Mitigation Strategies to Combat Social Media Addiction Using a Personalized

Habit-Driven Model

by

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Table of Contents

List of Figures

List of Appendices

Abstract

This thesis explores social media addiction through the lens of a habit-driven model, specifically the habit loop. The habit loop can help change harmful habits into positive ones successfully; it is driven by a craving and consists of three components: cue, routine, and reward. Previous research showed that the routine and reward for social media addiction were social media usage and feelings of satisfaction from dopamine surges in the brain, respectively. However, the cues and cravings for social media addiction had not been studied before. Thus, three research questions were formed: i) what are common cues that trigger users to enter the cycle of social media addiction? ii) what drives the continuous cycle of social media addiction? and iii) can habit-driven mitigation strategies be proposed to help users manage their social media? To answer these questions, 11 participants, between the ages of 18-28, were recruited to complete a 4-day diary study documenting their social media habits with the addition of supplemental surveys. Additionally, three participants, who are not current social media users, were recruited to fill out a survey asking questions about their experience without social media. A mix of quantitative and qualitative data were collected and analyzed via descriptive statistics and coded into analysis diagrams, respectively. Our results highlighted common cues that users share which included boredom, laying in bed, and notifications; cravings which included entertainment, numbness, and the Fear Of Missing Out (FOMO). These were used to propose and design a low-fidelity prototype application that can be further tested in future studies.

Chapter 1: Introduction

1.1 The Origin of Social Media

The desire for human beings to connect is innate and essential to their psychological well-being (Li et al., 2021). Social media is an avenue in which humans can fulfill this need, via social networking, especially with like-minded individuals. The earliest goal of social media complements this need by allowing users to connect with each other and dates back to 1997 with the first recognized social media platform, SixDegrees (Ortiz-Ospina & Roser, 2023). Since then, social media has advanced and increased in popularity. In 2023, it is reported that 4.9 billion people utilize social media, that is about 60.49% of the global population (Shewale, 2024). It is projected that this number will only increase in the future, with almost 6 billion people in 2027 (Number of Worldwide Social Network Users 2027, n.d.).

The many uses of social media include connecting with friends and family, learning new hobbies and skills, marketing new business endeavors, and catching up on local and international news. The current medium of social media is multi-purposeful which is advantageous because it allows for increased usership and engagement from a wider audience. Different social media platforms that are currently popular among users include *Facebook*, *X* (formally known as *'Twitter'*), *YouTube*, *Instagram*, and *TikTok*. These platforms allow users to post and engage in content in the form of writings, pictures, and videos.

Social media usage has risen dramatically in recent years because of the COVID-19 pandemic in 2019 (Venegas-Vera et al., 2020). During this time period, because the routine of daily life changed for many people globally as a result of government mandated shutdowns,

1

people's social media habits also changed. While social media helped users receive information quickly in easy to read infographics and feel less alone during the time period where people were forced to stay home, it also helped spread misinformation from incredible sources and increased excessive usage amongst users (Venegas-Vera et al., 2020). On the other hand, in times of war, social media has been known to help amplify the voices of the oppressed through posts by independent journalists and civilian documentation, which was a previously denied privilege by state and western news outlets (Howard & Hussain, 2013). In 2023, social media succeeded in educating users on the genocide in Gaza, Palestine because of documentation posted by Palestinian journalists, whose voices were previously censored by mainstream media sources (Hailey, 2024). The use of social media isn't the primary issue, the excessive use of social media is.

The excessive use of social media is a growing problem that needs immediate attention. It is proven to have harmful consequences to the personal, professional, and social functioning of users (Cataldo et al., 2022). The excessive use of social media is more commonly known in clinical settings as Problematic Use of Social Media (PUSM), and is likened with addict-like behaviors (Cataldo et al., 2022). Griffith's addiction model is a widely recognized method of defining addiction (Bhargava & Velasquez, 2021). To measure PUSM, the Bergen Social Media Scale (BSMAS) is the most accurate and commonly used tool (Zarate et al., 2023). BSMAS has six distinct categories to classify addiction levels based on Griffin's model: salience, mood modification, tolerance, withdrawal, conflict, and relapse (Luo et al., 2021). It is estimated that an average of 210 million users globally have social media addiction in 2017 (Longstreet & Brooks, 2017); this number has only increased today.

Social media platforms are purposely designed to be addicting for users. Platforms benefit from increased usership because it increases the total revenue they can accumulate from selling advertisements and selling user data (Bhargava & Velasquez, 2021). The business side of social media thrives on keeping users on their respective platforms for as long as possible despite the negative consequences that can transpire from excessive use by utilizing the attention-economy business model (Bhargava & Velasquez, 2021). This business model's strategy preys on the behavior disorder of addiction with methods inspired by gambling addiction that influence decision-making by using classical and operant conditioning, cognitive biases, and dopamine signals (Bhargava & Velasquez, 2021). Social media companies are primarily to blame in purposefully perpetrating social media addiction in its users.

The importance of understanding social media addiction is essential in exploring how to create mitigation strategies to help lessen the impact of harmful mental, emotional, and physical health issues on users. Feelings of FOMO (fear of missing out) are associated with increased sensitivity to negative emotional symptoms that can trigger social media addiction in adolescents (Fabris et al., 2020). Depression and anxiety are the two most common symptoms associated with excessive social media use (Alonzo et al., 2021). Doom scrolling is strongly associated with depression, a habit that was amplified in users during the COVID-19 pandemic (Sharma et al., 2022). Spending extended periods of time viewing content by influencers with edited images of impossible body standards can cause users, especially young adolescents, to develop body dysmorphia which can then lead them to develop fatal eating disorders (Rizwan et al., 2022). Many social media users are also less likely to take risks and develop romantic relationships (Bouffard et al., 2022). Additional symptoms include the development of fatigue, reduced attention span, social anxiety, and suicidal ideations (Nussenbaum, n.d.). Social media addiction

is a growing phenomenon that poses paramount consequences on users worldwide. Expunging social media is not a plausible solution because while addiction is possible, social media supports users in education and social networking in a way that isn't attainable elsewhere.

1.2 Thesis Objective

The best method to understand how to help users, who have already developed a social media addiction, navigate social media's benefits without procuring its harmful effects, is unraveling the intricacies of addiction habit formation. Previous studies have already proven the positive correlation associated with excessive social media usage and its consequences that negatively influence the daily lives of users, especially when the user is no longer able to control their social media usage transforming into addiction (Aydin et al., 2021)). Understanding addiction begins with unveiling the brain's role in habit formation. The purpose behind habit formation is to increase life's satisfaction by molding tasks into easy-to-complete components (Ramírez-Vizcaya & Froese, 2019). The human brain is designed to take the most effective and efficient approach when completing repetitive mundane chores, like the brushing of teeth in the morning (Duhigg, 2012). This reduces the mental effort necessary to complete low-level tasks, conserving energy for new, energy-demanding tasks. With enough repetitions, a task can be completed without conscious awareness and become almost automatic (Duhigg, 2012). In the world of habit formation, this is viewed as a positive evolutionary trait that allows humans to transcend in life in order to progress the future of civilization.

Unfortunately, the human brain cannot distinguish between positive and negative habits, and once habits become negative compulsive behaviors that are no longer within the realm of control, they are deemed addictive (Ramírez-Vizcaya & Froese, 2019). For many people, this is

the case for their social media usage. In "Building and Breaking Social Media Habits,"
researchers categorized and analyzed social media habits through five different levels: platform,
device, interface, behavior, and motor (Bayer et al., 2022). They explained how social media
usage relies on habit formation and is described as 'addictive' when its usage does not coincide
with the user's situational goals (Bayer et al., 2022). This research concluded that the same social
media platform can produce both prosocial (positive) and problematic (negative) habits in users
(Bayer et al., 2022). This was discovered by digitally tracking component parts and cognitive
pathways via a multilevel approach to help understand how users can reflect and rewire their
negative habits (Bayer et al., 2022).

Thus, the questions arise, how can the elimination of problematic habits help users use
social media for its prosocial benefits? How can users navigate and utilize social media platforms
responsibly? Fortunately, habit-driven designs are viewed as a potential successful solution in
helping to rewire social media users' addictive habits (Bayer et al., 2022). To build upon this
momentum, this thesis delves deeper into habit formation and habit transformation to understand
the best mitigation strategies to combat the new growing epidemic of social media addiction

Chapter 2: Background

2.1 Habits and Addiction

2.1.1   Dopamine's Role in Habit Formation

To understand habit formation, it is essential to first understand the mechanism behind it. The science behind social media addiction revolves around the mesolimbic reward system (Wadsley et al., 2022). The mesolimbic reward system is a dopamine system that influences feelings of motivation and emotions of satisfaction and pleasure (Salamone et al., 2016). The positive feelings associated with dopamine tell the brain to repeat the action to further increase its positive effects, almost working in a positive feedback loop (Macit et al., 2018). The cycle of a positive feedback loop is never-ending and, despite its name, can be harmful when the cycle is affixed to a negative habit, like social media addiction.

The brain is both a very powerful and highly malleable instrument in the human body. This can be problematic when the brain becomes accustomed to a negative habit that is harmful. Unfortunately, the mesolimbic reward system cannot differentiate between positive and negative habits because they can both produce the same positive feelings that the brain craves with the release of dopamine (Salamone et al., 2016). The brain's craving of dopamine is the driving power for the repetition of actions, habits, which can cause physical changes to the neurological connectivity pathways in the brain, a phenomenon known as neural plasticity (National Institute on Drug Abuse, n.d.). Habits are complex and intricate; they influence the web of psychological, behavioral, and physical entities in the human body.

The repetition of an action caused by dopamine surges eventually transpires it to become an automatic, subconscious habit. The mental activity required to accomplish a habit decreases with each repetition until the brain's decision-making center eventually no longer needs to contribute to successfully accomplish the activity; habits are stored in the basal ganglia, which becomes the only part of the brain that is activated when a habit is conspired (Duhigg, 2012). For positive habits, this is beneficial in order to ensure certain behaviors remain consistent and run efficiently in our daily lives (Mendelsohn, 2019). When these habits become subconscious, they remove the need for the body to expend unnecessary energy into making decisions for simple everyday tasks (Mendelsohn, 2019). This system works because it is efficient and allows for the opportunity to dedicate more mental energy towards new complex decision-making tasks (Mendelsohn, 2019). In our not so perfect world, negative habits can result in more harm than good by limiting our ability to succeed in important tasks by creating impassable obstacles that we cannot navigate, and only awaken when it's too late. To control the uncontrollable, it is necessary to understand how habit formation works behaviorally in a way that is visually manageable.

2.1.2 Habit Formation: The Habit Loop

A large chunk of a person's day is dominated by habitual actions, almost 40% to be exact; these habits are void of any decision-making process and are automatic in nature (Duhigg, 2012). These habits encompass 'low-energy spending' actions that take the 'path of least resistance,' like checking your email first thing in the morning or drinking a cup of coffee after brushing your teeth (Duhigg, 2012). Once habits are formed they are easy to maintain because our bodies have memorized when and how to conduct the action; this makes positive habits feel

like superpowers and negative habits feel like curses. The habit loop can help to understand how habits are triggered and maintained over long periods of time.
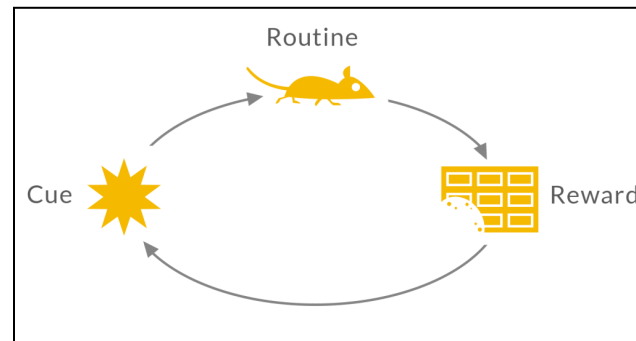
Figure 1: The habit loop (Duhigg, 2012)

The habit loop is composed of three main components: cue, routine, and reward (Duhigg, 2012). The cue is essentially the trigger that tells your brain to conduct the action (routine). The reward is the end-product that is received after the action is completed. Rewards are usually positive and produce dopamine surges in the brain, which is why the body is programmed to look for the same cue again in the future. This causes a sense of craving in users which ensures the habit loop's infinite cycle (Duhigg 2012). For social media addiction, the routine is using the application and the reward is a dopamine surge resulting in a feeling of satisfaction. Unfortunately, the cue is not so obvious and can be different for everybody. Cues can be physical (waking up in the morning), or behavioral (feeling bored). Interestingly, cues are sufficient enough to immediately trigger an automatic response (Mendelsohn, 2019). For this reason, the body involuntarily completes the action without a conscious decision from the brain. When this happens with a negative habit, like social media addiction, many users find themselves scrolling through the application without remembering when or why they opened the application in the

first place. The line between habits and addictions is very fine and many times hard to distinguish between without concrete definitions.

2.1.3   When a Habit Becomes an Addiction

The issue with addiction is in its compulsive nature that leaves a person feeling regretful, yet can keep them permanently tethered to repeat the same actions regardless (Courtwright, 2019). Behavioral addictions, like social media addiction, show similar physical changes in the brain as substance-use addiction, in addition to similar physical symptoms of craving, intoxication, and withdrawal (Courtwright, 2019). Many people prefer to avoid the word 'addiction' because of its intimidating nature, but the reality of the situation indicates that excessive social media usage is subconscious, impulsive, and harmful- all terms that lead to the universally accepted definition of 'addiction.' Nevertheless, this acknowledgement should not rake users with shame because the fault lies with social media founders and engineers who purposefully designed their applications to be addicting to users (Bayer et al., 2022).

Once social media usage becomes second nature, the dopamine reward system is activated and the user learns to expect its reward when only experiencing the cue (Macit et al., 2018). If the action does not follow the cue and the reward is not actually received, dopamine levels drop causing feelings of dissatisfaction and symptoms of withdrawal (Macit et al., 2018). The baseline for dopamine is vulnerable and ever changing depending on the type of habits a person supplies in their daily life. This is why it is especially important for people to be consciously aware of addictive habits that plague their time to ensure a higher quality of life satisfaction.

Additionally, because the baseline for dopamine is so fickle, addictive habits need to always be consumed in higher degrees to increase the level of dopamine in the brain's reward

center; when an addictive habit becomes autonomous, each increase of dopamine release becomes the new baseline that needs to be competed against (National Institute on Drug Abuse, n.d.). This phenomenon is known as 'tolerance' and breeds a more permanent addiction (National Institute on Drug Abuse, n.d.). This never-ending cycle is why the habit loop is described specifically as a loop. Overtime, as the habit becomes more automatic and both its cue and reward become more prominent, a sense of anticipation and craving associated heavily with addiction flourishes (Duhigg, 2012). These are the same characteristics associated with long-term social media usage. Unfortunately, once an action becomes an addictive habit, it is impossible to permanently eliminate it (Duhigg, 2012).

2.1.4   Changing Old Habits

It is virtually impossible to permanently eliminate habits once they've already formed, but old habits can be overshadowed by new habits (Duhigg, 2012). Brain scans reveal that once a new habit is formed, the impulse for the new habit shows up visibly stronger and, thus, is able to override an old habit (Duhigg, 2012). Two key factors are essential for formulating a radically new habit: focusing on a singular goal and then putting in the work to accomplish it with conscious effort (Duhigg, 2012). Alongside conscious effort, behavioral inhibition, self-discipline, and conscious commitment are important characteristics to embody and implement (Duhigg, 2012). Building a new beneficial habit to do in place of social media usage can help curb the number of hours spent scrolling aimlessly on the applications. Alas, it is not an easy endeavor.

The simplification of goals to a singular target allows the individual to dedicate the majority of their mental energy to it because conscious decision-making can be mentally taxing with the formation of a new habit. When an individual focuses on trying to accomplish many

different goals at the same time, they are less likely to be successful. Additionally, the formation of a singular positive, new habit can cause a domino effect that creates even more positive new habits (Duhigg, 2012). For example, building the habit of exercising 4 days a week can lead to a better sleep schedule, which can lead to better eating habits, which can lead to weight loss, and then feeling more energized to work harder in school.

While initiating new habits are proven to help users reduce past harmful habits, it can be beneficial to take steps to also reduce the probability of the old habits from reoccurring. Accessibility is a major deciding factor that determines a person's ability to complete a habit successfully (Meurisse, 2021). If you increase the number of steps it takes to accomplish a goal, you are less likely to do it (Meurisse, 2021). For example, having to log into your social media account every single time you want to use it might make you less likely to continue the negative habit of addiction. The additional step of logging in allows your brain to consciously understand the action it is doing and gives it the opportunity to decide whether it wants to continue the routine. Sometimes the simple fact of your social media account already being logged in every time you open the application makes it so much easier to fall into the cycle of addiction.

Through the lens of the habit loop, the methodology utilized to change old habits is by creating a new routine with the same old cue and reward (Duhigg, 2012). This is beneficial because it provides a quick way to develop new habits by revising old habits, instead of trying to start from scratch. This has been previously successfully accomplished with individuals who had an alcohol addiction (Duhigg, 2012).
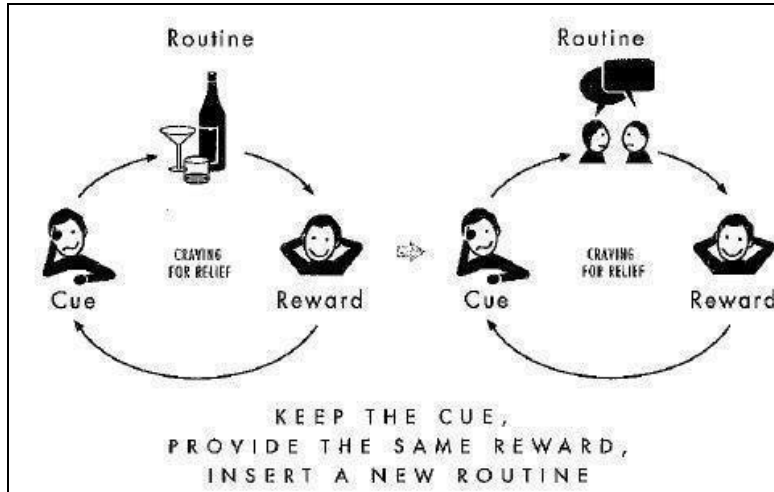
Figure 2: Changing the routine within a habit loop, example: alcohol addiction (Duhigg, 2012)

The trick is to target the routine component of the habit loop after recognizing the cue. Once the individual becomes consciously aware of their addiction's cue, they can purposely implement another routine that will produce the same reward. For alcoholics, the routine of drinking is commonly traded for talking with a sponsor to produce the same reward of relief, which is the craving that drives the entire habit loop.

Developing mitigation strategies to help users eliminate their social media addiction by helping them make conscious decisions and substitute it with other healthy habits is the purpose of this study. This can be accomplished by developing common habit loops specific to social media addiction. It is understood that the routine for social media addiction is excessive social media usage and the reward is the feeling of satisfaction caused by a dopamine surge. The missing pieces are understanding the common cues that trigger users to use social media in the first place and the cravings drive the continuous cycle of social media addiction.
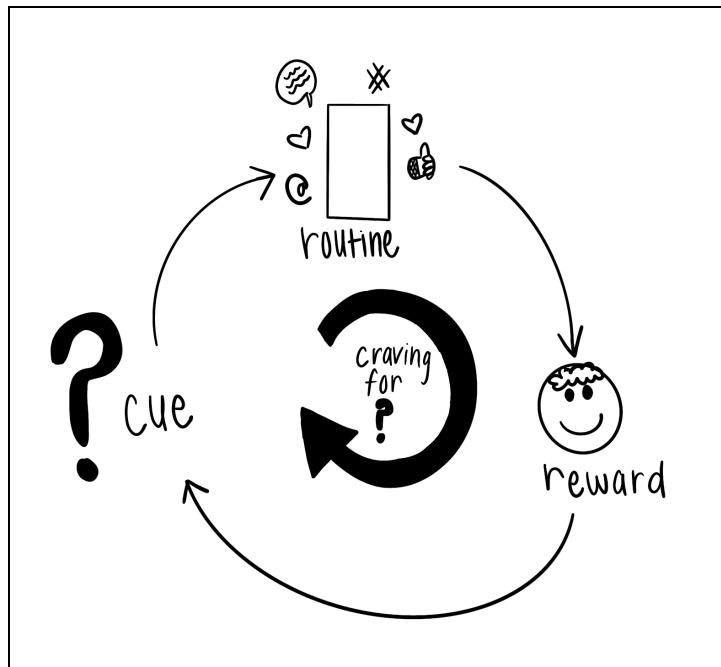
Figure 3: Social media addiction habit loop

2.2 Available Mitigation Strategies

There are currently phone applications available that are aimed towards helping users reduce their overall screen time. Many of these applications work by allowing users to block other applications and websites, including social media platforms. Fortunately, some of these appl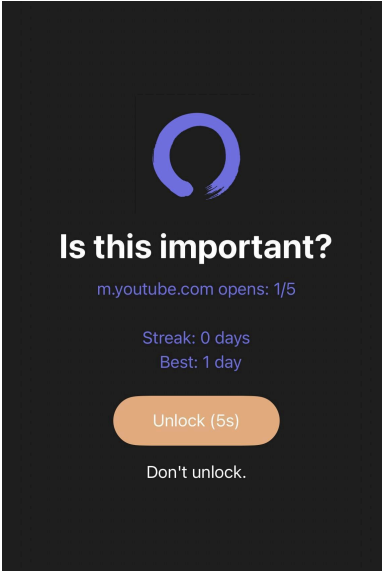ications have garnered success by helping users reduce their screen time, but many others are not successful because of their many usability issues.

Table 1: Available social media applications that aim to help users combat social media addiction.

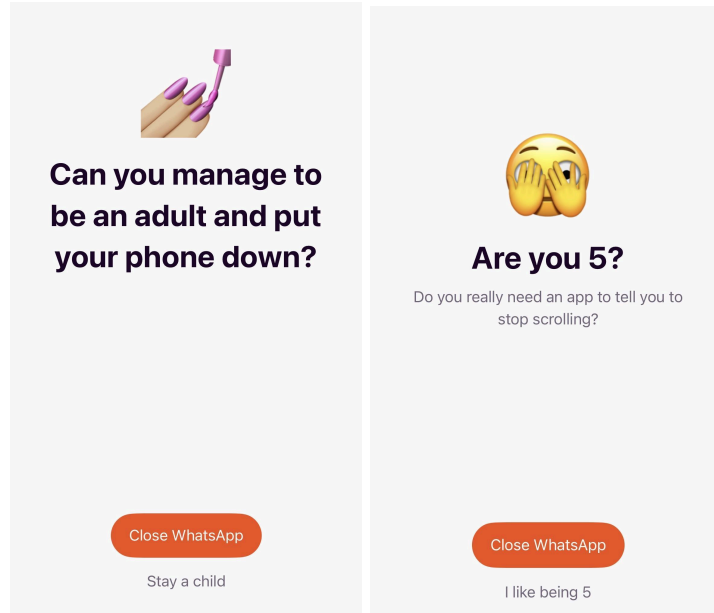| Phone Application	Description	Usability
WellSpent	Wellspent aims to remind its users when they are doom scrolling. The application's goal is to find a new solution, one that does not revolve around limiting or blocking applications. This is accomplished by setting up nudge timers by users for when they access specific applications. For example, a nudge timer may be set for every 3 minutes on *Instagram*.	The free version of the application can only set up a total of 6 applications. Utilizes negative language (positive punishment) by informing users how much of their lifetime is spent using their phone based on their screen time. Example: "You're on track to spend 4.5 years in your life mindlessly scrolling on your phone. That's 10% of your waking hours." This is what the app claims based on a 4-5 hour daily screen time (the global average). Users can choose how they want the application to "talk" to them. Options include reflective, friendly, roast, fun, hype, authoritative, and educational. The application gives users an estimation of what their average screen time will look like in a month after using the application.
One Sec	OneSec aims to remind users to stay mindful when using their phone. The application provides users with a notification that reminds them to be mindful and breath when using certain specified applications.	The free version of the app has limited features. Utilizes positive language by informing users how much time they will save after using the app. Example: "Users save one hour everyday- that's 2 weeks per year!" The application provides a tutorial to help users navigate the app.

Opal	Opal helps users by allowing them to set up personalized timers/schedules to specify when applications should be locked throughout the day. Users are rewarded gems for accomplishing different milestones, like using Opal for 2 days or focusing for 50 hours. The application has a "Session Time Leaderboard" that showcases the top 10 users globally that had the most session time in the past 24 hours. Also, there is a "Community Board" where users can chat with other users and read Opal news.	Opal is not very user-friendly. It is difficult to navigate. It is difficult to discern between Opal and Opal premium. Opal allows users the opportunity to collect gems as a reward system, but the purpose behind collecting them is uncertain. It uses a mix of positive and negative language. Users are informed how much time they'll waste using their phone in their lifetime, but this information is followed up with the app's ability to help reduce this time quickly. The free version of the application allows users to set up only 3 applications to block.
ScreenZen	ScreenZen forces users to pause and reflect while using specified applications and websites. ScreenZen unlocks applications/websites after a designated pause time by using an initial pause screen. Users set up limits where ScreenZen will lock the application/website after a specific time. Users set up goals for how many times they want to open a specific application/website per day. This can be set up as strict which will not allow users to exceed their daily opens. Users can also set up a schedule if they want with specified time frames for when to enable ScreenZen.	Users can choose up to 49 applications and 49 websites to set up. Users can personalize the pause screen. Options include, "Is this important? Check this later? Wait till Monday? Is this a good time? Why am I checking? How long will I check? Take a deep breath. Relax your shoulders." Users can also personalize time limits and the number of times they can open a specific application per day. Pause screen also shows the user's "Streak" and "Best" in regards to how many days they were able to meet their goal. Color scheme is simple.

| ClearSpace: Reduce Screen Time | ClearSpace aims to help users reduce their screen time by restricting applications.

Users can set up a "budget" for how many times they're allowed to open an application, a "session length" to limit how long they're allowed to be on an application, and a "breathe screen" to set up how long they want to do a breathing exercise for before opening the application.

To complete the breathing exercise users press on a notification and are redirected to the ClearSpace app. | The application does not have the feature to restrict websites.

Application is easy to navigate.

The breathing exercise forces users to be intentional with their social media uses which reduces unconscious use.

Users are shown an inspirational quote after completing the breathing exercise to reduce their motivation of using the restricted application. |

Is this important?

m.youtube.com opens: 1/5

Streak: 0 days
Best: 1 day

Unlock (5s)

Don't unlock.

Figure 4: ScreenZen

Figure 5: WellSpent (using the option "roast")

These are notification based applications and while they can be beneficial in reducing screen time by creating conscious awareness in users, they do not encourage users to reflect deeply on their social media habits and what triggers them. Past research shows that media consumption is more impactful based on habit strength, rather than conscious intentions (Wohn, 2012). Conscious awareness is the first step in addressing negative habits, but it does not seem to be enough to help users change their habits long-term. This is because habits are a three part system: cue, routine, and reward. The current available applications aim to restrict social media application usage, which targets the routine component of the habit loop. This means users are not receiving the reward, the component that satisfies the craving for wanting to use social media in the first place. This may be the reason why many users relapse and are not successfully able to control their social media usage long-term. This thesis addresses this weakness by studying and understanding the common cues that trigger social media addiction and the cravings that allow

the addiction to persist in users to develop mitigation strategies to help users to be in control of their habits long term.

Chapter 3: Methods

The habit loop is an effective strategy in understanding social media addiction by helping to recognize the cue, routine, and reward system that triggers users to enter its relentless cycle. Through literature review, it is understood that the routine for users with social media addiction is opening up and using a social media application. The reward is the satisfaction that users gain through a dopamine surge when using a social media application. The missing pieces are the cue (the feeling or action that initiates the habit cycle) and the craving (the feeling or action that ensures the habit cycle continues). Thus the questions arise, what are common cues that trigger users to enter the cycle of social media addiction in the first place? What drives the continuous cycle of social media addiction?

A diary study is the best method to recognize the specific cues that trigger social media addiction in young adults. This methodology allows participants to dictate the specificities of their social media usage habits. Additionally, to better understand social media habits, a survey was conducted and aimed towards users who currently do not have any social media accounts. The goal of this study is to understand and empathize with the target user, and develop a strategy to minimize negative social media usage in order to increase user satisfaction and overall positive use of social media applications.

3.1 Participants

3.1.1 Diary Study

Eleven participants, between the ages of 18 to 28 years old, who utilize social media on a daily basis, were recruited to participate in a four-day diary study. Before the start of the study, participants were given a consent form and notified they could withdraw at any point during the study without repercussions (see appendix A). Participants were also informed that their identity would remain entirely anonymous.

Only eight out of the eleven participants conducted the diary study in full. Three participants did not document their daily social media habits, but they did contribute in other aspects of the study by filling out the pre-study survey, the end-of-day surveys, and the post-study survey.

3.1.2 Users Without Social Media

Three participants, between the ages of 18 to 28 years old, who do not use social media were gathered to participate in a single survey. Prior to, participants were given a consent form, informed their identity would remain anonymous, and notified they could withdraw their responses after submission without any repercussions (see appendix A).

3.2 Procedure

3.1.1 Diary Study

Participants were first given a pre-study survey, via *Google Forms*, to gauge their awareness of their social media habits, screen time averages, daily/weekly schedules, and previously utilized self-control strategies related to social media usage (see appendix B1).

The study ran from Friday (March 8, 2024) to Monday (March 11, 2024). During the

study, participants were asked to write down every time they opened a social media application,

specifying the time, type of social media application, device they used, what they were doing

prior to opening the application, what their intentions were for opening the application, how long

they spent on the application, what they did on the application, and how they felt after using the

application. These questions were asked with the purpose of understanding common cues and

cravings of social media usage. It is essential to understand why users use their social media

applications and what they are doing prior to opening their social media application. A sample

guide was provided prior to the start of the study so participants could have an understanding of

how to formulate their study notes (see appendix B-2). They were given the option to dictate on a

Google Docs document, their *Notes* application, or *Google Forms* form.

At the end of each day, participants were given a survey asking them to rate their level of

satisfaction with their social media usage, whether they felt like they were making conscious

decisions on social media, their total social media usage, and whether they were unable to record

their social media usage at any point throughout the day (see appendix B3). These questions

were aimed to help aid in our understanding of the participants' notes from the diary study after

its completion. The intention was to gather more insights about their feelings and reactions to

their social media usage over the course of the four-day diary study period.

After the completion of the study, participants were also given a post-study survey that

asked them questions pertaining to the study and whether they learned anything about their social

media habits they hadn't previously noticed, if they were satisfied with their current social media

habits, and what, if anything, they wanted to change about their social media habits (see

appendix B4). Additionally, participants were asked to send screenshots of their daily screen

times and pickups from their phone's *Settings*. Pickups refer to the number of times a user

opened a specific application, whether it was seconds, minutes, or hours.
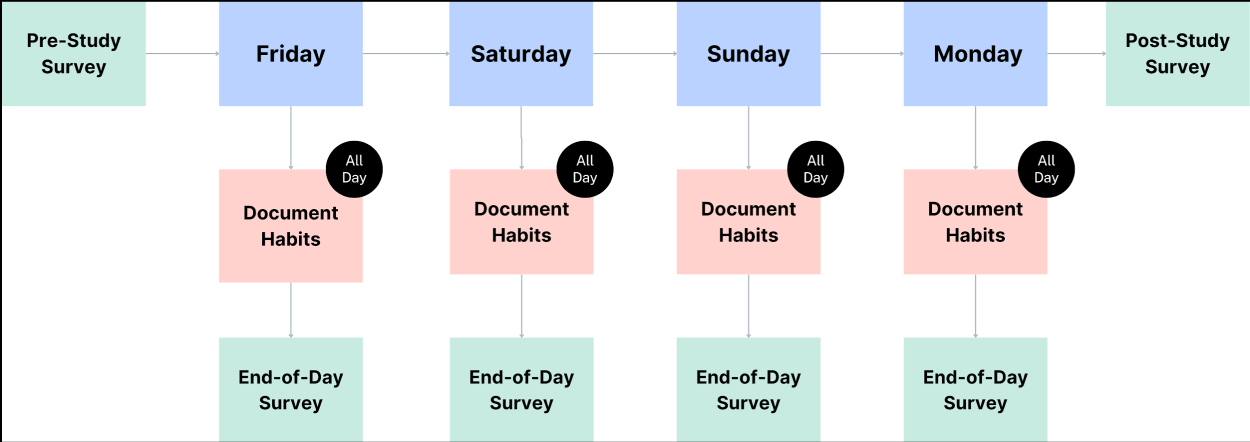
Figure 6: Diary study timeline

3.1.2   Users Without Social Media

Users without social media were given a single survey to complete. The survey was split

into two sections: users who used social media in the past and users who did not. For users who

had social media previously, the questions asked what applications they used, how long ago they

stopped, whether they felt satisfied communicating with others without social media, whether

they felt satisfied keeping up-to-date with the news without social media, and what aspects of

social media they would want to change. For users who never had social media in the past, the

questions asked whether they felt like they were missing out without social media, if they ever

felt motivated to download any social media applications, whether they felt satisfied

communicating with others without social media, whether they felt satisfied keeping up-to-date

with the news without social media, and what aspects of social media they would want to

change.

Chapter 4: Results and Findings

4.1 Diary Study

The qualitative data obtained from the diary study was analyzed via descriptive statistics, and card sorting which was later coded and translated into clustering analysis diagrams. This data came from participant notes and the responses from the open-ended questions in the post-study survey. The quantitative data was cleaned, summarized, and analyzed via different descriptive statistics to identify trends and patterns. This data was obtained from participant phone settings (screen time and pickups), and responses from the pre-study survey and post-study survey.

4.1.1 Behavioral Patterns

4.1.1.1 Social Media Breakdown

First, the social media platforms that our social media user participants currently use and the social media platforms our non-social media user participants used in the past were compared. The intention was to indicate whether non-social media users could provide insight into plausible mitigation strategies. This would be possible if there are similarities between their respective social media platform usages. For social media users, participants were asked in the pre-study survey, "what social media applications do you use on a daily basis?" This was an open-ended question, so many participants had overlapping responses. According to the results shown in figure 7, the most used social media application was found to be *Instagram* which had a total of ten responses. *TikTok* was the second most used application with six total responses.

23

The other applications participants indicated were *Snapchat*, *Facebook*, and *X* with two, one, and one, respectively. For non-social media users, a similar question was asked in their survey. The most used social media applications were *X* and *Instagram* with three participant responses each. The other applications participants indicated were *Snapchat*, *Facebook*, and *TikTok* with one response each. *Instagram* was found to be the most common social media platform amongst the two groups.
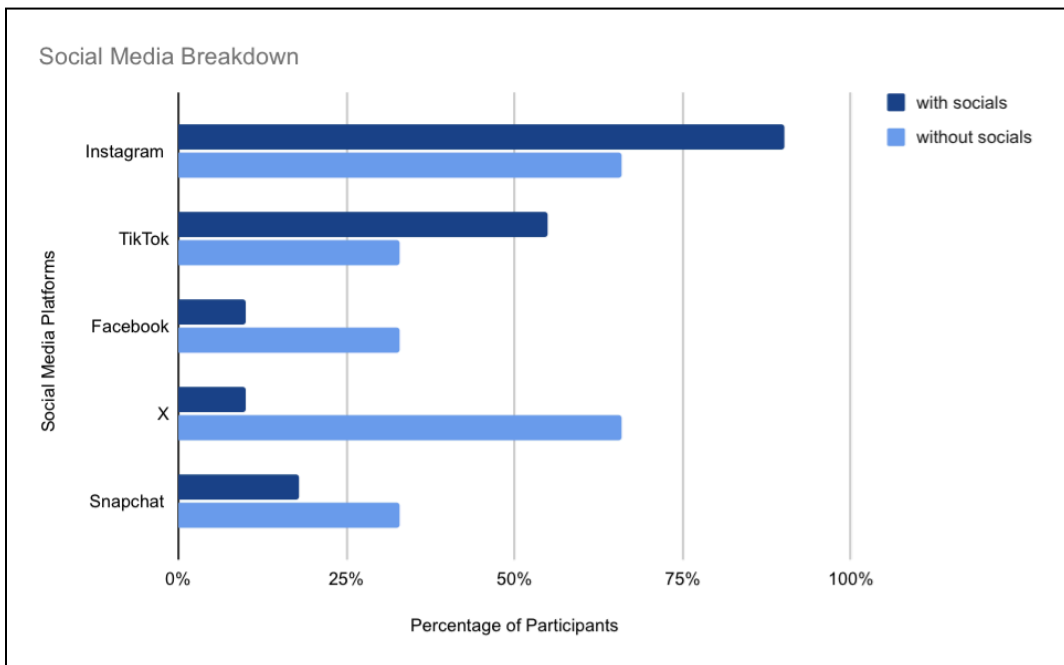
Figure 7: Social media breakdown for current and past social media users

4.1.1.2 Weekday vs. Weekend Participant Screen Time Averages

Next, the participants' daily weekday and weekend screen time averages were compared to see if stricter weekday schedules and more lenient weekend schedules affected the participant's social media usage. This is because on the weekends, participants have more opportunities to use social media for longer periods of time because of their more unrestricted schedules (see figure E3). The intention was to try to understand how and if different schedules

throughout the week changed a participant's habits and why. Would users need multiple different methods to help them manage their social media usage on a weekday versus a weekend? Participants were asked to send screenshots of their screen time analytics, which were stored in their iPhone screen time settings. According to figure 8, of the eight participants, seven of them had higher weekend screen time averages than weekday screen time average. Participants two and seven had the largest difference in screen time when comparing their weekday and weekend averages. On the other hand, participants three and six had the smallest difference in weekday and weekend screen time averages. Of note, participants seven and eight had high screen time averages on both the weekday and weekend with each averaging more than 200 minutes; participants three and six had low screen time averages on both the weekday and weekend with each averaging less than 100 minutes.
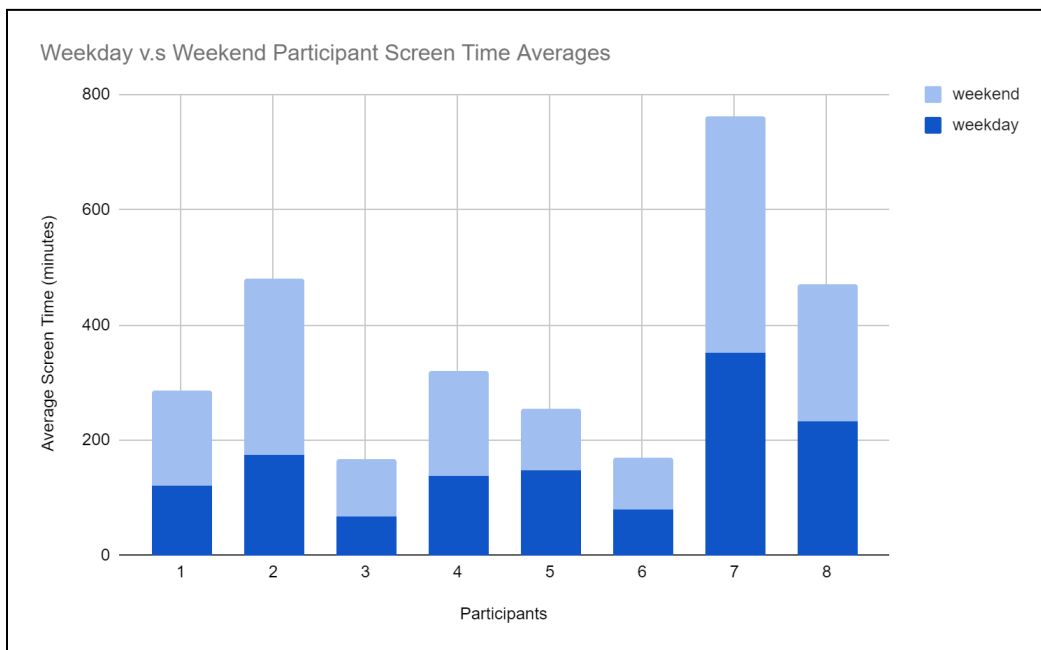
Figure 8: Weekday vs. weekend screen time averages

25

4.1.1.3 Participant Self-Reflections vs. Screen Time Averages

To understand how participants labeled themselves in terms of their social media usage, the participants' daily social media screen time averages were compared to how they responded to the pre-study survey question, "would you consider yourself to have a social media addiction?" Participants were given four options to choose from: yes, somewhat, no, and unsure. These responses were based on the participant's self-reflections prior to the start of the diary study. The results are shown in figure 9. When comparing their responses to their screen time averages, it is apparent that participants who responded "yes" and "no" gauged their "addiction" in accordance to their screen time. Participants who answered yes had the highest screen time averages and participants who answered no had the lowest screen time averages. Of note, the participant who answered unsure had a higher screen time average then the participants who answered no. This information is essential in helping understand how participants view themselves in terms of their social media usage, and whether they believe they have a social media addiction.
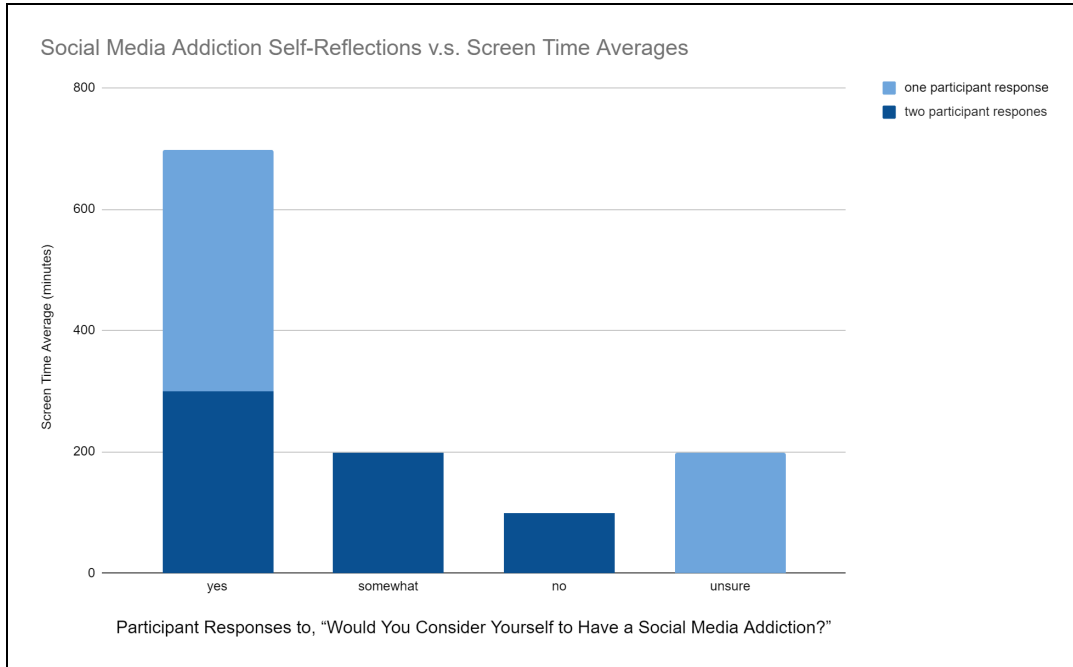
Figure 9: Self-reflections vs. screen time averages

4.1.1.4 Screen Time vs. Pickups

Next, the comparison between the participant's daily screen time averages and their daily

pickup averages was assessed to detect whether there was a correlation between the two data

sets. Pickups refers to the number of times a participant opened a social media application.

Participants were asked to send screenshots of their pickups analytics, which was stored in their

iPhone screen time settings. According to figure 10, there seems to be a weak correlation

between screen time and pickups. A participant with one of the lowest screen time averages at 85

minutes had the highest number of pickups at 61 pickups. Additionally, a participant with one of

the highest screen time averages at 380 minutes had one of lowest number of pickups at 21

pickups. This information tells us that the amount of time people use social media is not

correlated with the amount of times they open their social media accounts. It seems like some

participants open their social media often for smaller incriminates of time, while others open

social media less often for longer amounts of time. This information is unique because it gives

27

insight into a possibly new method of evaluating social media addiction in terms of tracking the habit of opening an application without intent, but more information is needed in future studies.
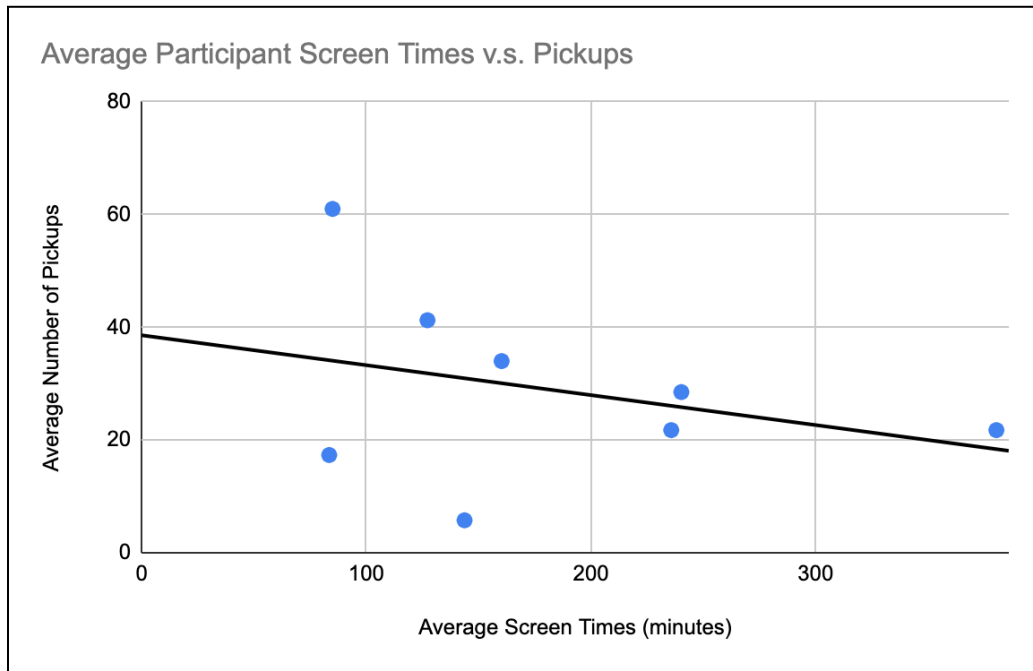
Figure 10: Average screen time vs. pickups

4.1.1.5 Post-Study: Overall Social Media Satisfaction

Each participants' satisfaction was reviewed in regards to their social media usage. In the post study survey, participants were asked, "overall, are you satisfied with your current social media habits?" This likert scale question had a total of seven responses participants could choose from, including very dissatisfied, dissatisfied, somewhat dissatisfied, neutral, somewhat satisfied, satisfied, and very satisfied. According to figure 11, three participants responded very dissatisfied, three participants responded somewhat dissatisfied, four participants responded neutral, and only one participant responded very satisfied. Comparing this information to figures E6 and E7, the participants who labeled themselves as very dissatisfied were the same participants who spent the longest amount of time on social media, per their screen time

averages. Surprisingly, the participants who had the highest number of pickups labeled themselves as neutral. It seems like individuals tend to gauge their satisfaction levels with their screen time averages, not the number of times they pick up an application.
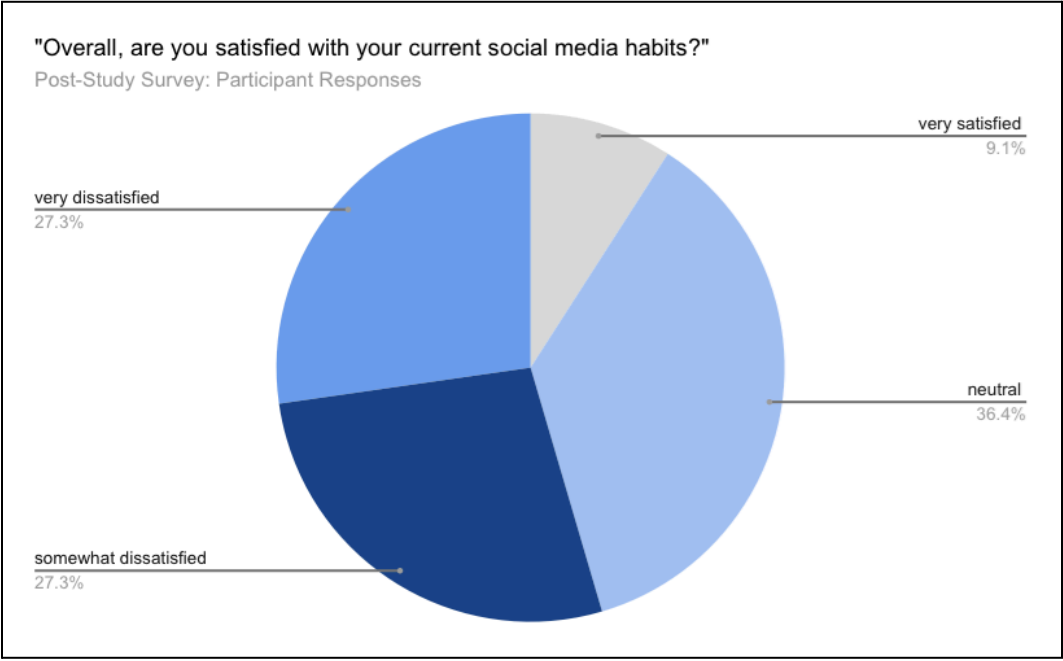
Figure 11: Participant satisfaction with social media habits

4.1.2 Habit Loop

4.1.1.1 Post-Study Reflections: New Insights

In order to better understand how participants felt and what they learned about themselves throughout the four-day diary study period, data was analyzed from the post-study survey where participants were asked, "did you notice anything about your social media habits that you might not have noticed prior to the study? If yes, what were they?" This information would give insights that could not have been deduced from the participants' daily social media habits documentation and end-of-day survey results. The open-ended question garnered many

responses (see figure E8). The most notable response was from a participant about documenting their habits in the diary study. The participant said, "If I had to document my social media every time I used it, I wouldn't want to use it anymore."

One common theme from the participants' responses was related to procrastination; one participant said, "If I find time to procrastinate or waste time while I am at work or somewhere not at home, I find myself increasing time on the restrictor by 10-30 minutes." Another participant said, "I was unconsciously procrastinating [for 45 minutes on *TikTok*] at a time."

Another common theme was the participants' negative feelings associated with *TikTok*. One participant said, "I'm unhappy with how much time I spend on *TikTok*." Consequently, many other participants also stated that a majority of their social media screen time was spent watching videos. *TikTok* and *Instagram* are both social media applications that can showcase content through the form of unlimited video content. This is also related to the theme of doom scrolling; one participant said, "If I don't need to look at the time then I'll let time slip without even realizing it."

Of note, one participant said, "I am always holding my phone and using it within short time frames." This is consistent with participants that have high numbers of pickups and low screen time averages (see figure 10).

4.1.1.2 Cues and Cravings

The data that participants documented during the diary study was collected and thematically coded. Participants noted their social media habits including what they were doing when they opened a social media application, what they did on the application, and how they felt afterwards. This data, according to figure 12, showed common themes: seven participants noted

using social media while laying in bed, four noted feeling bored prior to opening social media, and two were already using their phone for a different task when they opened social media.

Many participants noted using social media while in bed, just as frequently before getting up in the morning and before going to sleep at night. One participant said, "I was in bed. I should've gotten out of bed, but I scrolled through *TikTok* instead." Some additional quotes by participants related to laying in bed include, "I don't feel like getting up in the morning [so I use social media]," "sometimes I just use [social media] so I can procrastinate schoolwork," and "I use [social media] as a way to relax at the end of the day."

Other participants specified feeling bored and using social media to pass the time. One participant said, "I was bored and wanted to pass the time scrolling through [*Instagram*] reels until my work meeting started." Another participant said, "I was bored so I decided to watch videos on *TikTok*."

Participants also noted using their phones for a different task before opening their social media application. One participant said, "I was on my phone texting. I don't know why I opened [*Instagram*]." Other participants said they usually see a notification for social media on their phone when they decide to open the application. Some participants said, "I can't not open a notification" and "I don't want to miss out on something important."

It could be deduced that these are some of the common cues that triggered participants to open a social media application and the common cravings associated with them. The data also showed which actions left participants feeling satisfied or dissatisfied after their time on social media. For example, checking messages left some participants feeling satisfied and scrolling through videos left some participants feeling dissatisfied most of the time. One participant said, "I mostly scrolled through [videos] on *TikTok*. This is a very bad habit that I feel guilty about,

31

because I know it's bad for your eyes and brain to sit on your phone first thing in the morning. I

give myself a pep talk to stop doing that." This information is essential because it tells which

aspects of social media users consider important or a beneficial use of their time. In other words,

the tasks completed on social media that result in satisfaction signify a craving that has been

fulfilled and a task that resulted in dissatisfaction was a craving that was not fulfilled. These cues

and cravings helped to develop some common habit loops, with new cues and cravings, that will

help to develop mitigation strategies to combat social media addiction.
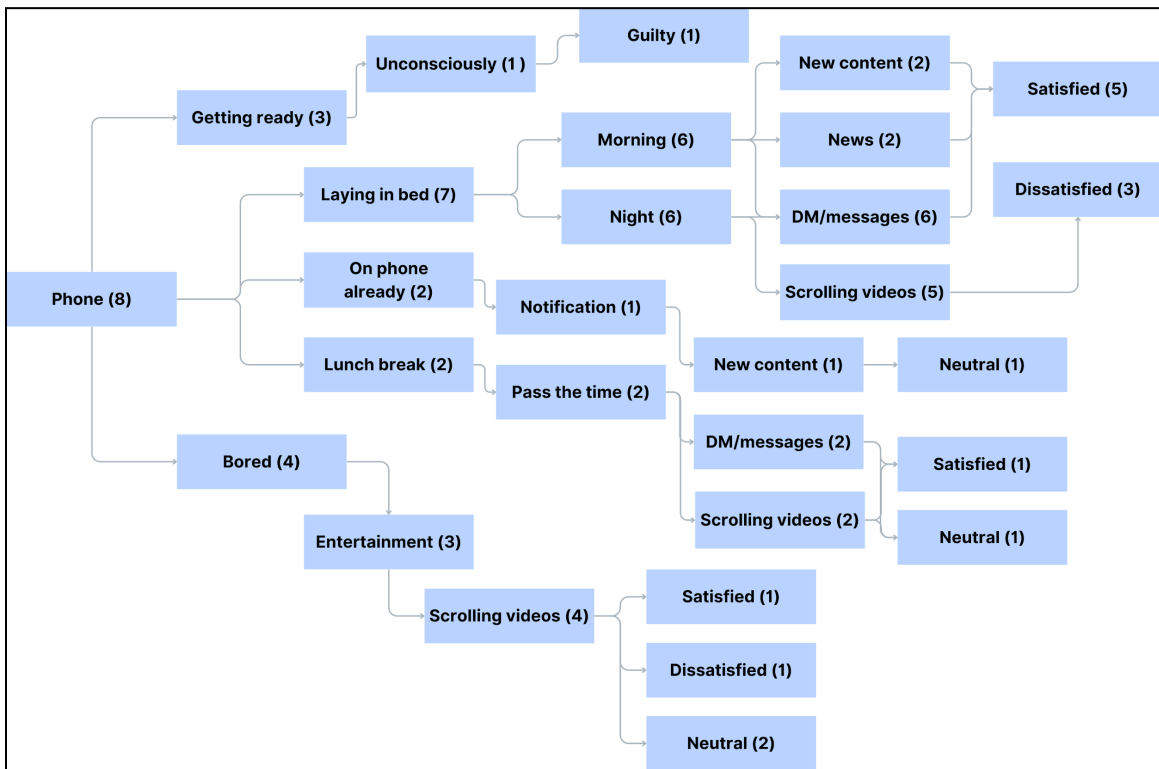
Figure 12: Analytical diagram: cues and cravings

4.2 Users Without Social Media

The qualitative data obtained from the survey was analyzed via analysis diagrams and

descriptive analysis. This data came from participant responses to the open-ended questions in

the survey. The quantitative data was sorted and analyzed via descriptive statistics. This data was obtained from participant responses to the close-ended questions in the survey.

4.1.1 Behavioral Patterns

All the non-social media user participants who filled out the survey were previous users (see figure F4). Thus, the data that was collected would help to better understand why and how participants stopped using social media in the first place. In the survey, participants were asked two open-ended questions: "Why did you decide to stop using social media?" and "How many attempts did you make to stop using social media before you became successful? Please elaborate." Participants responded that they stopped using social media for two main reasons: it wasted a lot of their time and it was affecting their mental health. Of the three participants, two were able to stop immediately and one had tried multiple times before being successful. They were able to accomplish this by deleting the social media applications off their phones. This information verifies that social media negatively affects users when they feel like their time is being wasted or their mental health is progressively getting worse. Participants from both social media users and non-social media users dislike social media's ability to waste their time without intent.

4.1.2 Satisfaction With Communication and News Sourcing

The purpose was to understand whether non-social media users were satisfied connecting with others without a social media application. Based on our research from the literature review, it was concluded that the original purpose for social media's creation was to allow users to connect with other people. To better understand how non-social media users felt about connecting with others without any social media applications, participants answered, "how

satisfied are you communicating with others without social media?" This was a likert question with seven total responses: very satisfied, satisfied, somewhat satisfied, neutral, somewhat dissatisfied, dissatisfied, and very dissatisfied. All three participants noted they were "very satisfied" communicating with others without social media (see figure F7). Participants noted they felt satisfied without social media because they were able to use other messaging applications to fulfill this need via *Whatsapp* and *iMessage* (see figure F9).

Furthermore, understanding how non-social media user participants felt about obtaining news media outside of social media was beneficial in understanding social media's purpose. In the survey, participants were asked, "how satisfied are you keeping up-to-date with the news without social media?" This was a likert question with seven total responses: very satisfied, satisfied, somewhat satisfied, neutral, somewhat dissatisfied, dissatisfied, and very dissatisfied. Of the three participants, two responded that they were "somewhat dissatisfied" and one responded that they were "very dissatisfied" keeping up-to-date with the news without social media (see figure F8). Participants were dissatisfied because they were unable to keep up with the news, could not find opposing and unbiased viewpoints elsewhere, and realized people don't really discuss the news outside of social media (in-person) (see figure F9). This information gives an idea of what users might gravitate towards and find to be a beneficial use of their time on social media. It informs that the original purpose for social media, which was to connect with others, might not be the purpose it is used today.

Chapter 5: Discussion

This thesis examined common cues and cravings that trigger social media usage in users by examining their daily social media habits through a four-day diary study. Participants provided many valuable insights that were used to develop complete habit loops using the methodology proposed by Charles Duhigg (Duhigg 2012). By filling in the gaps for the social media habit loop, it can be better understood how to navigate and help users with social media addiction take back control of their habits to use social media responsibly, eliminating the risk of symptoms associated with social media addiction.

5.1 Social Media Usage Patterns

5.1.1   Weekday vs. Weekend Habits

Social media users' habits are inherently unique, making it difficult to develop a singular strategy that fits the needs of all users (Graybiel & Smith, 2014). Even more so, a single user's habits can differ depending on the time or day or day of the week. During the weekdays, users tend to have strict routines, especially if they have school and/or work that take up a majority of their time. While on the weekends, users tend to have a more relaxed schedule that can be spent on unspecified tasks and activities that may occur more spontaneously. According to the study, users are more likely to have higher screen time averages over the weekends, in comparison to the weekdays. These changes in daily social media habits throughout the week indicate that a single user may need multiple different methods to combat their social media addiction using

habits depending on the day of the week. They may have a different cue and craving for the weekday versus the weekend.

5.1.2 Current vs. Past Social Media Users

Social media was originally created in an attempt to fulfill the human need to connect at a time when the world felt isolating without the current technology available today (Ortiz-Ospina & Roser, 2023). Today, this need can be fulfilled without the assistance of social media through other messaging applications (Savage et al., 2022). According to our data, the purpose behind social media usage today for many users is seemingly shifting away from communication and connection, and towards entertainment and news content. Many users, including participants from our study, who currently use social media spend a majority of their time watching videos of content by users they don't know, rather than interacting with content by users they do know (Yang et al., 2021). One of the most popular social media applications, *TikTok*, is only composed of video content for users to consume, rather than pictures or messages (Bhandari & Bimo, 2022). Video content is addicting and is proven to affect a user's enjoyment, concentration, and distortion of time which has been labeled as the "flow experience" (Qin et al., 2022). This experience explains how users are most affected by video content online when their concentration levels are lowest, making them vulnerable to the effects of continuously scrolling and consuming excessive amounts of content unconsciously (Qin et al., 2022). Consuming this type of content is indicative of filling a user's need for entertainment, not so much connection. Additionally, many past social media users, according to our data, confirm their satisfaction in connecting with others without the use of any social media platform. This helps to develop mitigation strategies that are effective in fulfilling the habitual needs of current social media

users, rather than still holding onto the assumption that the role of social media in a user's life has not changed in the past 25 years.

5.2 User Awareness and Behavioral Insights

5.1.1   Conscious Awareness

The first step in combating social media addiction is user conscious awareness because the majority of issues that arise with excessive social media usage is linked to lack of concentration (Qin et al., 2022). Social media addiction is a habit that is formed when the action of excessive social media usage becomes second-nature, almost unconscious, and is fueled by a craving that impedes a user's quality of life (Hilliard, 2019). In regards to changing habits, conscious awareness is also known to be a key element (Duhigg 2012). Changing habits is not spontaneous; it goes against nature's need to make life easy by paving pathways of least resistance in the brain (Duhigg 2012). Thus, conscious awareness is not enough to combat addictions alone through the lens of habits. To enact real, life-long change, habits need to be further analyzed by understanding their triggers and cravings. This information can help develop mitigation strategies to ensure users become aware of the mechanisms that trigger their social media usage and also satisfy the craving they need fulfilled in a different way.

5.1.2   Screen Time vs. Pickups

Through the study, it was concluded that users with high screen times were consciously aware of their social media addiction. The participants who labeled themselves as "very dissatisfied" with their social media usage were the same participants who spent the longest amount of time on social media, per their screen time averages. High social media screen time

averages are associated with increased symptoms of depression, anxiety, shortened attention span, and fatigue (Hilliard, 2019). In addition to screen time, pickups are also representative of a user's social media habits. According to the study, users with a high number of pickups did not label themselves to have social media addiction. Many users are unaware, or underestimate, the number of times they pickup, or open, a social media application within a given day because it is not a socially normalized statistic to be aware of (Coyne et al., 2023). While a high number of pickups is not formally labeled as addiction, it is still a negative habit that should be corrected and further studied. Users who subconsciously open social media applications out of habit, without intent, may suffer from the switch-cost effect. The switch-cost effect explains how switching between tasks often leads to worsening performance because of increased cognitive load (Swainson et al., 2021). When users are constantly switching between checking their social media and the current task they are doing, like school work, their ability to successfully complete their task decreases. The switch-cost effect is known to increase both mental and physical fatigue which can affect a person's overall quality of life negatively (Swainson et al., 2021). The small habits that make up a person's day tend to accumulate quickly and cause a domino effect in other aspects of their life (Duhigg 2012). For example, a person constantly checking their social media throughout their work day may become too exhausted to make dinner when arriving home, causing them to order takeout often which results in poor health.

Current solutions to mitigate social media addiction focus solely on minimizing screen time averages for users. While many users may benefit from a screen time focused mitigation strategy, there seems to be other indicators for negative social media usage, like pickups, that other users might find more effective in combating their usage. Future research would be beneficial in understanding how to correct both screen time and pickups simultaneously to create

a single strategy to benefit both types of users. Users are not a one-size fits all model and, thus, should not be treated as such. By understanding social media users' habits, it becomes easier to navigate effective solutions to help them reduce negative social media usage, specifically actions done without positive intent, thus increasing overall positive usage.

5.3 Cues and Cravings

According to our data, some of the common cues that triggered participants to get onto a social media application were discovered. The first cue was specific to a location, participants dictated using social media the most while laying on their bed, both in the morning and at night. The second cue was the feeling of boredom which many participants indicated feeling prior to opening social media; it was their main motivator. The third cue was receiving a notification for social media while already using the phone to complete a different task. These cues showcase common triggers that unconsciously direct users to open a social application, sometimes without consent.

Additionally, some common cravings that are relevant to the cues associated with social media usage were found. The data that was collected and analyzed showed common themes of different actions that left participants feeling satisfied, dissatisfied, or neutral while using a social media application. For example, checking messages left participants feeling satisfied, while scrolling through videos sometimes left participants feeling dissatisfied. This information is important because it indicates what aspects of social media fulfill the participant's cravings. In other words, what users feel is most important and a positive use of their time on social media. The craving associated with laying in bed is boredom. The craving associated with boredom is entertainment. The craving associated with a notification is feelings of FOMO. These cues and

39

cravings helped to develop complete habit loops to better understand how to instigate effective and successful mitigation strategies to combat social media addiction.

5.4 Habit Loops: Social Media Addiction

Based on the results, three different habit loops that signify different cues and cravings were proposed. Every social media user may have a unique cue and craving in their habit loop that tells them when and why they are using social media. These habit loops are some examples of common cues and cravings that many users might relate to and can, hopefully, help them better understand their habits when it comes to social media addiction. By understanding the cues and cravings of social media users, it can be better understood how to satisfy the cravings that are associated with social media usage without falling into the harmful routine of addiction.

This first habit loop's cue is boredom, a common feeling that triggers many users to open a social media application. This type of cycle is driven with the craving for entertainment, also known as new and exciting content.
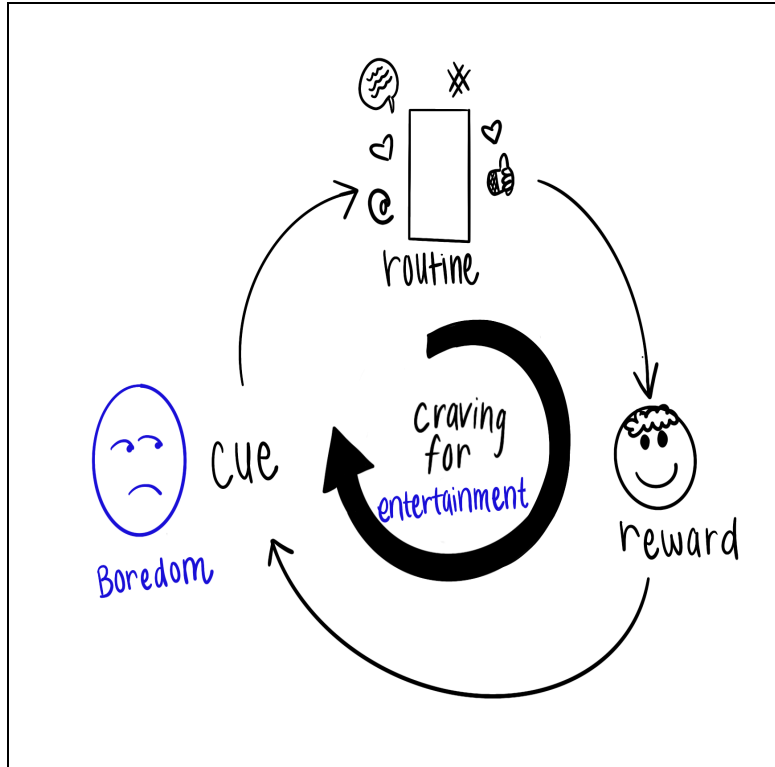
Figure 13: New habit loop #1 (cue is boredom and craving is entertainment)

The second habit loop's cue is laying in bed, a common location where users might unconsciously open a social media application. This cycle is driven by the craving for numbness, a method to occupy one's attention early in the morning to procrastinate the start of a new day or a way to wind down and not think after a long day.
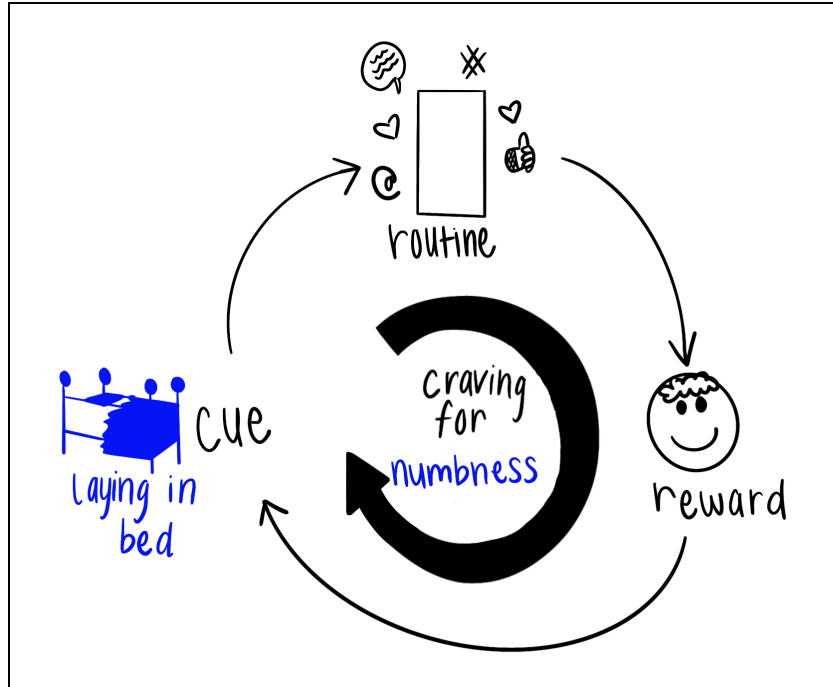
Figure 14: New habit loop #2 **(**cue is laying in bed and craving is numbness)

The third habit loop's cue is receiving a notification from a social media application while the user is already on their phone completing a different task. This cycle is driven by FOMO, the fear of missing out. When users get a notification, they immediately feel the need to know what it is they might be missing out on.
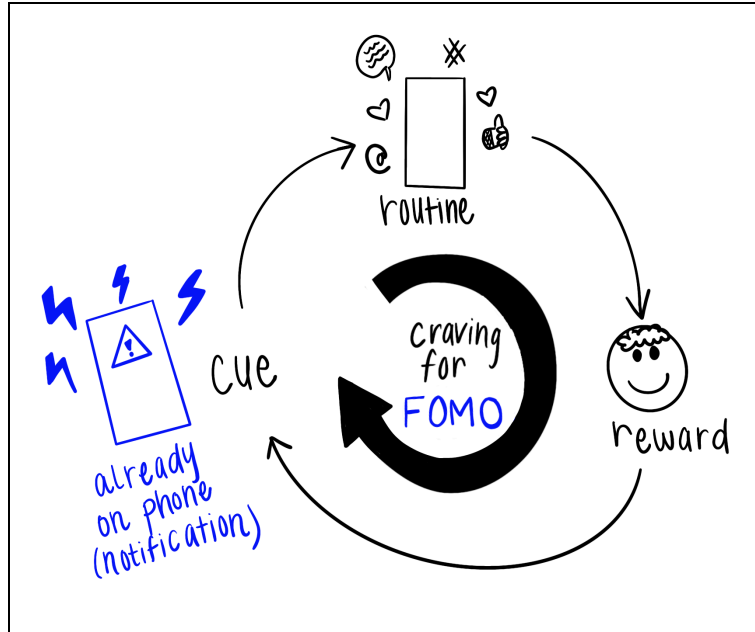
Figure 15: New habit loop #3 (cue is a notification and the craving is FOMO)

These habit loops helped propose a prototype and mitigation strategy that users can successfully use to better their social media usage experience. The goal is for users to recognize the cues that trigger their social media usage and to develop a way to satisfy the cravings associated with the respective habit loop in a way that is productive and realistic.

5.5 Design Implications and Mitigation Strategies

5.1.1   Proposed Solutions

The first step to aiding users in navigating their social media usage through habits is helping them understand what their specific cues and cravings are. Addictions stem from a user's impairments in their own self-awareness (Moeller & Goldstein, 2014). Thus, conscious awareness, or self-awareness, has been proven essential in helping people who suffer from most types of addiction, including alcohol and substance-use (Rettie et al., 2021). Similarly, without conscious awareness and purposeful intent, users will not be able to manage their habits or social media addiction. Therefore, a proposed solution includes the implementation of an adaptive application that can assess user habits using a combination of real-time data and user insights. Real-time data, such as screen time averages and pickups, would be accessed through the user's phone settings after gaining permission. User insights would be generated through short daily forms that could be taken over a short period of a couple days. This combination of data would give users an estimation of their common cues and triggers and give personalized recommendations for which mitigation strategies, or features, to use.

The mitigation strategies would be personalized and designed according to the different habit loops. For the first and second proposed habit loop user groups, the craving for entertainment after feeling bored and the craving for numbness after laying in bed can be satisfied from watching some videos on a social media application. While social media provides this avenue to fulfill the craving of entertainment, its problematic nature originates from the application's design of how videos are displayed. Social media applications, like *Instagram* and *TikTok,* showcase a seemingly unlimited number of video content on a constant loop (Kabata et al., 2022). Users are usually left unsatisfied, regardless of the number of videos they consume.

User habits are complicated; different habits can also interconnect and influence one another. The constant loop of videos encourages users to continue watching by igniting a new craving, the fear of missing out, as each new video acts like a notification that triggers the user's need to know what it is about. This is why implementing a strict screen time might be ineffective to users who suffer from this habit loop. Screen time limits are activated as soon as the time runs out, regardless of whether users are in the middle of watching a video. When this happens, users are more likely to override their screen time limit to increase their allotted time on the social media application, causing themselves to fall into the cycle of addiction. Interruptions in the middle of a task, or action, are associated with feelings of annoyance and increase a user's likelihood of returning to the task afterwards (Üsten & Sieben, 2023).

The proposed solution to combat social media addiction, according to the first and second habit loop, is to implement a design feature that limits the number of videos a user can view at a given time or to set screen time limits to only activate after the user has finished interacting with the video they are viewing at the time. This will allow users to feel more satisfied and accomplished by fulfilling their need for entertainment, without the complication of doom scrolling caused by their desire to watch the next video in the loop.

For the third habit loop user group, the craving for FOMO caused by an external notification can be mitigated through an application feature that restricts the social media application's content when users open a notification. This feature would allow users to only view the notification's content, whether it was a message from a friend, a new video or post, or simply a follower request. Users would not be able to move past this blockage and view other social media content without leaving the application to re-open it. This allows the user to satisfy their

FOMO craving without wasting additional time on the social media application when it was not the original intention.
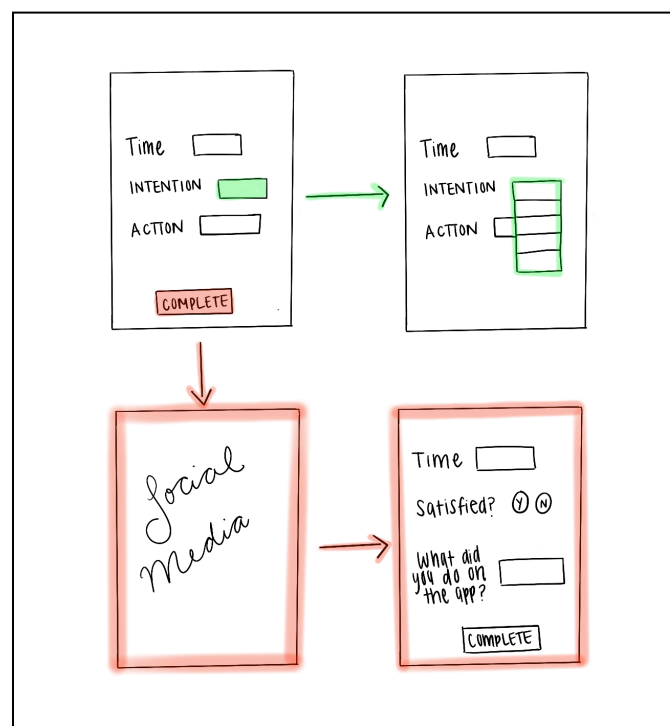
5.1.2   Low-Fidelity Prototype

To develop these features into a low fidelity prototype, the application *ScreenZen* was used as a baseline for inspiration because it already included many beneficial features; like limiting the number of times users could open an application, limiting the screen time for applications, and providing an allotted pause time before applications opened. The prototype was designed with the ten usability heuristics in mind.

When users first open the application, they will see a screen with the question, "want to take back control of your social media habits?' The question is intended to be motivating to encourage users to want to take the step to remove social media addiction from their lives. As soon as users are ready to commit, they will be given the option to learn more about how the application's goal is to understand user habits through data analysis in order to generate a personalized solution for each user. Users will then be able to start the process by allowing the application to access their screen time settings in their phone's settings; the user's screen time averages, application usages, and pickups can be accessed through this. This will provide real-time data for the application to analyze. Afterwards, users will be asked to choose which social media platforms (either applications or websites) they want the application to monitor for the next couple of days to assess their social media habits further.
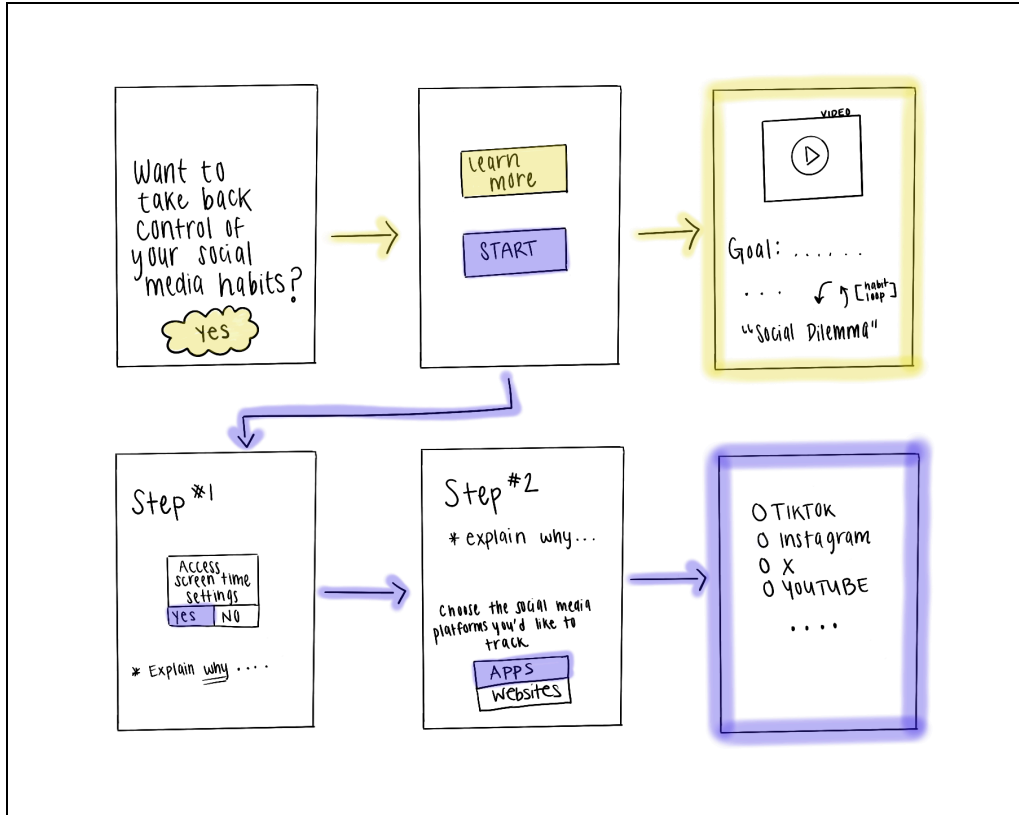
Figure 16: Low-fidelity prototype, new user set-up for personalized data analysis

The social media applications that the user had chosen in their setup, will be monitored by the application. The application will include a small form for users to complete when they open the social media application and another one to complete when they leave the social media application. The form that will appear when users first open the social media application will auto-fill the current time, ask the user to choose from a dropdown list answering what their intention for using the application is and what action they were doing prior/during the time they opened the application. In the form appearing after users leave the social media application, the time will auto-fill, and the questions will ask users if they were satisfied with their social media usage, and what they did while on the application. These questions are similar to the questions used in the dairy study of this thesis.

**Figure 17:** Low-fidelity prototype, new user study for data analysis

Based on the data gathered through the user's phone settings and completed forms, the application will analyze and propose the most likely habit loops for the user. Users will be able to choose to learn more about what their habit loops mean and choose options for different features they can implement accordingly.
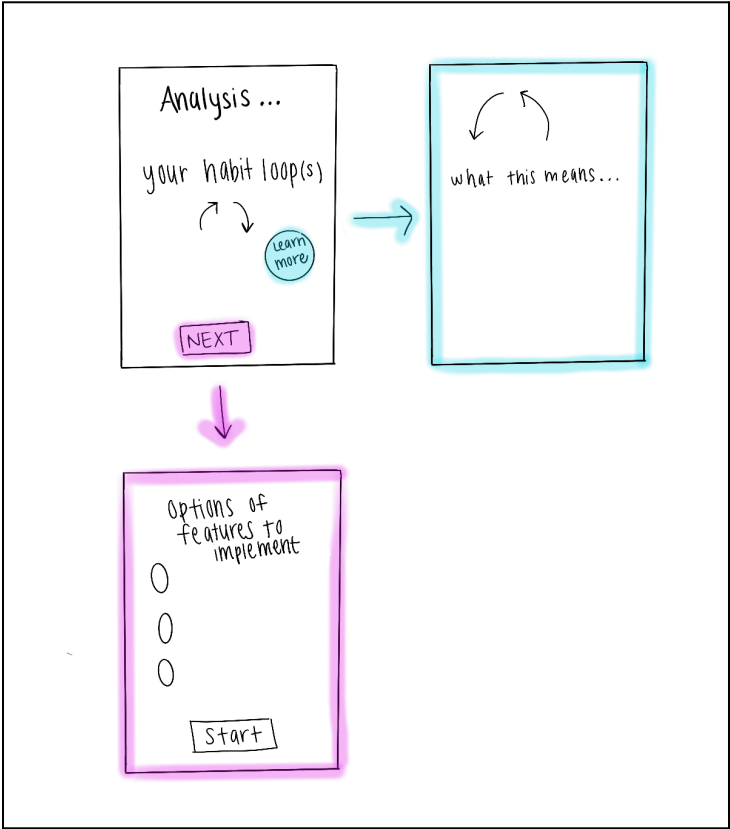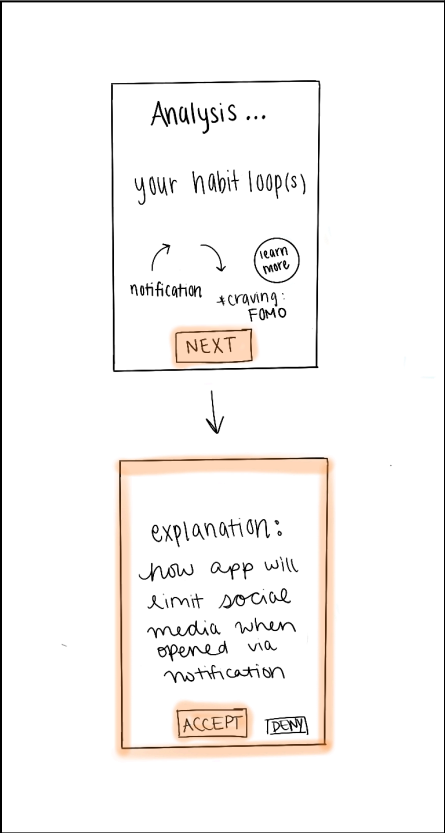

Figure 18: Low-fidelity prototype, proposed habit loops and features set up (general)

Figure 19 shows how the application can showcase the analysis and proposed features according to habit loop 2, when the cue is laying in bed and the craving is numbness. The options for features include limiting their screen time and limiting the number of video content they can access. After choosing which feature they want to implement, users can choose the exact number of minutes/videos they want to limit it to. This process would be similar for habit loop 1, where the cue is boredom and the craving is entertainment, because the solutions are the same.
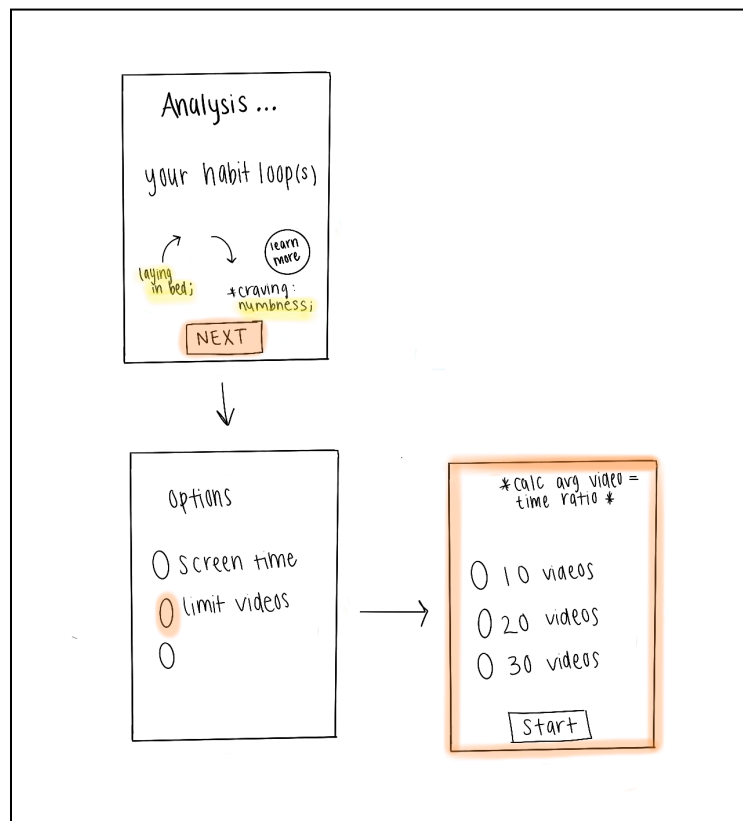
Figure 19: Low-fidelity prototype, proposed habit loops and features set up (habit loop #2)

According to figure 20, the application showcases the analysis for habit loop 3, where the cue is a notification and the craving is FOMO. There is only a single feature that was proposed as a solution for FOMO, so users would automatically be asked if they accept to limit their social media when accessing the application through a notification.

Figure 20: Low-fidelity prototype, proposed habit loops and features set up (habit loop #3)

After users choose which features they want to implement to help aid their social media addiction, the features will automatically be turned "on" every time the user accesses their social media. In figure 21, A showcases how users will experience their social media if they choose to limit their video/screen time according to habit loop 1 and 2. Users will have a start page when they initially open their social media application. This gives users an extra step and a moment to pause and decide if they want to open their social media. After users click "start," they will be

able to watch and view content until the limit is reached. When this occurs, users will see a screen with a positive farewell written in front of a black screen. B showcases how users will experience their social media according to habit loop 3. When users click to open their social media directly from a notification pop-up, they will be directed to a start screen. If they choose to open the application, they will be shown a screen pertaining to the notification information, but be unable to access other parts of the social media application.
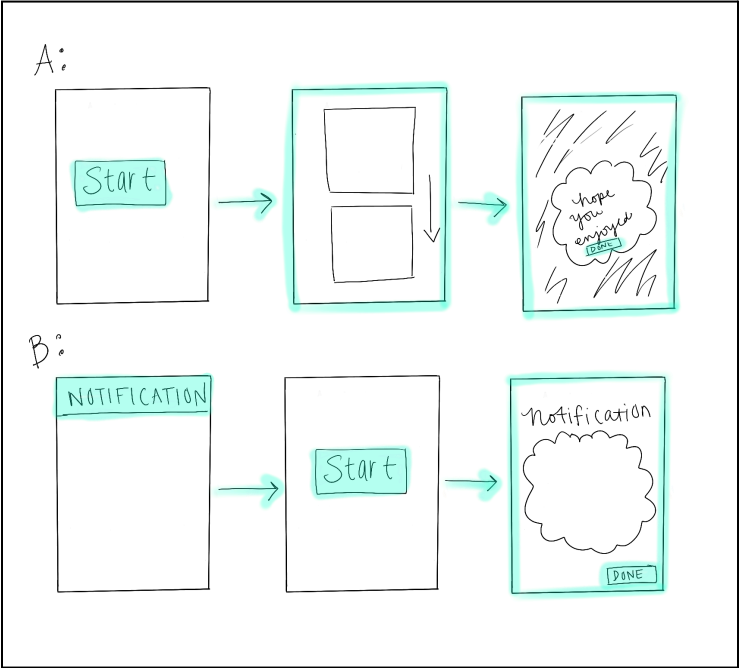
Figure 21: Low-fidelity prototype, application in use after features set-up

(A: habit loop #1 and 2, B: habit loop #3)

Additional features that are not included in the prototype that may help users with their social media addiction include:

1. Allowing users the option to change the color scheme in their social media application to either black and white or dull colors.

2. Having a stopwatch in the corner of the screen when users use their social media to easily track how long they've been on the application.

3. Having users log-in to their accounts on social media every time they want to use it.

5.6 Limitations and Future Work

This study's limitations include its small sample size, limited participant age group, short study period, infrequent data sampling, subjective data bias, and time constraints. Ideally, a larger sample size and real-time data collection would give more data to further confirm findings. This would help to reduce biases in participant documentation to help gain a better understanding of user social media habits.

Generally, assessing social media habits and addiction is a very complicated process that requires increased effort in understanding and empathizing with its users. It may take multiple future studies to gain a well-rounded understanding of navigating its complexity in order to develop a fully functional and effective mitigation strategy, or application, that is able to help all users with social media addiction.

Social media addiction is oftentimes compared to gambling addiction and drug-use addiction, specifically cocaine; the chemical reactions in the brain associated with these addictions is the same (Hilliard, 2019). Additionally, social media's business model's strategy was inspired by the behaviors associated with gambling addiction (Bhargava & Velasquez, 2021). Current solutions for people with gambling addictions include cognitive behavioral therapy and motivational intervention through individual or therapy-based self-help (*Treatment Recommendations for Gambling Disorders*, n.d.). Future studies should focus on understanding

gambling addiction in terms of the habit loop and its solutions, and how it compares to social media addiction.

Furthermore, the low-fidelity prototype proposed should be transformed into a high-fidelity prototype and tested to evaluate its effectiveness and usability, especially coupled with the benefits of positive reinforcement which is proven to be effective in helping reduce addictions (Duhigg 2012). Additionally, since the nature of social media habits are unique and complex, there are many more habit loops that could be found pertaining to social media addiction. It is essential that future studies further empathize with social media users by examining a broader sample size and population. This new data can give key insights into developing additional features that could be added into the prototype to help users with different cues and cravings than the ones discovered in this study.

There is currently a gap in the research about the current applications available that promise to help users reduce their social media screen time averages. There aren't any studies available that assess their differences, effectiveness, and usability issues. It will be beneficial to also address this in a future study to further develop the prototype and understand what features users might like and dislike based on past applications.

The additional testing of pickups and how it relates to the habit of social media addiction is necessary for future studies to conduct. Pickups are not currently recognized as an addictive habit in social media addiction which can be problematic for users who suffer from unconsciously checking their social media without intent. Future studies should analyze whether there is a strong correlation between pickups and social media addiction and how it negatively affects users in terms of the habit loop. This new finding would revolutionize how social media addiction is evaluated and how future mitigation strategies are developed to combat the issue.

Of note, future studies should also target the younger aged population because it can sometimes be easier to attempt to curate preventative measures in the early stages, or before the development, of a negative habit, like social media addiction.

Chapter 6: Conclusion

Social media addiction is a growing problem; psychologists estimate that five to ten percent of users in America have some form of social media addiction (Hilliard, 2019). It is a behavioral issue characterized by a user's uncontrollable urge to use social media enough that it impedes the user's quality of life (Hilliard, 2019). Users, especially youth, who spend three or more hours a day on social media platforms are at a higher risk of developing mental health issues, like depression, low-self esteem, and anxiety (Riehm et al., 2019). Social media addiction can also affect a person's personal relationships; previous studies have revealed that adults have shown a negative relationship between their social media addiction and their work-life balance (Zivnuska et al., 2019). Social media addiction is a real problem that negatively affects users, thus it is important to develop strategies to try to mediate the issue.

Most current strategies to combat social media addiction are focused on user conscious awareness and screen time limit intentions. This is an important component to address, but the issue is deeper than that. Many users know they have an excessive social media usage problem, yet they are unable to curb their usage. Existing solutions focus on eliminating or limiting social media usage entirely rather than focusing on assessing habits that revolve around it which is much more difficult to discern and transform without the right tools. Habits are complex to study because every user is different, with different schedules and daily routines which translate into different triggers and cravings (Hagger & Rebar, 2020). Understanding habits is a tricky and compounded subject that needs to be assessed through multiple rounds of research. To this end,

this thesis focused on understanding habits through the habit loop model, proposed by Charles Duhigg, in relation to social media usage to help combat addiction.

Through a diary study, I was able to start the process of empathizing with social media users by gaining an understanding of their social media habits. By sorting through the data, common cues, or triggers, and cravings that control users to open and continually use their social media were discovered. This data was helpful in creating a low-fidelity prototype with features that might be able to help users manage their social media usage.

It was also discovered that many users don't use social media solely to connect with other users, which was the case almost two and a half decades ago (Ortiz-Ospina & Roser, 2023). The current purpose for social media usage seems to be leaning away from communication and connection, and towards entertainment and news content. Past research focused on social media with the sole purpose of connecting with others without considering how people's intentions for using social media might have changed. The change in purposes of social media implies changes in users' habits as well.

This study is a step in the right direction, but there is still that needs to be accomplished before any real change can be made. Habits are complicated to understand and unique to each individual, but there are still some universal commonalities, like the proposed habit loops, that can be addressed and used as a baseline for future studies. Social media is not going away anytime soon, so it is essential to understand how to navigate the applications without falling into the cycle of addiction. By understanding the purpose behind social media usage and curating a methodology that is effective in tracking cues and cravings, users can recognize them within themselves and utilize the mitigation strategies available to control how they want to spend their time on social media.

Appendix A: Diary Study Consent Form

University of Michigan- Dearborn

Study Title: Mitigation Strategies to Combat Social Media Addiction

Principal Investigator: Jana Taleb

Contact Information: jmtaleb@umich.edu or (313) 400-8874

Introduction:

You are invited to participate in a research study focused on understanding human habits surrounding social media. The aim of the study is to create effective mitigation strategies for users, 18-28 years old, who struggle with social media addiction. A mitigation strategy is a plan that is developed to either manage, limit, or completely eliminate the setbacks associated with a problem. Before you decide to participate, please take a few minutes to carefully read over the procedures and potential risks/benefits of the study. Do not hesitate to reach out, if you have any questions/concerns before committing to participate.

Purpose of Study:

To develop effective mitigation strategies to help young adults who struggle with social media addiction.

Procedures:

    A. **Participants who use social media**

a. Participants will conduct a diary study over a period of four days (Friday, March 8 to Monday, March 11). A diary study is used to collect long-term qualitative data about a participant's behaviors and activities. The duration of the study is four days (Thursday to Sunday) from the moment participants wake up till the moment they go to sleep. For this study, participants will log via *Google Docs* (or their notes application) their social media habits with pre-constructed questions to help guide them along the day. They will also have daily questions to answer at the end of each day. Additionally, participants will fill out a survey before the study begins and a survey after the study finishes.

B. Participants who do not use social media

a. Participants will fill out a single survey via *Google Forms* with questions asking about their experience without social media. Participants may be asked to elaborate further on their answers in the survey, only if needed.

Risks and Benefits:

There are minimal anticipated risks associated with participating in this study. While the study aims to create ways to help social media addiction, participants may experience emotional discomfort confronting their habits or mental discomfort having to remember to document their habits. However, in the case that participants experience any discomfort, they may reach out to the principal investigator for support.

The potential benefits of participating in this study include gaining insights to personal social media habits, understanding how to control their social media habits, and contributing to advancements in social media addiction management.

Confidentiality:

All information that is collected during this study will be kept confidential. Your identity will remain anonymous in any reports or publications that result from this research.

Voluntary Participation:

Your participation is entirely voluntary throughout the duration of the study. You have the right to withdraw at any moment without consequences. If you do decide to withdraw from the study, your data will be discarded.

Contact Information:

If you have any questions/concerns about the study, at any time, please contact the principal investigator at jmtaleb@umich.edu or 313-400-8874. If you have any concerns about the ethical conduct of the study, you may contact the Institutional Review Board at irbhsbs@umich.edu or 734-936-0933.

Statement of Consent:

I have read and understood the information provided in this consent form. I have had the opportunity to ask questions and have received satisfactory answers. I voluntarily agree to participate in this research study.

Participant's Name (print): _____

Participant's Signature: _____

Participant's cell phone number: _____

Date: _____

Appendix B-1: Diary Study Pre-Study Survey

Pre-Study Survey questions:

1. Age
2. What is your daily screen time average?
3. What is your daily screen time average specific to social media?
4. How did you estimate your average daily screen time?
5. What social media applications do you use on a daily basis?
6. Would you consider yourself to have a social media addiction?
7. What are some self control strategies that have worked for you in regards to social media usage?
8. What are some self control strategies that have not worked for you in regards to social media usage?
9. What does your daily schedule look like on a weekday? (Please include your school/work schedule)
10. What does your daily schedule look like on a weekend?
11. What does your weekly schedule like?

Appendix B-2: Diary Study Guided Questions

Guided Questions:

1. Record every time you open a social media application
2. What are you doing right now?
    i. At work, home, relaxing, doing homework, etc.
3. Why did you decide to open up social media?
    i. Bored? Get an update on the news? Not sure?
4. What social media application did you use?
5. How long were you on the app?
6. What did you do on the app?
    i. Can be as specific or vague as they want..
        1. Watch reels, stories, etc.
7. How do you feel after using social media?
    i. Satisfied? Dissatisfied?

daily reminders via *WhatsApp (x4/day @ 10am, 2pm, 6pm, 10pm)*

Sample Guide:

This can be done on a Google Docs that is shared with me via email OR on a notes app and then screenshot and sent to me via text. It does not need to be formatted into a chart, please just make sure it is clear, detailed, and all the questions are answered.

Table B2: Sample Guide for Day One

Time: What was the time when you opened the app?	Application Type? Where did you use it?	Action: what were you doing when you opened the app?	Reasoning: why did you open the app?	Time Spent: How long did you spend on the app?	Utilize: What did you do on the app?	Feeling: How did you feel after using the app? Why?
7:30am	Instagram Phone	I just finished praying and got back into bed	Bored; wanted to pass the time	45 min	Scrolled through random reels, watched stories- journalists,	Okay… I used the app longer than I wanted to but overall was satisfied.

63

					replied to DMs from family & friends	
10 am Instagram Phone	post-gym	unsure- no purpose	30 min	mostly scrolled through random reels	Not good. I didn't intend to use social media right now. I try to limit myself to one hour per day.	

Appendix B-3: Diary Study End-of-Day Survey

End-of-Day Survey questions:

1. What did your schedule look like today?
2. How satisfied are you from your social media usage today?
3. If you were not satisfied, why do you think that is?
4. Do you feel like you made conscious decisions when you opened social media today? Please elaborate
5. Do you feel like you made conscious decisions while on social media today? Please elaborate
6. Did you feel like you were at any point not aware of your time while on social media today? Please elaborate
7. Were there any instances you were not able to record your spontaneous social media usage? Please elaborate
8. What was your total social media usage for the day? Please explain how you found this information

To be completed at the end of each day (4 days total)

Appendix B-4: Diary Study Post-Study Survey

Post-Study Survey questions:

1. Did you feel like there were any limitations that were within your control throughout the duration of the study? If yes, what were they?
2. What is your average social media usage for the week? Please explain how you gathered this information
3. Would you conclude that your social media usage over the past four days during the study period is similar to your social media usage on a regular basis? Please elaborate
4. Did you notice anything about your social media habits that you might not have noticed prior to the study? If yes, what were they?
5. Overall, are you satisfied with your current social media habits?
6. If you are not satisfied with your current social media habits, what are some changes you would want to implement?

Survey for Users Without Social Media

1. Age
2. What is your daily screen time average?
3. Did you have social media in the past?
    a. Yes
        i. What social media applications did you use?
        ii. Why did you decide to stop using social media?
        iii. How many attempts did you make to stop using social media before you became successful? Please elaborate
        iv. How long ago did you stop using social media?
        v. Are there any aspects of social media that you miss?
        vi. How satisfied are you with communicating with others without social media?
            1. Can you elaborate more on the previous question?
        vii. How satisfied are you with keeping up-to-date with the news without social media?
            1. Can you elaborate more on the previous question?
        viii. If you could change aspects of social media, what would you change?
        ix. if you changed the aspects you listed in the previous question, would you re-download social media?
    b. No
        i. Why did you decide to not use social media?
        ii. Have you ever been motivated to download social media? Why or Why not?
        iii. Have you ever felt like you were missing out by not having social media? Please elaborate
        iv. How satisfied are you with communicating with others without social media?
            1. Can you please elaborate more on the previous question?
        v. How satisfied are you with keeping up-to-date with the news without social media?
            1. Can you please elaborate more on the previous question?

vi. If you were to download social media in the future, which application do you think you would use? Please elaborate.

vii. If you could change aspects of social media, what would you change?

viii. if you changed the aspects you listed in the previous question, would you re-download social media?
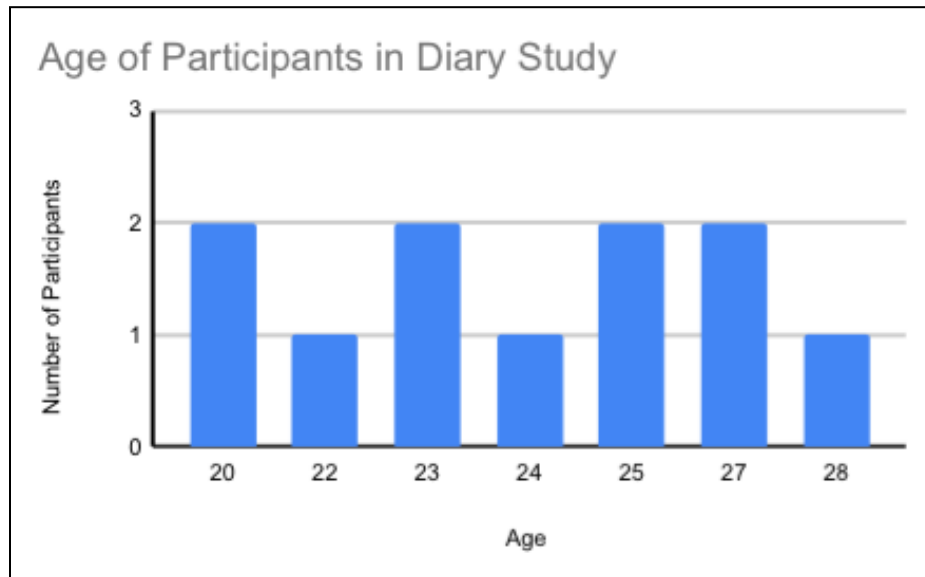
Appendix D: Diary Study IRB Exemption

Figure D1: IRB

Appendix E: Additional Diary Study Results

Figure E1: Age of Participants

From the pre-study survey, diary study participants answer, "what are some self control strategies that have worked for you in regards to social media usage? What are some self control strategies that have not worked for you in regards to social media usage?"

Table E2: Self-Control Strategies

Successful Strategies	UnSuccessful Strategies
1. A private account that wasn't shared 2. Setting time limits 3. Getting busy 4. Talking with people 5. Putting phone away 6. Turn off notifications 7. Deleting the apps for a week every other month 8. Using social media only on my computer 9. Deleting apps (2) 10. Having someone else set the password for the time limit	1. Setting timers (3) 2. Deleting the application (3) 3. Using my phone before bed 4. Putting phone on do
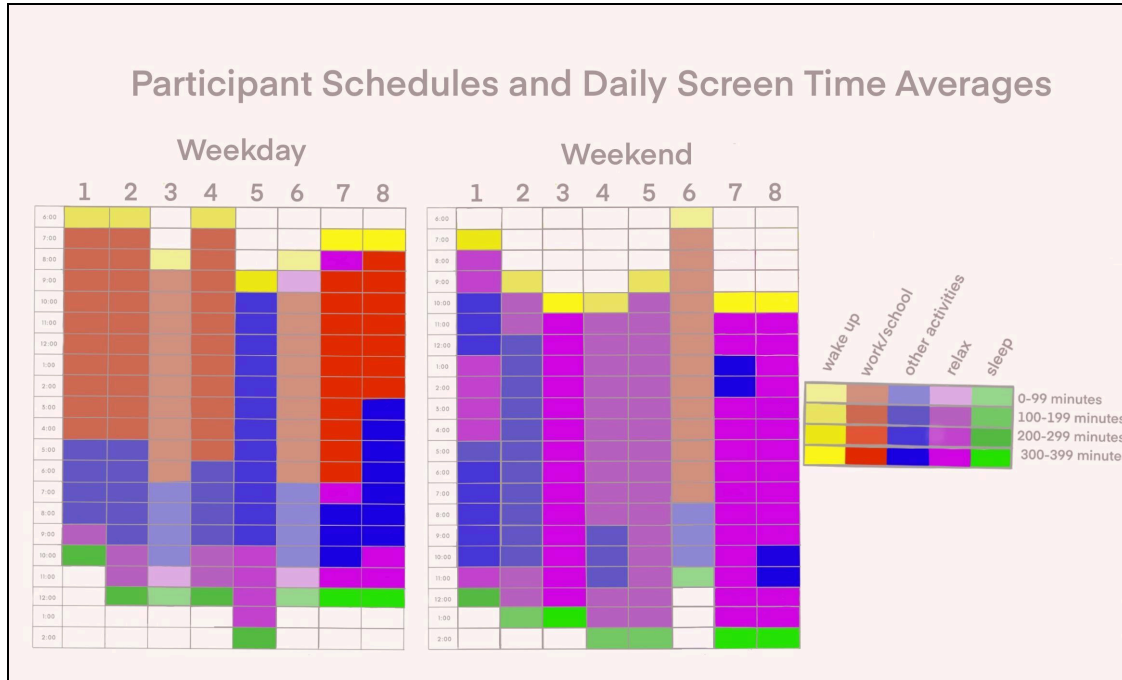
Figure E3: Participant Schedules and Screen Time Averages Comparison
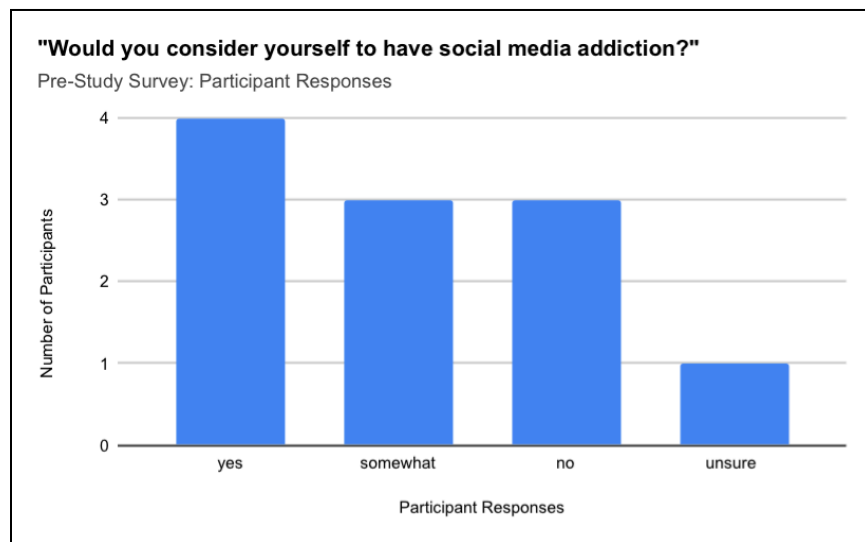
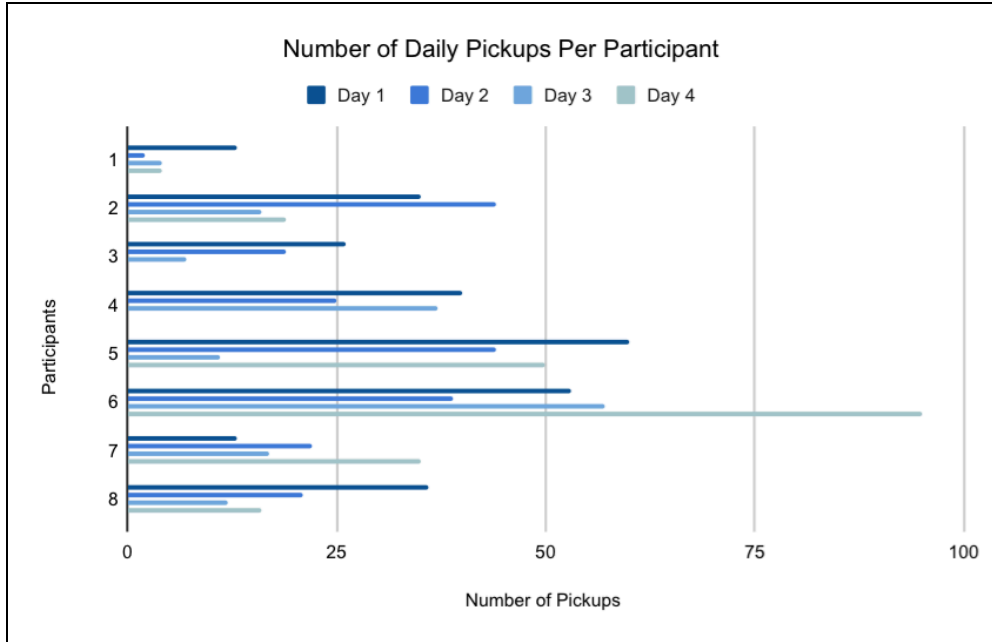**Figure E4:** Pre-Study Self-Reflection About Social Media Addiction
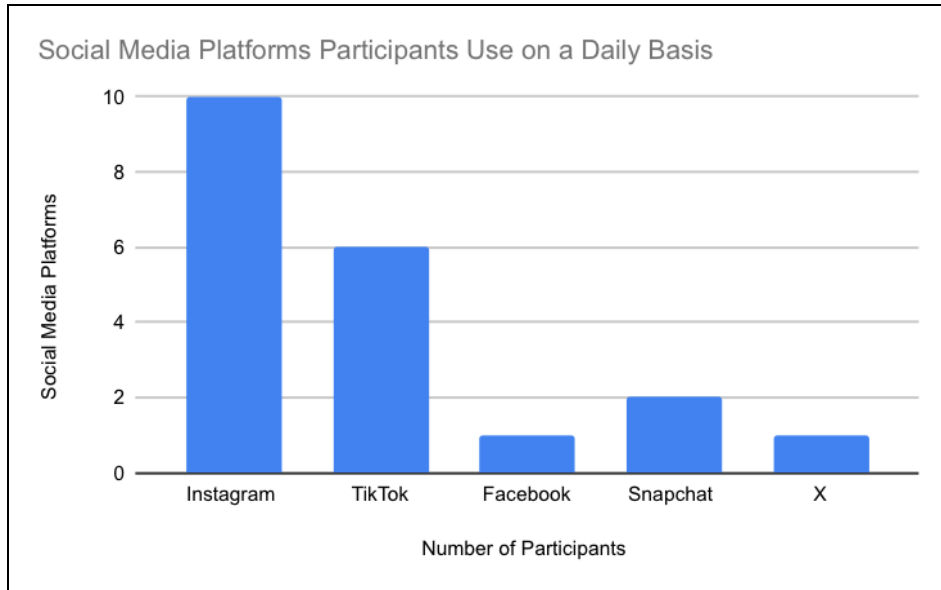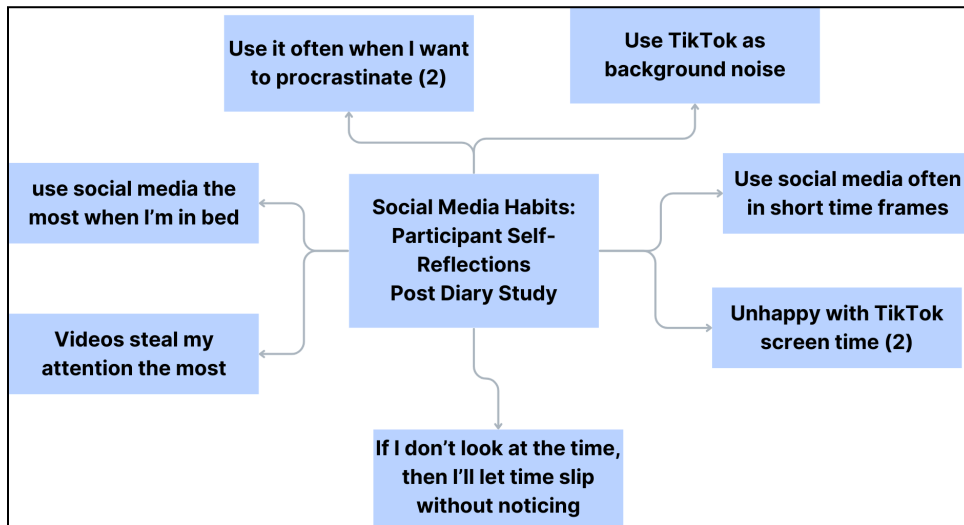
Figure E5: Social Media Breakdown
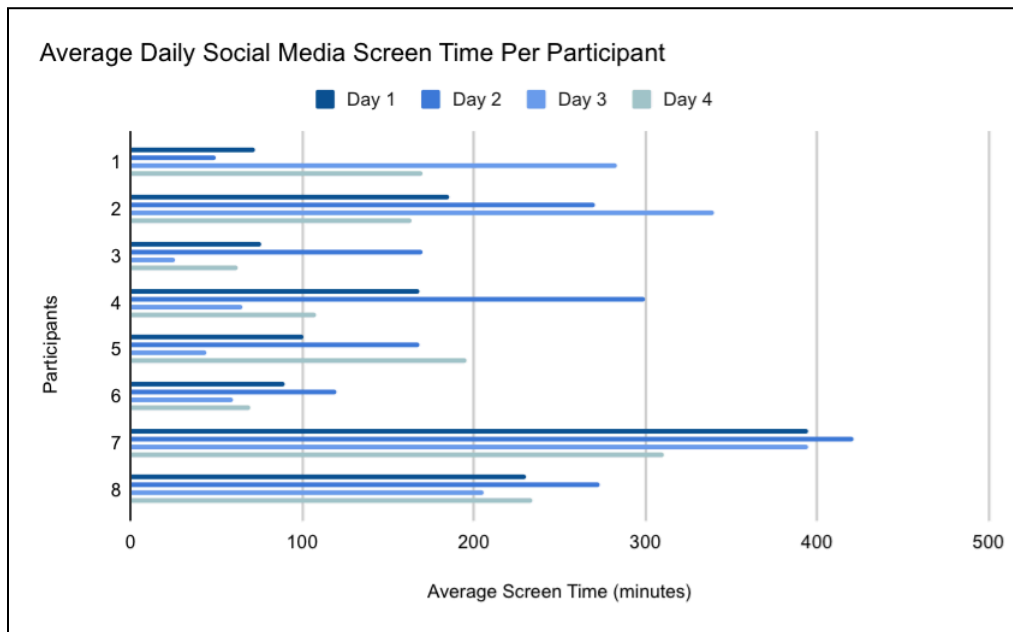
Figure E6: Participant Average Screen Time

73

Figure E7: Participant Average Pickups

Figure E8: Post Study Reflections, New Participant Insights

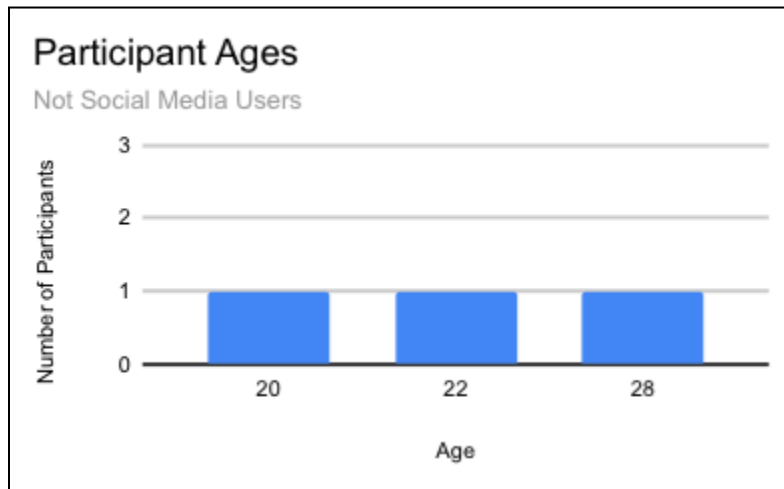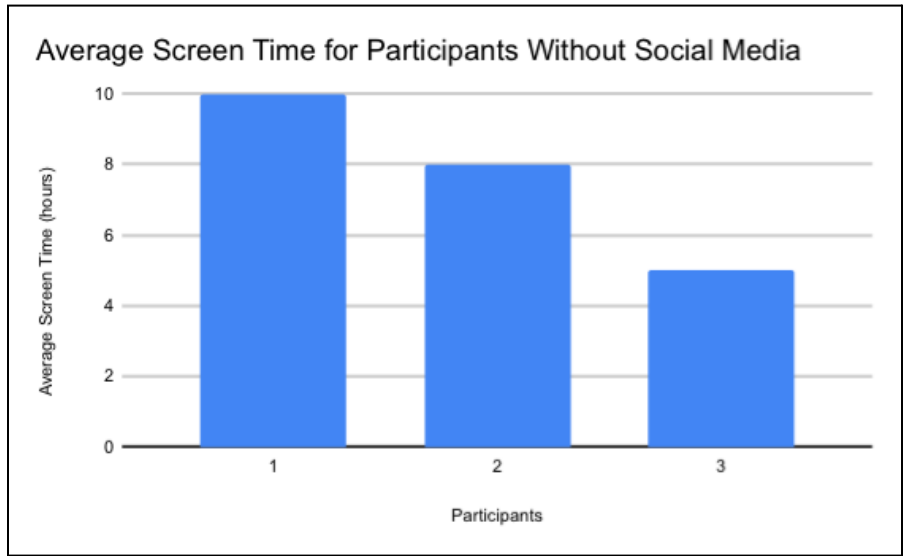**Appendix F: Additional Users Without Socials Survey Results**
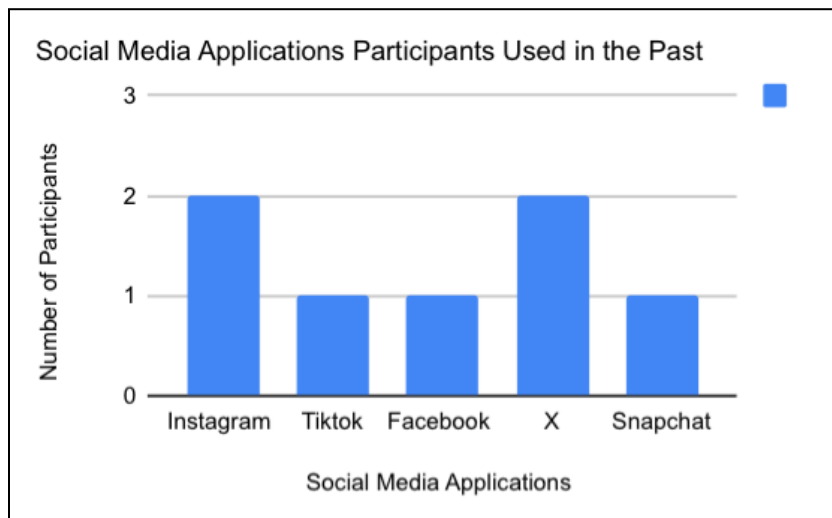

Figure F1: Participant Ages

Figure F2: Average total screen time for phone use for participants who do not use social media.

Table F3: Participants responses to survey question,"if you could change aspects of social media, what would you change?"
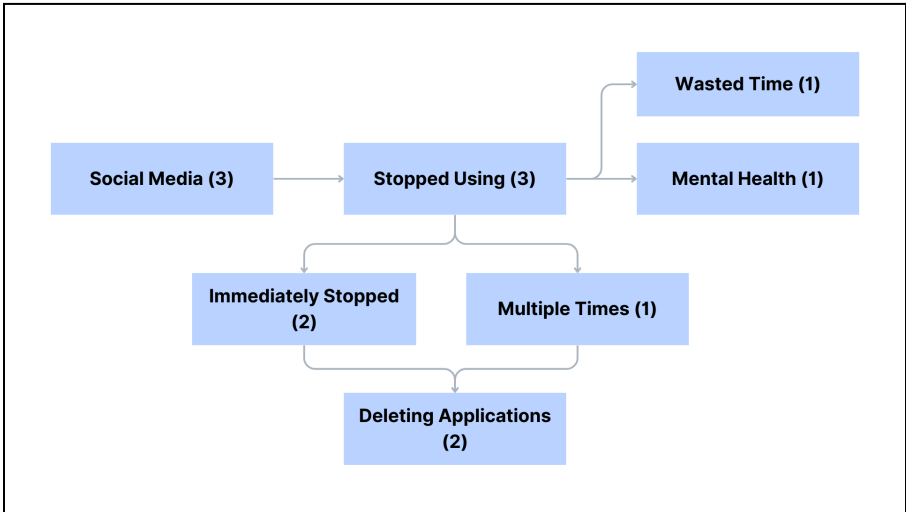
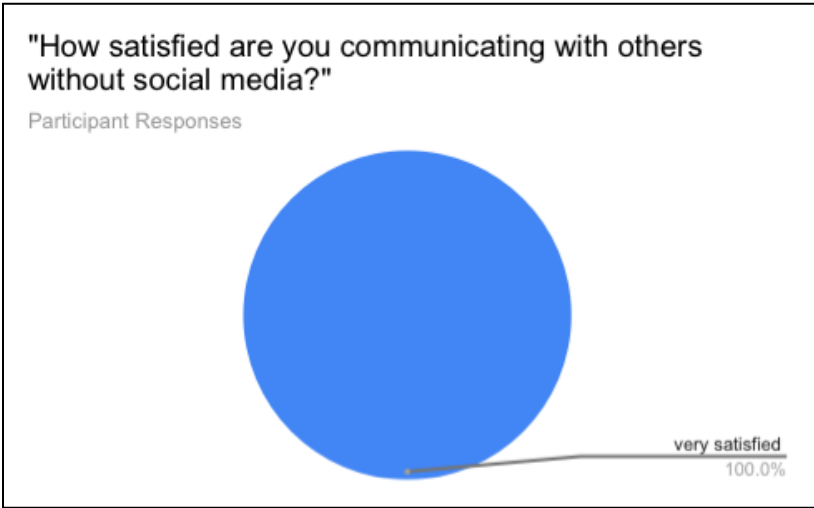| Aspects of Social Media Participants Would Change |
|---|
| i.   Privacy |
| ii.   Addiction |
| iii.   Consumption: too much unlimited content, neverending, |
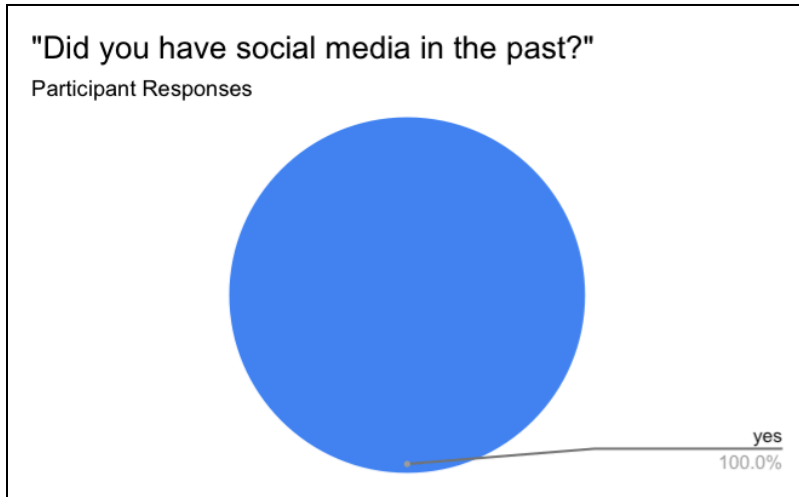
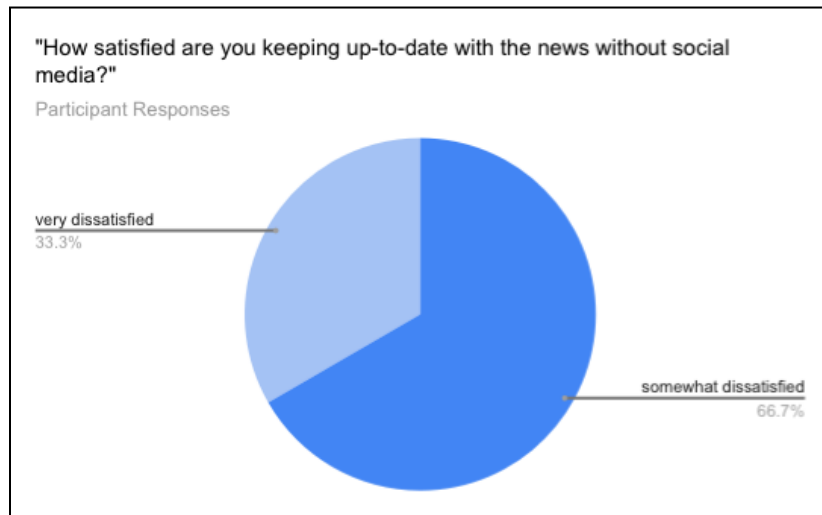**Figure F4:** Previous Users of Social Media

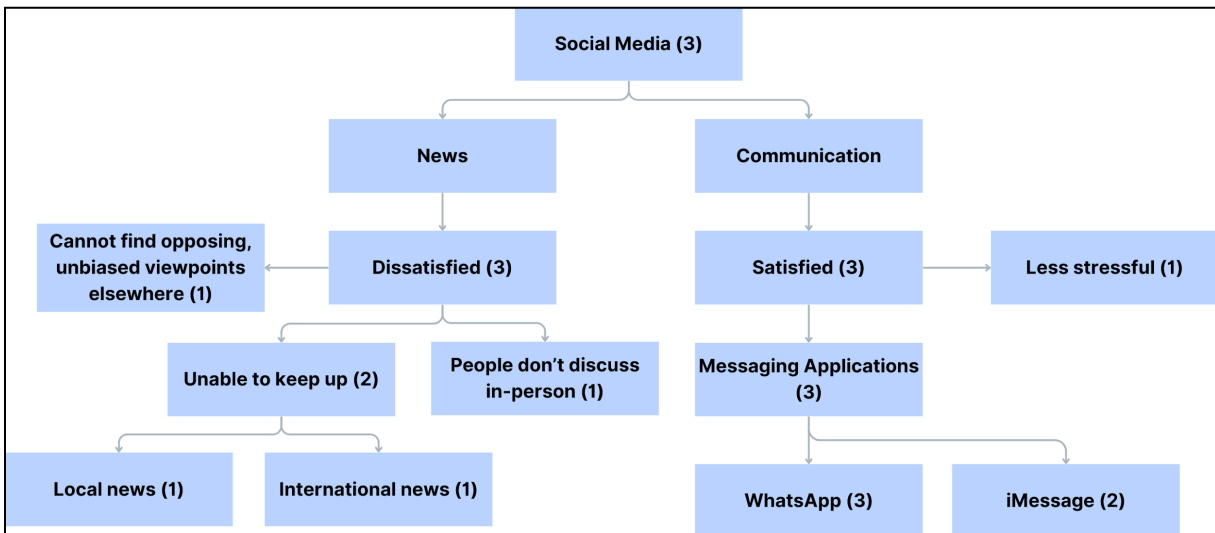**Figure F5:** Social Media Applications Participants Used in the Past

Figure F6: Reasons Participants Stopped Using Social Media

Figure F7: Communication Satisfaction

Figure F8: News Media Satisfaction

Figure F9: Reasoning for Communication and News Media Satisfaction/Dissatisfaction

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