Participatory Intervention Method to Reduce Smartphone Addiction and Screen Time of Undergraduates

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Increased smartphone dependence has resulted in increased smartphone addiction and resultant screen time, which in-turn has a negative impact on their health and well-being. Current research aims to reduce the smartphone addiction and screen time of 45 undergraduates (M=15; F=30) in the age group of 18-24 years with the help of a two-week digital participatory intervention. Single group pretest-posttest design was employed to determine the impact of the intervention (independent variable) on the dependent variables-smartphone addiction, measured by SAS-SV developed by Kwon et.al (2013) and smartphone screen time, measured by 'Digital Wellbeing App' and 'Screen Time' (for Android and iOS users respectively). Data on smartphone addiction was collected two weeks before the start of the intervention. The intervention started with an orientation wherein all participants were briefed about what the intervention entails. On the orientation day, baseline measure on screen time was retrospectively collected for the past two-weeks period. The intervention consisted of activities like support group sessions, collecting daily screen time data, sharing information e-brochures, setting app timers, google calendar reminders, grayscale and bedtime mode. Post-intervention data on smartphone screen time was collected daily for two consecutive weeks after the intervention orientation as also smartphone addiction score on the 14th day after the introduction of intervention. Dependent t-test found a significant change in pre and post-intervention data on smartphone addiction and screen time. Effective digital participatory intervention to combat smartphone addiction has significant implications for the future.

Keywords: screen time, participatory intervention, digital well-being

The internet has not only provided hands-on access to a variety of information and services but has also resulted in lifestyle changes especially during the Covid-19 pandemic (World Health Organization, 2020). Increased access to new digital media devices (e.g., smartphones and tablets) have contributed to a rapid rise in average screen time exposure for children (Wartella et. al, 2014). According to Rideout (2015), children's (8 to 18 years age-group) total daily screen time across devices has risen from approximately five to eight hours since 1999.

Screen time, which refers to time spent engaging with visual screen-based technologies such as televisions, computers/laptops, video games, smart phones, tablets/iPads, and handheld electronic or gaming devices is increasing among all age groups across the globe. Smartphone screen time is the amount of time spent using smartphone screens in a day. This usage includes social networking sites, online gaming, online shopping, communicating via text message, academic work etc. Solely auditory activities, such as talking on a phone and listening to music, are not included.

Screen time is being widely researched with related concepts in digital media use and mental health in current times. Screen time is found to be closely related to poor health outcomes such as obesity and lack of exercise, which have been well-documented by various researchers (Chiasson et al., 2016; de Jong et al., 2013; Dumuid et al., 2017; and Poitras et al.,2017). Twenge and Campbell (2018) found that increased screen time was usually linked to progressively lower levels of psychological well-being. They also found that it increases the risk of being diagnosed with anxiety or depression, poor sleep quality and reduced duration of sleep (Twenge and Campbell, 2018).

The incessant use of smartphones for communication, accessing social media, information-seeking and leisure activities such as music, watching movies, online shopping etc has made it a prevailing social problem in the form of 'smartphone addiction'. In today's times wherein smartphone screen time is rapidly increasing among all age groups, there is a need to minimize the long-term collateral impact of increased screen time such as low levels of happiness, poor sleep quality and reduced duration of sleep and in extreme cases-identified as smartphone addiction. Designing an intervention to effectively reduce the smartphone addiction and screen time is the need of the hour. Moreover, a participatory intervention method could be useful in bringing about desired change more effectively as per the needs and characteristics of the stakeholders (Ekirapa-Kiracho, et al., 2017).

Due to the existing research gap in the area of digital well-being, with a specific focus on participatory intervention on undergraduate students, it becomes pertinent to explore ways in which an intervention can be designed to alter the screen time habits of individuals. The present research aims to assess the smartphone addiction and screen time of undergraduate students and provide them with strategies to curb the rise in their screen time. Moreover, the current research makes an attempt to design an effective intervention that can be carried out remotely in a virtual mode.

Thus, current research was undertaken with an aim to reduce the smartphone addiction and screen time of undergraduate students through participatory intervention and also assess whether there is a significant difference in the smartphone addiction scores and screen time of participants post-intervention.

Hypotheses

$H1_0$: There will be no change in smartphone addiction scores of participants post-intervention.

$H1_A$: There will be a significant change in smartphone addiction scores of participants post-intervention.

$H2_0$: There will be no change in smartphone screen time of participants post-intervention.

$H2_A$: There will be a significant change in smartphone screen time of participants post-intervention.

Method

Participants

The research started with a total of 52 undergraduate students who indicated willingness to be a part of this four-weeks long intervention study. However, by the end of the four weeks, the sample consisted of 45 Undergraduate students (Males= 15; Females= 30) in the age group of 18-24 years who were subjected to online classes amidst the pandemic. The sampling technique used was non-probability convenience sampling.

Measures

Smartphone addiction was measured using the 10 item Smartphone Addiction

Scale- Short Version (SAS-SV) developed by Kwon et.al (2013). It is a six-point self-report Likert scale wherein 1 indicates "strongly disagree" and 6 indicates "strongly agree". Higher scores indicate higher levels of smartphone addiction. The Cronbach's alpha correlation coefficient of 0.91 indicates high internal consistency reliability of SASSV.

Pre-installed 'Digital Wellbeing App' (for Android users) and the 'Screen Time' (for iOS users) was used to measure the smartphone screen time of the participants.

'Digital Wellbeing App' and the 'Screen Time' provides users with insights into their digital habits and offer tools to monitor their app usage, set limits on app usage, pause distracting apps, and receive reminders to take a break from their screens etc. They also provide an option to set bedtime mode, which automatically fades the screen to grayscale and silences notifications with the Do Not Disturb mode at the timing set.

Since the research was conducted during Covid-19 pandemic in digital mode, the participants (undergraduate students) were subjected to online classes on MS Teams platform due to Covid-19 lockdown. Thus, the time spent on MS Teams was deducted from the total screen time, considering it as necessary for education purpose. Participants having more than one smartphone were requested to provide screen time of all smartphones.

Ethical considerations

Participants were provided clear instructions regarding the purpose and duration of the study. Voluntary participation was obtained through informed consent. Ethics of privacy and confidentiality was followed along with provision to withdraw from the research at any point of time. Since they were required to share screenshots of Digital Wellbeing app/ Screen Time logs for a total of 4 weeks period, the researchers made special efforts to ensure privacy and confidentiality.

Procedure

Design of the study

A participatory intervention with a single group pretest posttest design was used as researchers attempted to determine the effect of the intervention on a given sample. The smartphone addiction and screen time (dependent variables) were measured before and after the intervention orientation was executed. On the orientation day, pre-intervention/baseline measure on smartphone addiction was collected along with the smartphone screen time for the past two-week period retrospectively.

The entire study can be classified into following 3 phases:

Phase I: Pre-Intervention Phase

After the participants identified the problem of increased smartphone screen time, the baseline measure data was collected retrospectively as screenshots of the Digital Wellbeing app/ Screen Time logs for the 14 days duration, to ensure accuracy and objectivity. Since this was a participatory research, the participants were a part of the planning, designing and implementation of program activities for the intervention in order to reduce their own screen time. Participants were encouraged to read more on strategies to reduce smartphone addiction and screen time and their ideas were well received by the researchers and modified to ensure maximum gains for the participants. Pre-intervention data on smartphone addiction was also collected 2 weeks before the intervention orientation phase.

Phase II: Intervention Orientation

After the baseline data on smartphone addiction and screen time was collected and the participants' ideas on strategies to combat smartphone screen time were

discussed, evaluated and finalized with the researchers, the second phase of the intervention study started.

Given the unfortunate global pandemic and subsequent restrictions, the intervention study was conducted in an online mode. The intervention started with an Intervention Orientation, which introduced the participants to various program activities that needed to be undertaken, some of which were designed with the help of their ideas: They were as follows:

1. Collecting screen time data on a daily basis via the Google forms. The screen time was entered manually and the screenshot of the daily usage was also collected. This gives participants daily feedback and an additional sense of constant assessment.

2. Information related to the negative effects of high screen time, benefits of digital-wellbeing etc were shared in the form of e-brochures. Providing factual backing makes it more likely that the participants will follow through with the instructions (Kahneman, 2003; Lawlor, Keen, & Neal, 2000).

3. Participants were paired as buddies so as to check on their partners everyday: to know their progress in reducing screen time, challenges being faced by them etc. Sharing of objectives with others who are facing similar challenges acts as a motivating force for each other (Biedermann, Schwarz, Yau, & Drachsler, 2023). This increased the likelihood of the partners to follow through with the study.

4. Weekly Support Group Sessions were scheduled for the participants for the following two weeks. Since it was a two-week-long online intervention, sustaining the motivation of the participants was of utmost importance. Thus, sharing problems and progress with other people doing the same thing in group settings through support group sessions motivates them to sustain their efforts and perform better (Bandura, 1986; Baumeister & Leary, 1995; Seebohm et al., 2013).

5. Bedtime Mode and Grayscale Mode were scheduled to be activated for a minimum duration of 8 hours in a day. It makes the screens lose all their visual appeal. It also acts as a reminder to go to bed, while at the same time reducing blue-light exposure before bedtime. He et al. (2020) found that reduced smartphone usage before bedtime helps improve positive affect and working memory, increases sleep duration and quality, and reduces sleep latency and pre-sleep arousal.

6. App-timers were set up for the top three used smartphone applications to limit their usage. It pauses the app and its app notifications for the day, once the app timer runs out.

7. Focus Mode temporarily locks the selected distracting apps, reducing distractions and allowing one to focus on the task at hand without getting distracted by unnecessary phubbing.

8. An app was used for one of its mode and simple focus sessions as it allowed one to create one's own forest served as a way of reinforcement. The constant reminders also helped in preventing unnecessary browsing and keeping one on track.

9. Google Calendar was used to schedule all the daily tasks and events to ensure that everyone is automatically sent a reminder to do the needful.

10. Pledge was made by participants publicly as a tool to help participants make a public declaration to work on

reducing their smartphone screen time. Such a public declaration further strengthens commitment to complete a task (Bicchieri, 2007).

Participants were introduced to all the above activities that were to be followed for the upcoming weeks during the orientation session and they were also assigned various roles and responsibilities to carry out different activities in groups in order to increase their participation and motivation (Lindquist-Grantz and Abraczinskas, 2018).

Phase III: Post-Orientation Phase

The post-orientation phase started the day after the orientation session ended. Since the study was conducted in online mode, it became essential during this phase, to take steps to maintain the participants' motivation throughout the period of the study.

The participants received a self-feedback for the entire duration as they filled the daily log. The handouts were sent out every alternate day. The support group sessions were scheduled for the two Wednesdays of the two weeks. The Google calendar which was shared with them, sent reminders on their phones every single day. Participants downloaded an app which also sent frequent reminders to log in focus sessions. At the end of each day during the intervention period, the participants were required to upload their daily log along with screen time usage. At the end of the two-week intervention, SAS-SV was administered to know the smartphone addiction score of participants post-intervention.

Analysis

Descriptive and inferential statistics was used to compare the effectiveness of the intervention program. Dependent t-test was used to assess the significance of difference between the pre-intervention data and the post-intervention data. SPSS 21.0 was used to compute the results.

Results

A participatory research model was used to design the intervention to reduce the smartphone addiction and smartphone screen time of undergraduate students. The pre-intervention and post-intervention data was compared using the dependent t-test. The findings of the study are summarized in Table 1.

As noticed in Table 1, that the pre-intervention smartphone addiction score of the participants was significantly higher (M = 30.62, SD = 8.29) than their post-intervention scores (M = 25.53, SD = 8.47), with $t(44)$ = 5.56, p = <.001. This indicates that their scores on Smartphone Addiction Scale significantly decreased after the intervention was executed. Also, p-value (<.001) was found to lie below the specified 0.05 level of significance.Thus, the null hypothesis $H1_0$ is rejected and the alternate hypothesis ($H1_A$), which states that there will be a significant difference between the pre and post intervention scores on smartphone addiction is accepted.

Table 1 . Comparison between Pre-intervention and Post-intervention Smartphone Addiction and Smartphone Screen Time of undergraduates (N= 45)

	Pre-intervention		Post-intervention		t-value	p-value
	Mean (M)	Standard Deviation (SD)	Mean (M)	Standard Deviation (SD)		
Smartphone Addiction	30.62	8.29	25.53	8.47	5.56	<0.001**
Smartphone Screen Time (in minutes)	397.79	152.64	300.79	129.04	5.40	<0.001**

**Significant at p<0.01

It is also noticed in Table 1, the pre-intervention smartphone Screen time mean (in minutes) was found to be 397.79 minutes, with a standard deviation of 152.64. The post-orientation smartphone Screen time mean (in minutes) was found to be 300.79 minutes, with a standard deviation of 129.04. Thus, a difference of 97 minutes between the baseline measure and the post-intervention orientation measure. The dependent t-test indicated a t-value of 5.40, which is highly significant at p<0.01 level. This means that the $H2_0$ of no difference is rejected at alpha value of 0.01 and the $H2_A$ (there will be a significant change in smartphone screen time of college-students post-intervention) is accepted.

Discussion

The present research aimed at reducing the smartphone addiction and screen time of undergraduates using a participatory intervention design. Smartphone screen time is the amount of time engaged on smartphone screens in a day. SAS-SV was used to assess the smartphone addiction of the participant before and after the two-week intervention.

The study begins by measuring the pre-intervention smartphone addiction and screen time of college students. As shown in Table 1, there is a significant difference between the pre-intervention and post-intervention data, suggesting that the intervention thus designed was successful in bringing down the smartphone addiction and screen time of college students.

The study followed a participatory research model, wherein the participants themselves were a part of the planning, designing, and implementation of the intervention. This gave the study an added benefit of being highly cut to fit the demographic of the study. The study was customized and designed in a manner that catered to the specific problems of the college students. For the most part, the intervention design was positively responded to.

The intervention was designed in a manner to support the pattern suggested by Duhigg (2012) with respect to forming habits with the help of a three-step neurological pattern: Cue, Routine and Reward (see Figure 1).
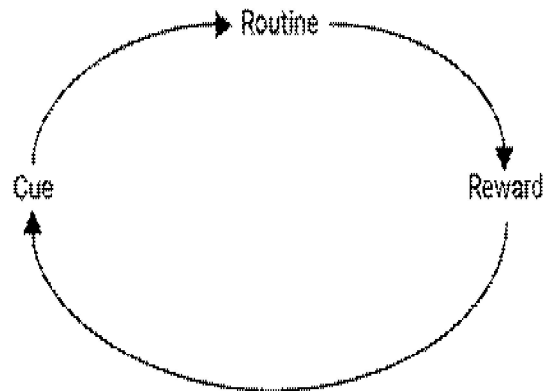

Figure 1. The three-step neurological pattern of a habit

Note. Figure based on Duhigg's (2012) work in The Power of Habit

The cue acts as a trigger which signals the brain into automatic mode, thus prompting a behavior. The behavior or action taken after the cue is signaled becomes the Routine. The Reward determines whether the brain finds a particular habit loop worth remembering. It is easier to form habits when immediate rewards are provided as opposed to delayed rewards.

In the present research, a series of activities posed as cues: grayscale mode which was scheduled during the bedtime hours served as a cue to stop using one's phone and as a reminder that it is time to go to bed. This not only made the phone screen lose its visual appeal but also pushed the participants to have a better sleep schedule. Holte and Ferraro (2020) in their study on the effectiveness of grayscale mode on reducing screen time concluded that

participants who had their phone screens in grayscale spent significantly less time on social media and internet browsing compared to those in the control group that does not use smartphone in grayscale mode.

Access to screen time data via Digital Well-being app acted as another cue to reduce screen time. The routine of uploading screen time data on a daily basis consecutively for 2 weeks made the participants conscious of their screen time usage, thereby serving as an objective feedback mechanism of their smartphone screen time.

Yet another cue which was set as a reminder to reduce the screen time of the participants was the use of Google calendar. The notifications regarding daily schedules and to-do lists acted as cues to reduce the use of smart phones. Moreover, the app downloaded by participants also provided them with notifications to log into 'focus' sessions. Similarly, use of app timers provided notifications on completion of set time limit and acted as a cue to stop using the app further. An attempt to change the social environment to foster such a positive change was made by pairing all participants with their buddies in order to check on each other's progress. This acted as a motivating force for the participants to continue with making efforts to reduce screen time for the entire intervention period. Support group sessions were also held once a week to sustain their efforts to reduce screen time. Such socially interactive spaces allowed one to share their struggles throughout the study, feel motivated by others' progress, and in general helped in lifting up their spirits during this unfortunate global pandemic.

Participants were also sent e-brochures every alternate day, that was based on objective scientific data. The e-brochures provided information related to negative consequences of increased screen time, advantages of digital well-being etc. They

served as logical cues to the rational participants, who as per the Rational Choice theory make rational decisions as per information available to them. Moreover, since app notifications serve as cues to use phones, the participants were required to switch them off to limit such usage due to the constant buzzing of smartphones.

All the cues such as app timers, google calendar notifications, grayscale and bedtime mode triggered the routine of limiting smartphone usage of the participants. Since the research study was two weeks long, sustaining the participants' motivation to reduce screen time was a major challenge. Thus, as per the third step of habit, the participants of this intervention study were provided 'Reward' in the form of motivation from their buddy, support group meetings, daily feedback from their own daily logs and also the 'app' installed by them, which allowed the user to grow their own forest with the 'raindrops' they earned by logging in 'focus sessions'. Other than this, participants were socially rewarded in the support group sessions when even their tiny victories were celebrated by their respective group members. A number of participants reported being able to spend their newly found free time with their loved ones, which can be considered a type of social reward. It was made sure that the different elements/activities of the intervention were scheduled evenly across the duration of two weeks following the orientation to ensure that the participants even in a virtual mode are consistently motivated to work towards their objectives and finally the ultimate goal.

After the intervention orientation day, the participants of this intervention study were required to upload their screen time data daily for 2 weeks. Additionally, the post-intervention data on smartphone addiction was collected after 14 days following the orientation day. This routine of daily upload of screen time data for 2 weeks provided an

object and regular feedback to the participants regarding their progress in reducing smartphone screen time. This in itself served as a reward to sustain the efforts of reducing screen time. As per Duhigg (2012), when the same behavior is repeated again and again as a routine, and it subsequently provides rewards, it eventually becomes a habit. According to Gardner (2012), when the chain is repeated, the cue in itself results in craving for the reward and makes it a habit.

Limitations

The present study presents many insights and potentials about how self-regulation through participatory approach can be used to reduce the smartphone addiction and screen time of college students through the digital mode. However, the scope of the research and its findings have certain limitations. Firstly, since the study was conducted on a narrow target group that comprised 45 undergraduate students from the Psychology Department, the conclusions may not be generalizable. Another limitation was that post-intervention data was collected in continuation of the intervention and no gap was given to see its effect. Since the research entailed the participants to be willing to participate in this two-week long intervention, it was difficult to sustain their participation for longer. A follow-up data could help understand the effectiveness of the intervention in the long run. Thirdly, since the research was participatory in nature, there is scope for personal biases. However, it must be noted that researchers took extreme caution in collecting data in an objective manner. Fourthly, the sample size was small as it was a two-week long intervention which entailed intensive participation from each participant. Lastly, the study was conducted virtually owing to the global Covid pandemic that translated to lockdowns and social distancing rules. The irony is that while the

study is aimed at reducing smartphone addiction and screen time, the same tools and technology were employed to achieve the goals. It should be noted that a point of advantage of the study is the convenience and cost-efficient manner in which participants were engaged through the duration of the study.

Implications

The present study has applications in a variety of situations and settings, since, in today's modern world, smartphone addiction is being identified as a social problem along with increased smartphone screen time for people of all age groups. Since it is a participatory intervention, it can be customized to fit its target demographic like children, adolescents and adults who have a high usage of phones for different needs. Emphasis on self-regulation and participatory intervention in digital mode can pave the way for maximizing digital wellbeing of individuals at the convenience of their homes, workplaces etc with greater privacy and lower costs. Moreover, the corporate world often complains of employees wasting their time using social media sites, online gaming etc during working hours. Such participatory intervention methods can be conducted in workplaces for maximum efficiency of employees.

Future Research Suggestions

A non-participatory model could be designed wherein participants are not made a part of the design and implementation of the intervention, unlike the present study which followed the participatory research model. This will help compare the effectiveness of intervention program with external participants vs. internal participants. The study can further be customized to match the specific needs of the demographic used. Another age group can be used as the target population, or could have a wider age group

with a larger population size. Finally, the study can be modified to be conducted in a hybrid mode, wherein intervention activities like the orientation and the session groups could be done in a physical space for better cooperation.

Conclusion

Use of two-week digitized participatory intervention to reduce smartphone addiction and screen time among undergraduates during the Covid-19 pandemic was found to be effective in significantly reducing smartphone addiction and screen time.

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