Digital detox:

Do you own your smartphone or does your smartphone own you?

Experimental study into the effectiveness of digital nudges in reducing smartphone use

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Master Thesis, Communication Science

University of Twente

February 12th, 2022

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Abstract

Aim

This study will investigate how different digital nudges can be used best within digital detox apps to encourage people to reduce their smartphone use. Multiple digital detox apps have been developed and marketed to support users in reducing their smartphone usage by means of digital nudges. However, a lack of evidence exists on the effectiveness of those apps. This study brings knowledge about the effectiveness of digital detox apps, especially the effectiveness of digital nudges used within those apps. On the one hand, the results of this study contribute to app developments in the digital detox context, it gives useful insights to optimize the effectiveness of digital detox apps. On the other hand, this study contributes to the existing literature about digital nudging and adds new and interesting information about how to apply digital nudges within the context of digital detox.

Method

A between subjects 2 (gain frame vs. loss frame) x 2 (high engagement vs. low engagement) x 2 (with emoji vs. without emoji) experimental design with a moderator smartphone use was implemented to examine the effect on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use, whether or not influenced by smartphone use. The experiment was executed by means on an online experiment in the Qualtrics survey program. The use of three different manipulations: gain/loss framing, level of engagement and the use of emoji resulted into eight different conditions. The experimental conditions included a screenshot of a digital detox app. An independent measures design was used which assigned the participants to one of the eight conditions. A total of 251 respondents participated in the experiment. The majority of the respondents were female (72.5%). The mean age of the respondents was 22.58 with a minimum of 18 years and maximum of 35 years.

Results

The findings show that type of framing, the level of engagement and the use of emoji are not of direct influence on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. However, smartphone use has a direct effect on the intention to reduce smartphone use. People with high smartphone use have a high intention to reduce their smartphone use. Furthermore, the results of the subgroup analysis showed a significant interaction effect for female users between type of framing and the use of emoji on attitude towards smartphone use. For this subgroup, the combination of a loss frame with the absence of an emoji is most effective on attitude. Also, for the age group of 18 to 22, a significant main effect was found for the level of engagement on the intention to reduce smartphone use. A low level of engagement has the strongest effect on intention to reduce smartphone use. Lastly, for the low education group, an interaction effect was found of framing and level of engagement on the attitude towards smartphone use: when the level of engagement is high, a combination with a gain frame is most effective on attitude. A low level of engagement is most effective in combination with a loss frame.

Conclusion

With this study it can be concluded that in order to stimulate users to reduce their smartphone use by means of digital nudges within digital detox apps, it is of importance that the smartphone app and its nudges are personalized and customized to the users' characteristics, motives and preferences. It is important that a digital detox app recognizes the characteristics and needs of the user and that the application is set up based on this information. A simple app design which is the same for each user and applies the same nudges for everyone will most likely not work. The findings of this study contribute in reducing the lack of evidence about the effectiveness of the characteristics within the design of digital detox apps and give useful insights for people in the field of communication and app development.

Keywords:

Smartphone Use, Digital Nudging, Digital Detox, Level of Engagement, Type of Framing, Use of Emoji.

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1. Introduction

The use of electronic devices rapidly increased over the last decade. In 2019, 89% of the Dutch households owned a smartphone, whereas in 2014 this was only 67% (CBS, 2020). Alongside, screen time increased due to the advent of electronic devices with a screen as interface, such as laptops, tablets, smartphones and televisions (Montagni et al., 2016). Screens are used for multiple purposes, such as education, work and entertainment. And, more recently, the COVID-19 pandemic caused an even stronger increase in the average amount of screen time. The internet traffic increased by 40 to 60% during the global pandemic (Sandvine, 2020). Moreover, people make more use of social media to stay in touch with others and to fill their free time. With a number of 3.6 billion social media users in 2020, it is predicted to increase to 4.41 billion users by 2025 (Tankovska, 2021).

Researchers, policy makers, advocates, parents and users themselves express their worries about the increase of screen time and social media use. In the literature, excessive smartphone use has been found to have a potential negative impact on mental health, such as feelings of loneliness and suicidality (Berryman et al., 2018). Furthermore, social media are associated with, particularly, the increasing distribution of misinformation and fake news which can lead to mental health problems such as stress and anxiety (Gao et al., 2020). Social media use also includes sharing pictures and videos, which makes users compare themselves with other users on social media. This can lead to lower self-esteem, insecurity and social pressure (Babic et al., 2017). The Fear Of Missing Out (FOMO) plays a big role in this as well. Individuals are concerned that they miss out on something and that is why they excessively use their smartphone, to stay up to date with everything and everyone (Abel et al., 2016).

Multiple so called ‘digital detox apps’ such as ioS Screen Time, Android Digital Well-Being, Forest, Moment, Detox, Offtime and Space have already been developed to help smartphone users with cutting down their smartphone and social media use. Most of these apps make use of setting time limits for certain apps, giving feedback about the usage and sending notifications (Schmuck, 2020). ioS Screen Time and Android Digital Well-Being are in-built smartphone tools for reducing smartphone use. They track the smartphone usage and give the user options to set time limits or plan focus time. The digital detox app Moment tracks how much time the user has spent on the smartphone and sends notifications summarizing the phone usage. Next to that, users can also set daily time limits and goals, per app or for total usage. The app Forest has a more playful design, users can plant a tree and let it grow by being offline. Despite the growing number of digital detox apps, a lack of evidence exists on the effectivity of those apps, the effects have not been studied on a large scale (van Velthoven et al., 2018). Nevertheless, the use of digital detox apps is still quite popular, with a percentage of 41.7% of adults with an age between 18 and 35 that use digital detox apps (Schmuck, 2020). So the question remains why digital detox apps are so popular and whether they are actually effective in reducing smartphone use.

Within digital detox apps, digital nudges are applied with the aim to encourage people to cut down their smartphone usage. To help users with decreasing their phone use, digital nudging can be an effective tool. "Digital nudging is the use of user-interface design elements to guide people's behavior in digital choice environment" (Weinmann et al., 2016, p. 433). Some examples of digital nudges are inciting, using default options or giving feedback (Johnson et al., 2012). Digital nudges have some advantages compared to offline nudges, digital nudges are easier, quicker and entail lower costs. Furthermore, the internet and its features make it possible to track users which gives the opportunity to use personalized, and thus more effective nudges (Mirsch et al., 2017). Within the current study, three digital nudges techniques will be studied: gain/loss framing, level of engagement and the use of emoji.

A popular technique that can be applied to make nudges more effective is framing (Weinmann et al., 2016). The way in which a message is constructed can influence individuals' reaction to certain information. A well-known type of framing is gain/loss framing, by highlighting either the gains or losses of certain behavior, individuals' thoughts, opinions and perceptions can be influenced (Cheng, Woon, & Lynes, 2011). For example, an advertisement encouraging to quit smoking would emphasize on living longer when using the gain frame, whereas it would focus on dying sooner when a loss frame would be used.

The level of engagement of the user can also be of influence on the effectiveness of digital nudges. As explained by Zimmerman & Sobolev (2020), digital nudges aiming to reduce smartphone use can be either active (high engagement) or passive (low engagement). This depends on the level of engagement required from the user. Passive nudges do not require any action from the user whereas active nudges do. For example, automatic time limits set by the digital detox app which do not require any engagement from the user versus setting time limits yourself which involves high engagement from the user.

Another tool to influence people's response in the digital world is the use of emojis. Over the past years, the use of emoji in digital communication increased strongly (Das et al., 2019). Emojis can trigger anthropomorphism, which includes assigning human characteristics to non-human objects. Research shows that including emojis in marketing and communication can lead to positive effects such as an increase in engagement and interaction (Kim, 2018), higher connectivity (Tung & Deng, 2007) and more positive attitudes (Prada et al., 2018). The use of emoji within digital detox apps has not been studied yet. However, literature is available in the context of emoji marketing which proves the effectiveness of including emojis in marketing and communication, which makes the use of emoji in the digital detox context an interesting and relevant topic for research.

Few researchers examined the effectiveness of digital nudges on smartphone use (Hiniker et al., 2016; Okeke et al., 2018; Zimmerman & Sobolev, 2020). As mentioned above, several different nudges techniques have already been applied, all with the purpose to encourage users to reduce their phone and social media use. However, research into this topic remains limited and a research gap exists in comparing and merging

different nudging techniques to reduce smartphone use. Furthermore, the use of emojis in the context of digital detox has not been studied yet. The aim of this research is to fill this research gap and determine the most effective way to use digital nudges within digital detox apps. The results of this research can contribute to future research and app developments aiming to reduce smartphone use by means of digital nudges. It will add new insights to the existing literature about digital nudges and digital detox apps, with a focus on the design of those apps, which is quite scarce in literature up to now (Pacherazova, 2019). Furthermore, the outcomes can bring useful information which can contribute in optimizing the effectiveness of digital detox apps. Based on previous literature and the aim of this research, the following research question is formulated:

"*To what extent do type of framing (gain/loss), level of engagement (high/low) and the use of emoji (with/without) in digital nudging influence the intention to reduce smartphone use?"*

To answer this research question, first a theoretical framework with relevant existing literature is discussed in chapter 2, together with formulating the hypotheses. After the theoretical framework, the methods and instruments used for the experimental research are explained in chapter 3. In chapter 4, the results of the experiment are elaborated, followed by a discussion of the results in chapter 5. In this last chapter, the results are discussed, followed by the implications, limitations and future recommendations, the chapter ends with a concluding paragraph.

2. Theoretical framework

In the first part of this chapter, relevant literature about attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use will be discussed. Subsequently, three different digital nudging techniques are elaborated: gain/loss framing, the level of engagement and the use of emoji. After discussing relevant literature regarding these nudging techniques, the hypotheses are formulated. Subsequently, an explanation of possible interactions between these digital nudging techniques is given based on existing literature, followed by the hypotheses. In the last part of this chapter the possible role of smartphone use is discussed, with at the end a conceptual model which provides an overview of the expected (interaction) effects between the independent and dependent variables, including the moderator.

2.1 Attitude towards smartphone use

Attitude towards smartphone use can vary by age (Xie et al., 2012). Excessive smartphone use can lead to addiction which in turn can cause problems such as social isolation, lack of social skills and other well-being issues (Griffiths & Kuss, 2017). Particularly the younger generation is said to be vulnerable to smartphone addiction (Griffiths & Kuss, 2017). Some researchers state that smartphone use does no harm or even claim that the use of social platforms brings positive consequences such as self-development and interaction with others (Berryman et al., 2018). But what about the users themselves, what is their attitude towards smartphone use? Young people appear to have a more positive attitude towards smartphone use compared to older people, who seem to have a more negative attitude (Kurtulush & Aydin, 2019; Xie et al., 2012). However, the attitude of older people towards smartphone use is becoming more positive (Xie et al., 2012). Abraham (2020) investigated the attitudes of adolescents towards social media to discover whether social media has a boon or bane effect on adolescents and the society by means of a questionnaire among female adolescents in Saudi Arabia. The results indicated that social media indeed has an impact on the lives of adolescents, particularly on their social lives, relationships, privacy, academic performance, health, lifestyle and security. Whether it is boon or bane depends on how social media is used by adolescents. Social media can bring them a lot when using it positively. However, many adolescents spend a large part of their time on social media, which is wasted time (Abraham, 2020). Thus, the attitude towards smartphone use can differ based on age and usage, younger people have a more positive attitude, whereas for older people a shift seems to appear from a negative attitude towards a more positive attitude. For the current study, this means that the effect of the digital nudging techniques on attitude towards smartphone use can differ based on the age and usage. Furthermore, the shift from a negative attitude towards a more positive attitude among older people indicates that a change in attitude towards smartphone use is possible and digital nudges can play a role in this shift. The current study will examine the extent to which the digital nudging techniques gain/loss framing, level of engagement and the use of emoji can influence the attitude towards smartphone use.

2.2 Perceived app effectiveness

Although digital detox apps appear to be popular among smartphone users, the question remains what makes these digital detox apps so popular. Digital detox apps have been developed to support users in cutting down there smartphone use by observing users' behavior an trying to reduce their smartphone usage (Schmuck, 2020). Digital detox apps make use of digital nudges in their design, examples of digital nudges used in these apps are default, feedback and friction. A lack of evidence exists on the effectivity of digital detox apps that help users to control their phone and internet usage (van Velthoven et al., 2018). The effects of such apps have not been studied on a large scale. However, despite this lack of evidence, still multiple apps have been created to support users in managing their smartphone usage. without evidence on its effectiveness (van Velthoven et al., 2018; Lam & Lam, 2016; Purohit & Holzer, 2021). The risk of this is, that when such apps appear to be ineffective, it can discourage users to try other helpful tools for reducing their smartphone use. Digital detox apps have a high percentage of downloads: out of 500 adults, 47,1% have downloaded a digital detox app on their smartphone (Schmuck, 2020). However, the reason why smartphone users download these apps and what kind of features within these digital detox apps are effective is still unknown. It is of importance to gain knowledge about the users' perceived effectiveness of digital detox apps and its digital nudging techniques, to get a better understanding of what users' motives are for downloading digital detox apps and to what extent users perceive digital detox apps as effective. The current research will examine this issue by studying different nudging techniques within the context of a digital detox app and find out to what extent they influence the perceived app effectiveness.

2.3 Intention to reduce smartphone use

Whether digital detox apps are effective in reducing smartphone use also depends on the intention of the user to reduce his or her usage. Users are willing to observe their smartphone usage, however, they do not see the need to manage it (Zimmerman, 2021). Despite the negative consequences of high smartphone use, people continue their high usage. Smartphone use is most often automatic and habitual behavior which makes it difficult to change the behavior (Billieux, 2008). Furthermore, smartphone applications are created to be addictive which makes it hard for users to cut down their use (Purohit et al., 2020). To nudge people in a particular behavior, digital nudges are often used. Simplistic changes in the digital choice environment can already be of influence (Johnson et al., 2012). Thus, digital nudging techniques can be used to encourage people to reduce their smartphone use which can have a positive effect on their intention to reduce their usage. The current study will make use of three different nudging techniques: gain/loss framing, the level of engagement and the use of emoji, with the aim to stimulate and motivate smartphone users and positively influence their intention to reduce their smartphone use.

The present research will examine the digital nudges framing, level of engagement and the use of emoji. In the following paragraphs, these three digital nudging techniques will be discussed and hypotheses regarding the effect of those nudging techniques on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use are formulated.

2.4. Framing

The construction of a message can play an important role in nudging people. Digital interactions lead to digital decision making (Weinmann et al., 2016). The digital choice environment influences the decisions of individuals. Simplistic changes in the digital choice environment can already be of influence, which can lead to nudging people into a particular behavior. People do not always make decision in a rational way and can be influenced by the choice environment. As Johnson et al. (2012) explain, "what is chosen often depends upon how the choice is presented" (p. 488). Nudging can be done by means of framing. The way a message is constructed can be of influence on the perception of the receiver, this is called framing (Cheng et al., 2011). Frames are "mental structures that shape the way we see the world" (Lakoff, 2014, p. xv). Frames function as filters to judge and process information. Framing can be an effective technique to nudge people towards a desired behavior.

An often used type of framing is gain/loss framing, gain framing appoints the benefits whereas loss framing highlights the drawbacks (Spence & Pidgeon, 2010). By highlighting either the gains or the losses of certain behavior, individuals' thoughts, opinions and perceptions can be influenced. According to Spence and Pidgeon (2010), it is crucial to take the purpose of the message into consideration when deciding to use either gain or loss framing. Nonetheless, they state using a loss frame is more effective compared to gain framing. Until today, the effectiveness of gain/loss framing in digital detox apps to reduce smartphone use has not been studied yet. Choi et al. (2014) conducted a content analysis to study smoking cessation apps. In a way, these app are similar to digital detox apps, as these apps also aim to reduce addictive behavior. They found that most smoking cessation apps made use of gain framing and explained that gain framing appears to be more effective for prevention behaviors compared to loss framing (Choi et al., 2014). The prospect theory of Tversky and Kahneman (1981) explains that people's decision making is sensitive to the way that information is constructed. According to their research, people are risk seeking when information emphasizes losses and are risk averse when information emphasizes gains. Gain framing can be used to encourage risk-averse decisions, whereas loss framing can be used to encourage risk-seeking decisions (Rothman & Salovey, 1997). Preventive behavior can be seen as risk-averse and detection behavior as risk-seeking. The aim of this research is to reduce smartphone use and the risk of negative consequences to mental health. This is a preventive perspective which is considered risk-averse. Hence, the first hypothesis is formulated:

Hypothesis 1: *The use of gain framing in digital nudging results in a greater positive influence on (a) attitude towards smartphone use (b) perceived app effectiveness and (c) the intention to reduce smartphone use than the use of loss framing.*

2.5 Level of engagement

The level of engagement can be of influence on the effectiveness of digital nudging. Digital nudges aiming to reduce smartphone use can be either active or passive (Zimmerman & Sobolev, 2020). This depends on

the level of engagement required from the user, passive nudges do not require any action from the user (low involvement) whereas active nudges do (high involvement). Zimmerman & Sobolev (2020) conducted a research to examine the effectiveness of nudges on screen time reduction. They used three conditions in their randomized control trial: a control condition including self-tracking of smartphone use, a passive condition by changing the color of the screen and an active condition that required users to set time limits on the phone. The results of their research show that both the passive and active nudges were effective in reducing screen time, whereas the passive nudge resulted in a greater effect compared to the active nudge. The self-tracking control condition did not show a reduction in screen time. The current research will apply both a passive and active nudge in order to find out which of the two is most effective in reducing smartphone use. Self-tracking of smartphone use will not be included in the current study as it proved to be ineffective.

Passive nudges like phone vibrations can be used to nudge people to reduce their smartphone use. Okeke et al. (2018) used phone vibrations in their research which did not require any engagement from the users. If users exceeded their daily time limit for a certain application, their phone would start vibrating every five seconds. The vibration would stop when the user closed the application. The results of their experiment show that the daily smartphone use reduced by more than 20%. The vibrations led to users being more aware of their smartphone use. However, users felt irritated by the vibrations and fell back in their old usage behavior after the intervention (Okeke et al., 2018). Phone vibrations can be effective in reducing screen time, however, when applying this nudge it must been well thought out in order to avoid irritations.

Purohit et al. (2020) introduced a browser extension called “NUDGE” with the purpose to make addictive social media designs less addictive. They included both passive and active nudges in the browser extension, some examples are hiding nudges, default nudges, pause-reminder nudges and unfollow nudges. The outcome of their research shows that users value the extension “NUDGE” and believe in its effectiveness in reducing social media use. Unfortunately, the researchers did not examine the differences in effectiveness of the different nudges on reducing social media use. Purohit et al. (2020) state that the design elements that generate addictive behavior can also be used to reduce addiction. Furthermore, Hiniker et al. (2016) also build on the idea that technical solutions can support in cutting down smartphone usage. They created a smartphone application called “MyTime” which can help people to reduce their smartphone use through the use of active nudges, requiring high engagement from users. Within the application, users can select the apps on their phone which they perceive as distracting and set time limits for those apps. “MyTime” tracks the activities of the users and sends notifications when users exceed these limits. The results of the study show that the use of the “MyTime” application resulted in a reduction of smartphone usage of 11% compared to the week before without using the application. Hiniker et al. (2016) conclude that applications such as “MyTime” can effectively support users that aim to reduce their smartphone usage.

According to the previous mentioned studies, both high engagement and low engagement nudges can be effective in reducing smartphone use. However, research that examines the different effects of both high and low engagement nudges is limited. Based on the results of the previous mentioned studies, the second hypothesis is formulated:

Hypothesis 2: *Low engagement in digital nudging results in a greater positive influence on (a) attitude towards smartphone use (b) perceived app effectiveness and (c) intention to reduce smartphone use than high engagement nudges.*

2.6 The use of emoji

The use of emojis is becoming more and more popular. Visual elements in online computer-mediated communication are named as "graphicons" (Herring & Dainas, 2017). These graphicons include emojis, emoticons, images, videos and GIFs and have the same function as nonverbal cues have in offline communication. In 2016, 2.3 trillion messages included an emoji which makes the emoji a popular tool and new form of language to express emotions in digital interactions (Emogi Research Team, 2016; Ge & Gretzel, 2018). Not only in the online world the use of emoji is popular, but also in the offline world (Prada et al., 2018). Emojis are applied on products such as books, games and clothes, are used in music clips and even serve as characters in animation movies. Emojis consist of actual pictures which can include a human face, an animal, food or sports for example. The creation of emojis was inspired by the already existing emoticons from the 1990s. The difference between emojis and emoticons is that for emoticons, you use your keyboard characters to imitate a face which expresses your emotions, whereas emojis are created by technology companies and include little pictures of, among other things, faces, animals and objects which brings more depth and personality compared to emoticons. Emojis are richer, more alive and expressive than emoticons and have a greater impact on people's mood (Chen et al., 2017).

The human-like faces of emojis is referred to in literature as anthropomorphism. Anthro means human and morph stands for form in Greek language. It enables people to recognize human characteristics on nonhuman objects (Harun et al., 2021; Slice, 2008). We tend to assign human attributes to nonhuman objects in order to feel more comfortable and familiar. The car industry is a common example of this, a car's facial features can increase the perceived personality and stimulate interaction (Harun et al., 2021). The emoji started with an original smiley face but expanded over the years with a variety of emojis (Das et al., 2019). The function of the smiley face was to communicate humor, and today, emojis communicating positive emotions are still the most popular type of emojis (Novak et al., 2015). Pacherazova (2019) conducted a study in which she examined different design aspects and elements of digital detox apps. In the study, a mascot was included in the app prototypes to create a friendly relationship between the app and the user, which is in contrast with all other digital detox apps who are perceived as serious. A friendly relationship can be beneficial in making behavior change (Pacherazova, 2019). The mascot was visualized with a simple figure of the device including a smiley which could show different emotions depending on the phone usage of the user. The

results of the evaluations of the prototypes showed that the mascot was appreciated and experienced positively.

Including an emoji in a message can have positive influence on the effectiveness of the message on the receiver. The use of emoji can strengthen a message, the level of connectivity and social presence (Tung & Deng, 2007). These non-verbal cues can be used for engagement due to their power to lower impersonality (Ge & Gretzel, 2018). Furthermore, emojis can also help to soften a serious message. People seem to have positive attitudes towards the use of emoji in electronic mediated communication (Prada et al., 2018). Research into emojis is done in varies contexts, some examples of the different contexts are education, health, relationships, work, consumer behavior and marketing. Research focusing on the use of emoji in the context of digital detox is scarce, however, research into the use of emoji is available within the context of persuasion and marketing, which can be useful and of importance for the present research. Digital nudges within digital detox apps are used to nudge and persuade people into a certain behavior, which in a way is comparable with marketing techniques which are used to move people towards a certain direction. This is why the current study will make use of existing literature on the use of emoji within the context of marketing, since in the context of digital detox, literature regarding the use of emoji is scarce.

Marketing is a popular context in which emojis are used. In recent years, the use of emojis in online marketing and communication has strongly increased (Das et al., 2019). Brands using emojis to strengthen their message and the connectivity between the brand and its audience is also called emoji marketing (Aboulhosn, 2020). The saying ‘a picture is more than thousand words’ is very applicable in emoji marketing. Many brands use emojis in their marketing and communication which appears to have a positive influence on the level of engagement and interactions (Kim, 2018). Furthermore, emojis can be used to humanize a brand and connect with its audience. Emojis have a persuasive potential which makes the emoji an essential aspect in marketing (Ge & Gretzel, 2018). Das et al. (2019) examined the effect of emoji marketing on consumers’ purchase intentions. They conducted a laboratory experiment with US residents and an online study including university students. The results of their study show that including an emoji in advertisements resulted in a higher positive influence among consumers and thus a higher purchase intention.

Whether the use of emojis in communication is effective depends on how the receiver interprets the emojis. Despite the positive effects of using emojis in communication, it can be challenging to achieve persuasion through the use of emojis, because the interpretation of the receiver can differ from the actual intended message (Ge & Gretzel, 2018). An important thing to consider when applying emojis in communication is the meaning of the emoji you use (Aboulhosn, 2020). Make sure that the emotion or message you want to convey with the emoji is also how the audience perceives the emoji. Tigwell & Flatla (2016) agree with this and conducted a study to examine the differences in people’s interpretation of emojis. First, they distributed an online survey including 436 participants who were questioned about their emoji use. After the survey

they conducted an interactive study with the use of a two-dimensional emotion space to examine the differences in people's perceptions of emojis. The outcome of their study indicates that the interpretation of emojis indeed vary among people. To decrease the chance of misunderstanding of emojis, the use of simple emojis is recommended. Furthermore, combining an emoji with a written text might help to prevent possible misunderstanding (Tigwell & Flatla, 2016). On the other hand, Harun et al. (2021) argue that emojis actually are the solution to the problem of misunderstanding of text-based messages. Inappropriate messages due to distraction, bad punctation, rushed typing can be solved by just adding a single emoji. It makes a message more clearly and prevents misinterpretation of the text. Harun et al. (2021) state that emojis can increase the efficiency of communication and interactions.

The emoji continues to develop with new emoji designs every year. With approximately 2700 different types of emojis, a wide variety exists (Harun et al., 2021). All these emojis differ, in color, expression, emotion, design and so on. Few researchers compared and examined the differences in emoji types. Face emoji, in comparison with gesture emoji, is the most frequently used type of emoji (Tigwell & Flatla, 2016). As mentioned above, emojis expressing positive emotions are the most popular used emojis (Novak et al., 2015). People feel happier when receiving a message including a positive emoji compared to a message without emoji and people feel worse when a message includes a negative emoji compared to no emoji (Ganster, 2012). Harun et al. (2021) studied eight different categories of emojis: happy, fear, shy, sad, angry, funny, love and unwell. They conducted a semiotic analysis to examine the sampled emoji characters and a survey analysis including 350 higher educated students in Malaysia to study emoji use in instant messaging apps. In regards to perceived anthropomorphism, the results show that the categories love, happy, shy and sad scored highest. The other four categories scoring lower can be explained by the level of ambiguity in these types of emoji. Regarding the perceived efficiency of emojis, the categories love and shy were rated at the top. Harun et al. (2021) explain this outcome by the fact that the love and shy emojis include additional symbols, such as heart eyes and a smiling mouth, which increases the attraction. Hewage et al. (2020) studied the differences in impact of asymmetric and symmetric facial emojis by means of four studies. They found that asymmetric facial emojis lead to more favorable consumer reactions compared to symmetric facial emojis. With these results, the researchers conclude that marketing communication including asymmetric emojis can lead to more positive response compared to the inclusion of symmetric emojis.

Despite the enormous growth of the emoji, which still continues, research into the response of consumers on these emojis is limited. Specifically, the influence of an emoji, in this case a smiling face, in the context of a digital detox app has not been studied yet. The use of emoji can bring positive effects, it can strengthen a message, generate higher connectivity and interaction with the receiver and it can help to prevent miscommunication. Whether this also applies within the context of digital detox, is an interesting topic to study, as it can bring many positive outcomes. The current study is will examine this issue, by studying the effect of the use of emoji on attitude towards smartphone use, perceived app effectiveness and intention to

reduce smartphone use. Based on the literature found regarding the use of emojis in marketing and communication, the following hypothesis is formulated:

Hypothesis 3: *The presence of an emoji in digital detox apps results in a greater positive influence on (a) attitude towards smartphone use (b) perceived app effectiveness and (c) the intention to reduce smartphone use compared to the absence of an emoji.*

2.7 Interaction effects

Framing and level of engagement

Framing and the level of engagement together can have a positive effect on persuasiveness. Literature into framing suggests that the level of involvement of the receiver is an important factor which influences the effectiveness and persuasiveness of gain/loss framing (Kim, 2018). People tent to put more effort into negative (loss) framed messages compared to positive (gain) framed messages (Kuo et al., 2009). Loroz (2007) claims that regarding detection behavior and high involved people, loss framed messages are more effective, whereas regarding prevention behavior and high involved people, gain framed messages are more effective in persuasion. Furthermore, Rothman et al. (2006) argue that high engagement strengthens the effect of both gain and loss framing. Kim (2018) examined the effects of gain/loss framing and issue involvement on publics' responses in the context of nuclear energy messages in South Korea. They conducted an 2 (high issue involvement vs. low issue involvement) x 2 (gain frame vs. loss frame) x 2 (economic issue vs. environmental issue) experiment including 566 participants from South Korea. The results indicated issue involvement as a significant moderator of the effect of gain/loss framing. Loss frame messages appeared to be more effective for high involved people. For lower involved people no difference was found in the effect of gain and loss framing. The existing literature leads to the following hypothesis:

Hypothesis 4: The combination of loss frame and high engagement results in a greater positive influence on (a) attitude towards smartphone use (b) perceived app effectiveness and (c) the intention to reduce smartphone use compared to other combinations of framing and level of engagement.

Framing and the use of emoji

People feel happier when receiving a message including a positive emoji compared to a message without an emoji and people feel worse when a message includes a negative emoji compared to no emoji (Ganster et al., 2012). The use of emoji only leads to positive outcomes when used in appropriate situations, but can lead to negative outcomes when used in poor fit situations (Glikson et al., 2018). There is no evidence in literature about the use of gain/loss framing combined with the use of an emoji and its effect on smartphone use. However, some literature can be found about applying gain/loss framing and emojis in other contexts. Shao et al. (2020) examined the effect of anthropomorphism, gain/loss framing and temporal framing (near future vs. distant future) on promoting ugly food by means of a 2x2x2 between subjects experimental design. As explained in section 2.6, the human-like faces of emojis is referred to in literature as anthropomorphism.

Shao et al. (2020) found that the effect of gain/loss framing and temporal framing on purchase intentions depends on the level of anthropomorphism. Under the effect of anthropomorphism, persuasion can be effective by using loss framed messages combined with near future and gain framed message combined with distant future (Shao et al., 2020). Karpinska-Krakowiak et al. (2020) studied the effects of gain/loss framing and anthropomorphism on pro-environmental behaviors. They used a 2 (with anthropomorphic cue vs. without anthropomorphic cue) by x (gain frame vs. loss frame) between subjects design including effort as a measured factor. The results of their study show that negative (loss) framed messages were most effective in encouraging pro-environmental intentions, only when combined with anthropomorphism. No differences were found between gain and loss frames when not combined with anthropomorphism (Karpinska-Krakowiak et al., 2020). Based on the found literature, the following hypothesis is formulated:

Hypothesis 5: The combination of loss frame and the presence of an emoji results in a greater positive influence on (a) attitude towards smartphone use (b) perceived app effectiveness and (c) the intention to reduce smartphone use compared to other combinations of framing and the use of emoji.

Level of engagement and the use of emoji

In existing literature, no interaction effect of level of engagement and the use of emoji on smartphone use can be found. However, according to the available literature, there is an effect of the use of emoji on the level of engagement. The use of emoji leads to a positive influence on the level of engagement and interactions (Kim, 2018). McShane et al. (2021) examined how the use of emoji influences brand engagement on social media by means of three studies. In study 1 they compared Twitter messages with and without emojis to study the effect of emojis on engagement. In studies 2 and 3 they conducted controlled lab experiments to investigate the differences in the use of emojis and in which way this has an effect on engagement. The results of their study show that consumers' engagement is higher when communication includes an emoji. They explain that emojis have a positive effect on the level of playfulness which leads to a higher level of engagement. Based on this, the sixth hypothesis is formulated:

Hypothesis 6: The combination of high engagement and the presence of an emoji results in a greater positive influence on (a) attitude towards smartphone use (b) perceived app effectiveness and (c) the intention to reduce smartphone use compared to other combinations of level of engagement and the use of emoji.

2.8 Smartphone use

For most people, a life without a smartphone is unimaginable. The smartphone is used for several different purposes like work, contacting friends and family, checking the news, finances, agendas, social media, checking the weather, online shopping, games and so on (Montagni et al., 2016). Because of the smartphone having multiple different features, it can lead to excessive usage of the device. Excessive smartphone use can lead to negative consequences such as stress and loneliness (Karsay, 2019). Furthermore, a positive association exists between high smartphone use and anxiety and depression (Cao et al., 2011). The amount

of smartphone use can differ among people, some people use their smartphone just for work and contacting friends and family, others use their smartphone for social media, watching movies and playing games as well.

According to the Health Belief Model (HBM), the perceived severity of a problem is of influence on people's intention to change certain behavior (Stretcher & Rosenstock, 1997). So, for people to reduce their smartphone use, the smartphone use and its consequences need to be severe enough in order to change the behavior. Furthermore, users with a high smartphone use are more aware of the negative consequences of high smartphone use than users with a low usage, because they experience these negative consequences. The awareness of the potential risks of certain behavior can have a positive influence on behavior change (Zhou et al., 2020). Without any awareness of the potential risks, users are unmotivated to change their smartphone use. This means that the extremeness of smartphone use can be of influence on the strength of the effect of type of framing, level of engagement and the use of emoji on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. So, smartphone use can have a moderating role in these relationships. Based on this knowledge, the following hypothesis is formulated:

Hypothesis 7:
For people with high smartphone use, the effect of framing (a), level of engagement (b) and the use of emoji (c) on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use will be greater compared to people with low smartphone use.

2.9 Conceptual model

In figure 1, an overview of the experimental research design is displayed. It shows the expected effects of the independent variables framing, level of engagement and the use of emoji on the dependent variables attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. The moderating variable smartphone use is included in the model as well.

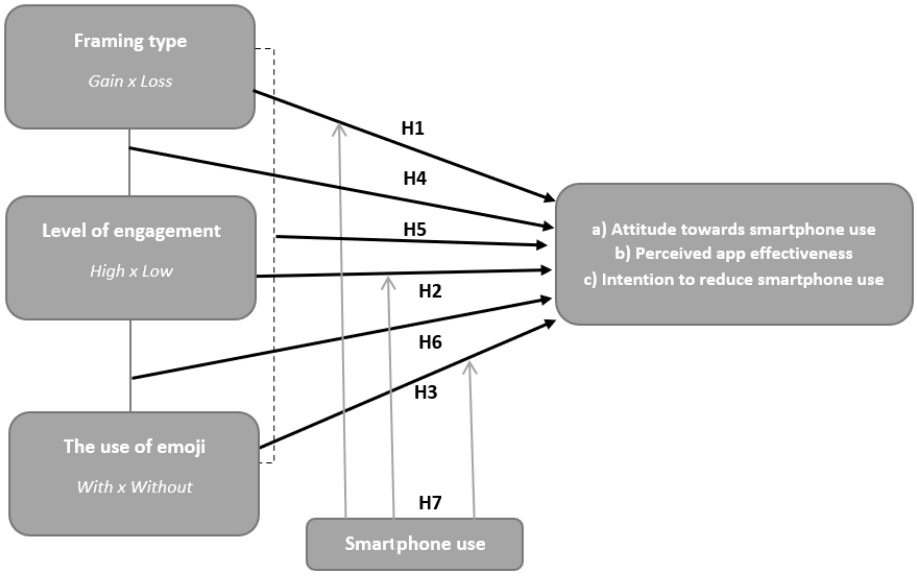


Figure 1: Conceptual model

3. Method

In this chapter, the method and instruments used for the experimental research will be discussed. Before conducting the experimental research, a pre-test was performed. The procedure and results of the pre-test are discussed, followed by the procedure of the final experiment. Subsequently, the stimuli are elaborated together with some visual examples of the stimuli. After the stimuli, the manipulation check is discussed, followed by an explanation of the measures used and a description of the participants. Lastly, the steps taken for data analysis are elaborated.

3.1 Research design

A between subjects 2x2x2 experimental research design with a moderator was used which resulted into eight experimental conditions (see table 1). The aim of this study is to research the cause-and-effect relationship between the independent variables framing type, level of engagement and the use of emoji and the dependent variables attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. The moderator smartphone use is included to examine whether this moderator changes the effect of the independent variables on the dependent variables or not. The cause-and-effect relationship is examined by means of an experimental research with eight different conditions. An independent measures design was used which assigned the participants to one of the eight conditions.

Table 1: Experimental conditions

Condition	**Framing type**	**Level of engagement**	**The use of emoji**
1	Gain	High	With
2	Gain	Low	With
3	Loss	High	With
4	Loss	Low	With
5	Gain	High	Without
6	Gain	Low	Without
7	Loss	High	Without
8	Loss	Low	Without

3.2 Pre-test

A pre-test was conducted to establish if the participants understood and interpreted the characteristics of the stimuli correctly and whether improvements needed to be made. The pre-test was created within the online program Qualtrics and had a total of 14 participants. The pre-test included four questions. The first question asked the participants to order ten different terms regarding the loss and gain frame from most positive to most negative to test which terms are best fitting for both frames: ‘waste time’, ‘expend time’, ‘save time’, ‘save up time’, ‘lose time’, ‘gain time’, ‘use up time’, ‘spare time’, ‘obtain time’ and ‘spoil time’. The results indicate that the respondents perceived ‘waste time’ as most negative which therefore is used in the loss frame. Respondents perceived ‘gain time’ and ‘save time’ as most positive. It was chosen to use ‘save time’ for the gain frame, as it fits better with the loss frame since ‘waste time’ and ‘save time’ are the opposite of each other. With the second question of the pre-test, the respondents were asked to what extent they felt engaged in several smartphone activities that aim to reduce screen time. The outcome shows that

respondents felt most engaged in setting goals regarding screen time and setting app limits. Respondents felt least engaged with the activity of phone vibrations when screen time limits are exceeded. For the third manipulation, the use of emoji, it was decided to use a positive emoji in the gain frame conditions with emoji and a negative emoji in the loss frame conditions with emoji, in order to strengthen both frames. With question three and four of the pre-test, sixteen emojis were tested, eight positive and eight negative. Respondents were asked to make four couples including one positive and one negative emoji that fit well and match with each other based on their appearance. On the basis of the results of these two questions, two emojis were chosen to use for the experimental conditions with emoji, one perceived as positive for the gain frame and one perceived as negative for the loss frame. An overview of the pre-test questions can be found in appendix A.

3.3 Experimental procedure

The results of the pre-test were used to finalize the final research instrument. The final experimental research was executed by means of an online experiment in the Qualtrics program. The distribution of the participants was done randomly, this assured that the probability of a participant to be allocated to a condition is the same for each condition. The lower limit for the amount of participants for this study was 30 participants per condition, which comes down to 240 participants in total. The age range for participation in this research was 18 to 35 years. According to Statista (2019), the age groups of 18-24 years and 25-35 years use social media the most. Furthermore, owning a smartphone was required for participation as well. Respondents were gathered by means of non-probability sampling and the use of snowball sampling as most participants were gathered via the network of the researcher. Non-probability sampling has a higher risk of sampling bias compared to probability sampling. However, non-probability sampling is very time and cost effective and it is an easy sampling method to use. The Test Subject Pool system SONA of University Twente was used to recruit participants, next to gathering respondents via social media channels.

The experiment started with a short introduction to explain the research and to thank the participants. Furthermore the introduction included informed consent and mentioned the anonymity of the participants. After the introduction the participants' age was asked, in order to fulfill the age requirement of 18 till 35 years old. If participants were younger than 18 or older than 35 years old, they were forwarded to the end of the survey without answering any further questions. When participants fulfilled the age requirement, they got asked two questions about their mobile screen time and smartphone use in which they could indicate their screen time and compare their smartphone usage with their peers. This was followed by sixteen statements about smartphone use in which participants could indicate to what extent they agreed or disagreed with the statements by means of the 5 point Likert scale which included 'strongly disagree', 'disagree', 'neither agree nor disagree', 'agree' and 'disagree'. After these statements, one of the eight experimental conditions was shown to the participants in the form of a screenshot, these eight screenshots can be found in appendix B. Subsequently, different statements regarding the dependent variables attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use were shown to the

participants. Lastly, manipulation check questions and some demographic questions such as gender and education were asked. The experiment ended with an open question to check whether the participants had anything left to say or mention about the experiment. An overview of the experiment questions can be found in appendix C.

3.4 Experimental stimuli

Gain/loss framing

Gain/loss framing is implemented in the screenshots by means of a text. The gain frame focused on the amount of time saved by the user: 'Good job…! You saved almost 1 hour of your time!", whereas the loss frame focused on the wasted time: "Oh no really…?! You wasted almost 3 hours of your time!". Furthermore, in the loss frame with emoji conditions, the emoji had a negative appearance and for the gain frame with emoji this was a positive emoji. In both gain and loss frame the same screen time visual is used, however, in the gain frame the text focused on the time below average (almost 1 hour) and in the loss frame the focus was on the amount of time the phone is used (almost 3 hours). In figure 2, the gain frame stimuli is indicated with a green diamond shape and the loss frame stimuli with a red diamond shape.

Level of engagement

The level of engagement depends on the action that is required from the user. According to the results of the pre-test, the participants felt most engaged with the activities of setting goals regarding screen time and setting app limits. These two activities are implemented in the experimental conditions that include high engagement by means of two button functions in the screenshot: 'SET your goals' and 'SET app limits'. The blue rectangles in figure 2 display the stimuli for high level of involvement. In the pre-test, participants felt least engaged in the activity of phone vibrations when screen time limits are exceeded. Therefore this activity is included in the low engagement experimental conditions by means of an informative text line: "When you exceed your screen time limit, your phone will start vibrating". The yellow rectangles within figure 2 show the stimuli for the low level of engagement.

The use of emoji

Two different emojis are used in the experimental conditions with an emoji. The emojis are simple basic emojis with two eyes and a smiling or sad mouth. In the gain frame condition with an emoji, a more positive emoji is used in order to strengthen the gain frame, indicated in figure 2 with a green circle. For the loss frame with emoji, a negative emoji is used to strengthen this frame, indicated with a red circle in figure 2. With the selection of these two emojis it was also taken into account that the two emojis fit well and match each other, so that the two are not completely different from each other. The emojis were included in the top left corner of the screenshot after the text 'hello'.

*First row (left to right) experimental condition 1 to 4, second row (left to right) experimental condition 5 to 8.

Figure 2: Stimuli within the experimental conditions

3.5 Manipulation check

To test the effectiveness of the manipulations, three manipulation check questions were included in the online experiment by means of a bipolar matrix which included one item per manipulation. An Independent Sample T-test was conducted for each manipulation to examine whether there was a significant difference between the two groups of each manipulation. For the manipulation framing, the Independent Sample T-test showed a significant difference between gain and loss framing: (Mgain = 3.56, SD = 1.44 vs Mloss = 1.69, SD = 1.13; $t(236.1) = 11.508$, $p < .001$). Also for the manipulation level of engagement, a significant difference between high and low level of engagement was found: (Mhigh = 3.22, SD = 1.53 vs Mlow = 2.66, SD = 1.32; $t(243.1) = 3.096$, $p = .042$). For the third and last manipulation, the use of emoji, a significant difference between with and without emoji was established as well: ($M$with = 4.65, SD = 0.87 vs Mwithout = 1.59, SD = 1; $t(245.4) = 25.839$, $p = .005$). These results show that the stimuli meet the intended criteria.

3.6 Measures

Different measurements were used to examine the extent of the effect of the independent variables framing type, level of engagement and use of emoji on the dependent variables attitude towards smartphone use, the perceived app effectiveness and the intention to reduce smartphone use. Multiple types of scales can be used to measure attitude, of which the semantic differential scale is the most common used, mainly due to its ease of use and structure (Ajzen, 2006). Derived from Ajzen (2006) and Osgood et al. (1957), eight scale items measured the participants' attitude towards smartphone use. The scale appears to be reliable with all 8 items according to the reliability analysis (α = .87).

To measure the perceived effectiveness of the screenshot of the app, the 'perceived impact' subscale of the Mobile Application Rating Scale (MARS) was applied. The MARS is widely used to examine the quality of mobile health applications (Stoyanov et al., 2015). The subscale 'perceived impact' includes six statements that were rated on a five point Likert scale varying from 'strongly disagree' to 'strongly agree'. The Likert scale consists of an uneven number of scales which lets the participants allocate points to the statements. An example of one of the statements measuring perceived app effectiveness: "The screenshot has increased my awareness of the importance of reducing my smartphone use". The scale was found to be reliable with all 6 items (α = .88).

The intention to reduce smartphone use was measured with five statements derived from Boehm (2019) who developed the Intention to Limit Social Media Use Scale. This scale is adapted to intention to limit smartphone use. An example: "I intend to reduce the number of times I check my smartphone". The reliability analysis showed a reliable scale with all 5 items (α = .83). Table 2 shows an overview of the reliability of all scales.

To measure the moderator smartphone use, The 5 point Likert Multidimensional Facebook Intensity Scale (Orosz et al., 2016) was used. This scale is developed to measure Facebook use with four factors: persistence, boredom, overuse and self-expression. For this study, the scale was applied to smartphone use in general. An example of a statement measuring smartphone use: "I spend time on my smartphone at the expense of my obligations". The reliability analysis shows a reliable scale with all 16 items (α = .78). In addition, the participants were also asked to give an estimation of their average mobile screen time per day and to compare their smartphone use with their peers using a five point Likert scale including 'much lower', 'lower', 'about the same', 'higher' and 'much higher'.

Table 2: Reliability of scales

Scale	N of items	Cronbach's Alpha	Items deleted
Smartphone use	16	.78	0
Attitude towards smartphone use	8	.87	0
Perceived app effectiveness	6	.88	0
Intention to reduce smartphone use	5	.83	0

3.7 Participants

A total of 282 respondents started the experiment, of which 251 participants remained for further analyses. Approximately a third of the total respondents were collected via the Test Subject Pool SONA which are all bachelor students from the University of Twente. The rest of the respondents were collected via the social media channels WhatsApp, Facebook, LinkedIn and Instagram. Via WhatsApp friends and family of the researcher were consulted to participate in the research. Respondents gathered via Facebook, LinkedIn and Instagram were mainly acquaintances of the researcher and other students.

For the duration of participation, a minimum duration of 2 minutes was set to make sure that the participants that rushed through the experiment without carefully reading the questions were excluded from further analyses. Furthermore, a maximum duration of 1 hour was set as higher limit, this was decided because the time between seeing the treatment and answering the questions should not be too long. In total, 7 respondents had a duration lower than 2 minutes and 8 respondents had a duration longer than 1 hour, these respondents were removed from further analyses. Lastly, an outlier analysis was conducted to determine whether there were respondents that had extreme scores that deviate from the rest of the respondents. On basis of this outlier analysis, 3 more respondents were excluded from further analyses.

Table 3 shows an overview of the sample characteristics gender, age, education and screentime per condition and in total. The majority of the respondents were female (72.5%). The mean age of the respondents is 22.58 with a minimum of 18 years and maximum of 35 years. One-way ANOVA analysis and chi-square tests were performed and showed no significant differences of the sample characteristics between the eight experimental conditions.

Table 3: Sample characteristics per condition

	Condition:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
		N = 33	N = 29	N = 31	N = 31	N = 30	N = 34	N = 31	N = 32	N = 251
Gender a)	*Male*	6 (18.2)	10 (34.5)	11 (35.5)	10 (32.3)	6 (20)	10 (29.4)	8 (25.8)	7 (21.9)	68 (27.1)
N (%)	*Female*	27 (81.8)	18 (62.1)	20 (64.5)	21 (67.7)	24 (80)	24 (70.6)	23 (74.2)	25 (78.1)	182 (72.5)
	Third gender	0 (0)	1 (3.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.4)
Age b)	*Mean*	21.97	22.69	22.16	23.1	22.57	22.59	22.52	23.06	22.58
	SD	2.66	3.01	2.4	4.17	2.5	4.03	2.85	2.63	3.09
Education a)	*1)*	14 (42.4)	12 (37.9)	15 (48.3)	14 (45.2)	14 (46.7)	14 (41.2)	13 (41.9)	12 (37.5)	107 (42.6)
N (%)	*2)*	9 (27.3)	8 (27.6)	6 (19.4)	4 (12.9)	9 (30)	7 (20.6)	8 (25.8)	12 (37.5)	63 (25.1)
	3)	10 (30.3)	10 (34.5)	10 (32.3)	13 (41.9)	7 (23.3)	13 (38.2)	10 (32.3)	8 (25)	81 (32.3)
Screentime b)	*Mean*	236.5	224.2	200.4	241.8	206.3	267.4	220.7	202.5	225.6
	SD	153.83	145.76	124.09	110.15	99.91	241.07	124.34	87.77	144.34

a) Chi-square test
b) One-way ANOVA

3.8 Data analysis

After data cleaning, the data is organized and variable labels and values were added. Furthermore, four negative formulated statements of the moderator smartphone use were recoded and dummy variables were

created. Then the first analysis was conducted, analysis of the sample characteristics. Mean scores and standard deviations for age and screentime were reported per condition as well as the N scores and percentages for gender and education, which can be found in table 3. An analysis of variance was performed with the use of one-way ANOVA analysis and crosstabs with chi-square test to check whether there were significant differences between the conditions regarding the sample characteristics. No significant differences were found which implies there was a homogeneous distribution over the conditions. Subsequently, manipulation checks were conducted by means of an Independent Sample T-test to prove that the stimuli meet the intended criterion. The results showed significance differences between the groups for all stimuli, as reported in subheading 3.4. After the manipulation checks, the reliability of the scales was tested on the basis of Cronbach's Alpha which determines the internal consistency between the items in a scale. According to the outcomes, all four scales prove to be reliable. For the remaining analyses, mean scores have been computed first. After doing that, mean scores and standard deviations per condition were reported for each dependent variable. The main effects and interaction effects of the independent variables on the dependent variables have been analysed by means of a multivariate analysis and three univariate analyses. This will be further discussed in the following chapter.

4. Results

This section presents the results of the experimental research. First the results of the multivariate analysis will be discussed followed by the three univariate analyses for attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. Subsequently, an overview of the results of the hypotheses is displayed. At last, the results of the subgroup analysis are discussed.

4.1 Analysis of variances

A multivariate test for variances (MANOVA) was conducted with Wilk's Lamba as test statistic to examine whether there are main and interaction effects of the independent variables on the three dependent variables. As the results show, no significant main effects were found for the independent variables frame $\Lambda = 0.99$, $F = 0.92$, $p = 0.43$, level of engagement $\Lambda = 0.99$, $F = 0.50$, $p = 0.69$ and the use of emoji $\Lambda = 0.99$, $F = 0.86$, $p = 0.46$. Although the main purpose of the moderator smartphone use in the study was to examine the effect of this moderator on the relations between the independent and dependent variables, a direct effect of the moderator on the dependent variables was found $\Lambda = 0.94$, $F = 4.80$, $p = 0.003$. Looking at the interaction effects, no significant effects have been found between frame and engagement $\Lambda = 0.99$, $F = 1.08$, $p = 0.36$, frame and emoji $\Lambda = 0.99$. $F = 0.97$, $p = 0.41$ and frame and smartphone use $\Lambda = 0.99$, $F = 0.79$, $p = 0.50$. Furthermore, between engagement and emoji $\Lambda = 1.00$, $F = 0.20$, $p = 1.00$, engagement and smartphone use $\Lambda = 1.00$, $F = 0.38$, $p = 0.77$ and emoji and smartphone use $\Lambda = 0.99$, $F = 0.54$, $p = 0.66$ no significant interactions effects were found. Lastly, also for the two-way interactions for frame, engagement and smartphone use $\Lambda = 0.99$, $F = 0.48$, $p = 0.70$, frame, emoji and smartphone use $\Lambda = 0.99$. $F = 0.86$, $p = 0.48$ and engagement, emoji and smartphone use $\Lambda = 1.00$, $F = 0.17$, $p = 0.91$ no interaction effects could be found. Table 4 shows the results of the multivariate analysis, the descriptive statistics are shown in table 5.

Table 4: Multivariate Test for Variance: Wilk's Lamba

Effect	Value	F-value	Sig.
Frame	.99	.92	.43
Engagement	.99	.50	.69
Emoji	.99	.86	.46
Mobile phone use (moderator)	.94	4.80	**.003**
Frame * Engagement	.99	1.08	.36
Frame * Emoji	.99	.97	.41
Frame * Mobile phone use	.99	.79	.50
Engagement * Emoji	1.00	.20	1.00
Engagement * Mobile phone use	1.00	.38	.77
Emoji * Mobile phone use	.99	.54	.66
Frame * Engagement * Mobile phone use	.99	.48	.70
Frame * Emoji * Mobile phone use	.99	.83	.48
Engagement * Emoji * Mobile phone use	1.00	.17	.91

Table 5: Descriptive statistics

	Gain frame N = 126	Loss frame N = 125	High engagement N = 125	Low engagement N = 126	With emoji N = 124	Without emoji N = 127	High mobile phone use N = 126	Low mobile phone use N = 125
Attitude towards spu	M = 2.96 SD = 0.67	M = 3.06 SD = 0.60	M = 3.03 SD = 0.60	M = 3.00 SD = 0.67	M = 2.95 SD = 0.67	M = 3.07 SD = 0.60	M = 3.05 SD = 0.62	M = 2.97 SD = 0.65
Perceived app effectiveness	M = 3.02 SD = 0.87	M = 2.91 SD = 0.81	M = 2.93 SD = 0.82	M = 3.01 SD = 0.87	M = 2.95 SD = 0.86	M = 2.99 SD = 0.83	M = 3.01 SD = 0.88	M = 2.92 SD = 0.80
Intention to reduce spu	M = 3.26 SD = 0.81	M = 3.25 SD = 0.74	M = 3.20 SD = 0.74	M = 3.31 SD = 0.81	M = 3.29 SD = 0.85	M = 3.22 SD = 0.69	M = **3.41** SD = 0.80	M = **3.10** SD = 0.72

Significant differences are in bolt font

4.2 Attitude towards smartphone use

For the dependent variable attitude towards smartphone use, the analysis of variance (ANOVA) did not show any significant main effects for frame $F = 1.21$, $p = 0.27$, level of engagement $F = 0.38$, $p = 0.54$ and the use of emoji $F = 2.05$, $p = 0.15$. Also the moderator smartphone use showed no direct effect on attitude towards smartphone use $F = 1.01$, $p = 0.34$. Furthermore, the combinations of frame and engagement $F = 2.58$, $p = 0.11$, frame and emoji $F = 0.14$, $p = 0.71$ and frame and smartphone use $F = 0.57$, $p = 0.45$ did not show any significant effects. This also applies for the combinations engagement and emoji $F = 0.001$, $p = 0.98$, engagement and smartphone use $F = 1.08$, $p = 0.30$ and emoji and smartphone use $F = 0.03$, $p = 0.86$, no significant effects could be detected. Looking at the two-way interactions, for frame, engagement and smartphone use $F = 0.26$, $p = 0.61$, frame, emoji and smartphone use $F = 1.08$, $p = 0.30$ and engagement, emoji and smartphone use $F = 0.24$, $p = 0.63$, no significant effects were found. In table 6 the results of the univariate analysis for attitude towards smartphone use are reported, table 7 shows the descriptive statistics.

Table 6: Univariate analysis: Attitude towards smartphone use

Effect	**F-value**	**Sig.**
Frame	1.21	.27
Engagement	.38	.54
Emoji	2.05	.15
Mobile phone use (moderator)	1.01	.34
Frame * Engagement	2.58	.11
Frame * Emoji	.14	.71
Frame * Mobile phone use	.57	.45
Engagement * Emoji	.001	.98
Engagement * Mobile phone use	1.08	.30
Emoji * Mobile phone use	.03	.86
Frame * Engagement * Mobile phone use	.26	.61
Frame * Emoji * Mobile phone use	1.08	.30
Engagement * Emoji * Mobile phone use	.24	.63

Table 7: Descriptive statistics: Attitude towards smartphone use

Gain frame N = 126	Loss frame N = 125	High engagement N = 125	Low engagement N = 126	With emoji N = 124	Without emoji N = 127	High mobile phone use N = 126	Low mobile phone use N = 125
M = 2.96	M = 3.06	M = 3.03	M = 3.00	M = 2.95	M = 3.07	M = 3.05	M = 2.97
SD = 0.67	SD = 0.60	SD = 0.60	SD = 0.67	SD = 0.67	SD = 0.60	SD = 0.62	SD = 0.65

Significant differences are in bold font

4.3 Perceived app effectiveness

The results of the ANOVA analysis for the dependent variable perceived app effectiveness show no significant main effects for frame $F = 0.93$, $p = 0.34$, neither for level of engagement $F = 0.57$, $p = 0.45$, the use of emoji $F = 0.10$, $p = 0.76$ and smartphone use $F = 0.60$, $p = 0.44$. Subsequently, for the interactions frame and engagement $F = 0.24$, $p = 0.63$, frame and emoji $F = 0.03$, $p = 0.86$ and frame and smartphone use $F = 0.09$, $p = 0.77$ no significant effects were detected. Furthermore, engagement and emoji $F = 0.05$, $p = 0.82$, engagement and smartphone use $F = 0.02$, $p = 0.90$ and emoji and smartphone use $F = 0.32$, $p = 0.57$ did not show any significant interaction effects. At last, for the two-way interactions frame engagement and smartphone use $F = 0.09$, $p = 0.77$, frame, emoji and smartphone use $F = 0.001$, $p = 0.98$ and engagement, emoji and smartphone use $F = 0.31$, $p = 0.58$ no significant could be found. The results of the univariate analysis for perceived app effectiveness can be found in table 8 below, followed by the descriptive statistics in table 9.

Table 8: Univariate analysis: Perceived app effectiveness

Effect	**F-value**	**Sig.**
Frame	.93	.34
Engagement	.57	.45
Emoji	.10	.76
Mobile phone use (moderator)	.60	.44
Frame * Engagement	.24	.63
Frame * Emoji	.03	.86
Frame * Mobile phone use	.09	.77
Engagement * Emoji	.05	.82
Engagement * Mobile phone use	.02	.90
Emoji * Mobile phone use	.32	.57
Frame * Engagement * Mobile phone use	.09	.77
Frame * Emoji * Mobile phone use	.001	.98
Engagement * Emoji * Mobile phone use	.31	.58

Table 9: Descriptive statistics: Perceived app effectiveness

Gain frame N = 126	Loss frame N = 125	High engagement N = 125	Low engagement N = 126	With emoji N = 124	Without emoji N = 127	High mobile phone use N = 126	Low mobile phone use N = 125
M = 3.02	M = 2.91	M = 2.93	M = 3.01	M = 2.95	M = 2.99	M = 3.01	M = 2.92
SD = 0.87	SD = 0.81	SD = 0.82	SD = 0.87	SD = 0.86	SD = 0.83	SD = 0.88	SD = 0.80

Significant differences are in bold font

4.4 Intention to reduce smartphone use

For the third and last dependent variable, intention to reduce smartphone use, the ANOVA analysis did not find any significant main results for the independent variables frame $F = 0.01$, $p = 0.92$, level of engagement $F = 1.42$, $p = 0.24$ and use of emoji $F = 0.39$, $p = 0.54$. However, despite that the main purpose of the moderator smartphone was to test the effect of the moderator on the relations between the independent and dependent variables, a direct effect of the moderator on intention to reduce smartphone use is found $F = 9.05$, $p = 0.003$. This indicates there is a significant difference between people with low smartphone use (M = 3.10, SD = 0.72) and people with high smartphone use (M = 3.41, SD = 0.80). Looking at the interactions, frame and engagement $F = 0.001$, $p = 0.98$, frame and emoji $F = 1.43$, $p = 0.23$ and frame and smartphone use $F = 0.98$, $p = 0.32$, there were no significant effects found. Also, the interactions engagement and emoji $F = 0.003$, $p = 0.96$, engagement and smartphone use $F = 0.32$, $p = 0.57$ and emoji and smartphone use $F = 1.54$, $p = 0.22$ did not show any significant effects. Subsequently, for the two-way interactions frame, engagement and smartphone use $F = 0.39$, $p = 0.53$, frame, emoji and smartphone use $F = 1.62$, $p = 0.20$ and engagement, emoji and smartphone use $F = 0.34$, $p = 0.56$, no significant effects were detected. Table 10 shows the outcomes of the univariate analysis for intention to reduce smartphone use, with the descriptive statistics in table 11.

Table 10: Univariate analysis: Intention to reduce smartphone use

Effect	**F-value**	**Sig.**
Frame	.01	.92
Engagement	1.42	.24
Emoji	.39	.54
Mobile phone use (moderator)	9.05	**.003**
Frame * Engagement	.001	.98
Frame * Emoji	1.43	.23
Frame * Mobile phone use	.98	.32
Engagement * Emoji	.003	.96
Engagement * Mobile phone use	.32	.57
Emoji * Mobile phone use	1.54	.22
Frame * Engagement * Mobile phone use	.39	.53
Frame * Emoji * Mobile phone use	1.62	.20
Engagement * Emoji * Mobile phone use	.34	.56

Table 11: Univariate analysis: Intention to reduce smartphone use

Gain frame N = 126	Loss frame N = 125	High engagement N = 125	Low engagement N = 126	With emoji N = 124	Without emoji N = 127	High mobile phone use N = 126	Low mobile phone use N = 125
M = 3.26	M = 3.25	M = 3.20	M = 3.31	M = 3.29	M = 3.22	M = **3.41**	M = **3.10**
SD = 0.81	SD = 0.74	SD = 0.74	SD = 0.81	SD = 0.85	SD = 0.69	SD = 0.80	SD = 0.72

Significant differences are in bold font

4.5 Results hypotheses

Below the overview in table 12 presents the results of the hypotheses.

Table 12: Overview results tested hypotheses

#	Hypothesis	Results
1a	The use of gain framing in digital nudging results in a greater positive influence on attitude towards mobile phone use than the use of loss framing.	Rejected
1b	The use of gain framing in digital nudging results in a greater positive influence on perceived app effectiveness than the use of loss framing.	Rejected
1c	The use of gain framing in digital nudging results in a greater positive influence on the intention to reduce screen time than the use of loss framing.	Rejected
2a	Low engagement in digital nudging results in a greater positive influence on attitude towards mobile phone use than high engagement nudges.	Rejected
2b	Low engagement in digital nudging results in a greater positive influence on perceived app effectiveness than high engagement nudges.	Rejected
2c	Low engagement in digital nudging results in a greater positive influence on intention to reduce screen time than high engagement nudges.	Rejected
3a	The presence of an emoji in digital detox apps results in a greater positive influence on attitude towards mobile phone use compared to the absence of an emoji.	Rejected
3b	The presence of an emoji in digital detox apps results in a greater positive influence on perceived app effectiveness compared to the absence of an emoji.	Rejected
3c	The presence of an emoji in digital detox apps results in a greater positive influence on the intention to reduce screen time compared to the absence of an emoji.	Rejected
4a	The combination of loss frame and high engagement results in a greater positive influence on attitude towards mobile phone use compared to other combinations of framing and level of engagement.	Rejected
4b	The combination of loss frame and high engagement results in a greater positive influence on perceived app effectiveness compared to other combinations of framing and level of engagement.	Rejected
4c	The combination of loss frame and high engagement results in a greater positive influence on the intention to reduce screen time compared to other combinations of framing and level of engagement.	Rejected
5a	The combination of loss frame and the presence of an emoji results in a greater positive influence on attitude towards mobile phone use compared to other combinations of framing and the use of emoji.	Rejected
5b	The combination of loss frame and the presence of an emoji results in a greater positive influence on perceived app effectiveness compared to other combinations of framing and the use of emoji.	Rejected
5c	The combination of loss frame and the presence of an emoji results in a greater positive influence on the intention to reduce screen time compared to other combinations of framing and the use of emoji.	Rejected
6a	The combination of high engagement and the presence of an emoji results in a greater positive influence on attitude towards mobile phone use compared to other combinations of level of engagement and the use of emoji.	Rejected
6b	The combination of high engagement and the presence of an emoji results in a greater positive influence on perceived app effectiveness compared to other combinations of level of engagement and the use of emoji.	Rejected

6c	The combination of high engagement and the presence of an emoji results in a greater positive influence on the intention to reduce screen time compared to other combinations of level of engagement and the use of emoji.	Rejected
7a	For people with a high smartphone use, the effect of framing, level of engagement and the use of emoji on attitude towards smartphone use will be greater compared to people with a low smartphone use.	Rejected
7b	For people with a high smartphone use, the effect of framing, level of engagement and the use of emoji on perceived app effectiveness will be greater compared to people with a low smartphone use.	Rejected
7c	For people with a high smartphone use, the effect of framing, level of engagement and the use of emoji on intention to reduce smartphone use will be greater compared to people with a low smartphone use.	Rejected

4.6 Subgroup analyses

As no significant main and interaction effects could be found from the independent variables on the dependent variables, some subgroup analyses were conducted to examine whether there were significant effects for certain subgroups. Subgroups include a group of participants that share the same characteristics, for example, the same gender, same age group or same level of education.

Gender

The first subgroup analysis was performed based on gender, a multivariate test was conducted for both male and female separately. The outcomes of the multivariate tests showed for male (N = 68) a direct significant effect of the moderator smartphone use on the dependent variable intention to reduce smartphone use. This indicates that there is a significant difference between people who have low smartphone use (M = 3.03, SD = 0.67) and people that have high smartphone use (M = 3.64, SD = 0.64). For female (N = 182), one significant interaction effect was found, for the combination frame, use of emoji and smartphone use on the dependent variable attitude towards smartphone use $F = 5{,}39$, $p = 0.02$. The corresponding plots in figure 3 show an interesting interaction for frame and the use of emoji when smartphone use is low. The interaction shows that combining a gain frame with the presence of an emoji or combining a loss frame with the absence of an emoji are most effective. Combining a gain frame with the absence of an emoji or a loss frame with the presence of an emoji would lead to adverse effects on the dependent variable attitude towards smartphone use. For high smartphone use, both gain and loss frame are most effective when combined with the absence of an emoji.

Age

For the characteristic age, the data set was divided into two groups based on the mean score of age (M = 22.58). The first group, with an age between 18 and 22.57 (N = 127), showed one significant main effect of engagement on the dependent variable intention to reduce smartphone use $F = 5.56$, $p = 0.02$. This means that the difference between people with a low level of engagement (M = 3.53, SD = 0.74) and people with a high level of engagement (M = 3.27, SD = 0.70) is significant. For the second group with the age of 22.58 till 35 (N = 124), a direct effect of the moderator smartphone use on the dependent variable intention to

reduce smartphone use was found. This signifies a significant difference between people who have low smartphone use (M = 2.91, SD = 0.75) and people that have high smartphone use (M = 3.36, SD = 0.79).

Education

For level of education, the participants were also divided into two groups. The first group included primary school, high school and MBO students (N = 101), whereas the second group included HBO and University students (N = 150). For the first group, one interaction effect was found for frame and engagement on the dependent variable attitude towards smartphone use $F = 5.17$, $p = 0.03$. Figure 4 displays a plot of this significant interaction. It shows that when there is a high level of engagement, the gain frame is most effective. However, when the level of engagement is low, the loss frame seems to be most effective. Combining a high level of engagement with a loss frame or a low level of engagement with a gain frame leads to adverse effects on attitude towards smartphone use. The second group, high education, did not show any significant effects, except for a direct effect of the moderator smartphone use on the dependent variable intention to reduce smartphone use. Which indicates a significant difference between low smartphone use (M = 3.06, SD = 0.74) and high smartphone use (M = 3.37, SD = 0.81).

Screentime

The last subgroup analysis was done was based on screentime, divided into two groups based on the mean score (M = 225.57). For the first group, low screentime (N = 128), again a direct effect of the moderator smartphone use on the dependent variable intention to reduce smartphone use was found $F = 10.08$, $p = 0.002$, signifying a significant difference between people who have a low smartphone use (M = 3.00, SD = 0.79) and people who have a high smartphone use (M = 3.47, SD = 0.75). For the second group, high screen time (N = 123), no significant effects were found.

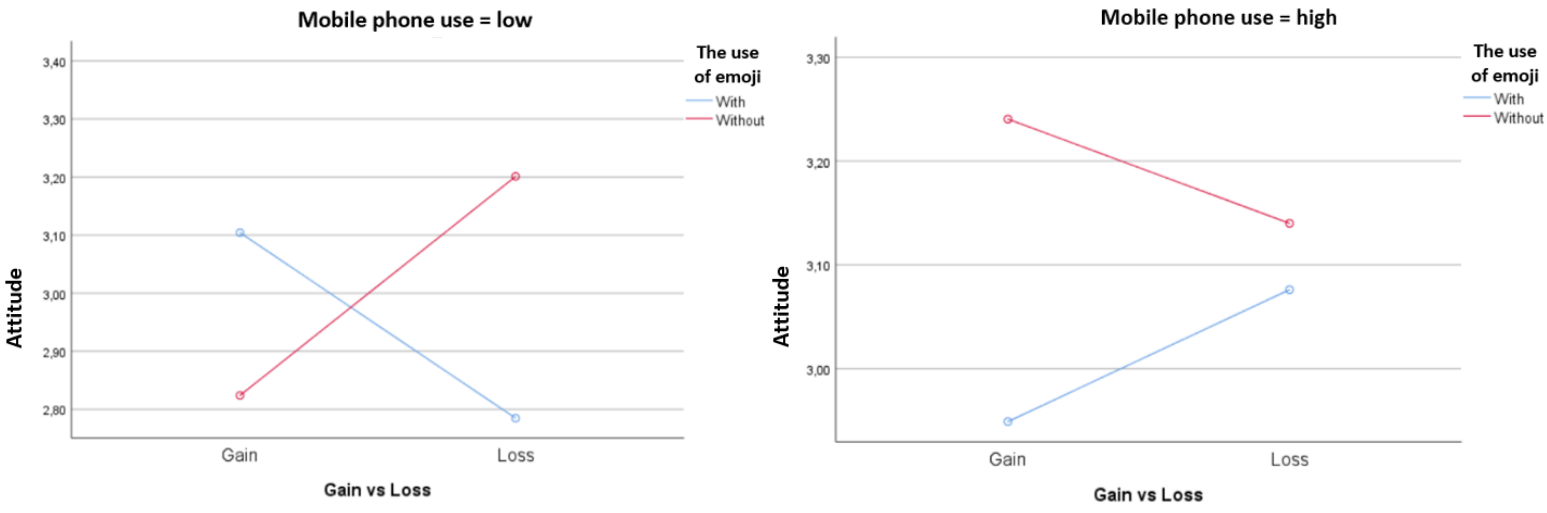


Figure 3: Interaction effect of frame and emoji on attitude when gender is female

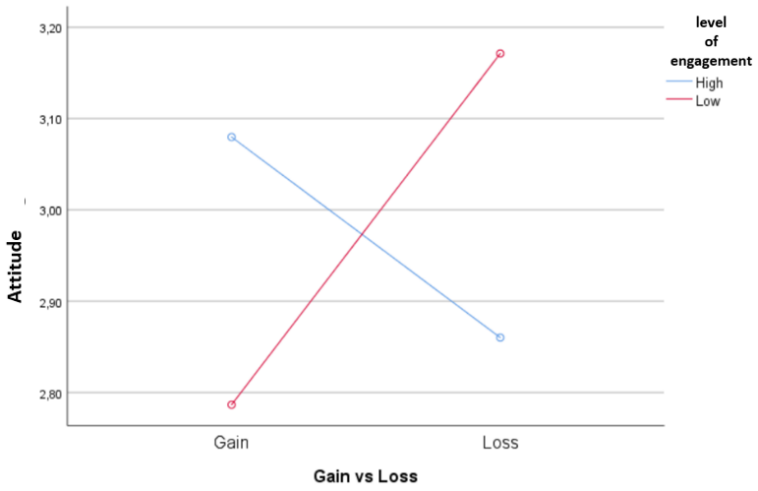


Figure 4: Interaction effect of frame and engagement on attitude when education is low

To summarize, despite the main analysis not showing any significant effects of gain/loss framing, level of engagement and the use of emoji on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use, the subgroup analysis did show some interesting outcomes. For female users, a significant interaction effect was found between framing and the use of emoji on the attitude towards smartphone use. Furthermore, for the age group of 18 to 22, the level of engagement has a significant effect on the intention to reduce smartphone use, the effect is strongest when the level of engagement is low. Lastly, an interaction effect was detected between framing and the level of engagement on the attitude towards smartphone use, for the low education group. A high level of engagement is most effective in combination with a gain frame, whereas a low level of engagement is most effective together with a loss frame. Thus, the subgroup analysis showed some interesting outcomes which will be further discussed in chapter 5.

5. Discussion

This chapter will start with a discussion of the results. Subsequently, the theoretical and practical implications will be elaborated. After the implications, the limitations of the research and the recommendations for future research will be explained, followed by some concluding remarks.

5.1 General discussion of the results

The expected effects of framing, level of engagement and the use of emoji on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use were not found. Smartphone use did not have any influence on the relations between the independent and dependent variables. However, smartphone use had a direct effect on intention to reduce smartphone use. Furthermore, some other interesting results were found for certain subgroups. All results will be discussed in the upcoming section.

Discussion of type of framing

The type of framing does not have any effect on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. On the basis of the literature, it was expected that by highlighting either the gains or losses of certain behavior, opinions and perceptions of individuals would be influenced (Spence & Pidgeon, 2010). Cutting down smartphone use in order to reduce the risk of negative consequences to mental health can be seen as preventive behavior which is considered risk-averse (Tversky & Kahneman, 1981). Based on this it was expected that gain framing would have a greater positive influence compared to loss framing (Rothman & Salovey, 1997; Choi et al., 2014). However, the results of the current study show no effect of framing on attitude, perceived app effectiveness and intention. The stimuli for framing were tested in a pre-test and the manipulation check in the main study shows that the stimuli met the intended criterion, which means it is not because of poor design of the stimuli that no effects were found. Gender, age, education and the amount of smartphone use do not play a role in the effect of framing on attitude, perceived app effectiveness and intention, all subgroups show no effects.

What might be a reason for no effects of framing is that in the current study, no distinction was made between smartphone use for pleasure or smartphone use for necessary purposes such as for work, checking the news, keeping track of finances or to staying in touch with family and friends. When people see their smartphone use as something necessary, it is plausible that they do not care about how much time they spent, saved or lost by using their smartphone. Which can lead to no effects of gain and loss framing on the attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. This applies not only within the context of digital detox, but also in all other contexts in which framing is used. The importance of the issue plays a key role in the effectiveness of framing: the effects of framing depend on the importance of the issue (Lecheler et al., 2009). This can explain the results of the current research, reducing smartphone use is not that important for people, which reduces the effects of framing. This means that for framing in the context of digital detox, but also in other contexts in which framing is used to persuade people towards

a certain behavior, it is best to make use of framing techniques only when the subject in question is perceived as important for the receivers. For example, framing rich people towards saving money will not be effective, whereas for less wealthy people the framing techniques can be much more effective. So, for framing to be effective, it is essential to have knowledge about the target audience to ensure that the subject in question is important enough to the target audience.

Discussion of level of engagement

The level of engagement is not of influence on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. Based on literature and previous studies, it was expected that both low and high engagement would have a positive influence and that the effect of low engagement would be greater compared to high engagement (Zimmerman & Sobolov, 2020; Okeke et al., 2018; Purohit et al., 2020). By contrast, the results of the current study show no effects of the level of engagement on attitude, perceived app effectiveness and intention to reduce smartphone use. However, for the age group 18 to 22, the level of engagement does have an effect on the intention to reduce smartphone use. For this age group, there is a difference between low engagement and high engagement regarding their intention to reduce their smartphone use. When the level of engagement is low, the intention to reduce smartphone use is greater compared to when the level of engagement is high. This signifies that the use of a low level of engagement within a digital detox app will be most effective on the intention to reduce smartphone use, for the age group of 18 to 22. This indicates that the younger generation, of 18 to 22 years, is more influenceable by the level of engagement compared to the older generation, 23 to 35 years. This applies not only within the context of digital detox, but in other contexts regarding persuasion as well. Younger adults are more susceptible and responsive to persuasive strategies compared to older adults (Abdullahi et al., 2018). Thus, for the level engagement this means that low engagement can be effective if targeted at the younger generation.

Discussion of use of emoji

The use of emoji does not have any effect on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. On the basis of literature, the expectation was that a positive emoji would strengthen the message in the conditions including the gain frame and that a negative emoji would strengthen the conditions with a loss frame (Ganster et al., 2012). The attitude of individuals towards the use of emojis in electronic mediated communication seemed to be positive (Prada et al., 2018). Using emojis in marketing and communication would have persuasive potential (Ge & Gretzel, 2018) and a positive influence on the level of engagement and interactions (Kim, 2018). Nevertheless, the outcomes of the current study are in contrast with this literature. Also gender, age, education and the amount of smartphone use do not play a role in the effect of the use of emoji on attitude, perceived app effectiveness and intention, all subgroups show no effects.

A reason for this might be that the interpretation of emojis vary among people (Tigwell & Flatla, 2016). Whether persuasion by using emojis is effective really depends on the interpretation of the receiver (Ge &

Gretzel, 2018). According to Tigwell & Flatla (2016), the use of a simple emoji and combining the emoji with a written text can help to prevent misunderstanding. Despite both using a simple emoji and combining it with a written text in the current research, it might be that the respondents interpret the emojis differently which could have let to no effects of the use of emoji. Hewage et al. (2020) state that asymmetric emojis can lead to more positive effects compared to symmetric emojis. For this study, it was chosen to use a simple and thus symmetric emoji, as recommended by Tigwell & Flatla (2016). Perhaps, the use of an asymmetric emoji would be more effective. With the outcomes of the current study it can be concluded that the use of emoji is not always effective or of influence. This does not mean the use of emoji can never be effective in the context of digital detox. This is a quite new area of research in which there is still a lot to be researched: when to use an emoji and when not to, what emoji to use in which context, combining an emoji with text or visuals, frequency of using an emoji and so on. The use of emoji is still a useful tool to strengthen a message, how this tool can be applied effectively in the context of digital detox still needs further research.

Discussion of interaction effects

The interactions of frame and engagement, frame and emoji and engagement and emoji show no effects on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. Only little literature is available on these interactions, especially within the context of digital detox. Nevertheless, based on the literature that was available in other contexts, some interaction effects were predicted. However, the results of the current study could not support these predictions. A reason for this might be that framing, the level of engagement and the use of emoji separately all do not have any effect on attitude, perceived app effectiveness and intention, which reduces the chance of any interactions. Furthermore, the novelty of the study might be a reason why the expectations based on the literature do not match with the results of the current study.

Despite not finding any results for the total sample, for the group of lower educated people, including primary school, high school and MBO students, there is an effect of the combination of frame and level of engagement on the attitude towards smartphone use. This effect indicates that when the level of engagement is high, the use of a gain frame is most effective on attitude towards smartphone use. When the level of engagement is low, the loss frame is most effective on attitude. Consequently, when combining low engagement with a gain frame or high engagement with a loss frame, adverse effects on attitude towards smartphone use will occur. So, up to now, the combination of frame and the level of engagement is the only interaction that has an effect in the context of digital detox. Literature is scarce on possible interactions, however, the existing literature does state that combining framing and emoji (Shao et al., 2020; Karpinska-Krakowiak et al., 2020) and engagement and emoji (Kim, 2018; McShane et al., 2021) can be of positive influence within other contexts. The results of the current study can not support this, but this does not mean that these combinations can not be effective in the context of digital detox. As this is a new research area, more research is needed to get a better understanding of the possible interactions and its effects.

Discussion of smartphone use

Smartphone use does not influence the relationships between framing, level of engagement, the use of emoji and attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. According to literature, the severity of a problem can be of influence on people's intention to change a certain behavior (Stretcher & Rosenstock, 1997). The awareness of potential risks of certain behavior can be of positive influence on behavior change (Zhou et al., 2020). Without any awareness of the potential risks, users are unmotivated to change their smartphone use. Based on this literature, it was expected that for people with high smartphone use, the effect of framing, level of engagement and the use of emoji on attitude, perceived app effectiveness and intention would be greater than for people with low smartphone use. However, this is not the case, there are no differences between low and high smartphone use. A possible explanation for this could be the fact that framing, level of engagement and the use of emoji do not have any effect on attitude, perceived app effectiveness and intention. If there are no direct effects, it is unlikely that smartphone use will change this.

Nevertheless, smartphone use does have a direct effect on the intention to reduce smartphone use. This effect indicates that the intention to reduce smartphone use is different for people with low smartphone use and people with high smartphone use. People with high smartphone use also have a higher intention to reduce their smartphone use, compared to people with low smartphone use. This seems plausible, as people with a high smartphone use are probably more motivated to reduce their smartphone use in comparison with people with lower smartphone use, as high smartphone use also means a greater risk of negative consequences. Negative consequences to users' mental health such as stress, anxiety, feelings of loneliness, isolation, social pressure, insecurity, lower self-esteem and sometimes even suicidality (Berryman et al., 2018; Gao et al., 2020; Babic et al., 2017). This is line with existing literature which explains that high-risk internet users have higher awareness and knowledge about the risks and consequences of addiction (Jiang & Leung, 2012). People experiencing these negative consequences due to high or even extreme smartphone use have higher motives to reduce their smartphone use than people with a lower usage who do not experience negative consequences.

Smartphone use does not influence the interactions between framing, level of engagement and the use of emoji on attitude, perceived app effectiveness and intention. However, for female users, smartphone use does have an effect on the interaction of framing and the use of emoji on attitude towards smartphone use. This effect signifies that the interaction of framing and emoji on attitude towards smartphone use is different between people who have low smartphone use and people who have high smartphone use. For female users, when smartphone use is low, an interesting interaction between frame and emoji occurs. The interaction indicates that the combination of a loss frame and the absence of an emoji is most effective on attitude towards smartphone use. When using a gain frame, the presence of an emoji is most effective. When smartphone use is high, the gain and loss frame are both most effective when combined with the absence of an emoji. To conclude, for female users with low smartphone use, combining a loss frame with the absence

of an emoji will have the strongest effect on their attitude towards smartphone use. Whereas for female users with high smartphone use, the combination of a gain frame with the absence of an emoji has the strongest effect on attitude.

In summary, smartphone use did not influence the relationships between type of framing, level of engagement, the use of emoji and attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use in any way. Only a direct effect of smartphone use on the intention to reduce smartphone use was found. Furthermore, the subgroup analysis did show an interaction for framing, emoji and smartphone use on attitude towards smartphone use, for female users. So, it is best to focus on users with high usage as their intention to reduce their smartphone use is higher compared to users with low usage, and thus the effectiveness of digital nudges might be higher.

Conclusion of results

The results of the study indicate that nudging smartphone users within a digital detox app towards reducing their smartphone usage is not done so easily. Digital detox apps are popular when looking at the amount of downloads. However, a lack of evidence exists on the effectiveness of these apps and its features. As explained before, users are willing to observe their smartphone usage, however, they do not see the need to manage it (Zimmerman, 2021). For digital detox apps it is best to focus on users with high smartphone use, as they have a high intention to reduce their usage. For this group digital nudges can be more effective than for users with low smartphone use and a lower intention to reduce their usage. For digital nudges within digital detox apps to be effective, they need to be personalized and appropriate to the user. Furthermore, the digital nudges need to be strong enough to be able to change possible pre-determined opinions and attitudes about reducing smartphone use. Lastly, digital detox app and digital nudges within this context need to focus on mobile phone use for fun, like social media, watching movies and playing games. Mobile phone use for work or other practical things is something that users see as necessary and is probably almost impossible to change or reduce.

5.2 Implications

Theoretical implications

Existing literature on digital nudging states that digital nudges can be of influence on people's behavior and thoughts (Weinmann et al., 2016). However, the results of the current study indicate that this is not the case for smartphone behavior. Smartphone use is addictive and addictive behavior is hard to change (Purohit et al., 2020). This can explain why the digital nudging techniques of gain/loss framing, level of engagement and the use of emoji were not of influence on the attitude towards smartphone use, the perceived app effectiveness and the intention to reduce smartphone use of the respondents.

As explained in existing literature, gain/loss framing can influence the thoughts, opinions and perceptions of individuals (Lakoff, 2004). However, as far as the researcher knows, before conducting the current study

the effectiveness of gain/loss framing has not been examined within the context of digital detox apps before. Within the current study, gain/loss framing did not show any effect on the attitude, perceived app effectiveness and the intention of the respondents. The results of the current study contribute to the existing literature about gain/loss framing and adds new insights about gain/loss framing within the context of digital detox apps. The importance of the issue in question plays a key role in the effectiveness of framing. So, for framing to be effective, it is essential to ensure that the issue in question is important enough to the target audience.

The level of engagement within digital detox apps has been studied by a few researchers by means of passive and active nudges and literature states that both passive and active nudges can be effective in reducing smartphone use (Zimmerman & Sobolev, 2020; Okeke et al., 2018; Purohit et al., 2020; Hiniker et al., 2016). The results of the current study are in contrast with this. Nevertheless, the subgroup analysis did show some interesting outcomes which contribute to the existing literature on the level of engagement within digital detox apps. When the age is between 18 and 22 years, the level of engagement does have an influence on the intention to reduce smartphone use and a low level of engagement has the greatest influence on intention to reduce smartphone use.

For the use of emoji, the effectiveness has not been examined within the context of digital detox apps before. Despite of the expectations of positive influence of the use of emoji, the outcomes were in contrast with these expectations. This new information about the use of emoji within the digital detox context can contribute to existing literature about the use of emoji and gives new insights about the effectiveness of the use of emoji. Combining a simple emoji with a written text is not automatically of influence. In the digital detox context, the use of a symmetric emoji shows no effect, which makes the use of an asymmetric emoji an interesting topic to investigate further. As mentioned before, a lack of evidence exists on the effectivity of digital detox apps (van Velthoven et al., 2018). The current study contributes in reducing this lack of evidence by adding interesting insights to existing literature which can be of use for future research.

Practical implications

Although the main hypotheses of the study were not confirmed, some useful practical implications can be formulated based on the outcomes of the study. An important insight found with this study is that for digital detox apps to be effective, it is crucial that the application is customized to the user. Based on for example gender, age, education, and extremeness of smartphone use. So for digital detox app developers, it is important that such an app recognizes the characteristics and needs of the user and set up the application based on this information. Current developments in the internet make it possible to track users, which gives useful information about the users that can be used to personalize applications towards the needs and motives of the users. Also, the nudging techniques gain/loss framing, level of engagement and the use of emoji can be used based on the information about the user. Just one simple design that is the same for each user and includes the same nudging techniques for everyone will most likely not work. First of all, it is important to

look at the extremeness of the smartphone use of the user. As concluded with the current study, smartphone use is of direct influence on the intention to reduce smartphone use. Users with high smartphone use have a higher intention to reduce their usage. Furthermore, it is crucial to take into account the age of the user. The level of engagement is of influence on the intention to reduce smartphone use for the age group of 18 to 22, but this is not the case for the age group of 23 to 35. Next to smartphone use and age, also gender and education can be of influence on the effectiveness of digital nudges within digital detox apps.

Another meaningful insight found with this study is the importance of carefully thinking and deciding about which emoji to use and what to communicate by means of the emoji. So, communicators have to make sure that their receivers interpret the emojis as intended. This is of importance because when receivers interpret the communicated emojis different than what was intended, it can lead to negative outcomes which cannot be undone once it is out in the world. Senders can reduce the risk of misinterpretation by pretesting the emojis on a large scale, within their target audience, to find out how receivers interpret the emojis and make sure this is in line with the intended interpretation. Furthermore, choosing the right emojis can be easier when a lot is known about the target audience. So, following the target audience closely, getting to know their behavior, motives, actions and preferences, can make it a lot easier to send the right intended communication and prevent misinterpretation. The use of emojis in communication can have positive effects and strengthen a message, but only if it is well thought out and done right by the sender.

5.3 Limitations and future recommendations

This study yielded some interesting and useful insights about the use of digital nudges in the context of digital detox apps. However, this research also had some limitations that need to be discussed together with recommendations for future research.

First of all, the current study was about smartphone use in general. No distinction was made between smartphone use for necessary purposes, like work, finances, agendas, contact with family and colleagues and so on, and smartphone use for leisure purposes, such as social media and watching movies and series. If the study was focused on smartphone use for leisure purposes only, it might have led to different outcomes. When people see their smartphone use as something necessary, it is plausible that they do not care about reducing their smartphone usage. Some respondents did mention that it would have been good to include a question in which they could indicate to what extent they used their smartphone for leisure and for other more necessary purposes. For future research it will be interesting to take into account the two different types of smartphone use and focus on just one of the two.

Second, the experimental conditions were self-made screenshots. Screenshots of what a digital detox app might look like. A screenshot is something static, which is a lot different from an actual smartphone application which users can actually use and in which they can click on buttons and set up things. It might be interesting for future research to design a prototype of a digital detox application which respondents can

use and play with. Results might be different if respondents deal with a dynamic prototype of a smartphone app compared to the static screenshot in the current study.

Third, in line with the second limitation. The respondents looked at the screenshot for no more than a few minutes, whereas with an actual smartphone application the time of usage is unlimited which is mostly for a longer time period. The use of a screenshot in the current study did not give the respondents the opportunity to really experience how an actual digital detox app would work. For future research it is recommended to test a prototype of a digital detox app for a longer period of time.

Fourth, the moderator smartphone use did not load correctly in the factor analysis. The statements regarding smartphone use were divided into four subcategories: persistence, boredom, overuse and self-expression. However, when performing the factor analysis, only self-expression loaded as one factor and the other three did not load together as one factor. Despite that, the Cronbach's Alpha of all statements together regarding smartphone use was 0.78 which indicates a reliable scale. This is why all 16 statements together were used as one scale for the moderator smartphone use.

Fifth, the division between male and female in the current study was not equal. From the total of 251 respondents, 182 were female (72.5%) compared to only 68 male (27.1%). Male and female can respond differently to certain digital nudges. An equal distribution of male and female could have showed different outcomes and therefore future research should aim for an equal distribution between male and female.

Sixth, the target audience of the current research was people with an age between 18 to 35 years old. However, the majority of the respondents were between the age of 18 and 25 years old (85.3%). This is mainly due to respondents being fellow students or respondents being of the same age as the researcher. So, the outcomes of the current study are not very valid or generalizable for the age group of 26 to 35. For future research it can be interesting to focus on this age group of 26 to 35 to examine whether results differ between age groups. With reference to limitation five and six, it is recommended for future research to be more cautious in selecting the respondents.

Seventh, for future research it is recommended to take into account the fact that the interpretation of emojis vary among people (Tigwell & Flatla, 2016). It depends on the interpretation of the receiver whether persuasion through emojis is effective or not. It is best to pretest the emojis on a large scale within the target group, to examine how the target group interprets the emojis and whether this in line with the intended communication or not. When results show that indeed interpretation of the emojis vary within the target group, it may be wise to use different emojis for different groups based on their interpretations.

5.4 Conclusion

The aim of this study was to answer the research question to what extent type of framing (gain/loss), level of engagement (high/low) and the use of emoji (with/without) in digital nudging influence the intention to reduce smartphone use, whether or not influenced by smartphone use. Answering this research question can contribute in reducing the lack of evidence about the effectiveness of digital detox apps and can give useful insights for people in the field of communication and for app developers. To answer this research question, a between subjects 2 (gain frame vs. loss frame) x 2 (high engagement vs. low engagement) x 2 (with emoji vs. without emoji) experimental research design with a moderator (smartphone use) was applied which resulted into eight experimental conditions. Participants of the online experiment were assigned to one of the eight conditions and subsequently had to answer questions regarding their attitude towards smartphone use, their perceived app effectiveness and their intention to reduce smartphone use.

With the results of the online experiment, none of the hypotheses was supported. First of all, the results show that framing type, level of engagement and the use of emoji do not have an effect on attitude towards smartphone use, perceived app effectiveness and intention to reduce smartphone use. Smartphone use does not change anything about these relationships. Furthermore, there are no interactions between framing, level of engagement and the use of emoji on attitude, perceived app effectiveness and intention, also not influenced by smartphone use. Although all hypotheses were rejected, some interesting and useful insights were found with this study. Results show that smartphone use has a direct effect on the intention to reduce smartphone use. People with a higher smartphone use also have a higher intention to reduce their usage. Furthermore, for certain subgroups some effects were found. For female, there is an effect of framing and the use emoji with the moderator smartphone use on attitude towards smartphone use. It shows that the combination of a loss frame with the absence of an emoji is most effective on attitude towards smartphone use. For the age group 18 to 22, there is an effect of the level of engagement on the intention to reduce smartphone use. This indicates that a low level of engagement has a stronger positive effect on intention to reduce smartphone use compared to a high level of engagement. Lastly, for the low education group, there is an effect of framing and level of engagement on the attitude towards smartphone use. The effect demonstrates that when the level of engagement is high, a combination with a gain frame is most effective on attitude. A low level of engagement seems most effective together with a loss frame, for the effect on attitude towards smartphone use.

So, to answer the research question, the type of framing, level of engagement and the use of emoji do not directly influence the intention to reduce smartphone use. With this study it can be concluded that in order to stimulate users to reduce their smartphone use by means of a digital detox app, it is of importance that the smartphone app is personalized to the users' characteristics, motives and preferences.

References

Abel, J. P., Buff, C. L., & Burr, S. A. (2016). Social media and the fear of missing out: Scale development and assessment. *Journal of Business & Economics Research (JBER), 14*(1), 33-44. https://doi.org/10.19030/jber.v14i1.9554

Abdullahi, A. M., Orji, R., & Oyibo, K. (2018). Personalizing persuasive technologies: Do gender and age affect susceptibility to persuasive strategies? *Adjunct Publication of the 26th Conference on User Modeling, Adaptation and Personalization,* 329-334. https://doi.org/10.1145/3213586.3225246

Aboulhosn, S. (2020). *How to use emoji in marketing to drive engagement.* Sproutsocial. https://sproutsocial.com/insights/emoji-marketing/

Abraham, B. K. (2020). The attitude of adolescents towards social media. *International Journal of Advanced Research, 8*(2), 443-453. http://dx.doi.org/10.21474/IJAR01/10480

Ajzen, I. (2006). Constructing a TpB questionnaire: Conceptual and Methodological Considerations.

Babic, M. J., Smith, J. J., Morgan, P. J., Eather, N., Plotniksoff, R. C., & Lubans, D. R. (2017). Longitudinal associations between changes in screen-time and mental health outcomes in adolescents. *Mental Health and Physical Activity, 12,* 124-131. https://doi.org/10.1016/j.mhpa.2017.04.001

Berryman, C., Ferguson, C. J., & Negy, C. (2018). Social media use and mental health among young adults. *Psychiatric Quarterly, 89*(2), 307-314. https://doi.org/10.1007/s11126-017-9535-6

Billieux, J., Van der Linden, M., & Rochat, L. (2008). The role of impulsivity in actual and problematic use of the smartphone. *Applied Cognitive Psychology, 22,* 1195-1210. https://doi.org/10.1002/acp.1429

Boehm, N. (2019). Stuck on social media: Predicting young adults' intentions to limit social media use. *The Journal of Social Media in Society, 8*(2). 143-166.

Cao, H., Qian, Q., Weng, T., Yuan, C., Sun, Y., Wang, H., & Tao, F. (2011). Screen time, physical activity and mental health among urban adolescents in China. *Preventive medicine, 53*(4-5), 316-320. https://doi.org/10.1016/j.ypmed.2011.09.002

Centraal Bureau voor de Statistiek (CBS). (2020). *ICT, kennis en economie 2020*. https://www.cbs.nl/-/media/_pdf/2020/42/ict-kennis-en-economie-2020.pdf

Chen, Z., Lu, X., Shen, S., Ai, W., Liu, X., & Mei, Q. (2017). Through a gender lens: An empirical study of emoji usage over large-scale android users. 1-20. https://arxiv.org/abs/1705.05546

Cheng, T., Woon, D. K., & Lynes, J. K. (2011). The use of message framing in the promotion of environmentally sustainable behaviors. *Social Marketing Quarterly, 17*(2), 48-62. https://doi.org/10.1080/15245004.2011.570859

Choi, J., Noh, G., & Park, D. (2014). Smoking cessation apps for smartphones: content analysis with the self-determination theory. *Journal of Medical Internet Research, 16*(2), 1-16. https://doi.org/10.2196/jmir.3061

Das, G., Wiener, H. J. D., & Kareklas, I. (2019). To emoji or not to emoji? Examining the influence of emoji on consumer reactions to advertising. *Journal of Business Research, 96,* 147-156. https://doi.org/10.1016/j.jbusres.2018.11.007

Emogi Research Team. (2016). *2016 Emoji report*. http://cdn.emogi.com/docs/reports/2016_emoji_report.pdf

Emojipedia. (n.d.). *Smiley's & People.* https://emojipedia.org/people/

Ganster, T., Eimler, S. C., & Krämer NC. (2012). Same same but different!? The differential influence of smilies and emoticons on person perception. *Cyberpsychology, Behavior and Social Networking*, *15*(4), 226–30. https://doi.org/10.1089/cyber.2011.0179

Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Wang, Y., Fu, H., & Dai, J. (2020). Mental health problems and social media exposure during covid-19 outbreak. *PLoS ONE 15*(4), 1-10. https://doi.org/10.1371/journal.pone.0231924

Ge, J., & Gretzel, U. (2018). Emoji rhetoric: a social media influencer perspective. *Journal of Marketing Management, 34*(15-16), 1272-1295. https://doi.org/10.1080/0267257X.2018.1483960

Glikson, E., Cheshin, A., & van Kleef, G. A. (2018). The dark side of a smiley: Effects of smiling emoticons on virtual first impressions. *Social Psychological and Personality Science*, *9*(5), 614-625. https://doi.org/10.1177/1948550617720269

Griffiths, M. D., & Kuss, D. (2017). Adolescent social media addiction. *Education and Health, 35*(3), 49-52.

Harun, A., Razak, M. R. A., & Fadil, M. Z. M. (2021). Understanding emoji characters in instant messaging apps. *E-Proceedings of International Conference on Language, Education, Humanities & Social Sciences,* 147-156.

Herring, S., & Dainas, A. (2017). "Nice picture comment!" Graphicons in Facebook comment threads. *Proceedings of the 50th Hawaii International Conference on System Sciences*. 2185-2194. https://doi.org.10.24251/hicss.2017.264

Hewage, G. S., Liu, Y., Wang, Z., & Mao, H. (2020). Consumer responses toward symmetric versus asymmetric facial expression emojis. *Marketing Letters, 32,* 219-230. https://doi.org/10.1007/s11002-020-09550-8

Hiniker, A., Hong, S., Kohno, T., & Kientz, J. A. (2016). Mytime: Designing and evaluating an intervention for smartphone non-use. *Association for Computing Machinery,* 4746-4757. https://doi.org/10.1145/2858036.2858403

Jiang, Q., & Leung, L. (2012). Effects of individual differences, awareness-knowledge, and acceptance of internet addiction as a health risk on willingness to change internet habits. *Social Science Computer Review 30*(2), 170-183. https://doi.org/10.1177/0894439311398440

Johnson, E. J., Shu, S. B., Dellaert, B. G. C., Fox, C., Goldstein, D. G., Haubl, G. Larrick, R. P., Payne, J. W., Peters, E., Schkade, D., Wansink, B., & Weber, E. U. (2012). Beyond nudges: tools of a choice architecture. *Marketing Lett 23*(2), 487-504. https://doi.org/10.1007/s11002- 012-9186-1

Karpinska-Krakowiak, M., Skowron, L., & Ivanov, L. (2020). "I will start saving natural resources, only when you show me the planet as a person in danger": The effects of message framing and anthropomorphism on pro-environmental behaviors that are viewed as effortful. *Sustainabillity*, *12*(14), 1-14. https://doi.org/10.3390/su12145524

Karsay, K. (2019). Longitudinal effects of excessive smartphone use on stress and loneliness: The moderating role of self-disclosure. *Cyberpsychology, Behavior, and Social Networking, 22*(11). 706-713. https://doi.org/10.1089/cyber.2019.0255

Kim, H. J. (2018). The effects of gain versus loss framing and issue involvement on publics' responses to nuclear energy messages in South Korea. *Asian Journal of Communication, 28*(5), 541-558. https://doi.org/10.1080/01292986.2018.1491057

Kim, L. (2018). *The stupid-simple secret ingredient to better engagement on Twitter.* WordStream. https://www.wordstream.com/blog/ws/2015/11/19/twitter-emoji

Kuo, F., Hsu, C., & Day, R. (2009). An exploratory study of cognitive effort involved in decision under framing – an application of the eye-tracking technology. *Decision Support Systems, 48*(1), 81-91. https://doi.org/10.1016/j.dss.2009.06.011

Kurtulush, A., & Aydin, Z. (2019). *Attitudes towards social media: A scale Development in Turkey*. https://aychakurtulush.medium.com/attitudes-towards-social-media-a-scale-development-in-turkey-7c5fdbc17c13

Lam, L. T., & Lam, M. K. (2016). eHealth intervention for problematic internet use (PIU). *Current Psychiatry Reports, 18*, 1-7. https://doi.org/10.1007/s11920-016-0747-5

Lakoff, G. (2004). *Don't think of an elephant! Know your values and frame the debate*. Chelsea Green Publishing Co.

Lecheler, S., Vreese de, C., & Slothuus, R. (2009). Issue importance as a moderator of framing effects. *Communication Research, 36*(3), 400-425. https://doi.org/10.1177/0093650209333028

Loroz, P. S. (2007). The interaction of message frames and reference points in prosocial persuasive appeals. *Psychology & Marketing, 24*(11), 1001–1023. https://doi.org/10.1002/mar.20193

McShane, L., Pancer, E., Poole, M., & Deng, Q. (2021). Emoji, playfulness, and brand engagement on Twitter. *Journal of Interactive Marketing, 53*, 96-110. https://doi.org/10.1016/j.intmar.2020.06.002

Mirsch, T., Lehre, C., & Jung, R. (2017). Digital nudging: Altering user behavior in digital environment. *Internationalen Taging Wirtschaftsinformatik,* 634-648.

Montagni, I., Guichard, E., Carpenet, C., Tzourio, C., & Kurth, T. (2016). Screen time exposure and reporting of headaches in young adults: a cross-sectional study. *Cephalalgia: An international Journal of Headache, 36*(11), 1020-1027. https://doi.org/10.1177/0333102415620286

Novak, P. K., Smailović, J, Sluban, B., & Mozetič I. (2015). Sentiment of emojis. *Plos One*, *10*(12), 1-22. https://doi.org/10.1371/journal.pone.0144296

Okeke, F., Sobolev, M., Dell, N., & Estrin, D. (2018). Good vibrations: can a digital nudge reduce digital overload?. *Association for Computing Machinery*, *4*, 1-12. https://doi.org/10.1145/3229434.3229463

Orosz, G., Tóth-Király, I., & Bőthe, B. (2016). Four facets of facebook intensity—The development of the multidimensional facebook intensity scale. *Personality and individual differences*, *100*, 95-104. http://dx.doi.org/10.1016/j.paid.2015.11.038

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1957). *The Measurement of Meaning* (No. 47). University of Illinois.

Pacherazova, M. (2019). Keep your screen happy: Improving the usability of screen time tracking apps.

Prada, M., Rodrigues, D. L., Garrido, M. V., Lopes, D., Cavalheiro, B., & Gaspar, R. (2018). Motives, frequency and attitudes toward emoji and emoticon use. *Telematics and Informatics*, *35*(7), 1925-1934. https://doi.org/10.1016/j.tele.2018.06.005

Purohit, A. K., Barclay, L., & Holzer, A. (2020). Designing for digital detox: Making social media less addictive with digital nudges. *Association for Computing Machinery*, 1-9. https://dx.doi.org/10.1145/3334480.3382810

Purohit, A. K., & Holzer, A. (2021). Unhooked by design: Scrolling mindfully on social media by automating digital nudges. *Americas Conference on Information Systems*, 1-10.

Rothman, A. J. , & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin, 121*, 3-19. http://dx.doi.org/10.1037/0033-2909.121.1.3

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication, 56*(1), 202–220. https://doi.org/10.1111/j.1460-2466.2006.00290.x

Sandvine. (2020). *The global internet phenomena report covid-19 spotlight.* https://www.sandvine.com/covid-internet-spotlight-report

Schmuck, D. (2020). Does digital detox work? Exploring the role of digital detox application for problematic smartphone use and well-being of young adults using multigroup analysis. *Cyberpsychology, Behavior and Social Networking, 23*(8), 526-532. https://doi.org/10.1089/cyber.2019.0578

Scribbr. (2021). *An introduction to quantitative research*. https://www.scribbr.com/methodology/quantitative-research/

Shao, X., Jeong, E., Jang, S., & Xu, Y. (2020). Mr. Potato head fight food waste: The effect of anthropomorphism in promoting ugly food. *International Journal of Hospitality Management, 89*, 1-13. https://doi.org/10.1016/j.ijhm.2020.102521

Slice, D. (2008). *Life is a highway: Study confirms cars have personality*. The Florida State University. https://www.fsu.edu/news/2009/07/06/car.personality/

Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change, 20*(4), 656–667. https://doi.org/10.1016/j.gloenvcha.2010.07.002

Statista. (2019). *Online social network activities in the Netherlands 2019, by age group.* https://www.statista.com/statistics/575564/online-social-network-activities-in-the-netherlands-by-age-group/

Stoyanov, S. R., Hides, L., Kavanagh, D. J., Zelenko, O., Tjondronegoro, D., & Mani, M. (2015). Mobile app rating scale: A new tool for assessing the quality of health mobile apps. *JMIR mHealth and uHealth, 3*(1), 1-9. https://doi.org/10.2196/mhealth.3422

Stretcher, V. J., & Rosenstock, I. M. (1997). The health belief model. *Cambridge handbook of psychology, health and medicine,* 113-117.

Tankovska, H. (2021). *Number of global social network users 2017-2025.* Statista. https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/

Tigwell, G. W., & Flatla, D. R. (2016). Oh that's what you meant! Reducing emoji misunderstanding. *Proceedings of the 18th international conference on human-computer interaction with mobile devices and services adjunct,* 859-866. https://doi.org/10.1145/2957265.2961844

Tung, F. W., & Deng, Y. S. (2007). Increasing social presence of social actors in e-learning environments: Effects of dynamic and static emoticons on children. *Displays, 28*(4/5), 174–180. https://doi.org/10.1016/j.displa.2007.06.005

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science, 211*(4481), 453–458. https://doi.org/10.1126/science.7455683

van Velthoven, M. H., Powell, J., & Powell, G. (2018). Problematic smartphone use: Digital approaches to an emerging public health problem. *Digital Health, 4,* 1-9. https://doi.org/10.1177/2055207618759167

Weinmann, M., Schneider, C., & vom Brocke, J. (2016). Digital nudging. *Business & Information Systems Engineering: The international Journal of Wirtschaftsinformatik, 58*(6), 433-436. https://doi.org/10.1007/s12599-016-0453-1

Xie, B., Watkins, I., Golbeck, J., & Huang, M. (2012). Understanding and changing older adults' perceptions and learning of social media. *Educational Gerontology, 38*(4), 282-296. https://doi.org/10.1080/03601277.2010.544580

Zhou, G., Gou, M., Gan, Y., & Schwarzer, R. (2020). Risk awareness, self-efficacy, and social support predict secure smartphone usage. *Frontiers in Psychology, 11,* 1-8. https://doi.org/10.3389/fpsyg.2020.01066

Zimmerman, L. (2021). "Your screen-time app is keeping track": Consumers are happy to monitor but unlikely to reduce smartphone usage. *Journal of the Association for Consumer Research, 6*(3). https://doi.org/10.1086/714365

Zimmerman, L., & Sobolev, M. (2020). Digital nudges for screen time reduction: A randomized control trial with performance and wellbeing outcomes. https://doi.org/10.31234/osf.io/nmgdz

Appendix A: Pre-test design

Introduction.
Thank you for participating in this pre-test which serves as preliminary research for my final research experiment. My research is about mobile screen time. Mobile screen time is the amount of time spent on your smartphone.

This pre-test includes only 4 questions so please take your time to read and answer the questions carefully. Participation is anonymous and all data will be treated confidentially, you can withdraw at any moment.

If you have any questions regarding the questions or your participation, you can contact me via email: j.e.m.kleingebbinck@student.utwente.nl

Thank you!

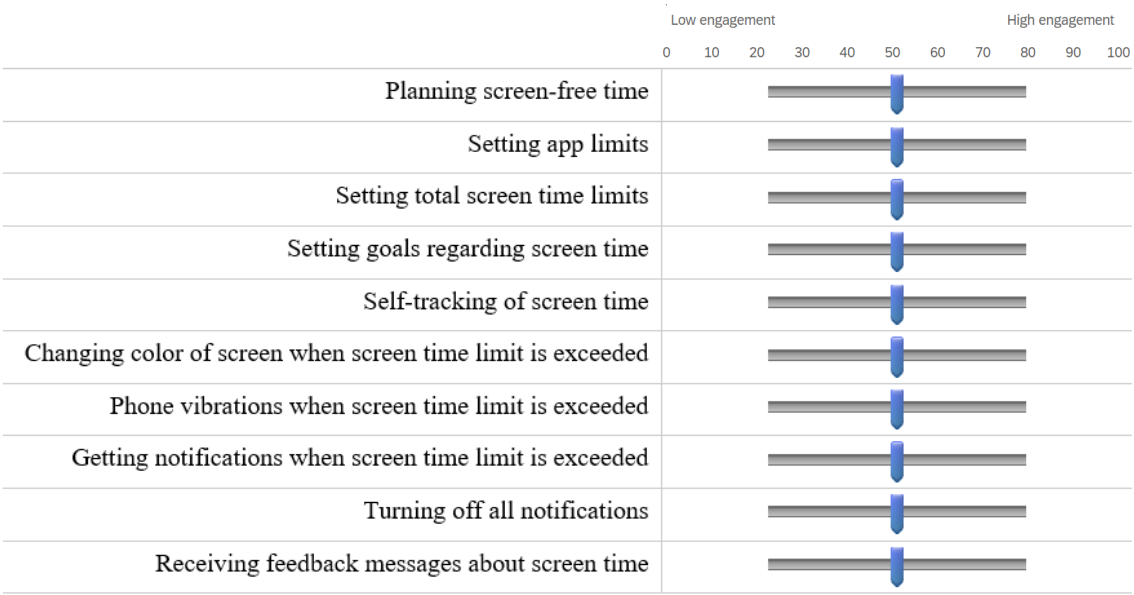
Gain/loss framing.

1. Please order the terms below from positive to negative, so most **positive** is 1 and most **negative** is 10.

- Save time
- Use up time
- Spare time
- Waste time
- Gain time
- Expend time
- Win time
- Receive time
- Spoil time
- Earn time
- Obtain time
- Lose time
- Save up time

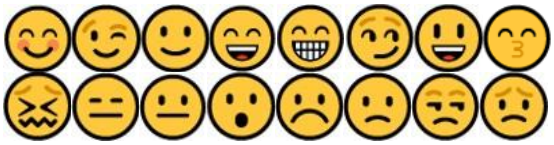
Level of engagement

2. To what extent do you feel engaged in the following smartphone activities to reduce screen time? Engagement implies whether you feel like you take part in the activity (high engagement) or you feel like the activity is performed kind of automatically by the smartphone itself (low engagement).

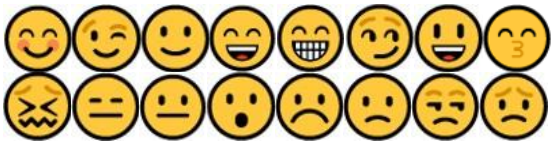


The use of emoji

3. Please order the emoji faces below from positive to negative, so most **positive** is 1 and most **negative** is 16.



4. Which positive and which negative emoji do you think are matching with each other? Please make 4 couples of **one positive** and **one negative** emoji that you think fit well and match with each other.



Couple 1	Couple 3
Couple 2	Couple 4

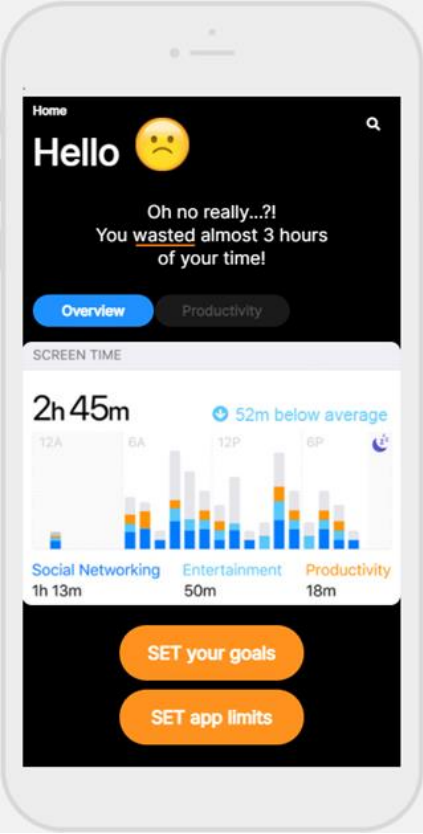
End of pre-test

5. You have come to the end of this pre-test, is there anything else you want to say or mention about the questions you answered? Was something unclear for you?

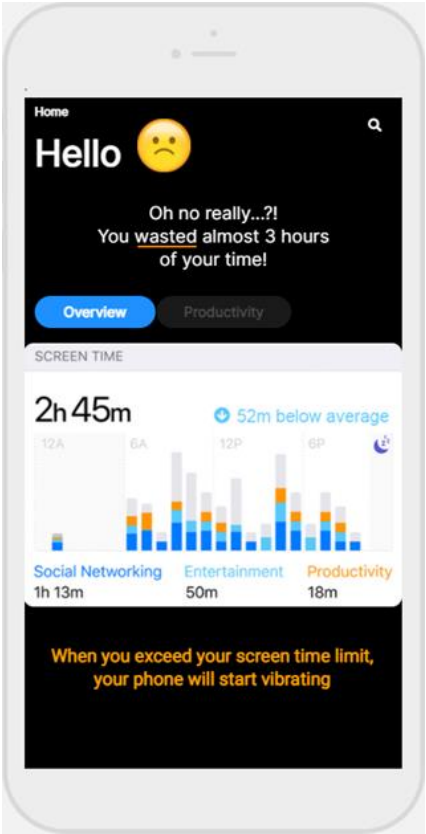
Appendix B: Experimental conditions

Condition 1: gain x high x with

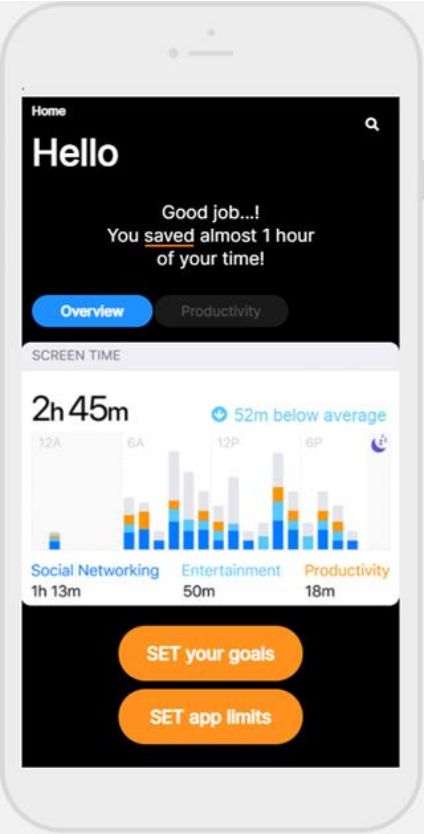
Condition 2: gain x low x with



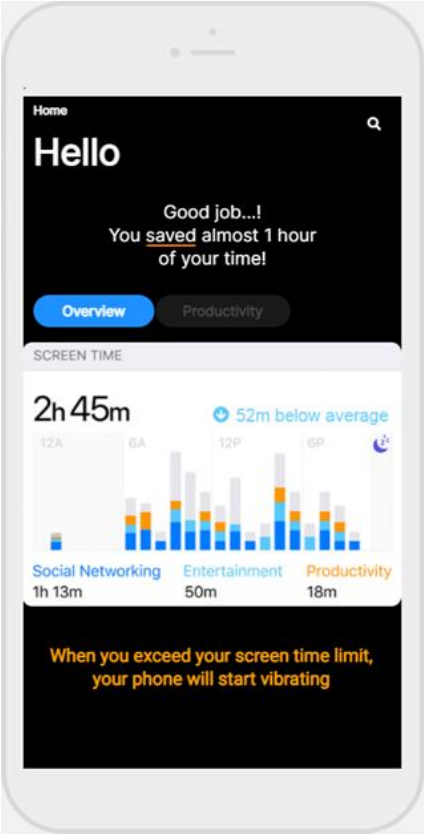
Condition 3: loss x high x with



Condition 4: loss x low x with

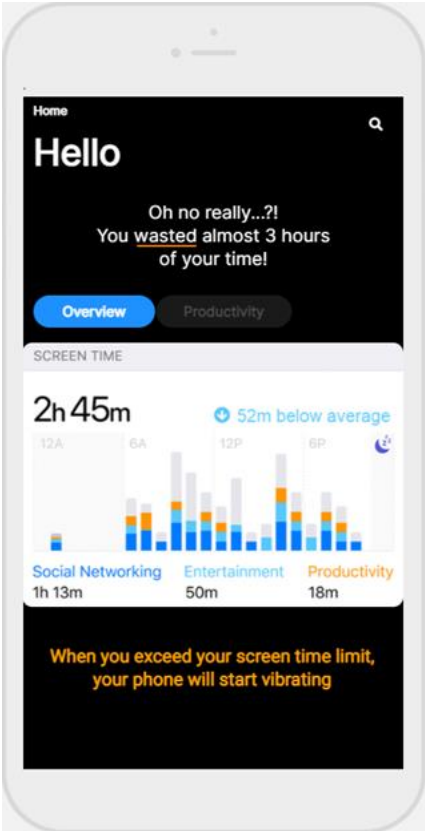


Condition 5: gain x high x without



Condition 6: gain x low x without

Condition 7: loss x high x without



Condition 8: loss x low x without

Appendix C: Experiment survey design

1. Introduction

Thank you for participating in this research. This online experiment is part of my master thesis project in Communication Science. The aim of this research is to examine different techniques to reduce smartphone use. The survey will take approximately 10 to 15 minutes and your participation is entirely voluntary. For participating in this experiment it is most convenient to use a device with a larger screen like PC/laptop/tablet.

You can withdraw from this research at any point during or after participation. The data gathered from this online experiment is only used for this research and will not be disclosed to other parties. Moreover, participation is anonymous and all data will be treated confidentially.

If you have any questions regarding the online experiment or your participation, you can contact me via email: j.e.m.kleingebbinck@student.utwente.nl

2. Age requirement

What is your age?

3. Screen time

Mobile screen time is the amount of time spent on your smartphone.

Please indicate your average mobile screen time **per day**, in minutes:

In comparison to my peers, my smartphone use is…

- ○ Much lower
- ○ Lower
- ○ About the same
- ○ Higher
- ○ Much higher

4. Smartphone use

Please indicate to what extent you do or do not agree with the following statements about smartphone use.	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I feel bad if I don't check my mobile phone daily.	○	○	○	○	○
I often search for Internet connection in order to use my mobile phone.	○	○	○	○	○
Before going to sleep, I check my mobile phone once more.	○	○	○	○	○
I don't mind being offline for a long time.	○	○	○	○	○
When I'm bored, I often use my mobile phone.	○	○	○	○	○
If I'm bored, I open applications on my mobile phone.	○	○	○	○	○
Scrolling through my mobile phone is good for overcoming boredom.	○	○	○	○	○
When I'm bored, I try to do other things than using my mobile phone.	○	○	○	○	○
I spend time on my mobile phone at the expense of my obligations.	○	○	○	○	○
I spend more time on my mobile phone than I would like to.	○	○	○	○	○
It happens that I use my mobile phone instead of sleeping.	○	○	○	○	○
I often put my phone away when I'm busy.	○	○	○	○	○
I like refining my online profile(s) on my mobile apps.	○	○	○	○	○
It is important for me to update my online profile(s) regularly.	○	○	○	○	○
My online profile(s) is/are rather detailed.	○	○	○	○	○
I don't really care what others think of my online profile(s).	○	○	○	○	○

5. EXPERIMENTAL CONDITION

Take some time to observe the screenshot below. When you continue you will be asked some questions regarding the screenshot. Remember, after continuing to the questions you can't go back to the screenshot.

6. Attitude

For me checking my smartphone regularly is…

Harmful	0	0	0	0	0	Beneficial
Unpleasant	0	0	0	0	0	Pleasant
Bad	0	0	0	0	0	Good
Worthless	0	0	0	0	0	Valuable
Unenjoyable	0	0	0	0	0	Enjoyable
Unhealthy	0	0	0	0	0	Healthy
Negative	0	0	0	0	0	Positive
Foolish	0	0	0	0	0	Wise

7. Perceived app effectiveness

Please indicate to what extent you do or do not agree with the following statements regarding the screenshot you observed before.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
- The screenshot has **increased** my awareness of the importance of **reducing** my smartphone use.	○	○	○	○	○
- The screenshot has **increased** my knowledge/understanding of smartphone use.	○	○	○	○	○
- The screenshot has changed my attitudes towards **improving** my smartphone behavior.	○	○	○	○	○
- The screenshot has **increased** my intentions/motivation to **reduce** my smartphone use.	○	○	○	○	○
- A mobile app like the screenshot would encourage me to search further tools to **reduce** my smartphone use.	○	○	○	○	○
- The use of such an app will **decrease** my smartphone use.	○	○	○	○	○

8. Intention to reduce smartphone use

Please indicate to what extent you do or do not agree with the following statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
- I intend to **reduce** the number of times I check my smartphone.	○	○	○	○	○
- I intend to spend **less** time scrolling through my smartphone.	○	○	○	○	○
- I intend to **reduce** the amount of times I alter or manage my smartphone settings.	○	○	○	○	○
- I intend to **reduce** the amount of time I spend messaging my friends via my smartphone.	○	○	○	○	○
- I intend to **reduce** the amount of times I check my smartphone notifications throughout the day.	○	○	○	○	○
- This question is to check how well all questions are read. If you're reading this, please fill in "Strongly Disagree".	○	○	○	○	○

9. Manipulation checks

With regard to the screenshot you observed, the screenshot…

Focused on **lost** time	○ ○ ○ ○ ○	Focused on **gained** time
Did **not** include functions to engage/involve the user in activities for reducing mobile phone use	○ ○ ○ ○ ○	Did include functions to engage/involve the user in activities for reducing mobile phone use
Did **not** include an emoji	○ ○ ○ ○ ○	Did include an emoji

If respondent indicated that the screenshot included an emoji:
The emoji in the screenshot…

Had a **negative** appearance	○ ○ ○ ○ ○	Had a **positive** appearance

10. Demographics

Gender

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

Education

What is the highest level of education you have achieved of which you have a diploma?

- ○ None
- ○ Primary school
- ○ High school
- ○ MBO
- ○ HBO
- ○ University
- ○ Other:

Smartphone brand

What is the brand of your smartphone?

Samsung	Sony
Apple	Motorola
Huawei	HTC
Xiaomi	Alcatel
OnePlus	OPPO
LG	Google
Lenovo	Other
Nokia	

11. End of survey

You have come to the end of the survey, is there anything else you want to say or mention about the survey?