IDENTIFYING TRENDS IN TECHNOLOGY USE AND OVERUSE DURING A PANDEMIC

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ABSTRACT
Technology addiction shows similarities to other addictions as addicts appear to be unable to control their usage despite obvious negative effects. Excessive technology usage, like other addictions, is associated with psychological problems including anxiety, depression, ADHD, and obsessive-compulsive disorder. The advent of the COVID-19 pandemic generates concern that this malady might be exacerbated. Input was solicited from university constituents to identify trends that might lead to more rigorous study of technology addiction and the extent to which it may be exacerbated by external factors. This study found that the pandemic led to an increase in technology dependence where a significant number of respondents recognize a need to reduce their usage.

KEY WORDS
Tech addiction, pandemic, internet, smart phone, dependence

1. Introduction

Technology Addiction manifests itself through various forms of screen time; it encompasses technology such as smartphones, tablets, computers, television, and gaming consoles. Types of Technology Addiction range over direct outlets of technology use (such as social media and compulsion to be online to monitor news, watch videos, or other time-consuming pursuits) to encompassing other forms of addiction by integration and/or exacerbation, e.g. compulsive gambling, pornography.

In [1], five specific internet addictions are identified. They are *gaming addiction (e.g. role-playing games, browser games), information overload (e.g. web surfing), "net compulsions" (e.g. online gambling or online shopping), cybersexual addiction (e.g. online sex), and cyber-relationship addiction (e.g. online relationships, chats, and social networks)*. They further state that an individual who spends most of their day using technology does not necessarily suffer from an addiction. However, when someone is unable to control their technology usage despite any negative effects it may cause (e.g. significant distress and financial difficulties), then it may indicate a Technology Addiction.

It doesn't end there. In [2] the author states that excessive use of technology also correlates with conditions such as anxiety, depression, and obsessive-compulsive disorder. It is posited that subjects can also share symptoms with those suffering substance use disorders.

These studies predated the advent of COVID-19. This pandemic has resulted in social isolation for many around the world. With businesses and schools relying on digital communication, the average person likely spends more time than usual using the internet in place of in-person communication. With the increased reliance on technology usage for daily tasks it is to be expected that overall screen-time has gone up, but it can only be considered a Technology Addiction if an individual experiences negative effects from their usage and are unable to stop.

In a study conducted in India [3] found that *a surge in emotional reactions, psychological difficulties and behavioral changes such as substance use disorders (SUD) has been reported [since the lockdown in India] ... Lockdown, social isolation, loss of employments, financial crises, resultant stress and ample leisure time have together created an opportunity for a relentless growth in behavioral addictions including problematic internet use (PIU), especially the use of social media, pornography websites and video gaming*.

As would logically be expected, combining ubiquitous technology and a pandemic leads to more technology usage in a large segment of society. Restrictions on activities at the same time create idle time for people who least need it. This work will attempt to identify underlying trends in order to determine areas for further study. The community at our university provides a mixture of perspectives, between faculty, staff, students, and administration that might lead to better understanding not only of the effects of the scenario, but perceptions of its effect.

To that end, the authors undertook to distribute a survey. This did not adhere to any strict controls; its intention was to collect data to identify trends. It was hoped that the survey would provide results upon which potential future research under stricter conditions could be undertaken. The survey, which asked questions related to technology usage before COVID-19 and the same questions regarding their current technology usage, garnered 567 anonymous responses.

The study undertaken as a result of the data collected aims to measure the change of technology usage from before the advent of COVID-19 to approximately one year into the pandemic (February 2021). The respondents' amount of screen-time as well as their attitudes towards their own screen-time will be used to determine COVID-19's effect on their likelihood to show signs of a Technology Addiction.

2. Related Work

Technology Addiction can be difficult to diagnose, given that it is often connected with other psychological disorders. Correlation does not mean causation, as [1] explains that *prior to labeling an individual as presenting with internet addictive behavior, it should be evidenced that such behavior does not stem from an underlying condition, for example, a mood or psychotic disorder*. Depending on the individual, a Technology Addiction may be the cause of a separate disorder. This implies that in some cases, treating the underlying condition may result in issues with technology also ceasing.

If the case is that Technology Addiction is a symptom of another disorder, further buttressing this perspective, [4] states *an important line of scientific inquiry is to investigate not only the predisposing trait variables influencing internet overuse, but also specific mechanisms explaining why some at-risk individuals (e.g., depressed persons) will ultimately engage in excessive internet use*. These works indicate that technology addiction issues do not exist in a vacuum and must be considered within the myriad addiction-related issues that afflict people.

Behavioral addictions (including technology, gambling, and sex addictions) share symptoms with more "traditional" substance abuse disorders, *including criteria assessing tolerance, withdrawal, interference in major areas of life functioning, and repeated unsuccessful attempts to cut back or quit* [5]. These addictions are often present with conditions such as ADHD, autism spectrum disorder, anxiety, depression, and Obsessive/Compulsive Disorder [2]. High technology usage in adolescents is also linked to increased rates of self-harm and suicide attempts [4].

Technology addiction has become a mental health and behavioral issue on par with other common afflictions. With the advent of the current pandemic and its accompanying social isolation, it could be expected that technology addiction symptoms and harm would be exacerbated. An Indian study on the effects of the COVID-19 imposed lockdown on internet addiction took place in 2020 with an average participant age of approximately 38 years and all participants having a Graduate or above education level. This study found that during lockdown, people reported significantly higher issues with relationships, communication, and social anxiety. They also reported symptoms such as irritability and anger in the absence of internet usage, while prioritizing internet usage over personal responsibilities. About one-third of respondents mentioned that others have advised them to reduce their internet usage [3], a concern the authors addressed in the aforementioned survey. There was concern that peoples' technology issues would become apparent to the degree that others would feel their intervention was appropriate.

Despite the negative effects that excessive technology use may cause, the unique circumstance of a global pandemic in an age of ubiquitous technology also offers the opportunity to stay connected with friends and family. One hypothesis suggests that social media usage amplifies social isolation and hinders social development, and [1] states that *the opposing, and more positive view, the stimulation or increase hypothesis, argues that online communication increases social interaction, thus enhancing well – being*. This can lead to a hypothesis that an increase in screen time as has occurred during the current pandemic can also engender greater social interaction, particularly if that at least a portion of the increase in screen time is owing to participation in real-time interactive events.

The study by [3] also reports that o*f the participants, 69% reported to have experienced benefits of internet use ... Of the group, 31% reported to have experienced harmful effects of internet use at some point of time, and up to 80% reported that they had a reasonable control on their internet use.* That leaves 20% uncertain, which is a concerning, if not troubling, statistic.

While technology and internet use can be an important tool during social isolation, over reliance on technology for socialization can result in compulsive use, making it more difficult to return to the normalcy of face-to-face interaction post-isolation. An increased awareness of Technology Addiction and its symptoms may help to mitigate this in some individuals.

3. Study Results

The survey distributed at Kutztown University in February 2021 starts with a series of questions regarding screen-time, smartphone usage, and purpose of technology usage. Each of these questions are repeated to get "pre-COVID" (i.e. before the advent of COVID-19) and "post-COVID" (i.e. since the advent of COVID-19) responses for comparison. The next part of the survey involves

respondents' feelings and/or concerns about their technology usage. Out of the 567 respondents, 402 were students at the university and 165 were faculty, staff, or administration. Any time spent using technology such as smartphones, tablets, computers, television, and gaming consoles may be considered "technology usage" or "screen-time".

Daily Screen Time, Most Days, In Hours

	Pre-COVID	Post-COVID	Percent Change
< Two Hours	68	12	-9.88%
2-6 Hours	286	66	-38.80%
6- 10 Hours	182	287	18.52%
Over 10 Hours	31	202	30.16%

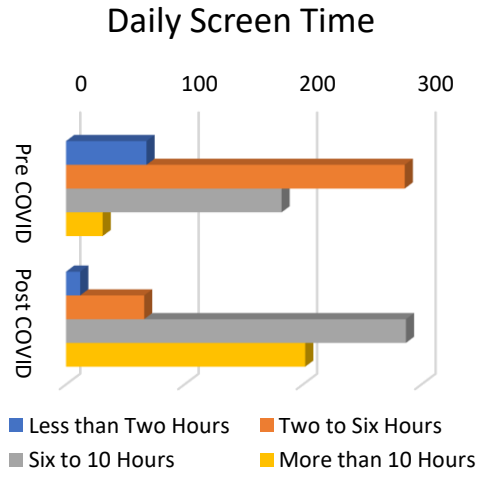


Figure 1

Student Daily Screen-Time, Most Days, In Hours

	Pre-COVID	Post-COVID	Percent Change
< Two Hours	47	4	-10.70%
2-6 Hours	213	47	-41.29%
6- 10 Hours	121	198	19.15%
Over 10 Hours	21	153	32.84%

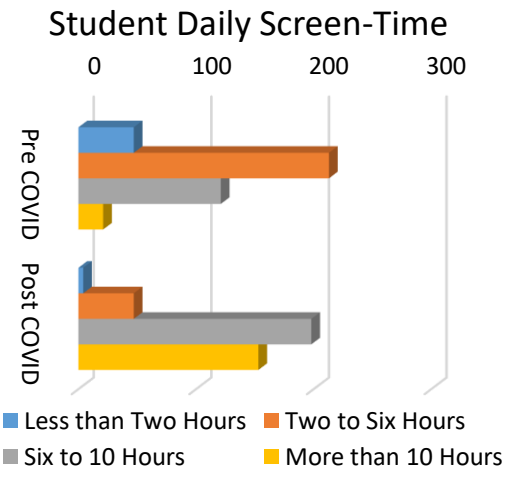


Figure 2

Screen-Time and Smartphone Usage

The majority of responses regarding average daily screen-time before COVID were either 2-6 hours (50.44%) or 6-10 hours (32.10%). 11.99% of respondents had less than 2 hours of screen-time each day, and only 5.47% responded "More than 10 hours". Responses for post-COVID screen-time (after the start of the COVID pandemic in 2020) showed a drastic increase: now 35.63% selected "More than 10 hours" and only 11.64% selected "2-6 hours", with 50.62% reporting 6-10 hours of daily screen-time. Only 2.12% used technology for less than 2 hours each day after the start of the COVID pandemic (see Figure 1).

Daily Smartphone Usage, Most Days, In Hours

	Pre-COVID	Post-COVID	Percent Change
< Two Hours	191	90	-17.81%
2-6 Hours	289	249	-7.05%
6- 10 Hours	71	160	15.70%
Over 10 Hours	12	66	9.52%

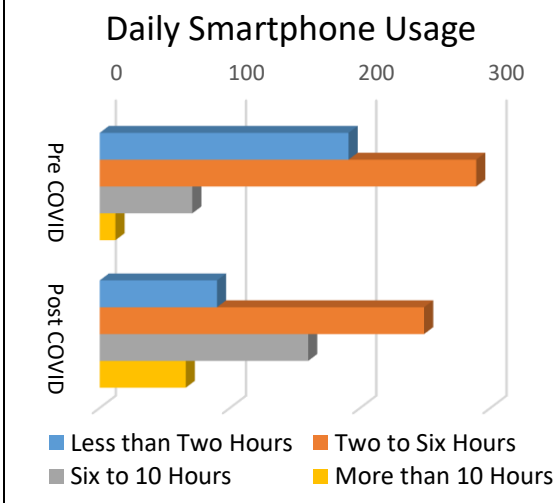


Figure 3

Looking at only the students' responses shows a similar trend, with students being more likely to spend more than 10 hours post-COVID using technology. Additionally, only 1.00% of students reported 2 or less hours of daily screen-time **(**see Figure 2).

Daily Social and Recreational Screen-Time, Most Days, In Hours

	Pre-COVID	Post-COVID	Percent Change
< Two Hours	249	159	-17.81%
2-6 Hours	259	239	-7.05%
6- 10 Hours	50	126	15.70%
Over 10 Hours	7	42	9.52%

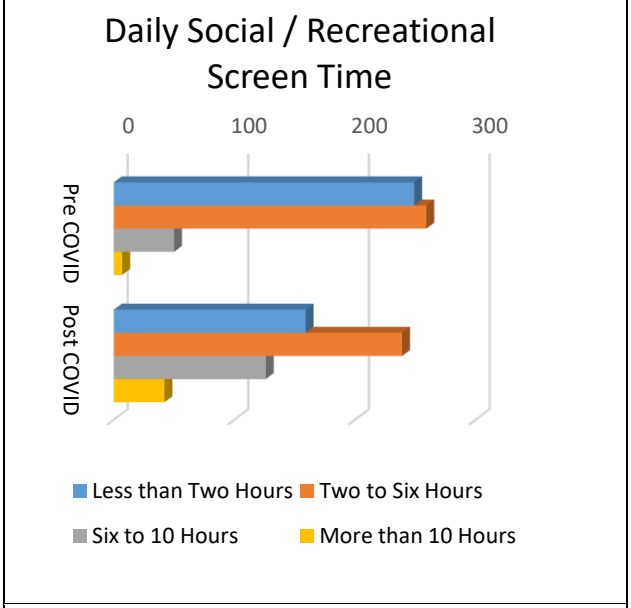


Figure 4

The next question of "average daily smartphone usage" follows the same pattern of increase from pre to post-COVID as the previous data, except smartphone usage is lower when compared to overall screen-time (see Figure 3).

Purpose of Technology Usage

When determining if a technology addiction exists, the purpose of the technology use is an important factor. With this in mind, the survey respondents were asked how many hours of their screen-time was for either social or recreational purposes. Pre-COVID, 43.92% spent less than 2 hours each day using technology for socialization / recreation, with only 1.23% spending over 10 hours daily. Post-COVID, 7.41% of respondents had over 10 hours screen-time, with students again being more likely to have higher screen-time overall (see Figure 4). Comparing this to Figure 1 where 35.63% of people have more than 10 hours of screen-time daily, it shows that the majority of those with high technology usage are not spending all of their time for social or recreational purposes. Respondents were then asked a series of questions to further explore the purpose behind their technology usage.

Screen-time activities were broken down into Necessary Tasks (such as school or work), Socialization (texting, instant-messaging, social media, etc.), and Recreation (television shows, video games, web-browsing, etc.), as depicted in Figure 5**.** The survey asked which of these three activities expended the majority of their daily screen-time. Prior to the advent of COVID-19, 30.69% selected Recreation and 47.44% selected Necessary Tasks. The student responses consisted of a lower percentage using technology for Necessary Tasks, and higher for both Recreation and Socialization. Post-COVID, we can see a significant increase for Necessary Tasks, with students sharing the same trend as previously observed (see Figure 6).

Screen-Time Majority Activity

	Pre-COVID	Post-COVID	Percent Change
Recreation	174	78	-16.93%
Socialization	124	62	-10.93%
Necessary Tasks	269	427	27.87%

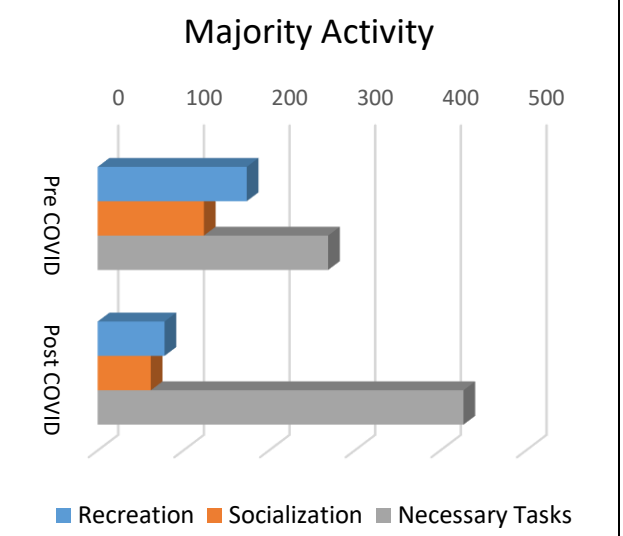


Figure 5

Attitudes Towards Activities

Perceptions of one's own technology usage can be enlightening regarding the nature of the specific addiction. In [6] a detailed study was undertaken regarding subjects' self-perception of whether their level of smartphone use represented addiction.

The goal was to find a cutoff point to distinguish between addicted and non-addicted individuals. This study, carried out over individuals over the age of 17 at the University of Valencia, defined a perceived addiction as a *propensity of a person to report feelings of deregulation and a compulsive device use*.

In this research we did not define the term, rather we merely asked respondents to select if they felt their technology usage was Minimal, Appropriate, or Excessive

Student
Screen-Time Majority Activity

	Pre-COVID	Post-COVID	Percent Change
Recreation	164	72	-22.89%
Socialization	117	56	-15.17%
Necessary Tasks	121	274	38.06%

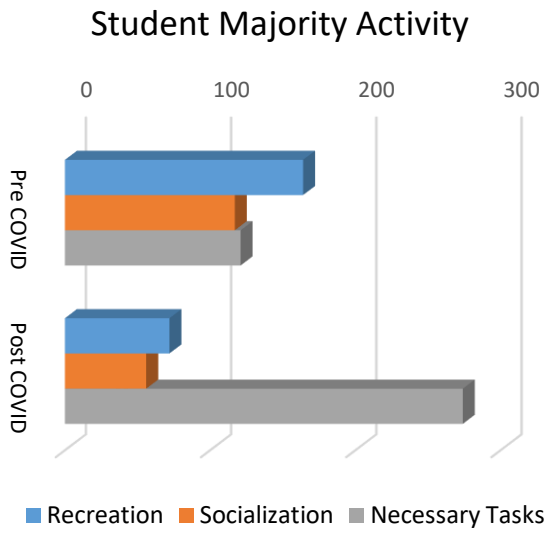


Figure 6

Attitude Towards Technology Usage
For Necessary Tasks

	Pre-COVID	Post-COVID	Percent Change
Minimal	68	5	-11.11%
Appropriate	465	237	-40.21%
Excessive	34	325	51.32%

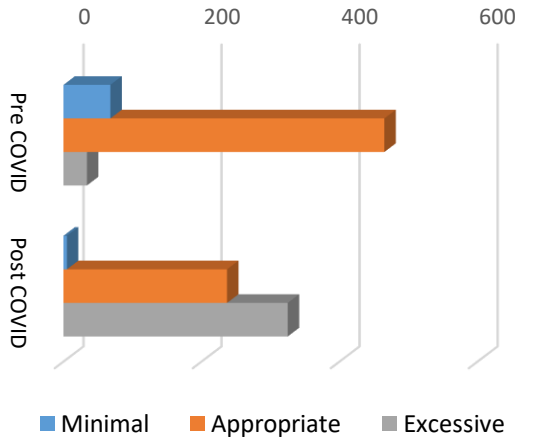


Figure 7

Student Attitude Towards Technology Usage
For Necessary Tasks

	Pre-COVID	Post-COVID	Percent Change
Minimal	58	4	-13.43%
Appropriate	320	150	-42.29%
Excessive	24	248	55.72%

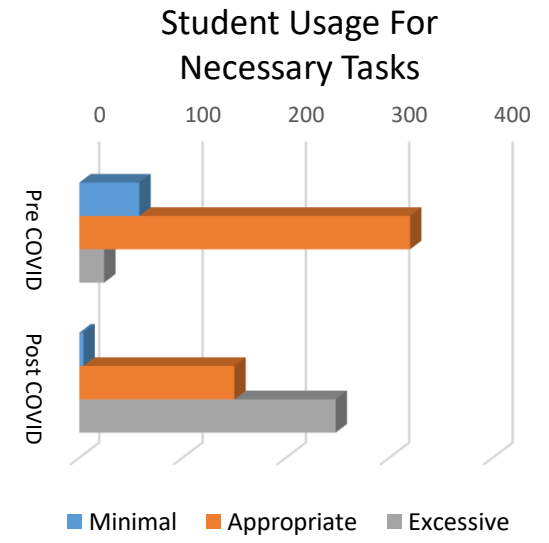


Figure 8

for each activity. Pre-COVID, 82.01% reported that they believed their technology usage to be Appropriate, and only 6.00% felt as if it was Excessive. Post-COVID, the Appropriate level of usage dropped to 41.80%, with Excessive usage increasing to 57.32% (see Figure 7).

Students were more likely to feel as if their technology use was excessive compared to the overall results, as shown in Figure 8.

Similar trends can be seen for the next set of questions regarding the respondents' feelings on their technology usage for Socialization and Recreation (see Figure 9). Overall, the COVID-19 pandemic has shown an increased likelihood for respondents to believe their technology usage to be Excessive.

Attitudes Towards Screen-Time

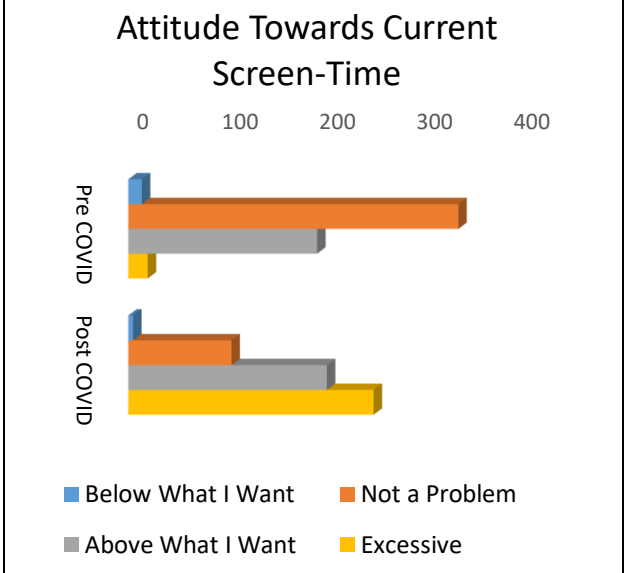
The next set of questions involves participants' attitudes towards their amount of screen-time. Pre-COVID, 59.79% felt as if their screen time was not a problem, which decreased to 18.69% post-COVID who felt this way. Post-COVID, there is a 40.92% increase of respondents feeling as if their screen-time is excessive, and only 18.69% feel as if their screen-time is not a problem. Additionally, 25.98% believe that their current screen time does not merit any concern, with the remainder selecting either "I would like to decrease my screen time" or "I need to decrease my

	Attitude Towards Technology Usage For Socialization			*Attitude Towards Technology Usage For Recreation*		
	Pre-COVID	**Post-COVID**	**Percent Change**	**Pre-COVID**	**Post-COVID**	**Percent Change**
Minimal	247	109	-24.34%	179	98	-14.29%
Appropriate	291	272	-3.35%	303	239	-11.29%
Excessive	29	186	27.69%	85	230	25.57%

Figure 9

Which Best Describes Your Screen-Time?

	Pre-COVID	**Post-COVID**	**Percent Change**
Below What I Want	14	5	-1.59%
Not a Problem	339	106	-41.09%
Above What I Want	194	204	1.76%
Excessive	20	252	40.92%



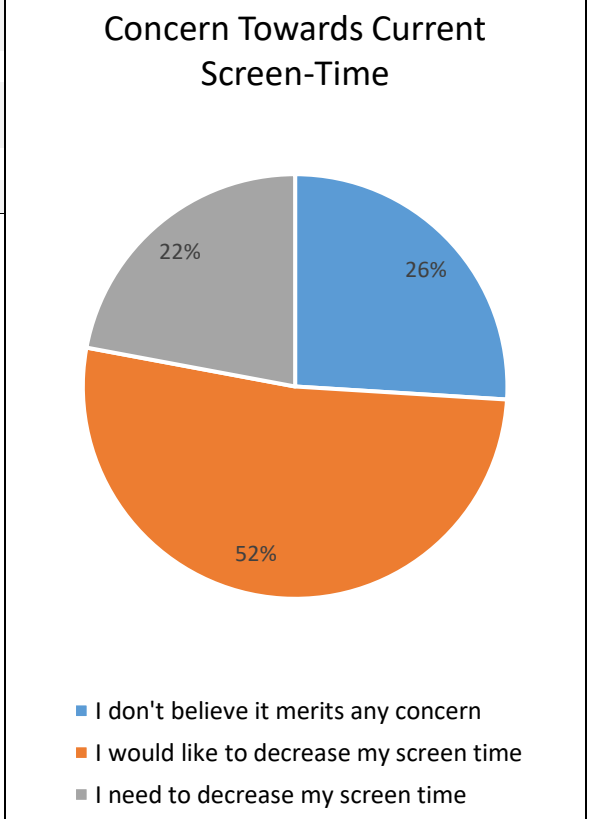


Figure 10

screen time" (see Figure 10).

When asked if anyone has ever expressed a concern to them regarding their screen-time, 21% of respondents said "Yes". They were then asked if they had previously taken any action in an attempt to decrease their screen-time. 75% of respondents reported they had tried to decrease their screen-time, either independently or through outside help. The vast majority made an effort on their own, with only 1.4% of participants consulting somebody (such as a family member, friend, or professional therapist). Out of those who believed their screen-time warranted concern or had someone express to them a concern regarding screen-time, only 25% considered any efforts taken to be permanently successful. 62% believed their efforts to be successful for a limited time, with the remaining 13% being completely unsuccessful, depicted in Figure 11. Although many respondents have concerns about the amount of time they spend using technology, they are usually unable to permanently take action to reduce it. This tends to imply that excessive technology usage is a common problem, and while there is certainly much evidence to support this supposition in the literature, delving into this area is outside the intended scope of this work.

Smartphone Usage

A possible indicator of technology addiction is a compulsion to access devices such a smartphone. In order to determine if participants may have a compulsion to check their device, they were asked about their smartphone usage during participation in social events with others: at a restaurant and at a movie/concert. A small percentage of

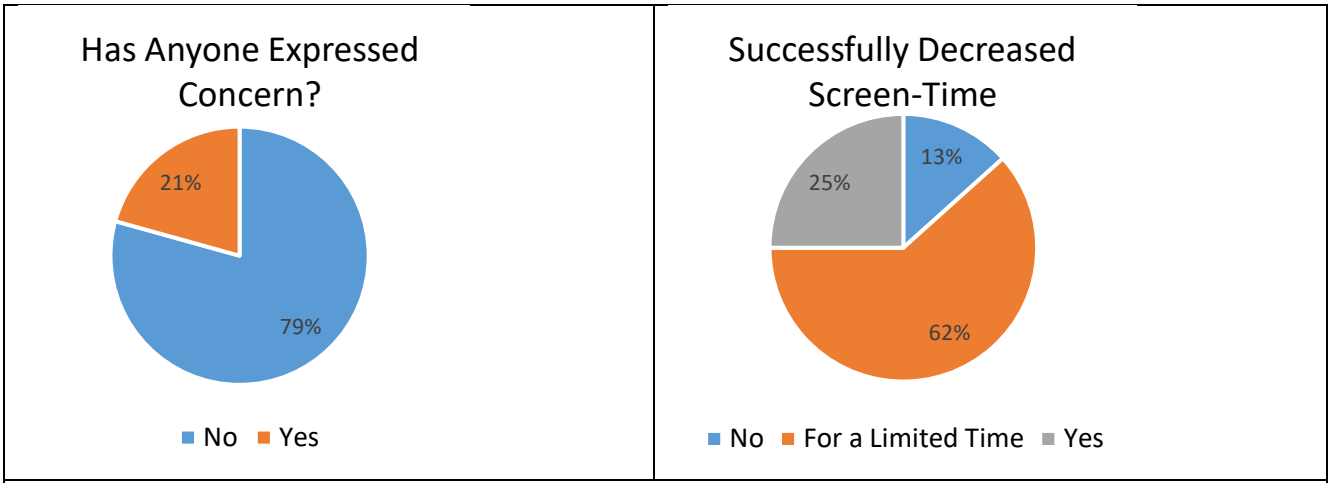


Figure 11

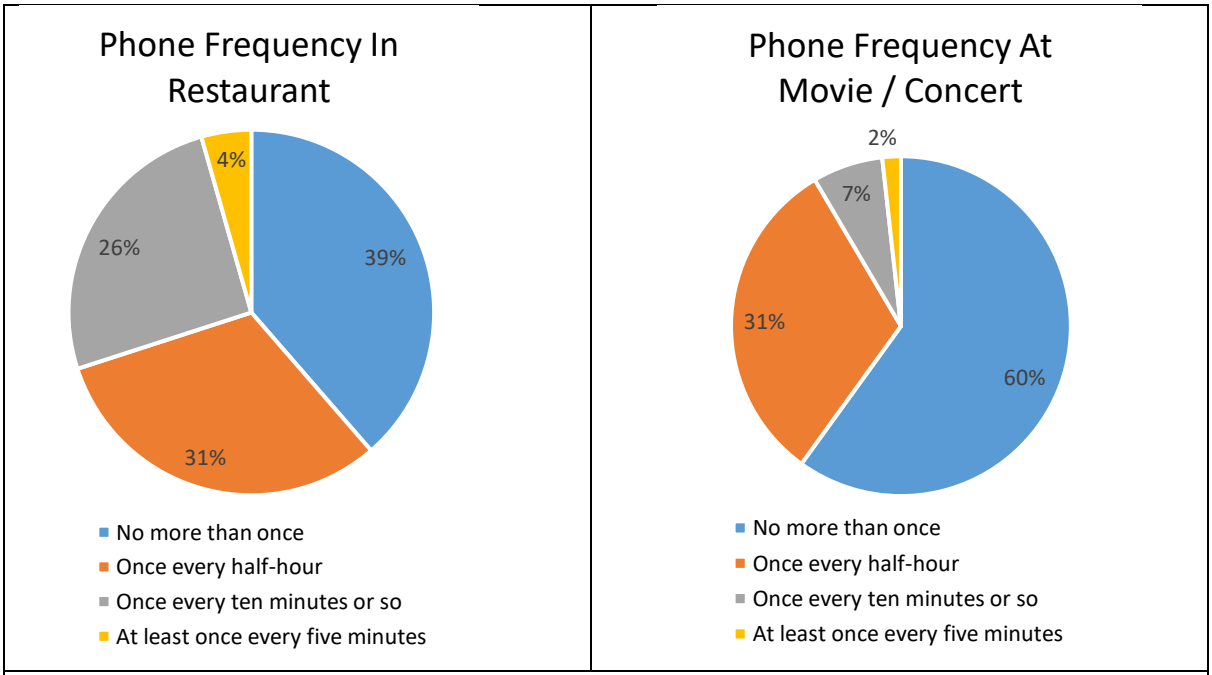


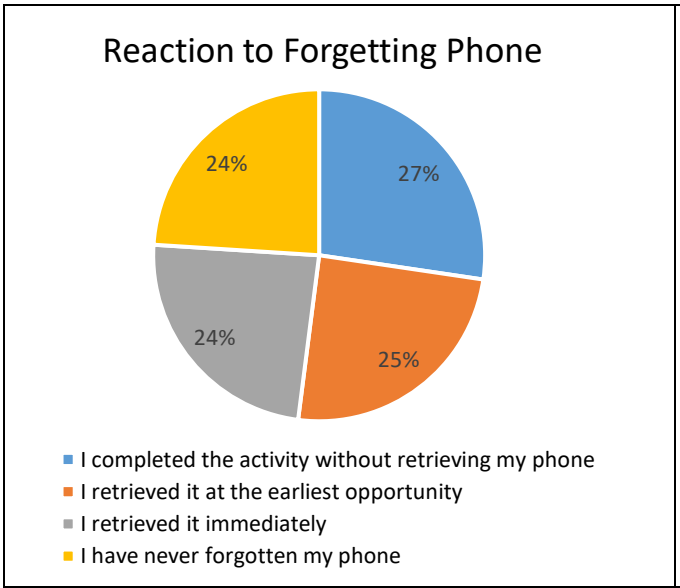
Figure 12

respondents check their phone at least once every five minutes if they are at one of these events (see Figure 12).

When asked "If you have ever left your home/dorm and neglected to bring your phone, how did you react?", 24% reported never forgetting their phone and 49% choose to go back and retrieve their device. Additionally, 42% of respondents reported that they will occasionally or commonly choose to decline an event in person in favor of engaging in a recreational or social screen-time activity (see Figure 13). These results show that even during face-to-face social events, many people prefer to maintain access to their technological devices; in a significant number of cases, screen-time becomes a replacement for these social events.

4. Study Comparison

The aforementioned study conducted by [3] used a sample size of 200 in the age group of 31-40 years. It is also important to note that the study took place in India in response to a 70-day lockdown which started on March 11th, 2020, and asked their participants about "internet use", which may not include all aspects of technology usage. They reported 33% of participants spending more than 4 hours per day online and 28% spending less than 2 hours (see Figure 14). Our study at Kutztown University showed 35.63% of participants with more than 10 hours of screen-time and only 2.12% had less than 2 hours of daily screen-time. They also state that 42% of participants reported no harmful effects of internet use, and 79% felt as if they had self-control over their internet usage. 18%



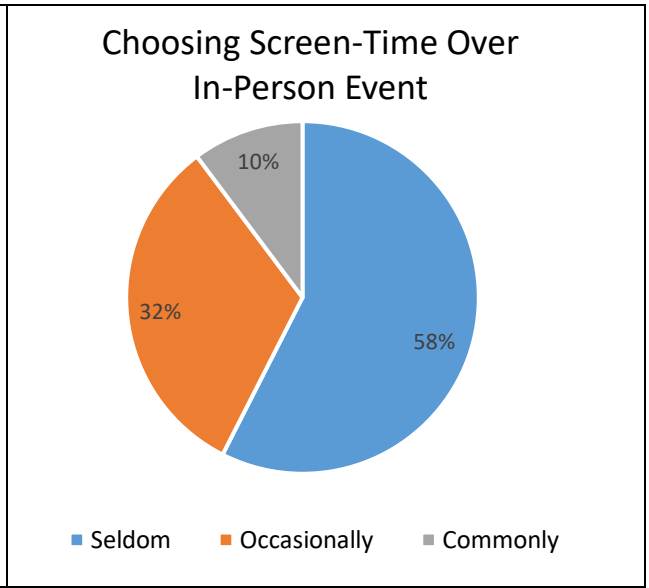


Figure 13

reported that they did not engage in any recreational activities besides internet use during lockdown, and only 43% could definitively say they did not believe they were addicted to the internet as depicted in Figure 15.

Time spent online (other than work/ academic purpose)		
Hours/day	**Number of Participants**	**% wise distribution**
<2	56	28%
2-3	46	23%
3-4	32	16%
>4	66	33%

Figure 14

Possible reasons for these differences between the two studies include the fact that this study took place in February 2021, nearly a year after the [3] study. Social distancing orders have been in place for much longer now, which could exaggerate COVID-19's effect on technology usage.

Also, the Mehta study [3] involves a younger age range of participants, and the comparison of student and faculty data shows that students use technology at a higher rate. Cultural differences may also account for the disparity between the two studies (such as our pre-COVID daily screen-time being much higher than that found by Mehta's internet usage during lockdown), including each nation's response to the COVID-19 pandemic.

IV. Conclusion

Technology addiction is recognized among other significant maladies interfering with many lives. The authors undertook a study whose goal was to identify trends among a specific population. While the focus was the effect of COVID-19 restrictions that required technological tools to maintain contact with many aspects of society, other information of interest was also uncovered.

Clearly, since the advent of COVID-19, there has been a large increase in screen-time and technology usage for most people. Technology is being used to accomplish necessary functions such as school and job-related tasks. In addition to necessary tasks, technology utilized for socialization and recreation saw new dependence among all with access to technology as a result of lockdowns and

	Harmful Effects Experienced			*Self-Control*		*Other recreational activities*	
	Yes	**No**	**Maybe**	**Yes**	**No**	**Yes**	**No**
Number of Participants	62	84	54	158	42	164	36
% wise distribution	31%	42%	27%	79%	21%	82%	18%

Figure 15

other societal restrictions during the pandemic. This is not concerning in and of itself, however substituting in-person interactions with digital ones appears to have exacerbated excessive dependence on this technology. This has in turn led to heightened addiction to technology that will likely make it harder to "go back to normal" once the effects of COVID-19 have dissipated.

Of particular interest is respondents' concerns about their own screen-time. An examination of whether there is a correlation between recognition of one's own addictive behavior between individuals suffering different addictions. Possibly it would involve determining a measure to quantify individuals' level of denial of their own issues.

Further study is certainly warranted to determine correlation of susceptibility to addictive behavior where an aspect of the malady cannot be avoided, e.g. having to attend Zoom meeting on the same device where game playing is available and has manifested itself into addictive behavior. The responses we received tend to imply that many respondents could possibly develop an addiction to technology in the future. While the numbers of individuals reaching out to others for help was low, as would be expected, individuals' recognition of their own issues leaves room to be optimistic that they would seek help at higher rates than those with other common addictions.

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