, 2020). A 32-year-old individual from Kerala jumped into the river and committed suicide as he was experiencing alcohol withdrawal symptoms. Following this incident, Excise Department was directed to provide alcohol on doctor's prescription (Times Now, 2020).

Due to this COVID-19 situation all school and colleges are remain closed for approximately 1 year till now. So, all the students of Odisha and all over India are staying at home due to COVID-19. They all are doing online classes and in other time they are using screen devices like TV, gaming console devices, smartphones, laptop/computer and tablets etc. Before lockdown they are going to school and tuition and they are not getting much time to use screen devices. But in lockdown they are at home and they are not going to school, college etc. and they are using screen devices much time as compare to before lockdown.

In this paper basically we want to see that while students are staying at home what is their depression, anxiety and stress level. Here also we want to see is there any relationship between screen time and their depression, anxiety and stress level and we are trying to see if they have any level of stress, depression and anxiety what is the time they are spending in screen and is it related to there their depression, anxiety and stress level. and here we found a positive result about the relationship among them. And we see the students are getting more stressed and repressed during lockdown and they are spending much time in screen devices due to it.

Previously adopted in the article Reliability of a new measure to assess modern screen time in adults by Mari carmen Vizcaino et al of 2019 The questionnaire was delivered online using Qualtrics and administered through Amazon Mechanical Turk (M Turk). U.S. workers on M Turk are more similar to the U.S. population compared to subjects recruited from traditional university subject pools and provide greater diversity in terms of age, ethnicity, and socio-economic status. Our study was quite different from them because we here want to check is there any relationship of screen time vs depression, stress and anxiety and we want to see their mental status during this COVID-19 pandemic.

In addition, both depression and stress have been linked to obesity. Cross-sectional and prospective studies have shown a significantly positive association between obesity and depression (14-17), with a recent meta-analysis suggesting a bidirectional relationship; Obesity was found to increase the risk of depression and depression was a predictive factor of obesity development. Likewise, human and animal studies suggest that chronic stress increases the intake of energy and nutrient-rich foods and thus the development of visceral obesity. (19-21) Two recent reviews suggest that chronic stress activates the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system, and SNS, which leads to the accumulation of visceral fat and related health problems (e.g., type 2 diabetes, cardio metabolic complications).

The COVID19 pandemic is a perfect opportunity to explore the positive effects of screen time. Not only did children and adolescents enjoy being connected to their ,190 friends and family via online platforms, but they also explored online options to continue or begin their physical activity instruction is also offered online or via teleconsultation. Schools around the world have been forced to switch all teaching to online mode due to the recent COVID19 pandemic. Digital technology in the school curriculum to meet the increasing demands of tech-friendly people is an urgent need. The dilemma now is whether parents should limit screen time to protect their children from reported harmful effects, or should they encourage them to acquire knowledge and what are the skills for the future? Recent guidance from the Royal College of Paediatrics and

Child Health (RCPCH) in 2019 showed a weak association with screen time limitation.

The adolescents used screen-based-media is about 98%. TV formed the maximum used media 96.5%. The mean screen time they found is 3.8(2.77) hr/day followed by other screen-based-media. 68% of adolescents having screen time more than the recommended (>2hr). They found significant association was observed between screen time and watching TV while eating (**screen**-based media and screen time assessment among adolescents residing in urban resettlement colony in New Delhi, India by Mahasweeta Dubey). 35.8 % (n=145) of the children viewed television for >2 h on schooldays. 20 % (n=81) used television as sleep-aid. 28.1 % (n=114) children had televisions in the room they slept. Lower maternal education, increased maternal television usage, presence of television in bedroom resulted in harmful television viewing practices among Indian children (Factors Influencing the Television Viewing Practices of Indian Children by S. R. Ravikiran). The parental rules that were effective in countering these were the rule on content viewed and needing parental permission to switch on television.

Research Methodology

Study area

Odisha is a state belongs to world's 2nd largest populated country India. For this research we take Odisha as our study area. And we take all samples from all the adults of Odisha for analysis. Odisha is a costal state which is near the Bay of Bengal. The nearest states to Odisha are Jharkhand, West Bengal, Andhra Pradesh, Chhattisgarh. The state Odisha has its total area up to 155,707 km^2 and 1030 km towards north to south and up to 500 km towards east to west and coastline of Odisha is 480 km. The state Odisha has 30 districts and its divided further in to 314 blocks.

Data Collection

To collect data about various objectives on Screen time and depression representative sample are collected using appropriate primary data collection technique based on the questionnaire of screen time previously adopted in the article Reliability of a new measure to assess modern screen time in adults by Maricarmen Vizcaino et al of 2019 and for the questionnaire of depression, anxiety and stress we adopted the questions of DASS21. The data collection is done from the period August 2020 to February 2021. We have collected total 304 numbers of sample for our data analysis from all over the Odisha. Due to COVID-19 situation we have adopted the data collection method online mode. We created a google form provided by Google and by sharing it in latest social media platform we collected the 304 amounts of data. Here we collected the data of DASS21 questionnaire for depression, anxiety and stress and we collected the Before lockdown and After lockdown screen time use by the candidates.

Data Analysis

For this research we use the Statistical software IBM SPSS Statistics 22 as analysis tools. Here we found while analyze the before lockdown and after lockdown data we found all the data are normally assumptions and positively skewed and after transformation median and IQR (Inter Quartile Range) are represented by screen time variables. ICC or Intra Class Correlation Coefficient was assessed for relative reliability using two-way mixed effects. If the value is greater than 0.75 then it has excellent reliability and less than 0.40 has poor reliability and the value between 0.40-0.59 has fair reliability and the value between 0.60-0.74 has good reliability.

Here we have calculated Standard Error Measurement or SEM for Absolute reliability using the formula given below:

Standard Error Measurement (SEM)=$\sqrt{\sigma_e^2}$

Where variance of error is denoted by σ_e^2 is a repeated measures ANOVA or known as analysis of variance of two-sided 95% confidence interval was estimated by given formula below:

$$\sqrt{\left[\frac{SSE}{\chi_{a,dfe}^2} ; \frac{SSE}{\chi_{1-a,dfe}^2}\right]}$$

Where sum of square of error is denoted by SSE which is calculate from the ANOVA and the Chi-Square value is denoted by $\chi_{a,dfe}^2$ for probability level α and dfe is the degree of freedom. The consistency scores of individuals refer to the absolute reliability. Therefore, it tells us how similar the scores for repeated measure are when measurement error is present. For interquartile correlation coefficient (ICC) between 0.4-0.6 implies to acceptable reliability otherwise for an interquartile correlation coefficient (ICC) between 0.6-0.8 implies too good to excellent reliability.

Now for stress, anxiety and depression Vs screen time data analysis we use here the non-parametric test

Kruskall Waills test. Here we go for this test because the data for this analysis is not normally distributed and the data are ordinal data therefore, we can't go for different type of correlation coefficient check, so we decided here to go for Kruskall Waills test. Which is also we done by IBM SPSS Statistics 22.

Results

A total of 304 adults having age from 14-25 years from Odisha were enrolled in this research. From there 62.7% were male and 37.3% of them were female and from the primary data collection we found that 56.8% are having family type nuclear and 43.2% are of family type extended. In this survey 89.1% of middle class, 6.3% of low class and 4.6% of high-class candidates were participated. Also, we see in this survey that 16.5% of candidate's family follows rules for watching TV and other 83.5% have no rule for watching TV. We also see 56.4% candidates were not watching TV while eating and 43.6% of them were watching TV while eating.

From the DASS21 questionnaire we see that 21 of the candidates were having normal depression, 6 of them were having mild depression,14 of them were having moderate depression, 17 of them were having severe depression and 246 of them were having extreme severe depression. In case of anxiety 18 were having normal anxiety, 03 of them were having mild anxiety, 09 of them were having moderate anxiety,07 of them were having severe anxiety and 267 of them were having extreme severe anxiety. At last, in case of stress 30 of them were having normal stress, 07 of them were having mild stress, 17 of them were having moderate stress, 21 of them were having severe stress and 229 of them were having extreme severe stress we found from the survey.

When we are analysing the data, we see before lockdown most were using TV for 2-3 hour as well as 2-3 hour in smartphone and TV connected devices also. They were spending very less time in Laptop/ Computer and Tablets. But when we analyse the data of after lockdown, we see that most of the candidates were using TV, Smartphone, TV connected device for 3-4 hour regularly and we also see they were using laptop computers for also 1-2 hour every day.

Table1 shows us the hours spent in each screen devices as a primary form of activity most commonly used screen in weekdays is smartphone and 2nd most common is TV and for weeknights and weekend TV was the most common screen device used by the candidates.

Table 1: Hours spent on different screen devices as a primary activity during an average weekday, weeknight, and weekend day by participants (N=304).

		Week Days		Week Night		Weekend	
		Median (hr)	IQR (hr)	Median (hr)	IQR (hr)	Median (hr)	IQR (hr)
TV	Before LD	1	1-2	1	1-2	2	1-2
	After LD	3	1-3	2	1-3	3	1-3
TV-connected devices	Before LD	1	0-2	1	0-2	2	0-2
	After LD	2	1-3	2	0-3	2	1-3
Laptop/ computer	Before LD	1	0-2	1	0-1	1	0-2
	After LD	1	0-2	1	0-2	1	0-2
Smartphone	Before LD	2	1-3	2	1-3	2	1.25-3
	After LD	3	2-4	3	2-3	3	0-4
Tablet	Before LD	0	0-1	0	0-1	0	0-1
	After LD	0	0-1	0	0-1	0	0-1

Table-2 shows hours exposed to background screen use during an average weekday, weeknight and weekend by the candidates and we see that most of the candidates use spend 3 hours on screen on after lockdown and before lockdown it is 2 hours in weekday, weeknight and weekend.

Table 2: Hours exposed to background screen use during an average weekday, weeknight, and weekend by participants (N=304).

	Week Days		Week Night		Weekend	
	Median(hr)	IQR (hr)	Median(hr)	IQR (hr)	Median(hr)	IQR (hr)
Before LD	2	1-2	2	1-2	2	1-2
After LD	3	1-4	3	2-4	3	2-4

Table-3 shows the intra class correlation results for the different sections of the screen time questionnaire and the ICC from 0.50-0.86 is excellent reliability in weekdays. Similarly, for weeknight ICC from 0.49-0.87 is excellent reliability and for weekend it was 0.54-0.84.

Table 3: Intra-class correlation results for the different sections of the screen-time questionnaire.

		ICC	95% CI	P-Value
Weekday	TV	0.65	0.56-0.72	0.000
	TV-connected devices	0.76	0.70-0.81	0.000
	Laptop/ computer	0.75	0.69-0.80	0.000
	Smartphone	0.50	0.38-0.60	0.000
	Tablet	0.86	0.83-0.89	0.000
Weeknight	TV	0.65	0.56-0.72	0.000
	TV-connected devices	0.78	0.72-0.82	0.000
	Laptop/ computer	0.72	0.65-0.77	0.000
	Smartphone	0.49	0.37-0.59	0.000
	Tablet	0.87	0.84-0.89	0.000
Weekend day	TV	0.69	0.62-0.76	0.000
	TV-connected devices	0.78	0.73-0.83	0.000
	Laptop/ computer	0.73	0.66-0.78	0.000
	Smartphone	0.54	0.43-0.63	0.000
	Tablet	0.84	0.81-0.88	0.000
Background use	Weekday	0.58	0.47-0.66	0.000
	Weeknight	0.59	0.49-0.67	0.000
	Weekend day	0.59	0.48-0.67	0.000

Table-4 shows the absolute reliability results of screen time questionnaire is presented. We see all standard error measurement are more for all types of screen devices across the different period under study.

Table 4: Standard error of measurement results for the different sections of the screen-time questionnaire.

		SEM B-L-D	SEM A-L-D	SEM (hr)	95% CI B-L-D	95% CI A-L-D	95% CI
Weekday	TV	0.053	0.072	0.0625	1.36-1.57	2.04-2.33	1.7-1.95
	TV-connected devices	0.058	0.079	0.0685	1.19-1.42	1.87-2.18	1.53-1.8
	Laptop/ computer	0.066	0.073	0.0695	0.91-1.17	1.13-1.41	1.02-1.29
	Smartphone	0.067	0.058	0.0625	2.08-2.34	2.81-3.04	2.445-2.69
	Tablet	0.055	0.063	0.059	0.45-0.67	0.56-0.08	0.505-0.375
Weeknight	TV	0.054	0.072	0.063	1.15-1.32	1.88-2.16	1.515-1.74
	TV-connected devices	0.064	0.079	0.0715	1.07-1.32	1.62-1.93	1.345-1.625
	Laptop/ computer	0.06	0.067	0.0635	0.76-1.00	1.02-1.28	0.89-1.14
	Smartphone	0.067	0.06	0.0635	1.89-2.16	2.61-2.84	2.25-2.5
	Tablet	0.058	0.06	0.059	0.50-0.73	0.54-0.78	0.52-0.755
Weekend day	TV	0.058	0.075	0.0665	1.54-1.77	2.09-2.38	1.815-2.075
	TV-connected devices	0.06	0.081	0.0705	1.28-1.51	1.92-2.24	1.6-1.875
	Laptop/ computer	0.064	0.074	0.069	0.98-1.23	1.11-1.40	1.045-1.315
	Smartphone	0.067	0.058	0.0625	2.17-2.43	2.86-3.09	2.515-2.76
	Tablet	0.057	0.061	0.059	0.48-0.70	0.57-0.81	0.525-0.755
Background use	Weekday	0.063	0.086	0.0745	1.73-1.98	2.43-2.77	2.08-2.375
	Weeknight	0.054	0.079	0.0665	1.54-1.76	2.48-2.79	2.01-2.275
	Weekend day	0.056	0.085	0.0705	1.67-1.89	2.60-2.93	2.135-2.41

Table-5 shows us the Chi-square values with respect to screen time Vs depression, anxiety and stress. Which shows a significant result which tells us that there is a association between screen time and depression, anxiety and stress.

Table-5: Chi-Square values calculated by IBM SPSS Statistics 22.

			Value	DF	Asymp. Sig. (2-sided)
Depression	TV	Pearson Chi-Square	103.090[a]	16	.000
		Likelihood Ratio	100.399	16	.000
		Linear-by-Linear Association	38.423	01	.000
	TV-connected devices	Pearson Chi-Square	93.094[a]	16	.000
		Likelihood Ratio	87.592	16	.000
		Linear-by-Linear Association	51.860	01	.000
	Laptop/ computer	Pearson Chi-Square	36.038[a]	16	.003
		Likelihood Ratio	41.875	16	.000
		Linear-by-Linear Association	3.032	01	.082
	Smartphone	Pearson Chi-Square	59.074[a]	16	.000
		Likelihood Ratio	48.746	16	.000
		Linear-by-Linear Association	13.862	01	.000
	Tablet	Pearson Chi-Square	43.137[a]	16	.000
		Likelihood Ratio	46.721	16	.000
		Linear-by-Linear Association	0.770	01	.380
Stress	TV	Pearson Chi-Square	76.991[a]	16	.000
		Likelihood Ratio	90.673	16	.000
		Linear-by-Linear Association	35.874	01	.000
	TV-connected devices	Pearson Chi-Square	89.974[a]	16	.000
		Likelihood Ratio	97.038	16	.000
		Linear-by-Linear Association	48.909	01	.000
	Laptop/ computer	Pearson Chi-Square	31.411[a]	16	.012
		Likelihood Ratio	34.865	16	.004
		Linear-by-Linear Association	3.447	01	.063
	Smartphone	Pearson Chi-Square	51.955[a]	16	.000
		Likelihood Ratio	49.369	16	.000
		Linear-by-Linear Association	13.978	01	.000
	Tablet	Pearson Chi-Square	21.856[a]	16	.148
		Likelihood Ratio	29.181	16	.023
		Linear-by-Linear Association	1.421	01	.233
Anxiety	TV	Pearson Chi-Square	82.481[a]	16	.000
		Likelihood Ratio	76.639	16	.000
		Linear-by-Linear Association	39.017	01	.000
	TV-connected devices	Pearson Chi-Square	90.151[a]	16	.000
		Likelihood Ratio	82.866	16	.000
		Linear-by-Linear Association	51.633	01	.000
	Laptop/ computer	Pearson Chi-Square	23.999[a]	16	.090
		Likelihood Ratio	27.103	16	.040
		Linear-by-Linear Association	1.588	01	.208
	Smartphone	Pearson Chi-Square	59.361[a]	16	.000
		Likelihood Ratio	45.002	16	.000
		Linear-by-Linear Association	13.464	01	.000
	Tablet	Pearson Chi-Square	26.342[a]	16	.049
		Likelihood Ratio	26.683	16	.045
		Linear-by-Linear Association	.322	01	.570

Discussion

This research is all about the study of assessed the reliability, Absolute reliability, Relative reliability, screen time questionnaire, Depression, Stress and Anxiety. The Screen time questionnaire shows the better picture of use of screen devices by the adults of Odisha. It also makes the distinction between the different way in which screens may be used. The screen devices used may be actual use vs background use as well as the weekday vs weeknight vs weekend. It is also the first questionnaire which inquiries about the use of commonly used screen among the Odisha adult's populations.

In this online questionnaire we asked the candidates to tell their screen time Before lockdown of COVID-19 and After lockdown of COVID-19. This thing comes in our mind because there is about one year passed with the COVID-19 situation and due to all school, college and universities are closed here for about one year. All the adults are currently in their home and we want to see while staying in home they were using screen more /less as compare to before lockdown. And we also asked them the DASS21 questionnaire which gives us the depression, stress and anxiety level of all the candidate during the lockdown. Here we want to see the relationship between the depression, stress and anxiety vs the screen time. Our aim was to see if the screen time increases the depression, stress and anxiety levels are increasing or not.

In this questionnaire we asked the candidate to give their average screen use in weekdays, weeknights and weekend and we also ask them the background use during weekdays, weeknights and weekend and we find that most of the adults are using TV, smartphone and TV connected device more in weekdays, weeknights and weekend. We also see that in before lockdown they use the screen for 2-3 hour but when lockdown came and the adults are staying at home, they use the screen devices for 3-4 hours. The most commonly used screen device we find were TV, Smartphone an TV connected devices and all are using the laptop/computers and tablets in very less amount.

With the help of this questionnaire, we find the ICC for every screen device in the different time. We find the ICC for TV ranging from 0.65-0.69, for TV connected device it was ranging from 0.76-0.78, for Laptop/computer it was ranging from 0.72-0.75, for smart phone it was ranging from 0.49-0.52 and for tablet it was ranging from 0.84-0.87. Here we also find the ICC for the background use during weekday was 0.58, for weeknight it is 0.59 and for weekend it is 0.59. which shows us the excellent reliability all weekdays, weeknights and weekend. This questionnaire is also able to distinguish the high and low use of screen by the adults of the Odisha.

In this research we were also calculated the absolute reliability of self-administrated questionnaire inquiring about screen time in adults. The self-reported measures may not provide consistent results over repeated assessments as indicated by measurement error. We found the standard measurement error for TV was 0.062-0.066, for TV connected devices it was 0.068-0.072, for laptop/computer it was 0.063-0.069, for smartphone it was 0.062-0.063, for tablets it was 0.059.

Here we also find the SEM for the background use during weekday was 0.074, for weeknight it is 0.066 and for weekend it is 0.070. which shows a good standard measurement error as well as absolute reliability.

Here we want to see is there any correlation between the screen time with respect to Depression, Stress and Anxiety. And we show it in table number 4. We use here chi-square test to check the correlation between them. And we see there is a significant result we have found from the chi-square test. That there must be correlation between the screen time with respect to Depression, Stress and Anxiety.

Conclusion

The result from this study suggests that the self-administered questionnaire can be used successfully to classify individuals into different categories of screen time user e.g., high vs. low. It was observed that high proportion of adolescents use screens for more than the recommended screen time amid COVID-19 pandemic. We also believe that there should be a recommendation for maximum screen time separately for developing countries like India.

Conflicts of interest
There are no conflicts of interest

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