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Original Research Article

Association of mental health with smartphone addiction – Towards a deeper understanding of well-being across age groups and gender

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ABSTRACT

With its numerous advantages, it creeps in the challenges of getting addicted to handheld devices, leading to the physiological foundation of diseases like anxiety, depression, low metabolism, sleep pattern disorders, and more. While researchers have dived into various prospects of gadget affinity, little research was observed on smartphone addiction and its adverse mental effects on patients with pre-existing ailments. Minimal attention paid to artifacts in comprehending the multiple influences of continuous attraction towards smartphones in various age groups and their relatedness on gender basis has encouraged us to probe in this area.

This study involved a time-based cross-sectional survey of OPD patients to evaluate the nature of comorbidity between smartphone addiction across age groups and the resultant effect on the respondents through empirical evidence. Medical diagnostics were done by recording pulse oximetry, electrocardiogram, electroencephalogram, and audiometer, supplemented by a thorough history-taking procedure. The results across clinical examinations of 512 OPD patients portray a better understanding of the interplay between mediators like depressive symptoms, anxiety, insomnia, vision, and hearing disorders by excessive screen timing. This study also examines aggravations in the existing ailments likeliness associated with Smartphone addiction (SPA).

The findings of our work suggest that extreme addiction to smartphones correlates with mental health symptoms, including anxiety, insomnia, depression, social phobia, and others. Thus, this study helps the audience become critical of excessive screen timing and may encourage future longitudinal studies, including a comparison to the real social world and treatment targets.

New and Noteworthy: The findings of our work demonstrate that extensive smartphone usage is a forebearer of several mental health disorders tending to insomnia, depression, anxiety, low among others. Further, it was analytically modeled that the cognitive risk factors for patients already suffering from similar ailments would intensify the adverse effects of long hours of screen time on these handheld gadgets. Our work confirms the significance of investigating the influence of smartphones on cerebrovascular regulation and mental wellness dynamics for gender-specific and based on various age groups.

1. Introduction

Smartphones and gadgets have become essential components of our daily ecosystem and contribute immensely to maintaining an ambient condition for our communication channel.[1] With personal devices, lower net tariffs, and Wi-Fi throughout the home and workplace, heavy screen time through smartphones has become inevitable. Although the human physiological system has the capacity to cope with short-term exposure to smart handheld devices, long-term internet addiction and the habit of smartphones have proven to be a menace to

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one's physiological wellness.[2] The nuances of smartphone addiction are intricately entwined with mental wellness, regulation of physiological performance and productivity, and metabolic alterations. Hence, it is important to speculate on various aspects of the aggravation of health issues as a result of the problematic use of smartphone technology.

Researchers have been obsessed with scientifically arguing relatedness between intense addiction to video gaming, binge-watching, excessive internet surfing and social harm, anti-health behavior followed by anxiety-depressive syndrome.[3–7] Insomnia, clearly defined as unsatisfactory quantity or quality of sleep, has been reported to cause significant distress or functional impairment. Continuous usage of smartphones in bed before sleep is believed to be related to sleep anomalies, as per previous researchers.[8–11]

To the best of our heuristic research, the past studies were limited and espoused the underpinning effects of internet addiction, thus being inconclusive about the association between risks of ailing patients and adverse screen time.

This study pursues to probe into the strong mutual associations between addiction to smartphones and wellness disorders. Secondly, we conceptualize the risk outcomes of SPA and its aftereffects if the excessive usage is carried on despite a history of similar existing ailments and its comorbidities.

2. Materials and Methods

In our current study, we examine several factors of health wellness and their drifting when exposed to excessive smartphone watching. The study was based on 512 patients' data aged in groupings of less than 18, between 18-35 years of age, and above 35 years of age. This was done to categorize patients within a broad category of real-time patients with a consented response rate of approximately 85%. The sample consisted of 21.88% females and 78.12% male respondents, with an average age of 32.5 years with std. deviation (SD 2.3). The collected data were analyzed by implementing an Excel spreadsheet package, python open-source software for data analytics and visualization, and using the 23rd version of the IBM® Statistical Package for the Social Sciences. Data was expressed as Mean ± SE and percentage. The paired sample 't' test and independent sample 't' test with a p-value of < 0.05 are considered statistically significant.

The cross-sectional investigation was formulated based on a set of hypotheses. Firstly, the possession of a smartphone by various age groups eventually increases electronic and social media usage (Hypothesis 1). Secondly, usage of smartphones over and above a particular set of hours daily leads to modulations in various health wellness factors (Hypotheses 2). Furthermore, for subjects already clinically diagnosed with mental and physiological disorders, excessive affinity to smartphones would accelerate wellness issues (Hypotheses 3). The study was conducted on outdoor patients in the cities of Jamui and Jhajha in Bihar, which comprise a middle-income population. The sample group gave their voluntary consent for participation to share their minimal demographic and detailed clinical history for inclusion. The selection for the research group was deliberate over a period of six months. The study involved a research sample of 530 people, which was eventually reduced to $n = 512$ owing to not meeting the inclusion criteria.

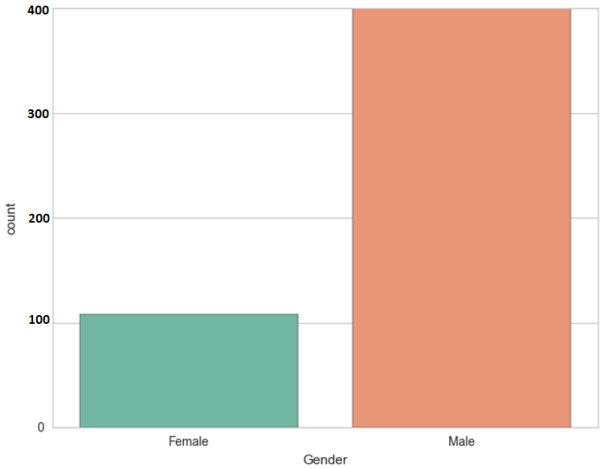

Figure 1: Count of the gender-wise respondents' data set post-data cleansing

Figure 1 illustrates the graphical summary of the data set undertaken for purposive sampling. The count of male plaintiffs was 400, and the total number of female respondents was 112. Medical diagnostics was performed as part of the implementation of the research model by monitoring the recordings of a pulse oximeter, electrocardiogram, electroencephalogram, audiometer, automatic eye refractors, and through a history-taking procedure. The details of the readings captured for individual stakeholders are intentionally not displayed in our work to abate compromise in clinical ethics. Summarizing the existing literature, the model, as depicted in Figure 2, was developed to encapsulate the physiological foundation of addiction to smartphone watching, and the parameters mediating during the clinical were depressive symptoms, anxiety, insomnia, heart rate disturbance, vision, and hearing disorders.

The determining parameters for classifying the study group as adductors were sex, age, hours of screen time on digital devices, pre-ailing symptomatic diseases, and other cognitive health risks. These were methodically investigated using medical tools and the history of the patients to identify the exacerbating effect of phone addiction on their physiological wellness. The gathered data

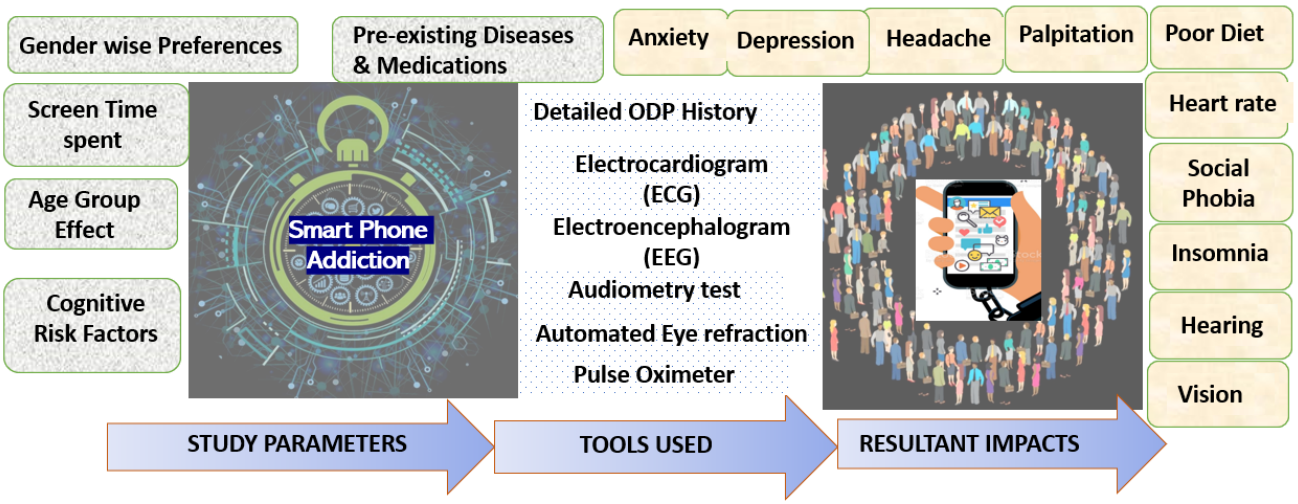

Figure 2: Process model depicting the trilogy of parameters investigated by tools resulting in impact factors

was systematically and statistically analyzed to diagnose the onset and evolution of health-hampering issues building upon each other.

3. Experimental Research Design

The entire study sample was analyzed based on two prime parameters of age group numbers and the duration of watching smartphones and digital gadgets connected to the internet. TheFigure 3 below illustrates the gender-wise grouping based on the age factor and the number of hours for which the study population was engrossed in digital media.

The classification shows that 30% of the sampled patients' data was less than 18 years of age, primarily being of age group 12 years to 17 years and falling under teenage and young adolescent cluster. While males/boys formed 32% of the total investigated male samples, females/girls formed 24% of the sampled females bracketed in the age group of less than 18 years. Similarly, 45.3% of the sampled patients' data were between 18 to 35 years of age. 44% of the total investigated male samples were supplemented by 50% of the sampled female set. Finally, it can be observed that 24.4% of the sampled patients' data were greater than 35 years of age. 24% of the total investigated male samples were supplemented by 26% of the sampled female set. This depicts the rationality of the sample taken for the experimental study.

Considering the hours spent on smartphone watching, 24.6% of the sampled patients' data spent less than two hours of their time with mobile screens. When enquired, they reported that the smartphones were used for prime communication and seldom for infotainment purposes, that too in small spans of time ranging from 5 minutes to 15 minutes at a stretch. 51.8% of females were identified to be classified in this class, which is a significant amount of female respondents. 17% of the male population truly responded to be in this hour-based group. About 45.5% of the male respondents were clustered in daily smart watching between 2-5 hours. They justified their hours by suggesting that post-pandemic, all work-related communications and major transactions were done using digital gadgets. Out of the 43.35% of total patients clubbed in this hourly bracket, 35.7% were females, who declared in their local theme of explanation that smartphones served as their friends in disguise after daily chores. 22% of the investigated sample were in the bordered zone of watching mobiles for 6 to 9 hours on a daily basis. The 21% of males, majorly young adolescents, agreed that they had infotainment applications that were viewed by them on a regular basis. Females comprised a meager 8% of this watching group. The most critical segment was the remaining 10% of the sampled patients' data, who were prone to watch smartphones for 10 hours daily. 9.2% of males showed clear indications of physiological disturbance with this addiction, while 4.5% of females bracketed in this indicative zone of smartphone watching. Further, investigative diagnosis depicts the correctness of the hypotheses considered for the study.

4. Results

With several features being potentially viable for suggestive diagnosis, to identify the correlation of the feature sets of the wellness disorders and their interdependencies on each other, we computed the cohort map (heat map or reliability indices) for each potential parameter as has been visualized inFigure 4.

The cohort heat map gives a broad idea of the degree of interrelatedness of the various pillar features selected for

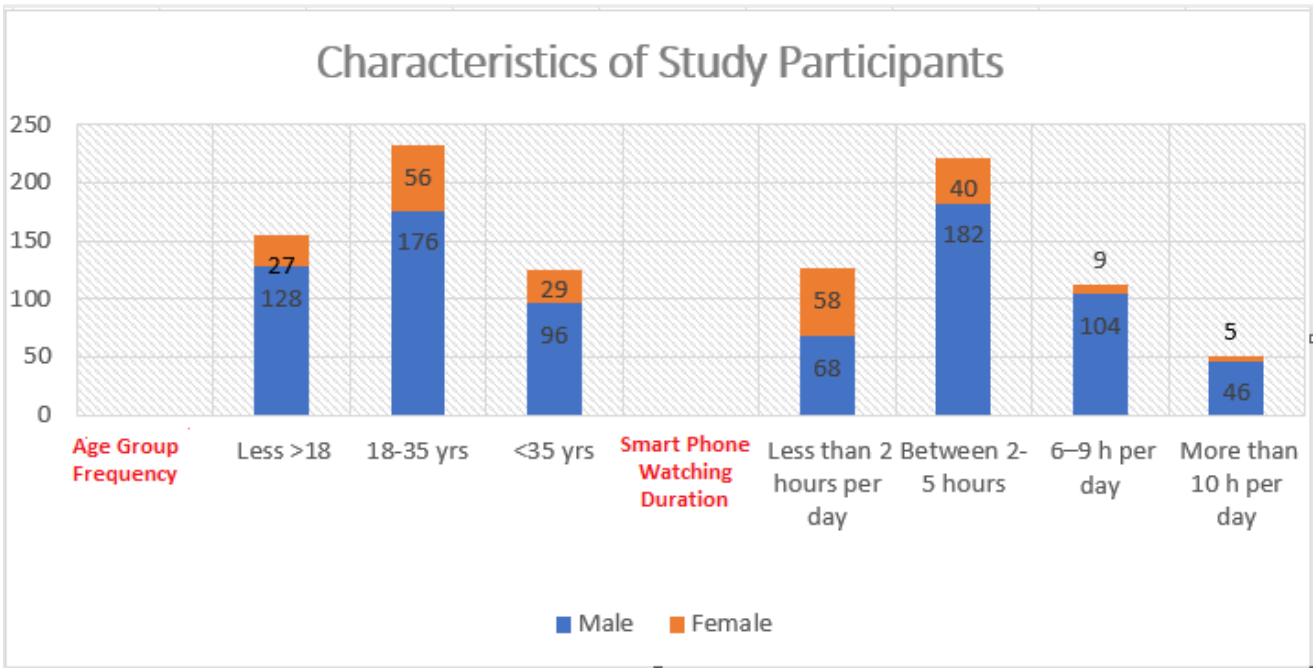

Figure 3: Analytic graph stating the grouping parameters for participating respondents

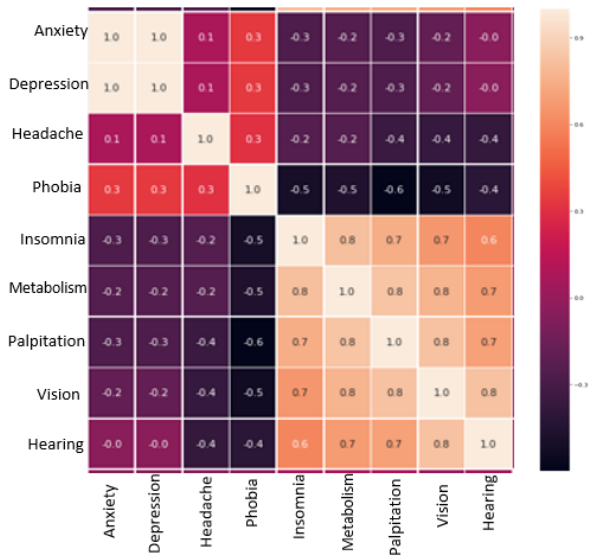

Figure 4: Degree of interrelatedness of the variables as shown by the heat map

physiological information mining. Hence, it generalizes our prediction model by reducing the noise in the input.

Further, as depicted in Table 1, Spearman's rank-order correlation was calculated to weigh the relationships among the eight predominant wellness variables. The statistical significance was considered for $p < 0.05$ in the expected directions. While insomnia and anxiety were predominantly affecting smartphone addiction, the metabolism of the study group negatively predicted smartphone addiction, which was an interesting perception of smartphone watching being normative.

5. Discussion

Upon applying the model appropriate for the study, the resultant outcome is exhibited inFigure 5. The majority of respondents explained that they were using electronic media driven by smartphone devices either during work and study purposes or in bed before going to sleep as part of their daily routine. However, upon physiological investigation, the patients, irrespective of their gender, who were already exposed to diseases like hypertension with increased symptoms of palpitation, blood sugar being on the higher end, and eye ailment, specifically myopia, had worsened and aggravated symptomatic syndromes for ailments when they were continuously exposed to smartphone watching.

Smartphone excessive usage, in general, and the specific experience of being a health victim to it are both degenerately associated with age factors as exhibited. The risk factor pyramid in the age group of young and youth respondents below 18 years of age is widely spread across lower percentages and is likely to increase up to 20 percent if already prone to ailments. The figure also demonstrates that males are more likely to be higher risk takers than female respondents in this group. Next, analyzing the age group between 18 years to 35 years of age depicts that while men suffer from a high risk of increment in existing

Table 1: Overview of statistical rank correlation of the study's wellness variable properties

Variables	1	2	3	4	5	6	7	8
1 Anxiety	–	0.66	0.45	−0.09	0.49	0.29	0.23	0.45
2 Depression		–	0.41	−0.04	0.39	0.28	0.26	0.42
3 Headache			–	−0.07	0.33	0.22	0.15	0.33
4 Metabolism				–	−0.03	−0.2	−0.21	-0.2
5 Insomnia					–	0.59	0.28	0.35
6 Phobia						–	0.26	0.1
7 Palpitation							–	0.18
8 Vision								–

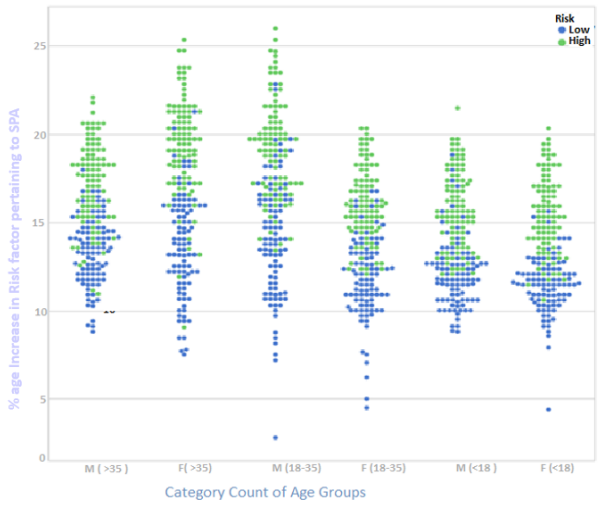

Figure 5: Plot of the degree of risk enhancement is classified gender-wise among age groups

health disorders, up to 27%, females are comparatively less prone, up to 20% in this segment. This might be because their nature of engagement in multifarious activities leads to lesser addiction to smartphones in terms of longer screen time at one stretch. Smartphone addiction and its association with a higher risk of enhancing existing wellness disorders was predominant in the age group of 35+ years of respondents. While the majority of the male segment lies between higher risk percentages ranging between 16-22, the higher risk of ailment increase in females was observed to be between 18-24 percent. This might be because females give lesser priority to their health issues, and an increase in screen time watching over the internet serves as a delusion from their existing health disorders. This tendency to escape reality was less prevalent among males, but their risk factor was nonetheless widely spread. The alleviation in depressive symptoms and anxiety behavior was indicative of cases of potential tachycardia, increased blood pressure, and seizures.

6. Conclusions and Future Path

This work comprehensively scrutinizes the prevalence of addiction to smartphones across various age groups, further classifying the datasets according to gender segments and deep drills on the increase in factors like anxiety, depression level, insomnia, visual and hearing disorders with the urge and tendency to be constantly partnered with one's smartphone for various activities like messaging, watching application driven content, social media connectivity among other doings. These digital devices, although a boon to the modern world, must be used within limits so that they refrain from potentially contributing to disturbing one's physiological health balance.

7. Source of Funding

None.

8. Conflict of Interest

None.

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