UNIVERSITÉ GRENOBLE ALPES
HUMAN COMPUTER INTERACTION

PROJECT REPORT

Vibration vs. Visual Cues: Investigating Notifications for Limiting Social Media Usage

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1 Introduction

1.1 Structure of this report

This report addresses a critical problem in the field of Human-Computer Interaction: managing smartphone screen time, particularly on social media platforms like Instagram. We first outline the problem and provide the research questions that guided our study. Next, the related work section reviews existing studies and solutions. Subsequently, the methodology section explains the experimental setup and the implementation of an app to investigate the problem. The results section summarizes our findings, which are categorised in the discussion.

1.2 Problem and possible solutions

In this subsection, we describe the problem within the field of Human-Computer Interaction that we aim to address.

Reducing smartphone screen time, especially on social media platforms, is a goal for many users. Users often tend to become addicted to continuous scrolling on platforms like TikTok or Instagram. Consequently it is getting more and more difficult to keep up with the want to spend less time on those apps. There are existing solutions to help users with this kind of problem, such as app-specific time limits and reminders. However, these interventions often fail to effectively change users' behaviour, as many users bypass notifications and continue scrolling. This highlights a critical need for more effective solutions to support users in achieving their screen time goals.

To explore a path of a possible solution to the presented problem we want to focus on the impact of vibration feedback used to indicate that the usage time of a social media app is over. In particular we want to focus on Instagram as a representative for the social media apps. More details on how this study was conducted will be provided in the methodology section [3].

1.3 Scientific Questions

The following research questions guide our study:

- Q1: Does the addition of a vibration alert alongside the visual notification enhance users' compliance with screen time limits on social media apps?
- Q2: Does continuous vibration feedback, when users extend their screen time limit, influence their behaviour compared to when the vibration stops after reaching the time limit?

These questions are motivated by the growing need for effective interventions to help users managing their screen time. Although visual notifications are commonly used, their impact on user behaviour is limited. By introducing vibration feedback as an additional factor, we want to investigate the extent to which users can be supported to achieve their goals and reduce the usage of the app.

2 Related Work

Tan et al (2019) investigated how haptic feedback on smartphones influences the user experience. According to their study, stronger and shorter vibrations contribute to an optimal user experience, whereas longer vibrations are perceived as annoying [3]. This may suggest that longer vibrations during notifications could be used to make users more uncomfortable while using their smartphones, so that they are willing to interrupt the continuous scrolling and adhere to their screen time limits.

Back in 2000, MacLean's work described how haptic feedback could be used to interact with users without relying on visual or auditory stimuli. Users can perceive cues directly through their sense of touch, which is a more direct and often more effective form of communication [1]. This finding highlights the role of haptic feedback as an important factor in shaping user behaviour in Human-Computer Interaction contexts.

Wu et al (2016) conducted a systematic review and meta-analysis to evaluate the effectiveness of interventions to reduce screen time. Their analysis found that strategies that combine multiple senses tend to achieve better results [4]. This supports the idea that combining visual notifications with haptic feedback could improve user compliance with screen time limitations.

3 Methodology

This subsection will describe the methodology, app implementation and data privacy related to this study.

3.1 Experimental Setup

An in-between study design was chosen for this study and therefor each participant was assigned to one group out of three. The following three states of notifications were investigated:

Group 1 Visual notification only: Only a visual limit notification displayed on the top of the screen will inform the user about the end of the timer.

Group 2 Visual notification and part time vibration: A visual limit notification on the top of the screen and a vibration during the displaying of the notification will inform the user about the end of the timer.

Group 3 Visual notification and continuous vibration: A visual limit notification on top of the screen will inform the user about the end of the timer. From the moment on, when the first timer is over, the phone will start and continue to vibrate, until the timer is not extended anymore but exited.

The participants use a provided smartphone with a pre-installed app designed for this experiment. After the assignment to one of the groups, each participant has to login to Instagram on this provided phone. Then, the study director will set up the app corresponding to the group's condition and set a timer to 5 minutes.

After that the participant can start to use his or her Instagram account. Once the timer expires, the participant was notified based on their group's condition. Now the user can either extend the time by 2 minutes (up to five times) or exit the app and stopp using Instagram. If a user decides to quit scrolling or if the five times of extentions are over, the user is asked to inform the study director. After this part, every user must answer several questions, see section 6 for the detailed questionnaires.

3.2 Data privacy

We decided to ask the participants to login with their own instagram accounts, because we want the scenario to be as realistic and comfortable as possible. We decided that it would not depict a real situation, if the participant has to scroll to a feed that is not customized.

The participation in this study was voluntary. Users were informed in advance that they would have to log in to Instagram using their credentials on a foreign device. They were also informed that the login information would not be stored and that they would be logged out immediately after the study. During the study, they were not observed and the screen or anything else was not recorded in any way.

3.3 Implementation of a screen time limitation application

To establish the test conditions, we developed an application in SWIFT for iPhones. The development was done on a MacBook Pro M1 (2021) using XCode. In the developed app, the user can choose one of the following conditions according to the three groups of the study:

- Visual notification only
- Visual notification and part time vibration
- Visual notification and continuous vibration

Now the user can set an initial time and start the timer. The timer will start to count down while it is possible to switch to another app. The timer app will notify the user in the desired way when the time is over. After that it is possible to extend the timer by two minutes, which will cause the app to close and return to the previous screen, e.g. Instagram. If a total of five times of extentions is reached, it is not possible to extend the timer anymore. The only remaining option is to click on "Exit", which will close the application and let the smartphone return to the home screen. The following figure displays the different stages of the application.

4 Results

In this section, all results of the conducted study will be described. The detailed answers of the participants to the questionnaires can be viewed in the appendix in section D. A total of 18 people took part in this study.

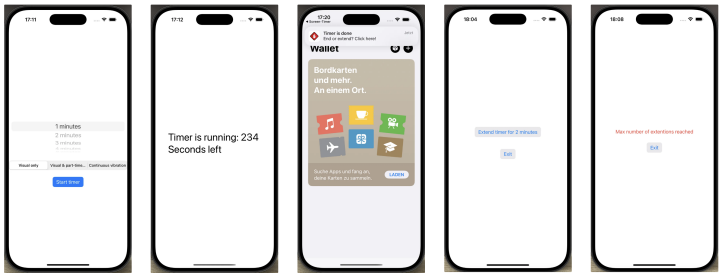

Figure 1: Different stages during the usage of the screen timer application

4.1 Group 1: Visual Notification Only

The participants assigned to this group were facing a visual notification as a reminder that their usage time for Instagram is over. Three out of six participants described the notification as "moderately noticable" ([P1][P3][P5]) and two as "barely noticable" ([P2][P4]), one person described the notification as "quite noticable". Everyone extended the screen time at least once. At the average they extended the timer two times. The reason they gave was their constant need to scroll and watch reels. 84% described this method of notifaction as "moderately helpful" ([P1][P2][P3][P5][P6]). Besides that, they mentioned that the measure was helpful, but not enough to motivate them to stop ([P3]). A countdown timer or active interaction could increase the effect for them ([P2][P4]). In addition, an acoustic alarm would be better to complement and emphasise the visual warning in their opinion ([P5][P6]).

4.2 Group 2: Visual notification and part time vibration

All participants within this group classified the used form of notification as at least "quite noticable". Three people did not extend the timer once ([P8][P10][P12]). They commented that they stopped because "the time was over" or "the notification was enough to make [them] stop" ([P12][P10]). The other participants extended the timer for their Instagram usage at least two times ([P7][P9][P11]), they stated that they wanted to see more reels ([P7][P11]), were not ready to stop ([P11]) or wanted to finish adding a friend ([P7]). All participants described the used kind of notification as at least "moderately helpful". As a feedback, one participant stated that the combination of visual notification and vibration was helpful, but a clearer vibration pattern could improve the effect ([P11]). Immediate opening of the blocker app and a calming visual effect could also increase effectiveness ([P7][P12]).

4.3 Group 3: Visual notification and continuous vibration

In this group, 50% of the participants found this method of notification "quite noticable" and 50% found it "very noticable". Two peope did not extend the timer once. They found the vibration too annoying or overwhelming right from the start ([P15][P18]). All other participants did not extend the timer more than one time ([P13][P14][P16][P17]). Three of the four participants who extended the timer once stated that they immediately wanted to end the timer because they did not like the feeling of the continuous vibra-

tion ([P1][P16][P17]). One person who waited until the first extended timer was over stated that the continuous vibration was annoying and made him nervous and anxious ([P14]).

5 Discussion

The results of group one show that a visual notification at the top of the screen is perceived as moderately helpful, but is not sufficient on its own to significantly influence usage behaviour. Despite the warning, participants were inclined to extend their usage time, indicating the limited effectiveness of this measure.

The results from group two show that the combination of visual and vibrating alerts significantly increased the perception of the usage limit, with all participants rating the alert as at least "quite noticeable" and "moderately helpful". However, this did not lead all participants to refrain from extending their usage time. Three participants consistently ended their usage as the notification was sufficient for them, while the others used the time extension more than once.

The continuous vibration in group three seems to be an effective way to get users to stop their social media usage. It interrupts scrolling and helps to reduce the want to spend more time on Instagram or the phone in general. All participants did not extend the timer more than once and found the app helpful and noticable. However, the vibration was perceived as uncomfortable by some users, potentially leading to frustration or stress in the long run. To increase the positive effect, it would be useful to adjust the intensity or duration of the vibration so that the method remains effective without causing negative feelings.

5.1 Limitations

The sample of this study (n = 18) is relatively small, which limits the generalizability of the findings. Although clear tendencies became recognisable, a repetition of this experiment with a lager sample can highlight those tendencies and bring forth a better representation for the entirety of Instagram users. As a representative social media app this study focused on Instagram. Nowadays 1.69 billion people are using Tiktok in 2024 [2]. Therefor a repetition of this study with focussing on other social media apps or other apps in general can help to investigate the applicability of this timer app in other areas. Furthermore it has to be taken into account that this is a snapshot of the users behaviour and a laboratory situation. A long-term study could reveal further insights into the users behaviour and the efficiency of the tested notification types.

6 Conclusion

To answer the two research questions mentioned earlier in this paper, the addition of a vibration alert alongside the visual notification during scrolling through Instagram significantly increases the likelihood of stopping the use of Instagram as a representative social media app. A short vibration alert already increases the user's compliance with the screen time limit, while a continuous vibration had a massive effect on every user

in this part of the study. With this type of notification, every user in the corresponding group achieved the goal of limiting their screen time.

References

[1] K.E. MacLean. "Designing with haptic feedback". In: *Proceedings 2000 ICRA. Millennium Conference. IEEE International Conference on Robotics and Automation. Symposia Proceedings (Cat. No.00CH37065)*. Vol. 1. 2000, 783–788 vol.1.

[2] Statista. *Number of TikTok users worldwide*. Accessed: January 18, 2025. 2024.

[3] Jun Tan, Yan Ge, Xianghong Sun, Yubo Zhang, and Yanfang Liu. "User experience of tactile feedback on a smartphone: Effects of vibration intensity, times and interval". In: *Cross-Cultural Design. Methods, Tools and User Experience: 11th International Conference, CCD 2019, Held as Part of the 21st HCI International Conference, HCII 2019, Orlando, FL, USA, July 26–31, 2019, Proceedings, Part I 21*. Springer. 2019, pp. 397–406.

[4] Lei Wu, Samio Sun, Yao He, and Bin Jiang. "The effect of interventions targeting screen time reduction: a systematic review and meta-analysis". In: *Medicine* 95.27 (2016), e4029.

A Questionnaire for Group 1: Visual Only

Q1 How noticeable was the visual notification when the time was up?

- Not noticable at all
- Barely noticable
- Moderately noticable
- Quite noticable
- Very noticable

Q2 How many times did you use the extension option?

- 0/1/2/3/4/5

Q3 Why did you extend the time for your usage of instagram?

Q4 How much did the notification helped you to stop using instagram?

- Not helpful at all
- Barely helpful
- Moderately helpful
- Quite helpful
- Very helpful

Q5 Do you have any other comments or suggestions for improvement?

B Questionnaire for Group 2: Part-time Vibration

Q1 How noticeable was the visual notification when the time was up?

- Not noticable at all
- Barely noticable
- Moderately noticable
- Quite noticable
- Very noticable

Q2 How many times did you use the extension option?

- 0/1/2/3/4/5

Q3 Why did you extend the time for your usage of instagram?

Q4 How helpful did you find the vibration during the notification to stop using instagram?

- Not helpful at all
- Barely helpful
- Moderately helpful
- Quite helpful
- Very helpful

Q5 Do you have any other comments or suggestions for improvement?

C Questionnaire for Group 3: Continuous Vibration

Q1 How noticeable was the visual notification when the time was up?

- Not noticable at all
- Barely noticable
- Moderately noticable
- Quite noticable
- Very noticable

Q2 How many times did you use the extension option?

- 0/1/2/3/4/5

Q3 Why did you extend the time for your usage of instagram?

Q4 How helpful did you find the continuous vibration to stop using instagram?

- Not helpful at all
- Barely helpful
- Moderately helpful
- Quite helpful

- Very helpful

Q5 Do you have any other comments or suggestions for improvement?

Q6 Did you want to stop earlier because of the continuous vibration or did you end your scrolling when the timer / extended timer was over?

- I did not extend the timer.
- I extended the timer one time and continued with scrolling until the timer was over.
- I extended the timer more than one time and continued with scrolling until the extended timer was over.
- I extended the timer one time, but I wanted to end it immediately because I did not like the feeling of the vibration.
- I extended the timer more than one time but stopped during the last cycle before the extended timer was up.
- I extended the timer more than one time and continued with scrolling until the extended timer was over.

D Answers to the questionnaires

Person	Q1	Q2	Q3	Q4	Q5
P1	Moderately noticeable	1	Because I wanted to continue watching my funny videos	Moderately helpful	No, it was great.
P2	Quite noticeable	2	I wanted to continue to scroll, didn't feel ready to do something new	Moderately helpful	Would be better if it forces me to wait 20 seconds or I have to do something else actively.
P3	Moderately noticeable	2	I want to watch more reels.	Moderately helpful	It was not strong enough to encourage me to stop.
P4	Barely noticeable	3	I wanted to finish replying to messages.	Barely helpful	Maybe include a countdown timer to make it more obvious.
P5	Moderately noticeable	2	I just wanted to keep scrolling—it felt relaxing.	Moderately helpful	Add a sound alert to the visual notification.
P6	Barely noticeable	4	I felt like I hadn't finished exploring all the posts I wanted to see.	Moderately helpful	A sound alert in addition to the visual notification might make it more noticeable.

Table 1: Responses of Group 1

Person	Q1	Q2	Q3	Q4	Q5
P7	Quite noticeable	3	Because I was not done with the adding of a friend and before I wanted to watch a bit more Instagram reels	Moderately helpful	I think it would be more intrusive when the blockage app opens immediately and not only the notification.
P8	Quite noticeable	0	I didn't.	Very helpful	Perfect app.
P9	Quite noticeable	2	Because I want to see more reels.	Quite helpful	The vibration helped to notice that the time was over.
P10	Quite noticeable	0	I didn't extend because the notification was enough to make me stop.	Quite helpful	Keep it simple—it works well as it is.
P11	Very noticeable	3	I wasn't ready to stop—felt like I needed more time to unwind.	Moderately helpful	Make the vibration pattern more distinct.
P12	Very noticeable	0	The time was over.	Quite helpful	Add a calming visual effect with the notification to reduce frustration.

Table 2: Responses of Group 2

Person	Q1	Q2	Q3	Q4	Q5	Q6
P13	Quite noticeable	1	Because I wanted to continue surfing through the Instagram discover section	Very helpful	No, this is definitely annoying enough	I extended the timer one time, but I wanted to end it immediately because I do not like the feeling of the vibration.
P14	Very noticeable	1	I extended only once because it is so annoying. It made me nervous and anxious while it vibrated	Very helpful	Informs you about achievements	I extended the timer one time and waited for it to be over until I stopped scrolling.
P15	Quite noticeable	0	It was annoying, that's why I did not extend.	Very helpful	-	I did not extend the timer.
P16	Quite noticeable	1	I wanted to keep watching Reels, but the vibration made me stop quickly.	Very helpful	Add a feature where the app locks after two extensions.	I extended the timer one time, but I ended it immediately because I do not like the feeling of the vibration.
P17	Very noticeable	1	I extended only once because the vibration was too annoying to keep going.	Very helpful	Maybe add more control over the vibration intensity.	I extended the timer one time, but I ended it immediately because I do not like the feeling of the vibration.
P18	Very noticeable	0	I didn't extend because the vibration while deciding to extend the timer was overwhelming.	Very helpful	Maybe allow a way to pause the vibration after a set period.	I did not extend the timer.

Table 3: Responses of Group 3