

# Social support embedded in a mobile phone application to reduce unwanted smartphone usage among students

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Excessive smartphone usage is a growing concern among young adults. While numerous studies have examined various mobile phone applications aimed at reducing excessive screen time, the utilization of social support networks to accomplish this objective can be further explored. This research investigated three different forms of social support with a focus on university students as the test group. Out of the various approaches tested, having a support buddy capable of granting permission to exceed time limits emerged as the most favored option. To further examine this concept, a two-day user test was conducted. Students valued the additional barrier provided by a support buddy, especially during busy periods when they desire to limit phone usage. Nevertheless, participants also emphasized the importance of personal autonomy when it came to determining their phone usage during moments of relaxation.

Additional Key Words and Phrases: Smartphone use; Reducing screen time; Behavioral change; Social support; Support Buddy

## 1 INTRODUCTION

Almost half of the population worldwide owns a smartphone, and this number keeps on growing [1]. The benefits of smartphones, when used in a meaningful way, are undeniable [2]. Nevertheless, excessive smartphone usage can have negative effects: Problematic Smartphone Use (PSU) can lead to poor sleep quality [3], dangerous behavior (e.g. calling while driving) [4], physical problems (e.g. muscle pain and ocular afflictions) [5], and a negative effect on mental health problems, including depression and anxiety [6]. The majority of countries have experienced a rise in problematic smartphone use over time [3] with more prevalent misuse among young adults [7]. For numerous students, smartphones have become an indispensable part of their daily life, and the idea of living without a smartphone has become unthinkable: frequently, a mobile phone is the first thing that is checked in the morning and the last thing used before going to sleep [8]. Often, students turn to their phones as an escape-coping mechanism when experiencing negative emotions, or when feeling stressed or anxious [9]. Also, while procrastinating, students often resort to using social media on their phones [10]. According to Deloitte's 2019 Global Mobile Consumer Survey, 48% of smartphone users admit to overusing their devices [11]. Many excessive smartphone users express a desire to reduce the time they spend on their devices, particularly on activities with no real purpose [2].

In response to the growing concern over excessive mobile phone use, various apps have been developed to help reduce screen time; diverse features like blocking, parental control, tracking, rewards,

reminders, and coaching, are all aimed at assisting users in reducing the amount of time spent on their smartphones [12]. Nevertheless, limited research has been conducted on utilizing users' social networks to assist them in decreasing their excessive screen time. Therefore, this research focuses on the use of social networks to reduce unwanted screen time among students who acknowledge spending too much time on their smartphones, as assistance from friends, family, or a support group can be useful when attempting to modify someone's behavior [13]. The following research questions are to be addressed:

- (1) What makes involving social support a promising strategy to reduce unwanted smartphone usage?
- (2) How can social support be involved in the process of reducing unwanted smartphone usage via an app?
- (3) What are the advantages and disadvantages of involving the user's social network in an app to reduce unwanted smartphone usage among University students?

To address the three research questions, the following steps are taken. Firstly, a literature review was conducted to answer the first question and determine the efficacy of social support in promoting behavioral changes. Secondly, to answer the second question, three Lo-Fi prototypes of an app were developed and evaluated, with a focus on utilizing social support to reduce screen time. Lastly, user tests with students were conducted to gather feedback on the concept, enabling us to address the third research question.

## 2 RELATED WORK

### 2.1 Social Support

Social support can be defined in various ways. Taylor explains [14]: "*Social support, which is the perception or experience that one is cared for, esteemed, and part of a mutually supportive social network, has beneficial effects on mental and physical health*". The objective of social support is always to be helpful, which sets it apart from intentional negative interactions [14]. Moreover, social support is one of the persuasive design features that encourage behavioral changes [15].

Social support has a significant impact when it comes to changing unwanted behavior; for instance, social support can help improve health-related dietary and exercise behaviors [16]. Multiple studies have demonstrated that individuals with strong social support networks, such as family, friends, or a support group, contribute to lower dropout rates during addiction treatment and increased chances of favorable recovery outcomes, which reduces the likelihood of relapse [17]. A longitudinal study involving 241 users found that as the levels of social support increased, smartphone usage decreased; the study showed that the greater the increase in support throughout the period, the greater the reduction in mobile phone usage [18].

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Social support can be applied to many fields. For example, spouse involvement is a powerful factor in weight control, where couples engaging in joint training tend to experience greater weight loss [19]. Mutual monitoring, particularly in the initial weeks, in addition to receiving support and encouragement from one's spouse plays a crucial role when trying to lose weight [19]. Interventions that encourage exercising together and promote positive communication have the potential to be effective in assisting individuals with serious mental illness in initiating and maintaining health behavior changes required to reduce obesity [20]. Next to this, significant increases in physical activity among older adults can be observed when their partners actively participated with them [21]. And engaging in cooperative learning in pairs or groups of four leads to increased academic achievement compared to individualistic learning [22]. Once a behavior is integrated into a network, it has the potential to become an integral component of the social identity of the group. Consequently, the group will strive to uphold the behavior to preserve its collective identity [23]. Overall, integrating social support into interventions and applications can be a powerful strategy for fostering positive behavior change and maintaining desired outcomes.

## 2.2 Theories and principles

In addition to social support, alternative methods can be employed to promote behavioral changes in smartphone usage, including the implementation of the Goal-Setting Theory and the integration of Gamification principles [24] [25].

**2.2.1 Goal-Setting Theory.** Goal-Setting Theory is often used in persuasive technologies and health interventions [24] and explains the importance for individuals to set their own goals instead of having them assigned by others, as this self-generated goal-setting leads to increased motivation [26]. For optimal results, goals should be challenging yet realistic, with measurable progress [26].

**2.2.2 Gamification principles.** Gamification, which involves integrating game design elements into non-gaming contexts, can be applied as a means to enhance engagement in technology-mediated programs [27]. Studies have shown that with gamification and rewarding actions positive behavioral changes in individual users can be achieved [25]. For instance, gamification and serious games, video games designed with a focus on practicing skills and problem-solving rather than entertainment [28], are promising techniques to promote healthier eating habits [29]. Oftentimes, the incorporation of competition is closely intertwined with the concept of gamification. Competition can be used as a motivational tool to induce users to embrace a desired attitude or behavior by making use of the human's natural inclination to compete [30]. Engaging in a friendly competition provides a strong motivation that, for example, enhances student performance [31].

## 2.3 Current Solutions

Various types of applications are available to assist users in monitoring their smartphone usage and decreasing their screen time [12] with some of them already incorporating social support. The application *NUGU* allows users to self-monitor their smartphone

usage behavior, establish limiting activities, for which users can earn points by successfully adhering to these limitations, and to participate in a points competition with their friends [32]. The participants in the research expressed their desire to establish specific goals for phone usage in order to enhance their focus on various activities, such as studying, working, and sleeping [32]. The participants felt particularly motivated to set more challenging goals upon observing the goals set by their group members [32]. *Let's FOCUS* helps users regulate their mobile phone usage in classrooms by issuing location-based notifications and enabling social comparison and competition [33]. Subsequently, *Lock n' LoL* allows its users to limit their smartphone usage together with their group members [34]. Existing research has focused on studying individual applications, but there is a notable gap in understanding the preferred type of social support among students and how it can be effectively integrated into a mobile phone application to mitigate excessive screen time. This paper aims to address this gap and provide valuable insights into this area of study.

## 3 METHODOLOGY LO-FI PROTOTYPE TESTING

This user test entails a semi-structured interview that provides qualitative data regarding which concept students prefer to help reduce screen time. The goal of this user test is to have the participants select their preferred concept, which will afterward undergo further testing. This user test was approved by the ethical committee CIS under application number 230342.

### 3.1 Materials

Three Lo-Fi prototypes have been formalized using the user experience software Figma to help visualize the different concepts for a screen time reduction application. The first concept emphasizes more on the individual in contrast to the other two, which have a stronger emphasis on group dynamics.

#### a) **Support buddy** (Figure 1a)

In this concept, the user can set multiple daily time limits for various apps. By establishing their own challenging time limits, it is expected that the user has a higher motivation to withhold from exceeding them, as explained in Goal-Setting Theory. Additionally, a support buddy has to be selected. Only one support buddy can be selected, i.e. a good friend or housemate. If the time limit is reached, the app gets blocked. To regain access, the user must request an unlocking code from their support buddy. The support buddy should evaluate the situation and make a judgment on whether the user should be granted additional time on the app. The judgment should be based on the user's goals regarding their smartphone usage.

#### b) **Gamification** (Figure 1b)

This concept was inspired by *NUGU* and uses gamification and competition to make reducing screen time more attractive to the user together with friends. Users can set their individual daily time limits for specific apps, and if they manage to stay under these limits, they earn points. However, if the user exceeds twice the allotted time limit for an app, points are deducted. Furthermore, each day, the person with the

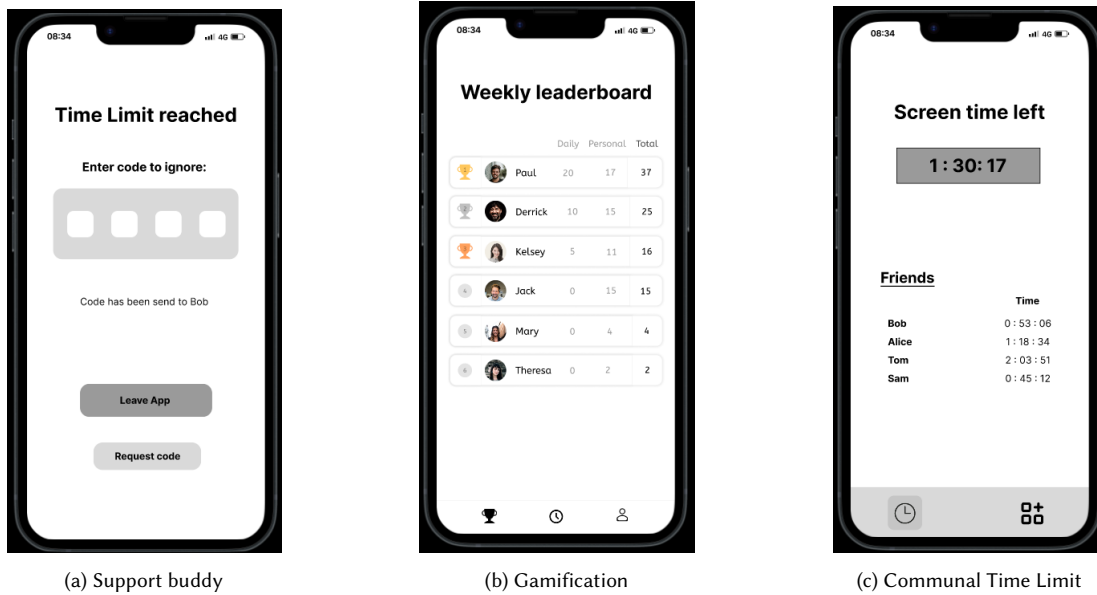


Fig. 1. Concept Lo-Fi prototypes

least amount of screen time among the participants receives extra points. A leaderboard is maintained to track the points, and at the end of each week, a winner is determined. The leaderboard resets at the start of each new week, providing a fresh opportunity for users to compete and earn points again.

#### c) Communal time limit (Figure 1c)

With the following concept, a friend group can set a communal time limit for a selection of apps. Each user individually selects their own set of apps, thus every user has their own app selection that counts for the communal time limit. The screen time of everyone in the friend group gets added up together and if the daily communal time limit is reached, the selected apps on all smartphones of the friend group are blocked for the remainder of the day. The users can see how much time each person has spent on their phones, and find out who is guilty for blocking all the apps. This concept encourages mutual monitoring, comparison, and cooperation among the group members.

### 3.2 Participants

A total of 5 university students from different studies at the University of Twente were involved in this user test. The students were recruited by directly approaching them on campus and inviting them to participate in the study. The participants are individuals who acknowledged spending excessive time on their phones and expressed a desire to decrease their unwanted screen time.

### 3.3 Procedure

Before starting the user test, the participants had time to read the information letter, ask questions, and sign the consent form. The first part of the user test consisted of questions about the participant's mobile phone usage. These questions helped us understand what

the participants use their phones for, identify the most problematic applications, determine the reasons behind their desire to reduce screen time and explore the methods they have previously attempted to achieve this goal. During the second part of the user test, the three concepts were introduced to the participants in random order, and a series of questions were asked to gain deeper insights into their thoughts and perspectives.

## 4 RESULTS LO-FI PROTOTYPE TESTING

The interviews were transcribed and analyzed by identifying topics and patterns in the participants' responses.

### 4.1 Context of phone usage

The students in our user test often engage with their phones when they are bored or looking to fill up spare time, seeking entertainment or distraction. They use their phones as a means to connect with people, whether it's through social media, messaging apps, or calls. Additionally, the students found themselves reaching for their phones while procrastinating, using them as a temporary escape or diversion from tasks they should be focusing on. The participants acknowledge that they occasionally reach for their phones without conscious intent, lacking a specific purpose in mind for their usage. According to Participant 5, "I flip it up and start scrolling through Instagram. So just out of nowhere, you start scrolling on it." Four students identified Instagram as the application that consumes the most unwanted screen time, primarily because it gets them caught up in mindless scrolling.

The student's primary motivation for wanting to reduce screen time is that there are more productive things they could do with their time. The students feel like they waste their time on their phones as it does not contribute anything meaningful to their lives

in the long run. Participant 4 gave an example, “*Reading also takes a lot of time, but I end up happier after reading, and Instagram is just, yeah, I just lost an hour of my life.*”

According to the participants, they would utilize an app for screen time reduction only temporarily when needed. The app would primarily be used during exam weeks, when they have significant project deadlines, or when they feel their phones are becoming a major source of distraction and time loss.

Although all participants’ phones keep track of their screen time, they admit to not utilizing this information to take any measures to reduce their screen time. Two of the students explained that they keep their phones in silent mode to minimize distractions and interruptions, enabling them to focus on other tasks. Similarly, two students have implemented time limits for specific apps. While this approach helps raise awareness about their mobile phone usage, they find it relatively easy to bypass these limits. Participant 4 mentioned that deleting the problematic app did help with reducing their screen time. Other approaches that were taken did not have a lasting effect and failed to produce significant results or make a notable impact on reducing smartphone usage. Despite expressing an interest in reducing their screen time, several students pointed out that spending time on their phones is not always detrimental. When feeling tired, they take pleasure in taking breaks and engaging with their phones.

## 4.2 Feedback concerning concepts

**4.2.1 Concept 1: Support buddy.** After presenting the three concepts, four students indicated their preference for the support buddy app over the other two options. The social presence of a buddy for accountability is seen as a positive aspect, as it acts as an additional barrier to prevent excessive phone usage. The participants appreciated the more personal experience, which focuses on individual progress rather than comparison with others. The participants view reducing screen time as a personal endeavor, something they do for themselves without the necessity of comparing it with others. Nevertheless, they acknowledge that having a supportive friend to assist them can be highly enjoyable and effective.

**4.2.2 Concept 2: Gamification.** The gamification was chosen by one participant as the preferred concept. The competitive element offers a fun and motivating approach that the participants found entertaining. However, one of the participants expressed concern that this app would limit their freedom to use their phones. They felt that the competitive nature of the app might prevent them from enjoying their phone during moments of leisure and relaxation.

**4.2.3 Concept 3: Communal Time Limit.** None of the participants were enthusiastic regarding the concept of an application with a communal time limit. Three participants expressed willingness to give this app a try. However, they did not have confidence that the app would be effective for their individual needs. The aggressive approach of the app, which could lead to annoyance and guilt, was a concern raised by the participants. According to the students, the application lacks personal control and relies too much on other

people. Participant 3 mentioned, “*I want to have control over it [my screen time] myself instead of sharing that responsibility or that burden.*” Moreover, the students expressed skepticism about the app’s long-term effectiveness. This approach heavily relies on trust within the friend group and may result in frustration if one person uses up most of the screen time. The participants believe that the introduction of the guilt factor could be demotivating rather than encouraging.

The preference among the five students was clearly towards the app with buddy support, which was preferred for reducing unwanted screen time and improving productivity in periods of high workload, due to its emphasis on personal accountability.

## 5 METHODOLOGY USER TESTING

Based on the findings from the previous Lo-Fi user test, we observed that the students have a preference for the concept involving a support buddy. In order to delve deeper into this concept, a two-day user test and an interview were conducted. The objective of this user test was to explore the user’s experience of having a support buddy while attempting to reduce screen time. Additionally, it aimed to investigate the benefits and drawbacks of incorporating the user’s social network into an application focused on minimizing excessive smartphone usage.

This user test was approved by the ethics committee CIS under application number 230388.

### 5.1 Materials

The implementation of the concept incorporated the existing functionality of Apple Screen Time<sup>1</sup>, enabling participants to utilize their own smartphones. This approach ensured an accurate representation of participants’ mobile phone usage patterns.

Within the settings of the iPhone, a Screen Time Passcode can be set and different time limits can be established for individual applications (Figure 2a). It is important to note that the code can only be modified directly on the iPhone itself, which means that it is not possible to change the code remotely. Upon reaching a limit, an overlay is activated to prevent the user from continuing to use the app (Figure 2b). The time limit can be skipped by requesting more time and entering the screen time passcode (Figure 2c).

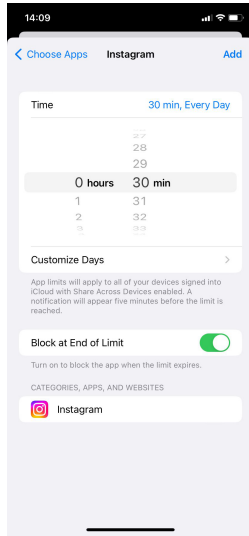
### 5.2 Participants

The participants in this user test were six students from the University of Twente who own an iPhone and had the desire to decrease their screen time. The studied participants consisted of a convenience sample of friends of the researcher, this group was selected to ensure consistency throughout the user test.

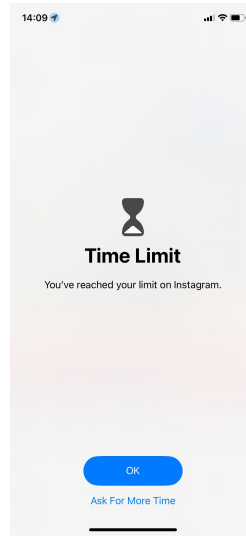
### 5.3 Procedure

The user test consisted of three parts: an intake, a two-day testing phase, and a semi-structured interview. Throughout the user test, the participants were distinctly informed regarding whether they were interacting with the researcher or the support buddy. This was

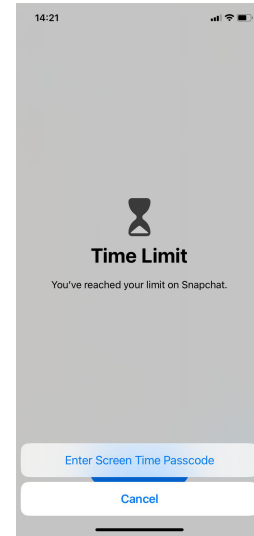
<sup>1</sup><https://support.apple.com/en-us/HT208982>



(a) Setting a time limit for app



(b) Time limit overlay



(c) Option to bypass limit by entering code

done to prevent any confusion, as the researcher also fulfilled the role of the support buddy.

**5.3.1 Intake.** The participants were first given the opportunity to read the information letter, ask any questions they had, and sign the consent form. Following that, additional details regarding the forthcoming proceedings were given by the researcher. Afterward, the participants, along with the researcher acting as the support buddy, established ambitious daily time limits. Granting the participants control over setting their screen time goals was essential, as it aligns with the principles of the Goal-Setting Theory, fostering motivation and engagement. The concept consisted of a support buddy, a close friend of the participant, whose primary responsibility was to assist the participant in achieving their objectives regarding smartphone usage. For the purpose of this user test, the researcher assumed the role of the support buddy for all participants.

The support buddy initially set a code, unknown to the participant, and subsequently, the daily time limits for individual apps were decided and imposed. The participant and the support buddy established a mutual understanding of the participant's objectives and determined the specific conditions for regaining access to a blocked app. This information should be utilized during negotiations when an app is blocked. It was essential for the support buddy to understand the participant's motivation for reducing screen time, enabling them to provide effective assistance. The support buddy was expected to follow the strict guidelines and not provide the code unless the participant presented a valid reason for its necessity. Furthermore, the duration for which the time limit could be lifted was mutually agreed upon.

**5.3.2 Test phase.** Upon the completion of the setup process, the participants were encouraged to use their mobile phones in the same manner as they would normally outside of the experiment. If the participant reached a time limit and desired additional screen time, they could reach out to their support buddy to request the code. They could contact their buddy through various means, such

as approaching the buddy in person, sending a text message, or, in urgent situations, making a phone call. It was the responsibility of the support buddy to assess whether granting more time on the blocked app aligned with the agreed-upon guidelines and goals.

To lift the time limit, there were different scenarios depending on whether the participant and support buddy were in the same location or not:

- a) *Participant and Support Buddy in the same Place:*  
The support buddy enters the unlocking code on the user's phone and determines the duration for which the app will be unlocked.
- b) *Participant and Support Buddy not in the same place:*  
The support buddy sends the unlocking code to the participant, nevertheless, it remains within the support buddy's purview to determine the duration for which the time limit is lifted. It is important to note that even if the participant is already aware of the code, they must still seek authorization from their support buddy to surpass the time limit. Once the code is known by the participant, the participant and the support buddy are expected to change the code as soon as possible. This step ensures that the participant continues to rely on their support buddy for the code when the time limit is reached again. It prevents the participant from secretly using the code to regain access to a blocked app without the knowledge and permission of their support buddy.

After using the buddy support system for 48 hours, the imposed time limits were removed.

**5.3.3 Interview.** Subsequently, the researcher interviewed the participant to gain valuable insights into their experience with the time limits and the impact of social support on their smartphone usage. The objective of this interview was to enrich our understanding of the participant's perspective on the support buddy concept.

#### 5.4 Monitoring

The applications, which the participants restricted, were documented. The number of times the participant requested the unlocking code, the specific apps for which they sought additional screen time, and the underlying reasons behind their requests were kept track of. This monitoring approach enabled a comprehensive analysis of the participant's behavior and provided insights into their usage patterns and preferences.

### 6 RESULTS CONCEPT TESTING

The interviews were transcribed, followed by a thematic analysis. The subsequent sections present the different themes.

#### 6.1 Overall Experience

The participants' overall experiences varied when it came to the support buddy concept. Five participants appreciated how the concept increased their awareness of their phone usage. Participant 1 noted, "Normally, you don't think about how long you use Instagram or Facebook, you just use it until you're done with it." Participant 2 pointed out, "You don't realize how long you are on there [an app] until you get the timer." The time limits helped them break the flow of being on a certain app bringing their attention to the passage of time. They could not simply bypass the limit; instead, they had to consider whether they should reach out to their support buddy for the code. Furthermore, one participant, who had previously deleted TikTok due to spending an excessive amount of unwanted time on the app, found the strictness of the limits beneficial, as reaching the limit compelled them to stop using the app. This allowed the participant to reinstall TikTok without the concern of spending excessive time on it.

Nevertheless, not all participants enjoyed the concept. Participant 3 argued that the time limits diminished their sense of autonomy, stating, "I just didn't like it because I normally can depend on myself when I want to stop". While, two pp mentioned that the concept caused them stress, as they worried about reaching the time limit and losing access to the app, making them feel rushed when using their phones, another pp appreciated the time pressure. Two of the participants indicated that they became more focused on completing specific tasks and once they finished, they promptly disengaged from their phones. For instance, Participant 5 mentioned being more conscious and goal-oriented when using Instagram as they knew they could not scroll endlessly long on the app: "Let's watch something, let's reply some messages and then close the app so I can save the time for later if I need it". With the exception of one participant, all others were conscious of the time limits while using their phones. Particularly in the morning, the participants made an effort to limit the usage of the restricted apps, ensuring that they would still have access to those apps later in the day when they considered them to be more necessary.

#### 6.2 Reaching the Time Limits

All participants except one reached their time limits on one or both testing days. The most common initial reaction upon hitting a time limit was a momentary annoyance, followed by acceptance of not

spending more time on the specific app. Participant 2 explained, "What happens is that if you get that pop-up of like the time is done, you're annoyed because you were in the middle of something, but then by asking a support buddy, you kind of have to hold on to that anger or annoyance longer, which makes it wear out".

Although the participants considered asking their support buddy for the code, they ultimately decided to not ask for the code and instead engage in alternative activities. They found requesting the code unnecessary as they anticipated not receiving it because it would not align with the goals they had set. Participant 6 was the only one to make a code request once, but since the support buddy was not able to respond in time, the participant did not receive any additional screen time. While waiting for the code, Participant 6 explored alternative solutions and ended up using their partner's phone to spend more time on the blocked app.

Participant 5 had an intriguing response upon reaching their time limit. Instead of being frustrated by the app being blocked, they felt a sense of relief knowing they would no longer be distracted by the application. Upon hitting the time limit, the participant thought, "Now I can turn off my phone, and my support buddy would be proud of me."

#### 6.3 Alternatives

Three participants acknowledged that they resorted to using different apps once a particular app was blocked, which resulted in increased screen time on apps that they normally would not use as much. They would switch to different apps until they either reached the time limits on all of them or lost interest. Participant 3 mentioned turning to their tablet to watch a movie when unable to use their phone. Additionally, as previously mentioned, Participant 6 sought to use their partner's phone to continue using the app that was blocked on their own device. None of the participants opted to utilize the web browser version of the app as an alternative means to continue spending time on the blocked application.

#### 6.4 Support Buddy

The participants were asked to describe the characteristics they desired in their support buddy should they have had the chance to decide. All six participants mentioned that the support buddy should be someone who is not hesitant to withhold the unlocking code when necessary. Participant 6 elaborated on their decision not to choose their partner as their support buddy, expressing concern that their partner would give them the code too easily and might even have a bad influence on their smartphone usage. Three participants emphasized the importance of having a support buddy they interact with daily, as it would make it easier to request the unlocking code when needed. Additionally, two participants highlighted the significance of selecting a support buddy with a similar daily routine, ensuring their availability when required.

#### 6.5 Periodic usage

Four participants expressed their interest in utilizing the support buddy concept during busy periods, such as exam periods or when they have a heavy workload. Participant 6 explained, "During exam season, I tend to really procrastinate for no reason, so then I would

rather have a support buddy”, and added, “*But on weekends when I don’t have any other commitments and I want to do something else, I’d prefer not to have a support buddy.*” While pp 2 even requested to maintain the set time limits as they found them helpful for the upcoming weeks, the idea of time limits was not appealing to everyone. Participant 3 explicitly stated that they would not use this concept as they preferred to retain full control over their screen time. Five participants expressed their desire to be notified whenever they reached their time limits, as it would increase their awareness of their phone usage and provide them with the opportunity to decide whether or not they wanted to take action based on this information.

## 7 DISCUSSION

Three distinct concepts were designed that integrated social support to promote a reduction in screen time and were evaluated by students. Furthermore, the preferred concept was further refined and subjected to a 48-user test. The outcomes of these tests have highlighted how students perceive social support as beneficial for reducing screen time, as it serves as an additional barrier. However, it is also acknowledged that social support can restrict their autonomy. This section offers answers to the research questions as well as several intriguing findings and their interpretation. The section concludes by providing the limitations of the research.

### 7.1 Answering Research questions

#### **What makes involving social support a promising strategy to reduce unwanted smartphone usage?**

Research has consistently demonstrated the value of social support in facilitating behavior change across various domains [16] [22]. A strong network of social support is a powerful motivator, encouraging individuals to pursue their goals [17]. Working together with others towards a common objective proves to be more effective than tackling it alone [19]. In the context of reducing screen time, studies indicate that increasing social support contributes to a decrease in smartphone usage [18]. While social support yields impressive outcomes in altering undesirable behaviors, it is noteworthy to recognize the significance of setting personal goals. Establishing individual goals promotes motivation, as is explained by the principles of the Goal-Setting Theory, resulting in promising outcomes [24].

#### **How can social support be involved in the process of reducing unwanted smartphone usage via an app?**

The first concept that was designed revolves around a support buddy who assists the user in reaching their screen time goals (Section 3.1a). The additional control provided by the support buddy helped the participants adhere to their time limits, as they would mostly not bother to ask the code to lift the limit. Next to this, the participants liked the fact they could set their own limits, as they found setting and following their own goals more motivating than depending on what others do. This outcome aligns with the Goal-Setting Theory [26].

The next concept involves promoting competition within a friend group to reduce screen time (Section 3.1b). The participants appreciated the entertaining aspect of this approach, which was seen

as a motivating factor, in line with the principles of gamification theory. However, it was also noted that the competitive element had an unintended consequence of lowering the pleasure of using the mobile phone during leisure moments. This contradicts the intended purpose of gamification as it makes the concept less enjoyable. This outcome differs from the findings of the NUGU research, where participants felt motivated to establish even more ambitious goals upon seeing the objectives set by other group members [32]. The final concept entails a communal time limit within the student’s friend group (Section 3.1c). The introduction of guilt and the reliance on others in this concept was not well-received by the students, who expressed that it would not work for them. Contrary to the expectations based on persuasive system design research [15], the comparison and cooperation aspects did not facilitate behavioral changes. One possible reason for this could be the absence of a reward [35]. By spending less time on their own phones or motivating others to do so, participants enabled other group members to utilize the remaining screen time, however, they did not receive any reward for their positive behavior.

#### **What are the advantages and disadvantages of involving the user’s social network in an app to reduce unwanted smartphone usage among University students?**

Social support serves as an additional barrier when it comes to restraining unwanted mobile phone usage. The act of requesting a code from a support buddy is a more significant step than skipping a time limit, leading students to reconsider if it is worth asking for the code or if they should simply leave the app. Moreover, requiring a code to lift a time limit provides users a break from the addictive cycle of dopamine stimulation commonly induced by apps [36]. This break brings the user awareness of how much time they have spent and allows them time to reflect on whether they genuinely want to spend more time on their phones.

Enforcing strict limits, monitored by a support buddy, allow the user to engage with previously problematic apps. Instead of worrying about excessive usage, the user can set firm time limits for specific apps and agree with their support buddy that once the limit is reached, access should not be regained.

Working on reducing screen time with a support buddy can foster a sense of accomplishment when goals are met. Knowing that someone will be proud of their achievements can serve as a motivating factor for users to excel further. This effect was also observed in other research focusing on social support [20].

On the other hand, some users may feel a sense of reduced control when someone else possesses partial authority over their mobile phone usage. The lack of autonomy may be demotivating for those who prefer to have full control over their actions and the resulting consequences. Additionally, knowing that your phone usage is limited by your support system may hinder users from fully enjoying the time they spent on their phones during moments of relaxation. Frequently, users desire to engage with their phones later in the day. As a result, if they spend time on their phones in the morning, they feel the pressure to avoid using up all their allocated screen time. This can lead to feelings of being rushed, guilt, and decreased satisfaction with their phone usage experience.

Social support may yield unintended outcomes if the habits of the support network, regarding phone usage, do not align with the user's objectives. Negative habits of the support buddy may influence the user and demotivate them from reaching their screen time goals. Furthermore, relying on friends to dictate screen time may lead to situations of tension. For instance, if a support buddy is unavailable or uncooperative, the user might become frustrated or annoyed with their friend, creating potential strain in the relationship.

## 7.2 Additional Findings and Interpretation

In addition to addressing the research question, this study provided valuable insights into the topic of smartphone usage among students and shed light on the factors that trigger their engagement with mobile devices.

One recurring theme that emerged was the significance that students placed on being able to use their phones during moments of relaxation. Frequently, students hold a positive perspective towards spending time on their phones, perceiving it as an intentional activity that does not require external control. The issue of excessive mobile phone usage primarily arises during busy periods when unintentional phone use serves as a distraction and contributed to procrastination. This finding aligns with the goals that were expressed by participants in the NUGU study, as they also aimed to improve their focus on various activities, such as studying and working [32].

During the user tests, three distinct reasons for initiating mobile phone engagement were observed. The initiation of interactions between students and their phones can be classified into three categories: self-initiation, initiation prompted by the phone, and unconscious initiation. When students initiate phone usage themselves, it was often driven by the desire to connect with others, fill idle time, or as a means of procrastination from undesirable tasks. In other instances, the phone captures the user's attention through sounds or vibrations. There are also occasions when students unlock their phones and start engaging with them without consciously being aware of their actions. The layover provided in the support buddy concept helps bring awareness to the user of their phone usage, which is especially useful when the initiation was driven by factors such as procrastination, notifications, or unconscious habits. In such cases, the user may not be fully aware of the amount of time they have spent on their phones.

## 7.3 Limitations

**7.3.1 Support Buddy.** The users were not given the freedom to choose their own support buddy; instead, the researcher was assigned the role of support buddy. Some users indicated a preference for choosing someone they interact with daily, such as their partner or a housemate, as their support buddy. In a real implementation scenario, users should be given the opportunity to choose their own support buddy, nevertheless, this was not possible within this research.

## 8 FUTURE WORK

### 8.1 Research on effectiveness

Further user testing is needed to establish the effectiveness of implementing social support to reduce screen time over longer periods. One viable approach for conducting a test could involve dividing the sample into two groups: either with or without a support buddy. Subsequently, an analysis can be conducted to determine whether the introduction of a support buddy resulted in a notable decrease in screen time among the participants.

In addition, it is crucial to consider conducting testing during busy periods, as these are the moments when students desire additional guidance to help them reduce their phone usage. An additional feature that could be incorporated into the concept is the ability to set a specific time duration for the app limits to be active. This enables the user to establish limits that will automatically cease once the busy period concludes.

### 8.2 Alternative devices

Another interesting area of investigation would involve exploring the impact of alternative digital devices on smartphone screen time. This study revealed instances where students would switch to different devices, such as tablets when they were unable to use their phones. This study did not provide specific guidelines on how to address the usage of these alternative devices. Therefore, further research could be conducted to examine the effectiveness of support systems in reducing screen time across multiple digital devices.

## 9 CONCLUSION

This work contributed to the study of the impact of social support on reducing screen time among students. Current findings suggest that having a support buddy to assist users in managing their smartphone usage and achieving their screen time goals is viewed as beneficial during busy periods. However, it is important to note that the presence of a support buddy may introduce limitations that can compromise the user's autonomy and negatively affect the student's satisfaction when using their mobile phones for leisure activities. Conducting an extended user test involving students during busy periods would demonstrate the effectiveness of the support buddy concept. Upon confirming the concept's efficacy in reducing unwanted screen time, the subsequent course of action would involve initiating the development of an app that implements the buddy support concept. This app should allow users to set their desired time limits and generate a unique unlocking code that can be shared with their support buddy.

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