TU WIEN Informatics

Digital Detox – Self-regulating digital user behavior

DIPLOMARBEIT

zur Erlangung des akademischen Grades

Diplom-Ingenieur

im Rahmen des Studiums

Media and Human-Centered Computing

eingereicht von

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Wien, 22.01.2024

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DIPLOMA THESIS

Submitted in partial fulfillment of the requirements for the degree of

Diplom-Ingenieur

In

Media and Human-Centered Computing

by

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Ernad Sehic, BSc.

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Acknowledgments

I would like to express my sincere gratitude to the following individuals without whom the completion of this master's thesis would not have been possible:

I am deeply thankful to my supervisor, Univ. Prof. Florian Michahelles, for his invaluable guidance, unwavering support, and insightful feedback throughout the entire research process. His expertise has been instrumental in shaping the direction and quality of this work. I extend my appreciation to Univ. Ass. Ambika Shahu for her assistance and support. Her dedication and contributions have been crucial in facilitating the smooth progress of this research.

My heartfelt thanks go to all the participants who generously dedicated their time and effort to be part of this study. Their involvement has enriched the research and contributed significantly to its outcomes. I would like to express my gratitude to my dear friends, Jasmina and Aldin. Their encouragement, understanding, and willingness to lend a helping hand have been a source of strength throughout this academic journey. Additionally, I want to acknowledge the support received from Human, whose assistance has been invaluable.

Last but certainly not least, I owe a debt of gratitude to my parents and brother. Their unwavering belief in my abilities, encouragement, and endless support have been the pillars upon which I built this academic achievement. Their sacrifices and love have been my constant motivation.

This thesis is a culmination of the collective efforts and support from these wonderful individuals, and I am sincerely thankful for their contributions to my academic journey.

Abstract

The presence of digital devices has become an enclosure in contemporary society, evolving from mere tools of communication to multifaceted information sources providing a multiplicity of possibilities for user engagement. Mobile engagement has become an important part of our daily lives, as it even starts to overshadow face-to-face engagement with people in our physical presence. This study analyzed how digital device usage affects our everyday lives and how well-chosen digital detox strategies could be used to improve our general health by limiting the amount of digital device interference[s during daily activities.

To investigate the pervasive impact of digital devices, this study began with an exploration of the theoretical notions of addiction, mental diseases linked to addiction and persuasion technologies. Drawing from this theoretical framework, the study conducted user research that involved exploring the usage patterns and detox attempts within the specified demographic.

Online surveys testified the severity of the issue and assessed the necessity and implementation for digital detox strategies. Two expert interviews were furthermore conducted within the relevant field to gain critical insights from professionals. Subsequently, drawing from these results, a digital detox prototype was developed, with its primary aim of assisting users to maintain and establish effective digital detox routines.

This study concluded with active experimentation of such a prototype in evaluationg the efficacy in providing insights on its potential impact on social relations, well-being, and interactions.

This research findings indicated that a digital detox assistant has the potential to significantly influence and regulate users' screentime behaviors in providing practical solutions in navigating these challenges. Participants exhibited notable reductions in their average screentime and increased engagement with the locking feature, signifying the prototype's efficacy in promoting mindful technology usage.

Kurzfassung

Die Präsenz digitaler Geräte ist in der heutigen Gesellschaft zu einem festen Bestandteil geworden und hat sich von bloßen Kommunikationsmitteln zu vielfältigen Informationsquellen entwickelt, die eine Vielzahl von Möglichkeiten für die Benutzereinbindung bieten. Mobile Interaktion ist zu einem wichtigen Teil unseres täglichen Lebens geworden, da sie sogar die persönliche Interaktion mit Menschen in unserer physischen Präsenz in den Schatten stellt. Diese Studie analysierte, wie sich die Nutzung digitaler Geräte auf unser tägliches Leben auswirkt und wie gut ausgewählte digitale Detox-Strategien zur Verbesserung unserer allgemeinen Gesundheit eingesetzt werden können, indem die Anzahl der Störungen durch digitale Geräte bei täglichen Aktivitäten begrenzt wird.

Um den allgegenwärtigen Einfluss digitaler Geräte zu untersuchen, begann diese Studie mit einer Untersuchung der theoretischen Definition von Sucht, mit Sucht verbundenen psychischen Erkrankungen und Überzeugungstechnologien. Ausgehend von diesem theoretischen Rahmen führte die Studie eine Benutzerforschung durch, bei der die Nutzungsmuster und Detoxversuche innerhalb der angegebenen Bevölkerungsgruppe untersucht werden.

Online-Umfragen zeigten die Schwere des Problems und bewerteten die Notwendigkeit und Umsetzung digitaler Detox-Strategien. Darüber hinaus wurden zwei Experteninterviews innerhalb des relevanten Fachgebiets durchgeführt, um kritische Erkenntnisse von Fachleuten zu gewinnen. Anschließend wird auf der Grundlage dieser Ergebnisse ein Digital-Detox-Prototyp entwickelt, dessen Hauptziel darin bestand, Benutzer bei der Aufrechterhaltung und Etablierung effektiver Digital-Detox-Routinen zu unterstützen.

Diese Studie schloss mit dem aktiven Experimentieren eines solchen Prototyps ab, um die Wirksamkeit bei der Bereitstellung von Erkenntnissen über seine potenziellen Auswirkungen auf soziale Beziehungen, Wohlbefinden und Interaktionen zu bewerten.

Diese Forschungsergebnisse deuteten darauf hin, dass ein digitaler Detox-Assistent das Potenzial hat, das Bildschirmverhalten der Benutzer erheblich zu beeinflussen und zu regulieren und praktische Lösungen für die Bewältigung dieser Herausforderungen bereitzustellen. Die Teilnehmer verzeichneten eine deutliche Verkürzung ihrer durchschnittlichen Bildschirmzeit, was die Wirksamkeit des Prototyps bei der Förderung einer achtsamen Technologienutzung unterstreicht.

Acronyms and Abbreviations

WHO	World Health Organisation
DSM	Diagnostic and Statistical Manual of Mental Disorders
TPB	Theory of Planned Behavior

Keywords

Digital Detox
Addiction
Mental Diseases
Persuasion Technologies
User Research
Social Media
Assistant
Prototype
Technology
Intervention Strategie

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1 Introduction

Digital devices are becoming an enclosure for all individuals at homes, at work or even on the streets. In the past, when digital devices first appeared, they were used for making and receiving calls or sending messages. Today, we see digital devices being used as an information source, networking, entertainment, and leisure. They are even becoming a substitute for some real-life activities. Mobile communication is combined with real-life communication, in some cases even in parallel, without noticing. We see people in coffee places on mobile phones, rather than talking to each other in person.

The digital device addictiveness has become so embedded in our everyday life, that it stays unnoticed. Everyone asks themselves how much time they spend on a mobile device daily and how each individual ignores the attention of other people. Prolonged usage impairs overall well-being, performance, and social interactions. Furthermore, focusing on one's own digital smart device during social encounters degrades the quality of conversation. The lack of self-control leads to addiction, which has been linked to depression and anxiety [LBK14], sleep problems [Tho18], and musculoskeletal issues [İDC15]. In 2020, 25% of people spent at least three hours a day on social media, mindlessly scrolling though their news [PH21].

As the problem gets more attention, people want to limit the amount of digital device interference in their daily lives rises [HL07]. The identification of effective digital detox interventions guides the development and dissemination of future digital detox solutions. There is a need for a positive and counterproductive tool. Most research in this field is limited to digital detox for kids and teenagers, neglecting other age groups [MS18]. This thesis will focus on students/young adults in the age group

23-26. Especially how digital devices impact their lifestyle in times where they need to focus on the transition between their student life and adult/work life.

In the contemporary digital landscape, the transformative power of technology comes with both promise and pitfalls. The increasing integration of digital devices into the daily lives brings unprecedented convenience, yet the inadvertent consequences on mental well-being and social dynamics are undeniable. As we navigate this complex interplay between technology and humanity, the need for thoughtful interventions to foster a healthier relationship with digital devices becomes paramount. This thesis seeks to address this imperative by not only highlighting the pervasive issues stemming from digital device addiction but also by proposing a tangible solution in the form of a detox prototype. By exploring the unique challenges faced by students and young adults during pivotal life transitions, this thesis aims to contribute not just to academic discourse but also to the practical realm of digital detox solutions.

After a brief introduction, the first part of the thesis deals with the theoretical backgrounds of addiction, mental diseases linked to addiction and persuasion technologies. The second major part consists of user research in the field of digital device addiction and detox attempts. Based on the results, a detox prototype is being developed, which intent is to help users with their digital detox routine. The thesis finishes with an experimental study to test the prototype in real life scenarios.

2 Related work

With the development of our civilization, various events have emerged that have had a direct impact on human development, lifestyle and socialization. We see people help each other, writers often knew how to wander around the world alone, to get ideas for their new works. Self-time and socialization are in the nature of every homo sapiens. Everyone needs time for peace, but also social time with other human beings. But, could new inventions somehow interfere with the humans natural behavior? The invention of the radio receiver was revolutionary. We listened to the stories of our parents, as they gather in one of the few houses that had a radio, and listened to broadcasts of Muhammad Ali's boxing exploits. The radio has become a strong factor in socializing people, listening and exchanging opinions. Somewhat later, the situation was very similar with the appearance of television sets. Until 1990s, television was a good tool for gathering people. After that came computers, cells phones, and today the most widespread invention, the smartphone. Smartphones are the most advanced technology available to everyone, from modern European countries to poor African countries, and even war-torn countries. Estimates say there are 4.1 billion smartphone users worldwide [Sta21][1]. Smartphones offer a number of benefits and useful tools that help in everyday life. I am a user of

1. [1]ttps://www.statista.com/forecasts/1143723/smartphone-users-in-the-world [Sta21].

myself and this prompted me to try to analyze, observe and explorer the other side of the story as well. How much do we become alienated because of digital devices?

Digital device addiction is a part of the behavioral addiction which is defined by DSM-V, and is one of the addictions that doesn't involve further substances [APA13]. The measurement of digital addiction differs from other addictions, because it hasn't any measurable indications. These indications include anxiety, mood swings, panic attacks and withdrawal symptoms [Gri05]. But, how can we measure the addictiveness of a screen? A research at the Loughborough University UK, tried to measure the addictiveness level of smartphones users [WOE19] by conducting abstinence tasks in a time frame of 24 hours. The interesting part of the research is actually how many users felt anxious about giving-up their device, and how relieved after the period was over. The term digital detox is defined in the Oxford Dictionary as:

"*A period of time during which a person refrains from using electronic devices such as smartphones or computers, regarded as an opportunity to reduce stress or focus on social interaction in the physical world. Example: 'break free of your device and go on digital detox'.*" [Oxf21].

In past years, many researches were conducted on the problem associated with digital overuse (e.g. [WES18]; [For15]; [BM15]). The most mentioned advice for digital detox are a good diet, sleep and exercise [For15], mostly walking and yoga [Zah16]. One advice that also stick out is deleting or unfollowing content that which wake bad emotions in our body [Rav14]. Furthermore, applications that support digital detox are slowly developing, but none of them are found on the market till date.

One of these applications nowadays is PEACH (Personality coACH), developed by researchers of [SFR21]. PEACH is not directly linked to digital detox, but is an application to improve personality traits in a desired direction. A total sample of n=1523 participants, divided in two groups, started to self-report changes in the desired direction. One of the two groups was introduced to the app one month prior to the other group, and significant personality changes were observed in a month length period. Moreover, self-reported changes persisted until 3 months after the end of the intervention. The authors self stated: "*This work provides the strongest evidence to date that normal personality traits can be changed through intervention in nonclinical samples.*"

In the work [PH21], a study was conducted on how digital nudges (notifications) influence the time user spend on social media timelines. The team designed a digital nudge called MISFEED, which task was to remember the user of social media overuse. With this method, the digital consumption was reduced by 20.58%.

One interesting study [RAS21], sum up all popular digital detox approaches and test their effectiveness. They conclude that some examined methods exert promising effects on usage itself and on depression symptoms. But, they rate the overall effectiveness of digital detox method as inconsistent, and they recommend a more high-quality research to be implemented to understand under which circumstances digital detox is helpful and for whom.

Dr. Ranita Basu [Bas19], conducted a digital detox study with individuals (n=70) working at various organizations. The hypothesis of the study: "There is an impact of digital detox on performance", was tested with a digital detox questionnaire. Most of the subjects stated that digital detox helped to be more attached with their job and that it boosted their motivation towards work.

Aside of the negative influences of digital devices, there are a broad range of studies that actually see the usage of digital devices as a benefit. Pointing out the benefits of using mobile devices in tutoring classrooms, resource research, connecting students, teachers and parents [Kat05]. As the study [JF11], states, 62% of students are using their smartphones in classes, and only 23% for non-academic purposes.

Most of the studies about digital detox focus on people already in a working position, or kids and teenagers [MS18]. Some studies, as [EWM20], describe the mobile phone as a distraction element in a student's life, but these studies do not offer insights into the reduction of digital device usage, nor do they present effective and sufficient solutions in this regard**.**

2.1 Human as a social being

A human is a social being, a being of community, because otherwise he cannot survive [Aer98]. In order to survive, a person needs to unite, build relationships and establish social interaction. In earlier stages of his life, to survive, the human just needed food, water and a place to sleep. With the development of civilization and the modernization, the human needs progressed.

Today, humans are teaming up to archive different goals, but they still remain social beings. It is interesting to observe how in the early ages humans teamed up to soil a field, and nowadays we can see how farmers unite to buy a tractor. And as time passes, bigger goals are appearing, achievable only by human socialization and organization. But the raise of technologies suddenly brings changes. Humans are now only few click away from every activities that was connected to socializing in the past. We don't meet at shopping malls with friends to buy new clothes, but rather we buy it via the internet. We don't visit coffees, but rather create virtual rooms to talk to each other. We are a button away to get our food, rather than cooking with the family or going out for a dinner.

Research show that hanging out with other persons not only can be fun, but also shows it benefits mental and physical health [Saw19]. Socializing not only deprive loneliness, but also sharpen memory and cognitive skills. Over the next decade, how will changes in digital life impact people's overall well-being, physically and mentally? To answer this question let's see what personality characteristics are and how they impact on our emotions.

2.1.2 Personality

Personality is a set of traits that define each individual, and how they deal with different situations and interact with their environment in different ways. Psychic traits are characteristics that describe the ways in which people differ from each other [Ahm98]. Saying someone is shy is to differentiate one from another. In addition, traits also determine the way in which people are similar to each other. For example, people who are are similar to each other in that they are anxious in social situations.

Although the term personality is used daily in various contexts, we should be aware of the fact that it is a very complex construct. Given the complexity of the construct, it is difficult to find one comprehensive definition that would include internal characteristics, physical characteristics, social effects, relationships with others, and internal goals [Lar08]. [Pet05] defines personality traits as general and common behavior in different situations, while [Lar08] says that personality is a set of psychic traits and mechanisms within an individual which are relatively permanent, influencing interaction and adaptations.

Most psychic mechanisms have three basic components: input, decision and output [Pet05]. Psychic mechanisms can make humans more sensitive to certain type of information from the environment (input), they can influence their thinking about certain options (decisions), and they can lead behavior towards a certain reaction (output).

From all the above, it can be concluded that a trait can largely determine a person's behavior, but the importance of social, situational and environmental factors should not be neglected. For example, a calm and withdrawn person can behave aggressively if such behavior is triggered by certain situational factors. Typically, we think we are the same people we were last week, last month, or last year, and that we will have the same personality traits in the coming months and years. Likewise, although our personality is certainly influenced by the environment in which we find ourselves, especially under the influence of other important people in our lives, we think we carry the same personality traits from situation to situation. The definition of personality emphasizes that the sources of personality are located within the individual, and that personality is therefore stable over time and to some extent consistent in different situations [Ahm98].

The study [KM48] defines three levels of personality, and state that each person is either:

1. Equal to all others

2. Equal to some others

3. Different from all others

Another way we can think about this division is that the first level refers to the "universal" (the ways we are the same), the middle level refers to the "personal" (the ways we are similar to some but different from others), and the third level refers to the "unique" (the ways we are different from all other people).

We can't meet two same persons, with the same personality traits. This is even not possible if we look a the behavior of two twins. Psychology try to understand the uniqueness of the individual and to develop ways to explore uniqueness of their life.

2.1.3 Emotional stability

Emotional stability (neuroticism) is the ability to experience psychological stress. It is described by anxiety, irritability and frequent feelings of insecurity [Kon10]. Humans believe that emotions are spontaneous processes, something that happens by itself and that they are directly caused by events over which they have no influence. However, the fact is that emotions and human behavior are closely related to our thinking and the way we think.

Negative emotional stability is a general negative emotional state such as sadness, fear, insecurity, anger. If persons are extremely emotionally unstable, they show difficulties to cope with stress and other everyday difficulties, which further worsens their emotional state [Leb07]. They are also prone to mood swings, feel unaccepted in society, that no one understands them, and feel exhausted from simple daily tasks. They find it very difficult to maintain social relationships, they have problems with trust and articulation of their thoughts and feelings [Lar08].

An emotionally intelligent person is able to understand his own and other people's feelings, knows how to distinguish them and accordingly knows how to understand himself, his needs, has a sense of self-control, is self-confident and has the ability to empathize.

Neurotic individuals have a weakened control mode, often come up with irrational ideas, and poorly tolerate frustrations [Leb07]. Research has shown that a neurotic person is more likely to develop post-traumatic stress disorder [Lar08]. Neurotic individuals lack self-confidence and lack self-esteem [MC97].

Different people react to the same events with different emotions precisely because they perceive the events that happen to them in different ways. The life of each individual, in the business, social or love sphere, is filled with numerous stressful events to which we react with certain emotions. They can be healthy or unhealthy. For each unhealthy emotion there is one healthy emotion, i.e. sadness – depression, caution – anxiety, remorse – guilt. Often, we don't do anything to change our unhealthy emotions, but on the other side we feel motivated to change out healthy emotions, when we are sad we change ourselves and the world to bring us more pleasure and less pain. The different emotions we express at the same event speak in favor of the fact that our beliefs and the way we think are key to understanding why we feel a certain way. This means that we have the power to influence our own emotions by changing our thinking.

To change our behavior by changing out thinking, we first need to understand what thinking is. Thinking can be rational or irrational. Rational thoughts lead to a healthier emotional state, while irrational thought do the opposite. Irrational thought are not in line with reality, they are illogical and maintaining them we bring ourselves into a state of suffering. Rational means logical, realistic and flexible thinking, which contributes to our well-being precisely because of these characteristics.

The key components of irrational beliefs are the demands we make on ourselves, others, and life itself, and the conclusions we draw if they are not met. These demands are expressed as "it must, it should, it is necessary, it should be so." We demand that things take place in the way we have outlined, although reality often denies us. If our expectations are not met, we conclude that it is terrible, not we can bear to be worthless because of what is happening to us and that we will never achieve what we set out to do. Thinking like this, we are introducing ourselves into unhealthy emotional states that are hampering our personal development [Leb07].

2.1.4 Alienation

In the past, alienation, never has been a phenomena of central concern in the sociological analysis. There are different definitions of alienation. [Mar75] sees alienation as a destructive socio-psychological dilemma of society, to [Heg49] it was a disastrous social phenomena. But both, Marx and Hegel, agree on one aspect of alienation: a person does not experience himself and other around him, the world (nature, objects) remain alien to him. Alienation is essentially experiencing the world and oneself passively, receptively, as the subject separated from the object [Fro66].

Already through this statement we can connect the influence of the media, and especially social networks on today's man. We often witness that people in the virtual world present themselves diametrically differently than they really are. We will not go deeper into the analysis of why they do so, but in this way they try to present themselves as more successful, happier, richer or more

interesting people. However, we know what happens to foreign bodies in the human body. Sooner or later it will be discarded or removed. Imagine then what happens to these people when they discard a part of their being.

Alienation may also be a consequence of a presence of to many norms. To [Hin76] the presence of to many norms to follow and not a single one that individual can relate to his subjective conditions can result in alienation. Alienation can occur in different stages and intensities. Some people could feel healthy, have a body, but decide to escape the "predefined human life" by alienating, to live a life of bless and freedom. This form of alienation is called conscious alienation. Alienation that is not conscious, often leads to a deeper stage of alienation, which can further lead to mental diseases.

2.2 Addiction and mental disorders

Addiction, as one of the categories of the most common mental disorders in society, is also one of the most significant public health and social problems that affect the individual, his family and the whole community with all its consequences [PS18].

Addiction is a chronic brain disease that develops gradually, under the influence of various substances. According to the current European classification of mental disorders, addiction is a set of physiological, behavioral and cognitive phenomena in which the use of a psychoactive substance or group of substances for a person becomes more important than other patterns of behavior that previously had greater value in his/her life. In order to be diagnosed with addiction, three or more of the following criteria that were present in some period of the previous year must be met [PS18]:

- a strong desire of feeling of compulsion towards an action
- difficult control over the behavior around taking a psychoactive substance in terms of the beginning, end or level of use
- physiological withdrawal syndrome when use is discontinued or reduced
- evidence of tolerance, increased doses of substances are necessary to achieve earlier effects
- progressive neglect of past interests
- continued use, despite clear facts of undeniable adverse effects, such as liver damage and depressed mood

What all drugs have in common is that they directly activate the reward system in the brain (by creating a feeling of extreme satisfaction) that is involved in behavior and the memory process. The intense response of the reward system causes the neglect of normal activities.

Addictive behaviors such as gaming, shopping addiction, sexual activity addiction, exercise addiction, etc. are not included in the classification of diseases due to the lack of relevant peer-reviewed data on the basis of which they would be determined as mental disorders [PS18].

Mental health is a part of general health. It is an important aspect for the individual, family and nation. Mental health problems and disorders, due to their relatively high prevalence and often chronic course, as well as the onset in adolescence and young adulthood, are one of the most prioritized public health problems in the world. People with mental health problems have increased morbidity and mortality from physical illnesses. The number of committed suicides, which are an indicator of the threat to

mental health, is higher than the number of people killed in traffic accidents. Mental disorders cause great subjective suffering to patients and greatly reduce the quality of life of patients, as well as their environment. Mental disorders are defined according to the existence of sets of symptoms, and the criteria for diagnosis are met when the sets of symptoms are relatively severe, long-lasting and accompanied by a decrease in functional ability or disability.

According to the International Classification of Diseases and Related Health Problems, World Health Organization (ICD-10), the group of mental disorders and behavioral disorders (F00-F99) includes the following subgroups:

F00-F09: Organic and symptomatic mental disorders

F10 – F19: Mental and behavioral disorders caused by ingestion of psychoactive substances

F20-F29: Schizophrenia and delusional disorders

F30-F39: Affective Disorders

F40 – F48: Neurotic, stress-related and somatosensory disorders

F50 – F59: Behavioral syndromes related to physiological disorders and physical factors

F60 – F69: Adult personality and behavioral disorders

F70-F79: Mental retardation

F80-F89: Psychological developmental disorders

F90-F98: Behavioral and emotional disorders in childhood and adolescence

F99: Unspecified mental disorder

In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), the disorder of excessive consumption of digital devices is listed in section three of the DSM-5. This is supported by various research and experiments.

2.2.1 Digital addiction

There are many controversies about what to call digital addiction. Scientists agree that it is a set of symptoms that include actions that increase dopamine levels in our body causing constant pleasure and the need for repetition [Swa14]. By removing the source of pleasure, the user becomes irritable and aggressive, demanding that he be allowed to use it again. Because most of a user's time and attention is focused on online content, therefore family, social, and business relationships are significantly reduced. Digital addiction is the inability to control its use, with the appearance of anxiety and dysfunctional disorders in everyday life, all the way to the development of more serious disorders such as depression.

Scientists cite several risk factors for developing digital addiction. The first is the availability not only as a computer, but also as a laptop, smartphone, tablet and other technical devices that we can have with us 24 hours a day. This increases the possibility of addiction because we are constantly exposed to the content we choose, which is constantly changing, adapting and filling with new information. The second factor indicates a change in personality that occurs due to the realization that there is no

age, gender, racial, educational or status difference on i.e. the Internet, and a person therefore gains a special power in communication that can be abused. Social factors show that a person can connect with people of similar interests around the world through social networks, most of whom they will never see in life, thus losing learned behaviors and social skills needed for everyday life. By increasing the circle of virtual friends, they don't spend time and effort for living contacts.

Excessive digital device usage can lead to addiction as an irresistible need can grow into a desire to increase the amount of consumption and re-experience the same effect or avoid discomfort due to lack of consumption [Swa14]. Today's devices, like smartphones, are made with so many additional functions that they are self-sufficient for each individual to spend a huge amount of time using them, without realizing it.

The study [Swa14] states that one in eight Americans suffers from problematic Internet use. Those estimates are even higher in China, Taiwan, and Korea, where 30% or more of the population may experience problematic use. Most of the people are afraid to missing out important news and event in their surroundings. Trends show that those people suffer from emotional problems like depression, mood disorders, social disorders and anxiety disorders [The14].

But there is hope. Experts suggest experimenting our self with digital device free hours and days, and go on digital device vacation may be a good option for contradiction. Identifying and creating balance and healthier relationships between technology and its use, is the key to success [Swa14].

2.3 Persuasion technologies

In digital environments it is possible to guide the user behavior by persuasive technologies which are defined in the study [OH09] as "computerized software or information systems designed to reinforce, change or shape attitudes or behaviors or both without using coercion or deception". Systems are using human-computer interaction and communication to give the user supportive feedback and in this way change the user behavior. The study defines four categories for a system which enable to be persuasive at an operational level [OH09]. This include:

1. primary task support, design that support and easy conducting tasks
2. dialogue support, design principles that support the achievement of goals, such as rewards
3. social support, social influence on learning and motivation
4. system credibility support, make the system trustworthy

The primary task support contains reduction elements, to reduce effort that user expend with regard to performing their target behavior may be more persuasive. By reducing effort, we can directly manipulate the user behavior, because the human brain is more attracted to a task that doesn't require much effort. Some self-regulation theories explain addictive behavior trough one's inability to override impulse [BH96]. Thus, reducing the steps needed to perform an action may worsen an individual's ability to restrain from performing the action. The second aspect of the primary task support is personification. A system that is more personalized for the user has a greater persuasive capability. Optimizing the system to the person who is using it, may encourage individuals to continuously use the system and joy experienced while doing so may create a slow experience. The

study [KKK13] demonstrates that people with lack of self-control are likely to become addicted to the internet, smartphones and video games.

A dialogue support represents any form of words, images, symbols that acknowledge the user of a positive reinforcement. Today, we are aware that music and sounds play a great value when it comes to gambling addiction. Rewards systems, reminders and suggestions make a system more attractive to the user. Reward target behaviors may have great persuasive powers [HL07]. Systems offering reminders and suggestions act as a cue to action, and they are often personalized to the individual's interests.

A person will be more motivated to perform a behavior if the see it from others. The study [Gun17] found that individuals with game addiction were friends with people who also showed excessive gameplay. Social influence drives individual's to adapt behaviors of society, so people choose to behave in ways that are common and seen appropriate. When it comes to social support, a key role play competition and cooperation. A system can motivate users to adopt a target attitude or behavior by leveraging the natural drive to cooperate. This is shown mostly in massive online multiplayer games where progress is accomplished by group work. On the other side, a system can motivate users by offering public recognition for an individual.

Credibility support aims to leverage roles of authority, i.e. influencers can be perceived as authority figures which are using or promote a platform. This can trigger other users to use them without thinking of consequences.

As shown, all principles aim to persuade the user in one or the other way. Some of them such as reduction, reward and social comparison may have a more direct effect on digital addiction, while other like personification may have a more moderate effect.

2.4 Psychological behavior theories

This section will provide a short theoretical overview of two psychological behavior theories, which are relevant for this thesis.

Psychological behavior is the study that aim to connect human minds and humans behaviors. It try to understand why people behave the way they do and they try to recognize patterns in the behavior. The goal is to us psychological behavior to predict how humans will behave, and how external factors can drive humans to a specific behavior.

2.4.1 Theory of planned behavior

The theory of planed behavior intend to predict a human behavior in a specific time and place. The goal was to explain all behaviors over which people have the ability to exert self-control. The behavioral intent is the key component of the model, and it is influenced by the likelihood that the behavior have the expected outcome and the subjective evaluation of the risks and benefits of the outcome. It has been used successfully to predict and explain a wide range on health behavior and intentions including smoking, drinking and substance use [Ajz91].

TPB believes that every behavioral achievement depends on both motivation and ability. Based on that it distinguishes between three types of beliefs: behavioral, normative and control. Every person has an attitude of the behavior of interest, and this attitude is influenced by many factors. Motivational

factors influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior will be performed. Furthermore, social and subjective norms play a key role, because behaviors that are attractive to us or the society are more likely to be performed. An external factor can influence a behavior by facilitating or impeding performance of a behavior. And last and not least, the perception of ease or difficulty of performing the behavior of interest.

The TPB is still limiting in its inability to consider environmental and economic influences. Over the past several years, researchers have used some constructs of the TPB and added other components from behavioral theory to make it a more integrated model [AC01].

2.4.2 Fogg's behavior model

Fogg's behavior model [Fog19] states that three things need to come together for a behavior to happen: motivation, ability and trigger. If a sufficient degree of motivation to perform matches the ability, then all needed for a behavior to happen is a trigger or call to action. Fogg's suggests, whenever we want to better understand why a behavior is not happening, all we have to do is simply walk through the following list:

- Are the motivation high enough?
- Is there a capability to do the behavior?
- Was there a trigger for the behavior?

Often the problem is in this three points. But sometimes it is needed to dive a little deeper into each of the different elements, especially the ability.

Fogg created what he calls the "Six Elements of Simplicity". The goal of these elements is to keep the to a minimum as much as possible:

- Time: there is more ability to perform behaviors that take very little time compared to one that takes a lot.
- Money: there is more ability to perform behaviors that costs very little money compared to ones that costs a lot.
- Physical exertion: there is more ability to perform behaviors that require a little physical effort and strain.
- Brain cycles: there is more ability to perform behaviors that are not mentally tiring or challenging
- Social deviant: there is more ability to perform behaviors that are socially acceptable
- Not common: there is more ability to perform behaviors that are performed over a longer period of time.

Furthermore, the designed behavior should be fast and easy, have low cost of money and don't violates any social norms. Triggers are very important to escape the busy and hectic life, and reminding ourselves helps break out of our usual machinations and do something new.

Digital addiction, recognized as a form of behavioral addiction by DSM-V, poses unique challenges due to its absence of measurable indications. Existing advice on digital detox often emphasizes lifestyle factors such as a balanced diet, adequate sleep, and regular exercise, particularly walking and yoga. In response, this research endeavors to prototype a new digital detox assistant that purposefully addresses the shortcomings identified in previous interventions.

In summary, the literature research has not only provided a comprehensive overview of existing knowledge but has also tailored the approach of this thesis. It has influenced the design of interventions which led to the required methods for this research. It highlighted potential gaps in the current market leading to expert interviews which helped to identify key issues from a therapist's point of view. By drawing on these insights, this thesis is poised to contribute to the evolving understanding of digital detox and offer practical solutions to mitigate digital device addiction.

2.5 Research gap

Neither the first manufacturers nor the first users could have predicted the technological boom of digital devices. This led to a communication revolution. Social interaction as an essential aspect of human life is increasingly taking place through digital devices, e.g. children are making their first acquaintances with other children through social networks. But in addition to the social aspects, digital devices are overloaded with content that eats up our time, even if we don't even notice it. In everyday discussions, we hear about overuse of digital devices. Parents use mobile phones as a proven method of keeping attention of their children. It is proven that excessive use of digital devices leads to complete isolation of individuals or certain social groups. Furthermore, the excessive usage of digital devices, decrease productivity and motivation, which can lead to anxiety and depression. It is relevant to research the digital device addiction and find a way to make digital detox lifestyles more attractive.

The research will contribute to the acquisition of knowledge about the subject of this research, and thus enrich current knowledge related to the use of digital devices and their impact on human everyday life. This research is also socially justified due to the need of finding a quality solution for the stated research problem.

The available and existing literature indicates notable gaps, especially when it comes to the digital habits in relation to the transition of young adults from student to professional life. Thus, a limited scope of digital detox strategies opens extensive inquiry into this domain. This master thesis aims to investigate the impact of digital detox devices within the lives of young adult students by exploring the possible effective outcomes of a digital detox strategy. This research aims to not only bring the intricacies of digital device influence to the fore but also to contribute by developing a practical outcome. To achieve this, a digital detox assistant will be carefully designed, developed, and thoroughly tested within the student demographic. The ensuing data will be instrumental in substantiating the findings of this study. To guide the research, the following research questions have been formulated:

- Which digital detox strategies are students following to improve their lifestyle nowadays?
- Which strategies should an app assistant follow to be able to help students on their way to a digital detox-oriented lifestyle?

- What conditions are needed to make a digital-detox approach as pleasing as possible?

3 User Insights and Perspectives

Before jumping to prototyping, it is important to discover some needs and pain points, which leads to the sharpest possible insights to work with. The following sections describe three methods which helped to expose problems and design opportunities and find crucial information to use in the design process.

3.1 Online Survey

The online survey method stands out as a widely employed data-collection approach, involving the dissemination of a set of inquiries to a targeted group, with respondents providing feedback through internet-based platforms. In this study, the choice of an online survey is motivated by its capacity to offer comprehensive insights into diverse user perspectives on various topics, deployable across a range of online channels such as websites, social media, and email platforms. Specifically conducted through Google Forms for this master thesis, the survey's principal objective is to delve into users' experiences, behaviors, and attitudes concerning the utilization of digital devices. The survey aims to identify key pain points and challenges users face when attempting to reduce or limit their digital device usage. This information is critical for creating the prototype to address real-world issues and user needs. By collecting data on the most reported issues or desired features, the survey assists in prioritizing the key functionalities of the digital detox assistant. You can inspect the survey under the following link: https://forms.gle/aAquuMznBXcDknz19 .

3.1.1 Results

Through the analysis of the survey, we will gain a better insight into the attitudes of the respondents regarding the use of digital devices, and the possible connection with digital addiction. First, the summarized results are presented and then a detailed representation of the data is found below:

Summary:

The survey included 118 participants, aged 24-27, bearing insights into their digital device usage and potential addiction. Importantly, all participants owned at least one device, with 41.5% having four or more. Device ownership did not link with their monthly expenses.

Digital addiction concerns arise, as 55.9% of the participants, mainly aged 24-27, use their smartphones for over 5 hours daily. Communication and social media are the primary uses, with 39.8% checking their phones 25-50 times daily. Concerningly, some participants also use social media to escape problems (10.2%).

60.2% of the participants reported that it impacted their health, including headaches, eye pain, lack of focus, and concentration. These findings align with a UK study making connections between smartphone use and mental health issues in young adults. Regarding digital detox, it has been stated that 62.7% have taken breaks, typically lasting a month. Notably, 37.3% have not attempted any form of detox, but 21 out of 44 show interest. App blockers are commonly used for digital detox, with the participants rating its usefulness and impact at an average of 3.3 out of 5. These results show a growing awareness of detox strategies, highlighting the need for persistent efforts to reduce device reliance.

Details:

A total of (N = 118) individuals participated in the research, where most of them were between 24 – 27 years old (44,9%). Gender-wise, there were 51,7% males and 45,8% females.

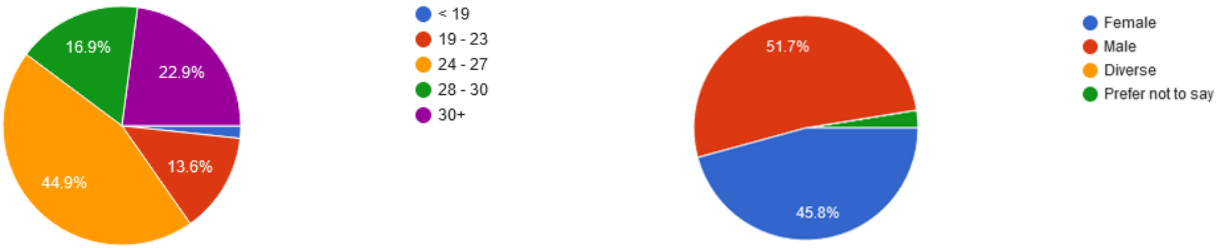


Figure 3.1: Age and gender of participants of the survey

The large number of respondents in the age group 24-27 match the target group of the thesis, which are students in their last semesters of a study. **An interesting fact is that none of the respondents possesses zero digital devices, and that even 41.5% of them stated to have 4+ digital devices.** The number of digital devices per users have a zero correlation with their monthly expenses for the devices.

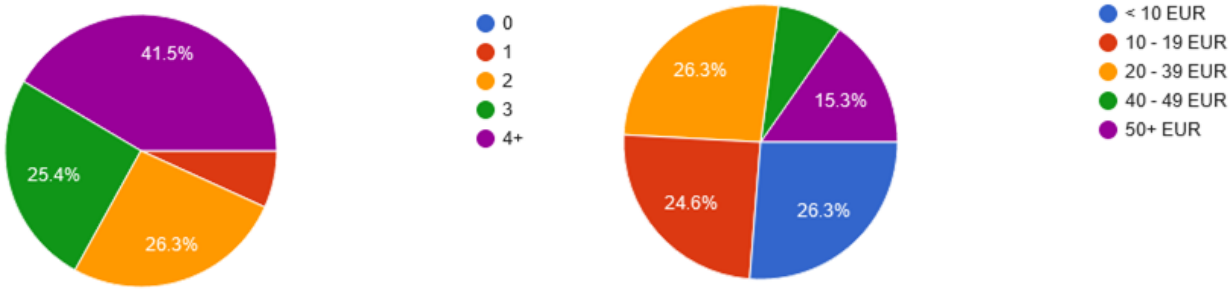


Figure 3.2: How many digital devices do you own? The most common reason for you to buy a new digital device?

It would be interesting to do another study in two to three years, and examine whether there will be an increase in the number of respondents who have more digital devices, given that global trends indicate an increasing number of users. **The most common reason for the respondents to buy a new device is out of functionality reasons (39.8%).**

The next part of the survey focuses more on the usage of digital devices. **Sadly, 66 (55,9%) respondents use their smartphone for a period of 5+ hours a day, most of them are in the 24-27 age group (84,5%).** When it comes to usage, communication (N = 104) and social media (N=96) are at the top of the list, following by music and video (N = 85), productivity (N = 81) and browsing (66,9%). At the bottom of the list, we have photography (N = 44) and gaming (N = 37). The target group 24-27 mostly use their digital devices for communication and social media, and the most used apps are web browsers (34,5%) and WhatsApp (16,1%). **It is evident that young people most often spend their free time using smartphones, mostly on various social networks.**

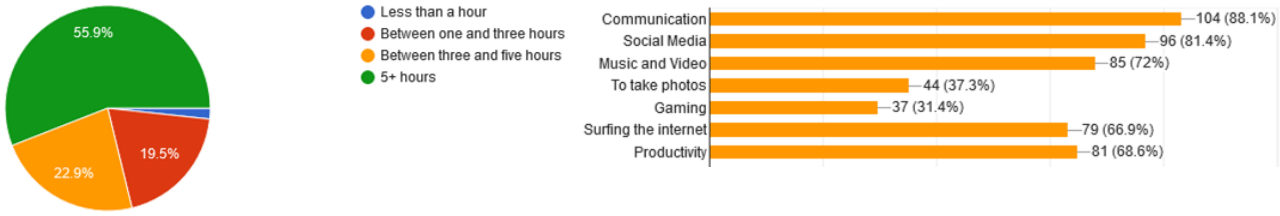


Figure 3.3: How many hours a day you spend on digital devices? Most often you use digital devices to communicate

On the question "Why do you use social media?", most respondents choose "Fun" (36,4%) as their answer, followed by "Establishing connections" (36,4%). **The interesting fact is that "Turning away from problems and obligations" (10,2%) hits number three on the list, and "Addiction" (5%) hits number five. This is very worrying, because this way of use can cause depressive states between users, while on the other hand it can build a society of unemployed people, a society that is unable to cope with the problems that are always present in life.**

Figure 3.4: Why do you use social media?

The next graph shows the number of unconsciously checks of digital devices.

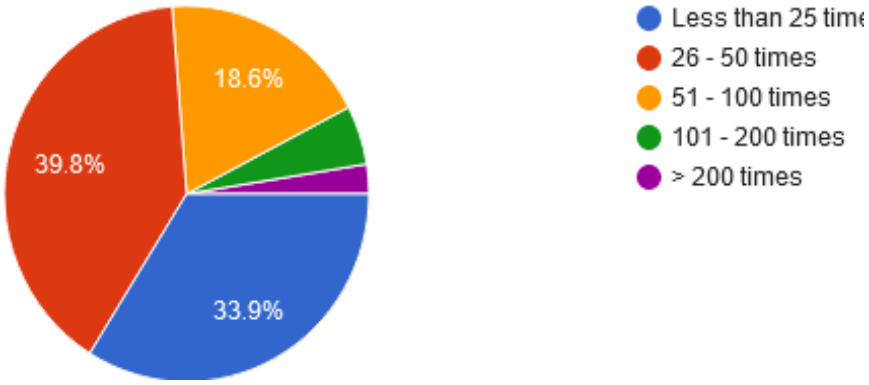


Figure: 3.5: How many times per day you unconsciously check your digital device?

A number of 47 respondents (39,8%), 35 of them in the age group of 24-27, checks their mobile phone between 25 and 50 times per day. That is one check every 20 – 35 minutes. If we add approximately 6 hours a day of work, where participants shouldn't check their devices, that's a check every 12 – 23 minute. **Taking into account the total number of respondents, we come to the conclusion that almost every second young adult checks the device every 17 minutes. This could indicate first signs of addiction to digital devices.** With such intensive and frequent use of digital devices, there is an increase in the possibility of these respondents being alienated from their relatives and the groups to which they belong. This is not only a suspicion, which is shown on the next graphs:

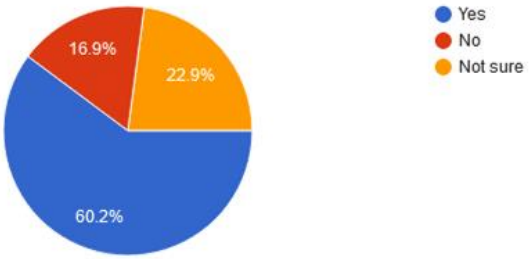


Figure 3.6: Did you ever notice an effect of digital devices on your well-being?

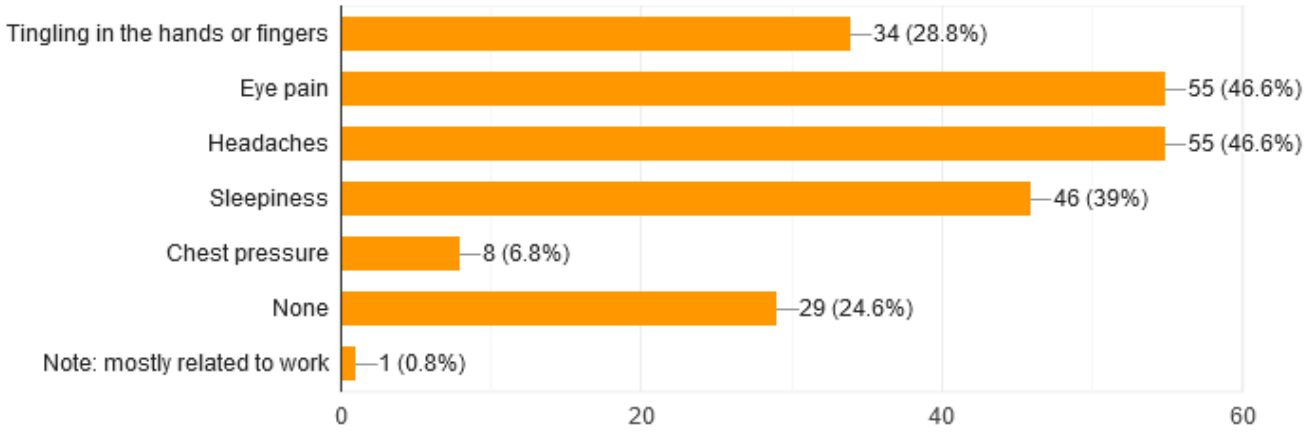


Figure 3.7: Have you ever had one or more of the following physical symptoms using digital devices?

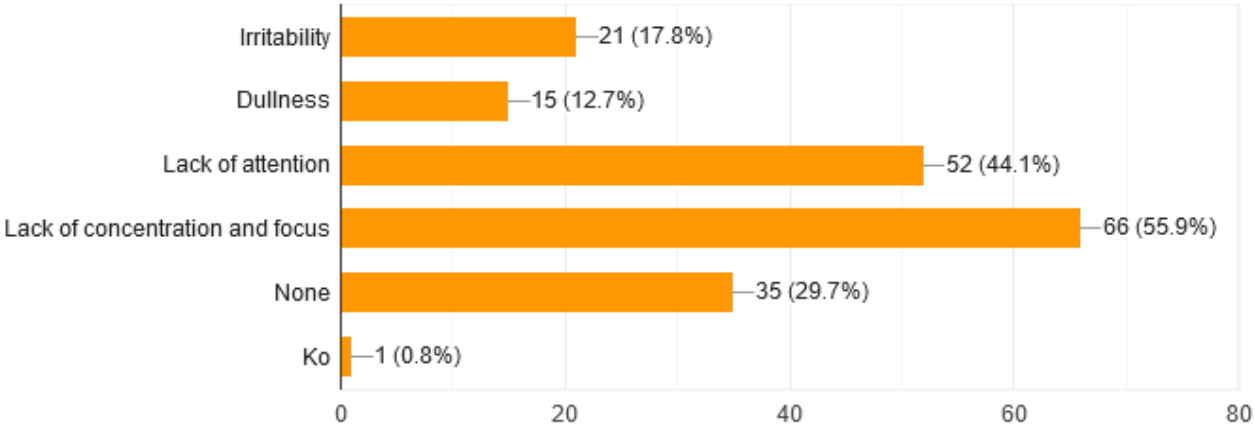
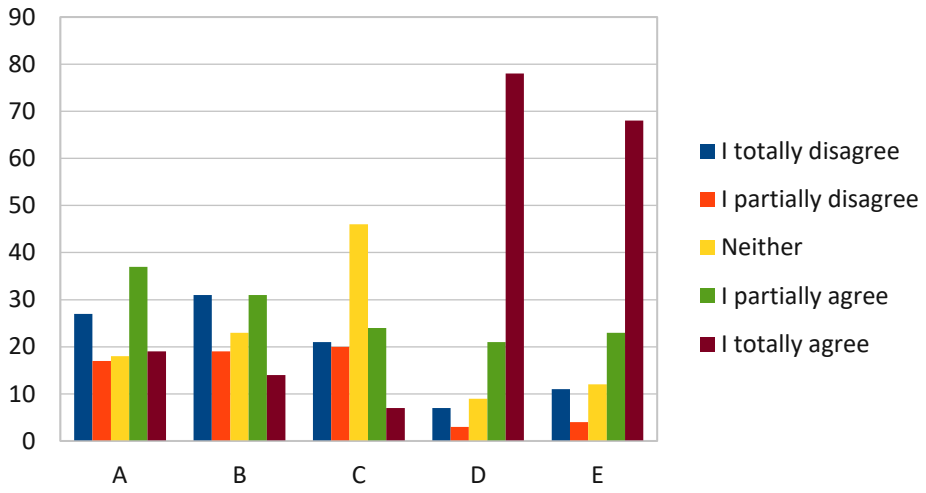


Figure 3.8: Have you ever had one or more of the following psychical symptoms using digital devices?

(N =71) respondents stated they felt an effect of digital devices on their health. Recently, a group of professors from the UK published the results of a study on the effects on mental health left by the problematic use of digital devices [SWK19]. Based on their research, the average prevalence of smartphone use among young people of 23,3%. As one of the starting points of the research, they analyzed the increased number of mental disorders in young people in a period in which the use of smartphones also increased significantly. This lead us in the position that we have to think about the percentage of those who already have a phase of problematic use, or rather excessive use of smartphones. Generally, if 60,2% respondents felt some health issues connected to digital device usage, that's troublesome. **As seen in the last two graphs, both physical and psychical symptoms are present. Led by eye pain and headaches, followed by lack of concentration and focus.** An

interesting fact is that in some studies, most respondents felt none psychical symptoms, which rises the question of honesty among respondents when it comes to mental health.

The table below gives a great insight, which metal triggers are caused by digital devices:



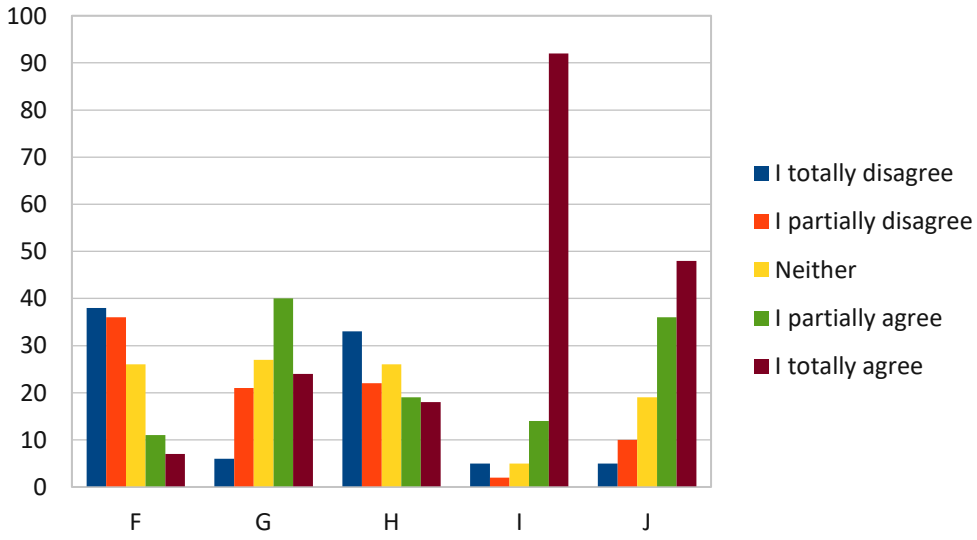
A: I have the feeling that I have to answer the phone if it rings at all times

B: I have the feeling that I have to be available at all times

C: Digital devices give me a sense of freedom

D: I always carry my smartphone with me

E: When going to sleep, I always put my device nearby



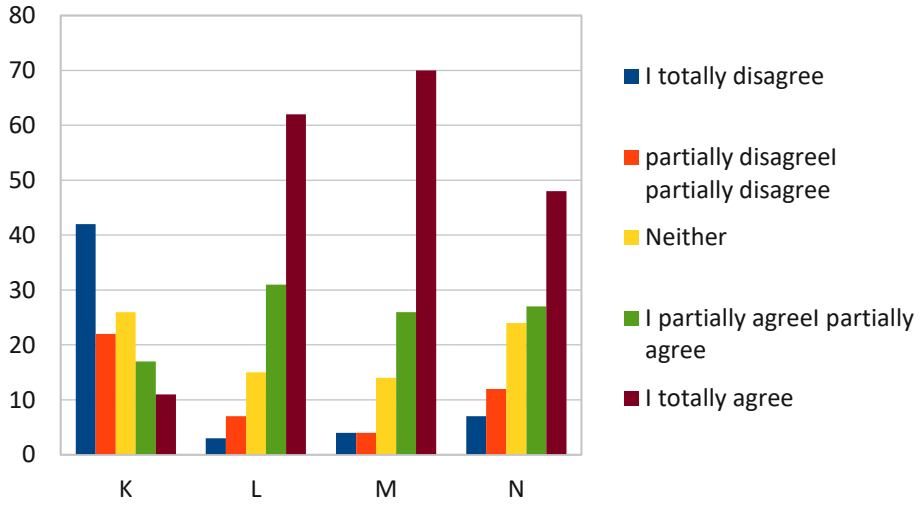
F: I often post photos of my life on social media

G: I use my smartphone in the presence of others

H: I play more on digital devices than in real life

I: I consume news more on digital devices than via newspaper

J: I often spend more time on digital devices than I planned



K: I feel more confident talking to other online than in real life

L: Digital devices help me in my everyday life

M: Digital devices provide me with a source of knowledge

N: Digital devices are more useful for planning daily tasks than ordinary planners

The next section of the survey focuses on the digital detox aspect. **Participants were asked if they ever took a break from their digital device, and 62,7% (N = 74) responded with "Yes", while 37,3% (N = 44) said "No", where 21 out of 44 said they would like to try a digital detox journey.** The digital detox journey of the 74 respondents lasted no longer than 1 month, and most of the participants used an app blocker to restrict access to certain apps. When they were asked to scale the effect of the journey on their lifestyle from 1 to 5, the average number was 3,3.

To finish the study participants were asked to rate how do they feel addicted to digital devices on a scale from 0 to 5, here is the result:

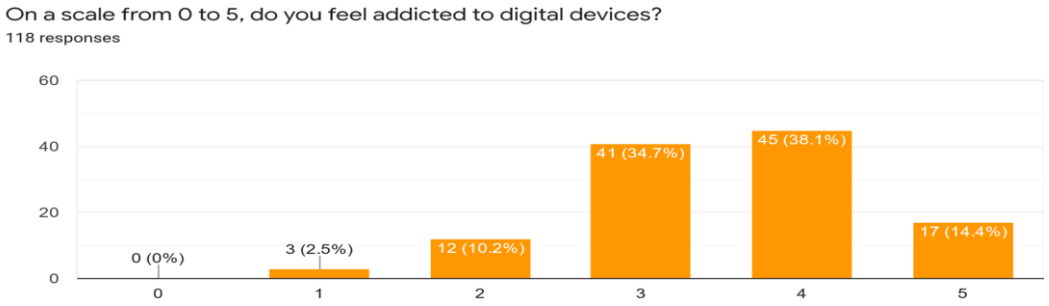


Figure 3.9: On a scale from 0 to 5, do you feel addicted to digital devices?

The participants of the survey shared diverse perspectives on their stance with digital devices, highlighting both the advantages and challenges associated with digital detox. The following section aims to provide insights into the reflections and experiences of individuals who contributed to sharing their meanings about the matter.

It can firstly be seen that there is focus placed on the awareness and acknowledgment of one's digital device usage. The influence of upbringing with digital devices are similarly acknowledged. Thus, recognizing the issue can be viewed as the first step towards a healthier relationship with digital devices:

"My parents always left me a lot of access to the internet since I was a child... I spend almost the whole day using digital devices."

"If someone is aware of his/her addiction problem, a digital detox journey is a perfect way to a new start. If the addiction is more serious, professional help should be sought."

Furthermore, some remarks highlight the perception of digital addiction, indicating that the lack of such an awareness surrounding digital addiction is also prevalent and needs to be addressed:

"I think digital addiction is a serious problem today, but most people aren't aware of that."

Beyond addressing the seriousness of the problem, participants noted how digital detox can lead to mindful consumption and productivity. Participants expressed positive correlations between increased productivity and reduced device usage, emphasizing the impact of digital detox on personal efficiency:

"While being on digital detox, your mind declutters, therefore one can say that we are consuming way too much content, and not in a conscious way. Media should serve our needs, what today is often not the case."

"Without digital devices, I am more productive."

Some participants also emphasized the balance between digital usage and the demands of our current lives. These point to the intricate balance between the digital and non-digital worlds we have to grapple with:

"We spend a lot of time on our devices, but in today's world, it's our reality."

"Digital addiction is dangerous, digital detox is useful for well-being but hard to do because of school/work demands and culture."

The participants' diverse perspectives indicate the complicated nature of digital device addiction. While some stand for the benefits of digital detox, others find it challenging due to the demands of societal expectations. The need for increased awareness, perception of digital usage, and a shift toward a healthier digital lifestyle emerges as key takeaways.

3.2 Expert Interviews

Expert interviews are a research method in which an individual with specialized knowledge and expertise on a particular topic is interviewed to gather information and insights. These individuals are typically professionals or scholars who have experience in the field and can provide in-depth and nuanced perspectives on the topic being studied. This master thesis includes two expert interviews with Mag. Dr. Doris Malischnig, a clinical psychologist and health psychologist who works at the Anton-Proksch-Institut, and Dr. Dominik Batthyány, a psychotherapist who specializes in digital addiction and works in private practice. These experts were chosen for their extensive knowledge and experience in the field of digital detox.

During the interviews, a range of topics were discussed including the definition of digital detox, the benefits of digital detox, the challenges individuals face when trying to detox, and strategies for overcoming those challenges. Dr. Malischnig emphasized the importance of setting clear goals and boundaries when implementing digital detox, while Dr. Batthyány highlighted the role of mindfulness and self-reflection in the process. Their insights were valuable in informing the research and findings presented in this thesis. Overall, the expert interviews provided a comprehensive understanding of digital detox and its implications for individual well-being in the digital age.

3.2.1 Results

To better understand the findings of the interview, a Miro board is used to divide the findings into topics. The six topics that were arise are: “Therapy”, “Digital addiction", “What leads to addiction”, “Consequences of addiction” and “Features”.

The findings from the "Therapy" topic concern the self-regulating user behavior during digital detox. Dr Malischnig asked why people have such strong attachments to the internet and stressed the need to investigate the reasons for this attachment. (“What is the reason that they hang so intensely on the Internet?”). It was found that many people looking for digital detox treatment are already at a point where they want to change their habits. The preparation phase, where individuals reflect on their behavior and consider its impact on others, was stressed as an important step before taking action. Dr. Batthyány said: “The preparations, so the preparation phase, where you think about others, what are they doing, how are they going to get away.”. Therapeutic strategies, such as interviewing and motivation, were mentioned as useful methods to complement individuals on their journey towards change. Both participants stressed the importance of setting a non-critical approach that where individuals are open to adapt to new behaviors and strategies, their word were: “And so you don't criticize but establish something and let the other adjust to it." and "Then the willingness to change is already one step further.". It was also noted that parental concerns about their children’s internet usage may not always be correct. The therapeutic process goes further than changing behavior alone; it

involves investigating and understanding the root causes and motivations behind excessive internet use. Participants stressed the importance of doing away with old strategies and learning new, healthier alternatives. To achieve successful digital detox, acceptance and surrender to the process are required, where Dr. Malischnig pointed out “You need to capitulate.”. Explaining personal motivations for such change is considered crucial. Here they emphasize the difficulties of self-regulating user behavior during digital detox and stress the importance of an understanding, supportive, therapeutic approach that addresses the underlying motivations and advances permanent change.

The insights gained from the exploration of the "Digital addiction" topic on the Miro board offer significant value in understanding the real meaning of digital addiction. Participants acknowledged that in the beginning stages of addictive behavior, individuals may experience some pleasurable feelings, which can add to the reinforcement of the addictive behavior (“In the beginning of the addictive behavior, it has, I'll say also nice feelings.”). The term "media addiction" was described as an umbrella term encompassing various addictive behaviors, including social networks, computer games, pornography, online shopping, and gambling. However, Dr. Batthyány said “Because when you talk about addiction, everyone's hair stands up straight away.”, so he remains cautious when using the term "addiction" as it can lead to strong reactions and may not capture the complexity of various addictive patterns. Participants highlighted the importance of distinguishing between specific types of addictions, such as pornography, gambling, shopping, and gaming addictions. It was noted that not all behaviors should be labeled as addiction, where the quantity of engagement and the balance in one's overall lifestyle were highlighted as significant factors in determining addictive tendencies (“Not everything is an addiction, it depends on the quantity, it depends on the balance.”). These findings emphasize the subtle complexities of digital addiction and highlight the need for careful consideration of individual circumstances and specific behaviors when discussing and addressing addictive tendencies.

The findings from the "What leads to addiction" topic on the Miro board shed light on various factors that contribute to the development of addiction. Participants noted the role of personal vulnerabilities, highlighting that the individual’s struggles and insecurities are also to be considered. The impact of social media was noted, as posting content and seeking validation could lead to doubts and anxieties about self-worth. These anxieties and doubts can result in conflicts within oneself and generate fear about proving oneself and meeting societal expectations. Dr. Malischnig stated: “They feel anxious, will they ever make it?”. Envy and societal conformity pressures were recognized as notable contributors to stress and addictive behaviors. Additionally, the pressure to perform perfectly and the fear of failure can trigger addictive tendencies, together with feelings of guilt when these expectations are not met. Feelings of not belonging and social isolation were also mentioned as potential addiction contributors. These findings underscore the complex dynamics between individual vulnerabilities, societal pressures, self-doubt, and social influences in the formation of addiction. Understanding these underlying factors is crucial to design strategies that address the individual as well as the social aspects, promoting healthier behaviors and coping mechanisms.

The next topic is "Consequences of addiction". This topic provides insights into the various consequences associated with addiction. Dr. Batthyány stated: “When I really, neglect things, neglect my job, my private life and don't do anything else anymore.”. He emphasized that addiction could result in the neglect of crucial life areas, such as professional responsibilities and personal connections,

as individuals become consumed by their addictive behaviors. He also noted the development of tolerance, where individuals require higher amounts of the addictive substance or behavior to achieve satisfaction. Persistent exposure to addictive content or participation in addictive behaviors can lead to intense desires and mental preoccupation, intensifying the addictive cycle. Dr. Malischnig stated: “Crawing is also bad, the constant mental confrontation with certain content is probably on top of that.”. Addiction can occur as a significant change in behavior, often resulting in a decline of the individual’s functioning and overall well-being. Participants underlined the suffering experienced by individuals with addiction, which serves as a motivation to seek help and to enforce changes. Additionally, addiction can result in conflicts with family members or people who have certain expectations or are negatively affected by the individual's behavior. Loss of control over one's actions and encountering negative consequences were identified as noteworthy outcomes of addiction. It was noted that individuals often seek support or come under pressure from their loved ones when they are already suffering from their addiction (“They are often already suffering, and then they come to us, or come under pressure from relatives.”). The impact on their mental health, such as the lack of drive, traumatic experiences, and worsened perception of others, was also highlighted. Additionally, addiction can also make individuals more tense and vulnerable, further impacting their well-being. Breaking away from addiction can be challenging, as individuals find it difficult recede from the addictive behavior or substance. These findings underscore the wide range of consequences of addiction and highlight the importance of recognizing and addressing the effects of suffering associated with addiction, as well as providing support for individuals to break free from this damaging cycle.

The findings from the "Features" topic on the Miro board suggest valuable insights into the main features that a prototype for a good digital detox assistant should possess. The prototype should provide alternative activities to engage with, encouraging users to explore healthier options instead of excessive digital and media use. It should facilitate the process of taking action towards reducing participants’ digital dependance and include features related to physical activities, offering feedback on personal well-being. It is important for encouragement of self-reflection and prompting individuals to evaluate their behaviors and self-worth. The prototype should be easily accessible, portable, and require minimal power or complexity. Performance reasons can motivate behavior change, and suggestions to improve mood can help individuals find healthier coping mechanisms. Providing feedback on emotions, tracking progress, and fostering social interaction and community building are important aspects. Additionally, features that assist in planning, support seeking, time management, self-care, and device interconnectivity can enhance the overall functionality and integration of the prototype. These findings serve as a guide for developing a digital detox assistant prototype that effectively promotes healthier digital behaviors and supports individuals in their journey towards achieving a balanced lifestyle.

3.2.2 Influence on prototype

The interviews directly indicate the key features the digital detox assistant should possess. It should offer alternative activities to replace excessive media use, promote self-reflection, encourage physical activities, and provide feedback on personal well-being. The prototype should be easily accessible, user-friendly, and incorporate performance incentives, mood improvement suggestions, and features for tracking progress. It should also facilitate social interaction and community building, assist with

planning, time management, self-care, and device interconnectivity to enhance the overall functionality and integration of the prototype.

In summary, the expert interviews have played a pivotal role in shaping the features of the digital detox assistant prototype. They emphasize the importance of understanding the complexities of digital addiction and providing support for behavior change, self-reflection, and understanding the underlying motivations. The interviews also provide specific features and functionalities that the prototype should include to effectively support individuals in achieving a balanced digital lifestyle.

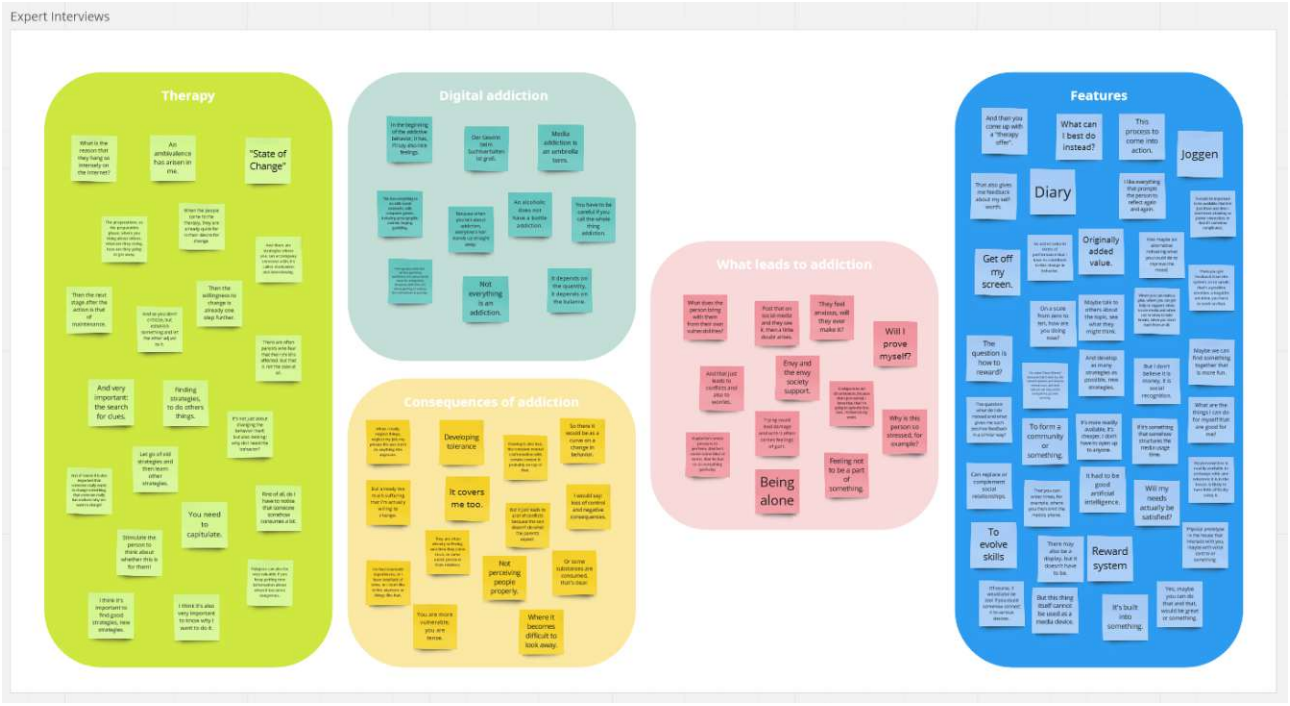


Figure 3.10: Expert Interview – Miro Board

3.3 Summary

Pooling insights from both survey data and expert interviews has been instrumental in shaping the design of the digital detox assistant prototype. In the survey, which engaged 118 participants primarily aged 24-27, a comprehensive examination of digital device usage and potential addiction revealed noteworthy patterns influencing prototype development.

Concerns about digital addiction were evident, with 55.9% of respondents, particularly those aged 24-27, reporting daily smartphone usage exceeding 5 hours. Primary activities included social media and communication, with 39.8% checking their phones 25-50 times daily. Alarmingly, 10.2% of participants turned to social media as a means of escapism.

Health impacts were prevalent, as 60.2% reported issues like eye pain, headaches, lack of focus, and concentration, aligning with a UK study linking smartphone use to mental health problems in young people. In terms of digital detox attempts, 62.7% had taken breaks, typically lasting a month, while 37.3% had not tried detoxing. Interestingly, 21 out of 44 respondents expressed interest in digital

detox. App blockers were commonly used during detox, with participants rating their impact at an average of 3.3 out of 5.

Adding to these findings, expert interviews provided perspectives on the features essential for the digital detox assistant prototype. These include offering alternative activities to replace excessive media use, promoting self-reflection, encouraging physical activities, and providing feedback on personal well-being. The prototype should prioritize accessibility and user-friendliness, incorporating elements like performance encouragements, mood improvement suggestions, and features for tracking progress. Furthermore, it should facilitate social interaction, community building, assist with planning, time management, self-care, and device interconnectivity to enhance overall functionality and integration. This integrated approach, drawing from both survey and expert interview insights, lays a foundation for the digital detox assistant's design, highlighting a complete understanding of digital addiction and the support required for creating a balanced digital lifestyle.

4 Prototype Development

Creating a prototype for the digital detox assistant is like making a hands-on model of the solution. This model helps test and improve the assistant before making the final version. This thesis doesn’t use a one-size-fits-all approach. Instead, it tries tailoring the prototype to directly address the specific things found in through the user research. This means looking at how people use digital devices, what issues they face, and what they want from the assistant, based on the online surveys and expert interviews.

The prototype provides different features and functions that directly tackle the problems identified. It's not just a show-and-tell, it's also a way for users to understand and give feedback. Paying attention to the details, considering the complex issues like digital addiction and the unique needs of young adults, especially students going through big life changes.

The digital detox assistant is about to be something special, not a one-size-fits-all solution. It's designed with specific features, like suggesting different activities, prompting self-reflection, encouraging physical activities, and tracking progress. These features come directly from what the expert interviews suggested.

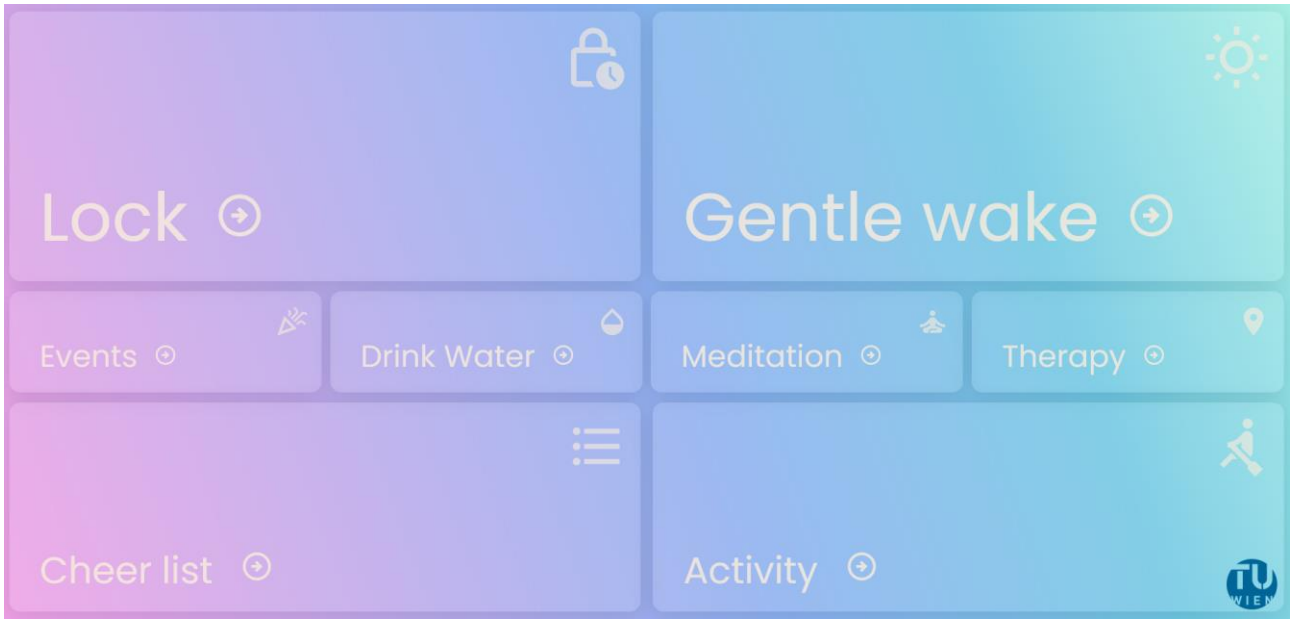


Figure 4.1: Main screen od the digital assistant

4.1 Feature list

Based on the user research a feature list for the prototype is created. To make it easier for users to regain control of their lives, it is very important to enable them to use digital devices only when they really need them. Many believe that the usage of devices and applications is necessary to keep up with the modern world. True, many jobs require computers, phones, tablets, and social networks. But if the small screens "demand" attention every second, this can lead to a series of problems. With the following set of tools, the digital assistant will help the user to regulate his/her consumption of digital devices:

- Locked section that allows the user to put his phone away during a certain period of the day or night. The section will be large enough to fit both a mobile phone and a laptop. Users have the option to select the periods of the day when they want to lock the device or the option to immediately lock it away for a certain number of minutes.

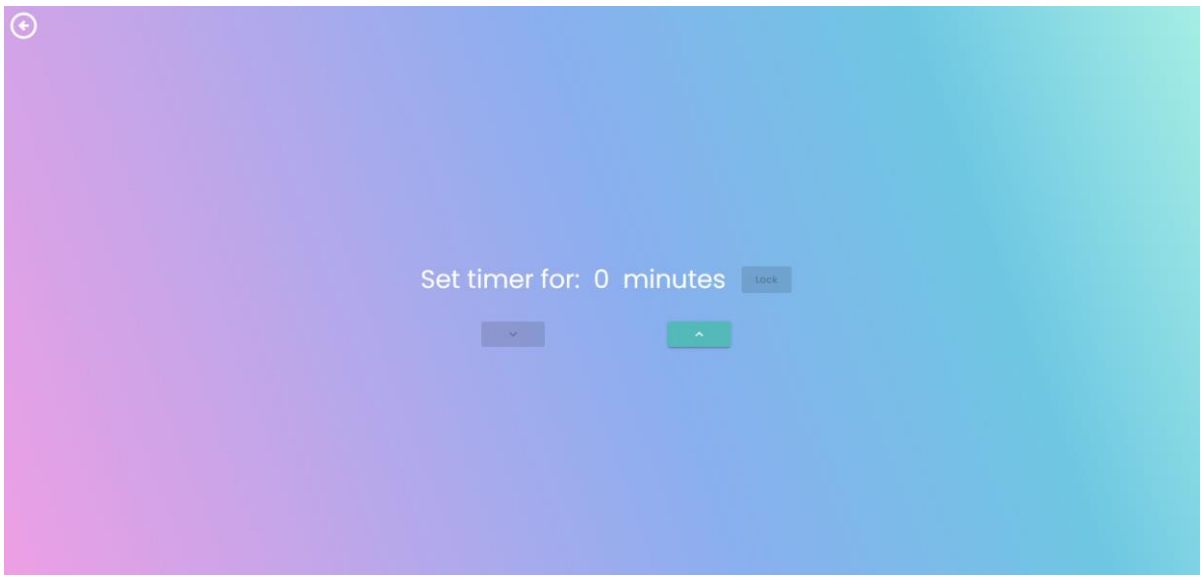


Figure 4.2: Lock feature before lock time is entered

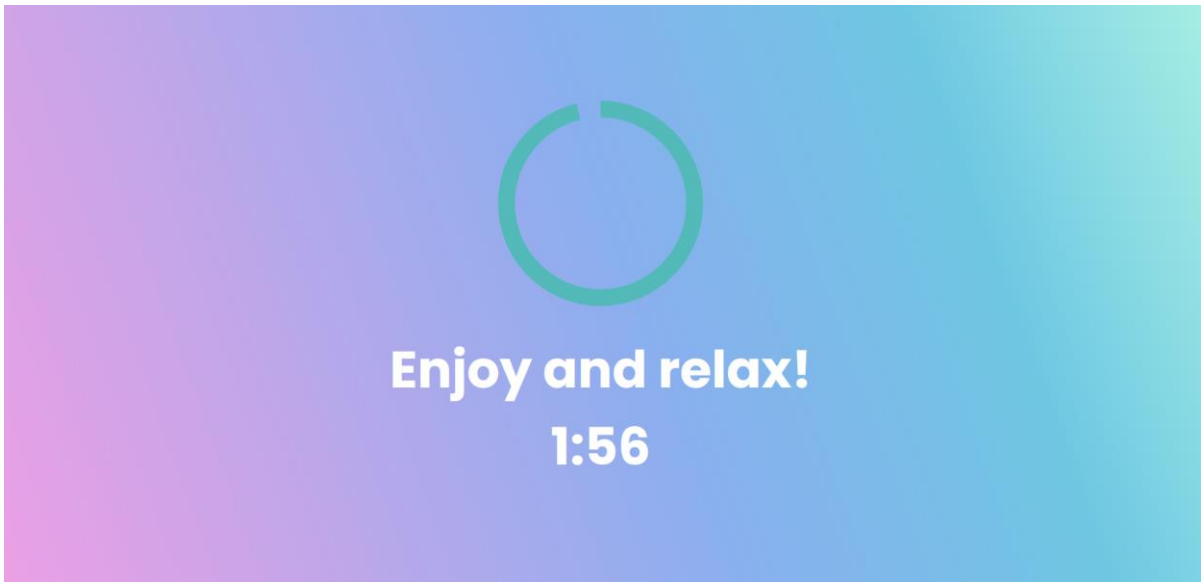


Figure 4.3: Lock feature after lock time is entered

- Wake up, phone down! This feature allows users to avoid the stressful alarm-ringtone from their smartphone and wakes the user with much more pleasant sounds. For the first 30 minutes of the day, users won't have the ability to access their digital device. Before going to bed, the user locks the device in the section described in the paragraph above and sets the alarm for the next day. The next morning, after the alarm, the device will remain locked for the first 30 minutes of the day, so that the user has a greater opportunity to start the day in his world, rather than in the world of other people on social networks.

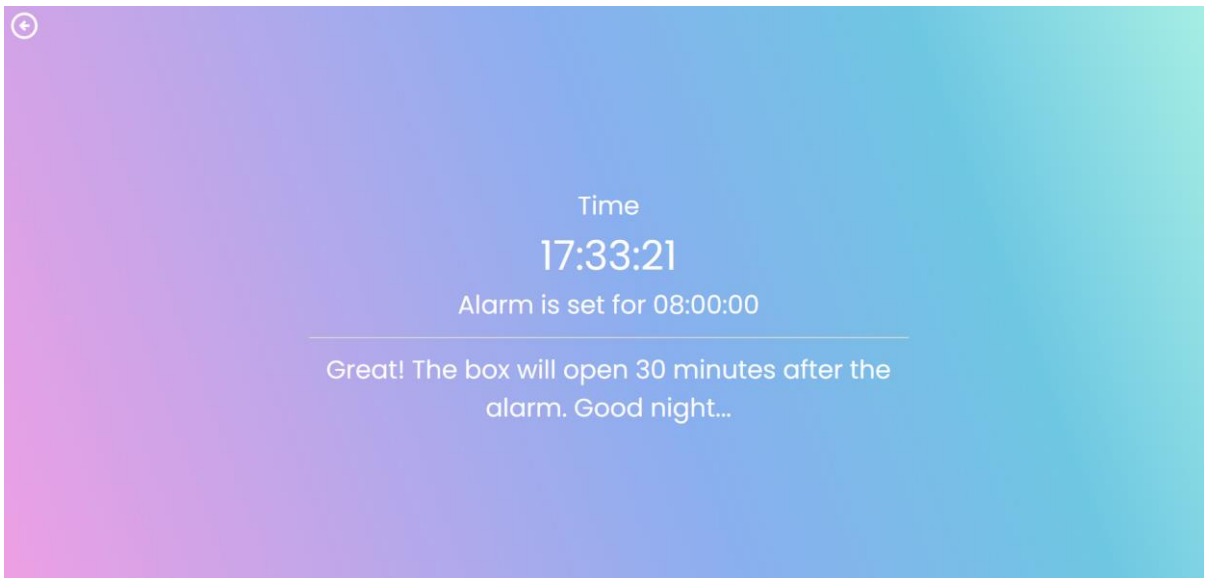


Figure 4.4: Gentle wake feature with alarm set to 08:00 AM

By working on ourselves and being aware of the importance of taking quality time for ourselves and being able to be present in the moment as often as possible, we are also gradually learning how to be in the "I can live without digital devices" group. The problem of the "connected world" arises when we are no longer able to distinguish between reality and the virtual world and consequently cut off most social contacts live. Therefore the features in this section will help the user to live a positive and relaxed life:

- Several studies show the importance of being present in the moment and how to achieve that. Guided meditations will help users to start their day on the right foot. Instead of connecting to social media in the morning and allowing such irrelevant information to fill all their thoughts and take them to a thousand ends, guided meditation helps getting the attention on feelings. Such a start to the day will lead to a calm, determined and clear course of the whole day.

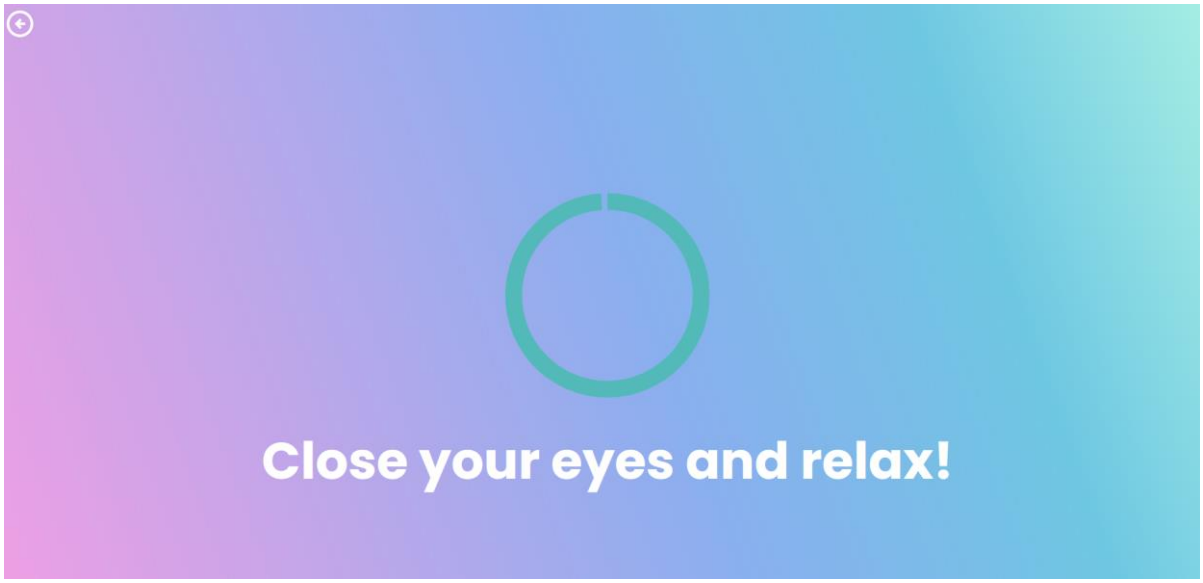


Figure 4.5. Meditation feature after start

- Some situations require help from a specialist, and in difficult situations no one really want to search the internet for a matching therapist in the area. Based on the data collected from the user, the digital assistant should be able to refer a mental specialist nearby, and provide the user with office information, contact and more.

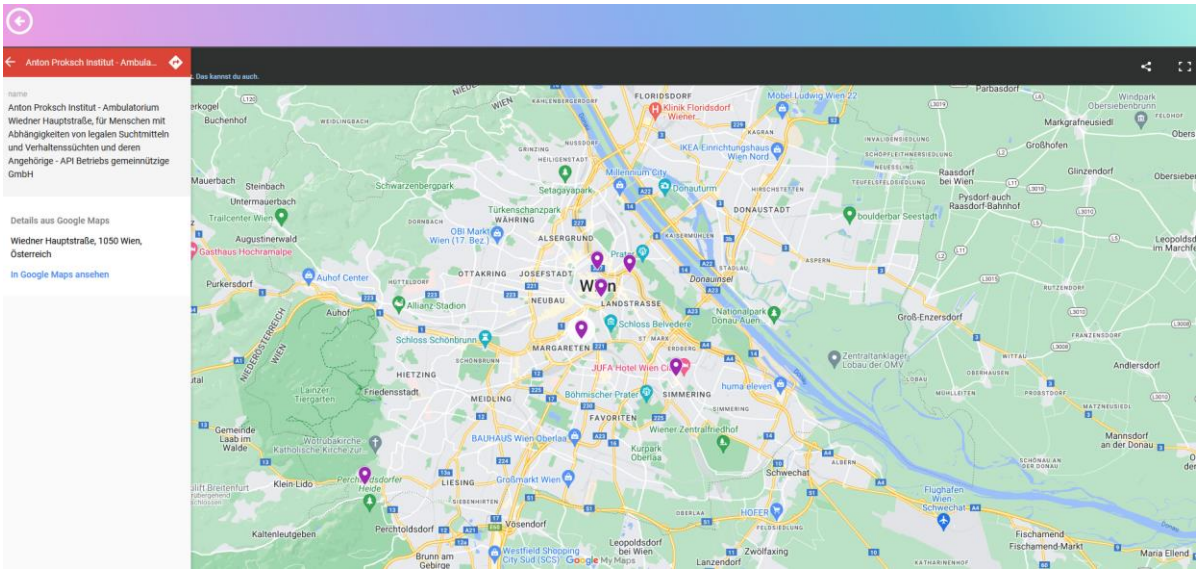


Figure 4.6: Therapy feature showing the therapy centers of the city of Vienna

- Everyone has treats that make us happy, is it a favorite food, a walk, a warm bath or maybe a song. There are millions of possibilities. In situations of stress, anxiety and depression it is often hard to get away from the wrong mindset and concentrate on something positive. Some people aren't even capable to think about anything that makes them happy. A positive reminder list will help the users to remind them on the positive parts of their life. Users will be able to fill out a list of things that they love to do, what calms them down and positive aspects of their life. In those situations, the "thinking process" will be done by the assistant, and the user just need to pick/do something from the list to rise their serotonin hormones.

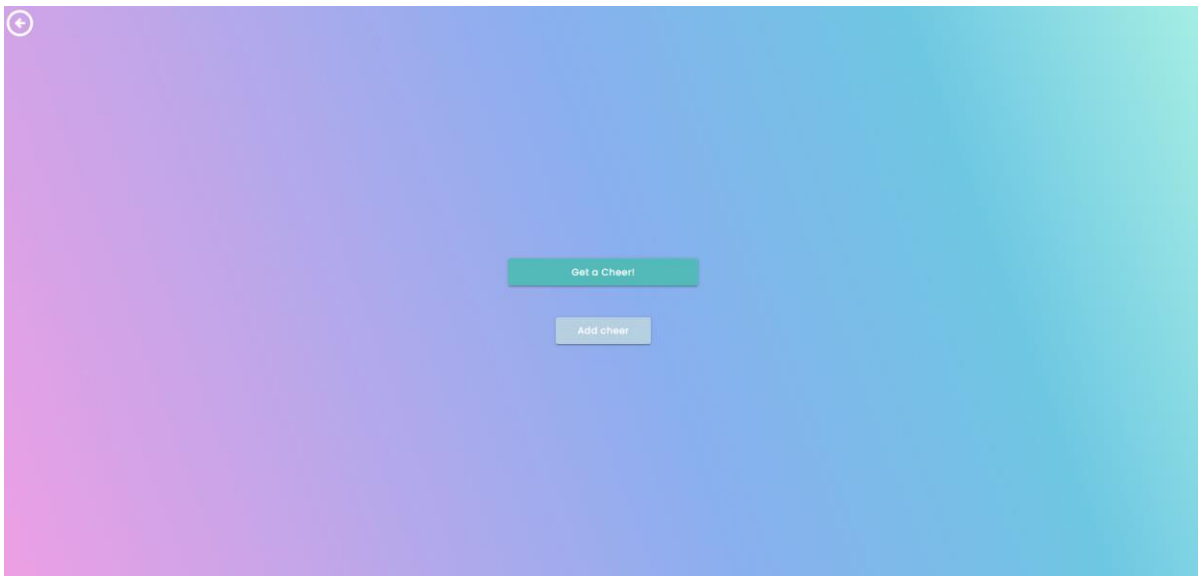


Figure 4.7: Main screen of the Cheer List feature

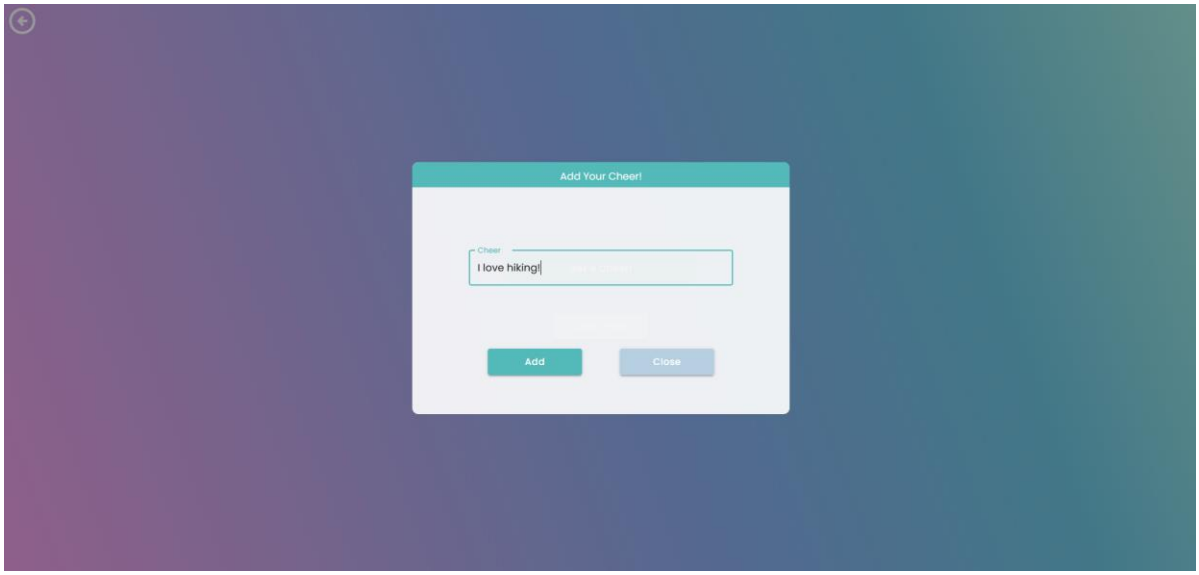


Figure 4.8: Adding a new cheer

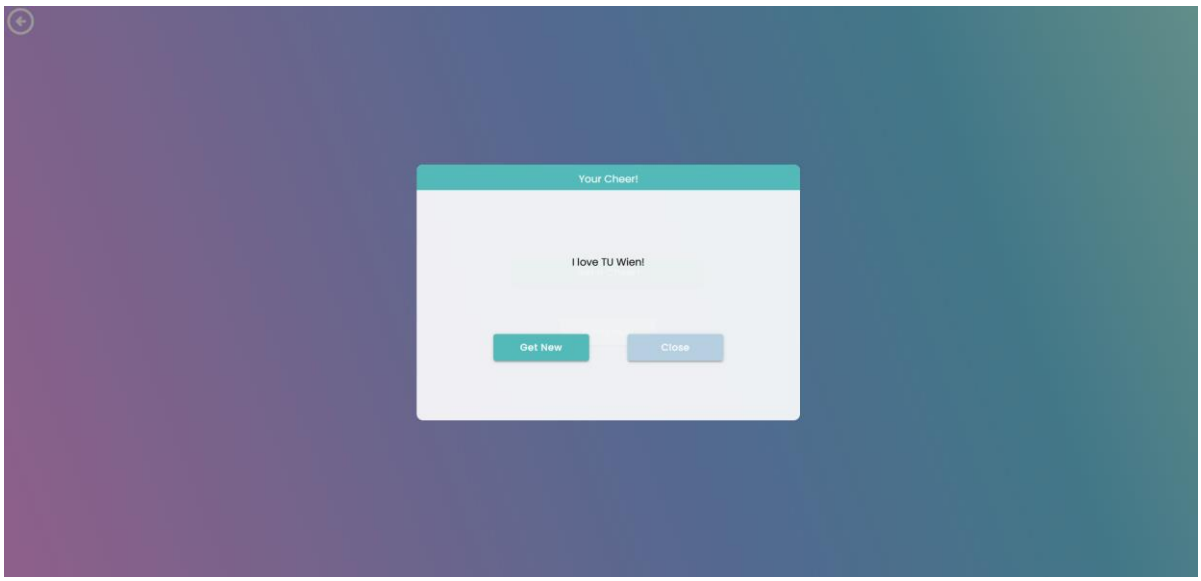


Figure 4.9: Getting a random cheer

- Most people don't need a water intake reminder. However, there are some people that could use one. Especially in situations of stress or depression proper hydration is the key for our nervous system to heal. The water intake reminder reminds users to take drinks at regular intervals and track how much they consumed. It's easy and simple.

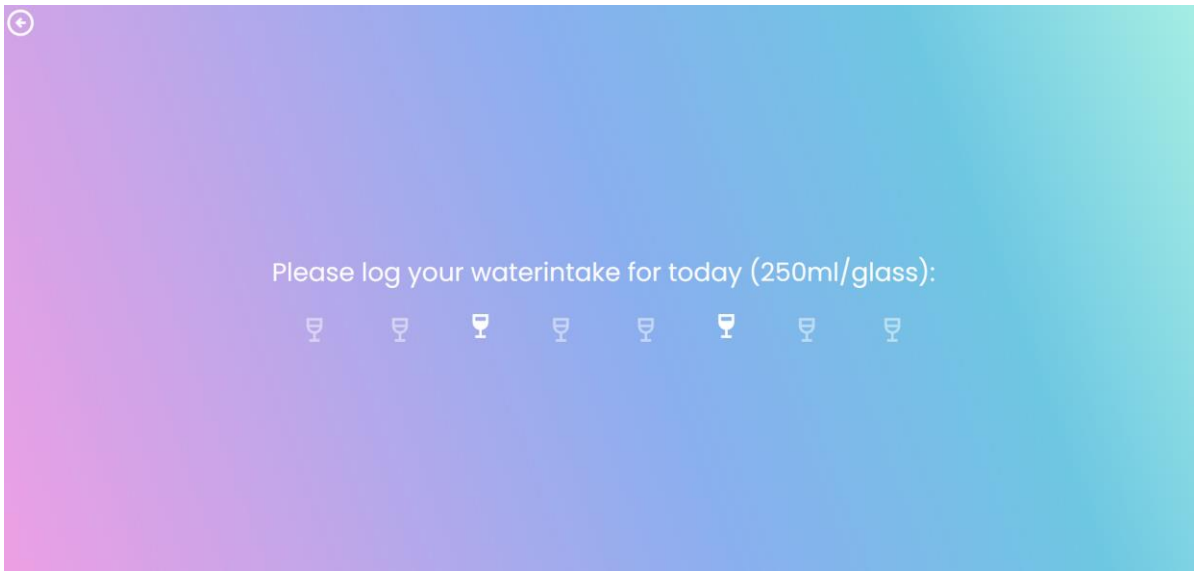


Figure 4.10: The interface of the water intake reminder

Entertainment needs to be different from the routine work. Going out for a dinner or walking alone at an unknown place is entertainment. When we think about healthy entertainment the first things in our minds are exercise and healthy food. No, but a movie, book, dance can be entertaining, if it

makes the user forget the tension. This section of the feature list presents features, which will help the user to turn off and rise his/her dopamine level in a healthy way:

- Since there are already ton of lists that focus on how to entertain kids, the assistant is focusing more on what can adults do. The idea is to suggest events nearby based on the users location. The user can then filter the list and pick an event that suits his/her current mood and needs.

Figure 4.11: Event feature

- To engage the user and do sports in an entertainer way, the assistant will support the user with sports challenges. The user collecting steps or do other sports which is than calculated into steps. Based on the sport, duration of the training and the heartbeat an activity index is calculated.

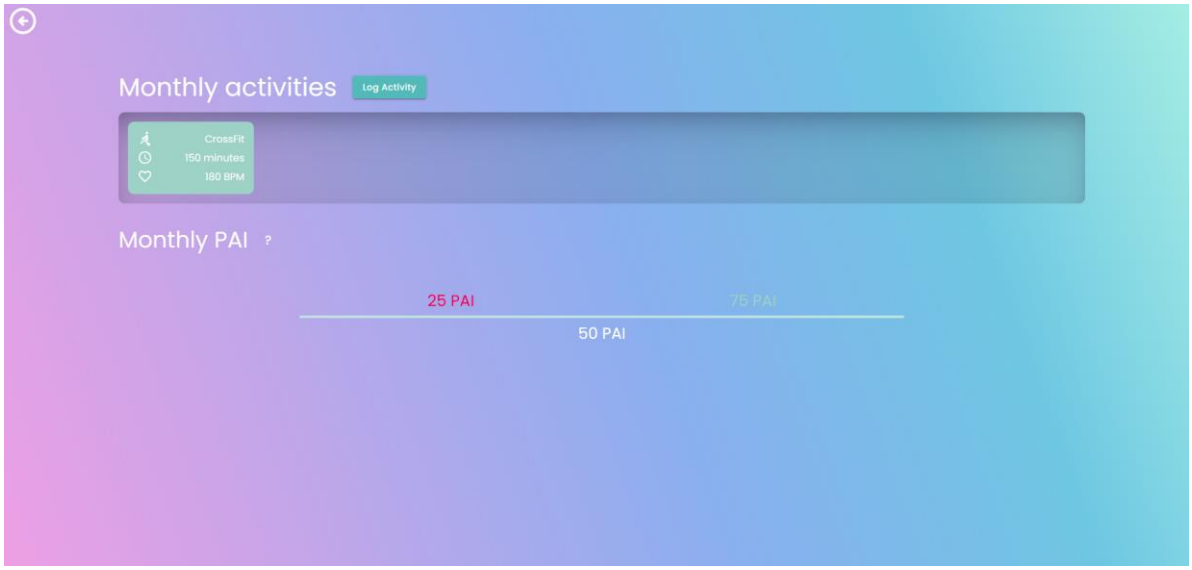


Figure: 4.12: Activity feature after one activity has been added

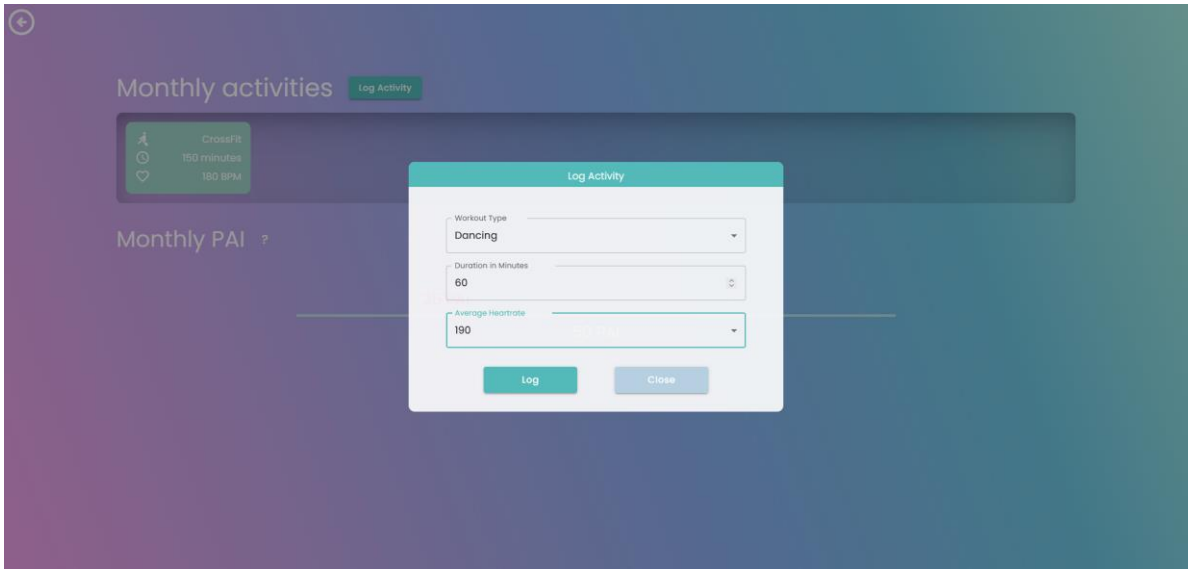


Figure 4.13: Adding one activity

4.2 Software

To create a functional and effective solution, certain technologies were used in the making of the digital detox assistant. For supporting the development process and achieving desired outcomes, React, Google Firestore, Netlify and GitHub were selected as main technologies. In summary this section provides an overview of these technologies and how they contributed to the development of the digital detox assistant which was one of a key component in the master thesis.

The digital detox assistant prototype's foundational technology was developed by React, a JavaScript library that has been widely adopted. By being component based and declarative in nature, it allows for building reusable user interface components simpler, updates are efficient and rendering

optimizations are possible. This made theprototype have a structured and interactive user interface using React, allowing for smooth user interactions anda seamless user experience.

To guarantee an efficient method of storing and managing data, the digital detox assistant's storage solution was based on Google Firestore- a NoSQL cloud-based database. In terms of scalability, flexibility, and real-time data synchronization, Firestore was a perfect choice for saving user information plus app data. By integrating Firestore with the prototype, considerable improvement was realized in terms of data handling, ensuring its integrity and facilitating flawless system updating which eventually boosted the performance of the overall digital detox assistant.

Netlify as a cloud platform specifically designed for web application deployment played a very important role in hosting and deploying the digital detox assistant. Consequently, leveraging this ability made it possible to access users throughout research and evaluation period during which the prototype could be smoothly deployed. Netlify's features added to optimal performance and served as a dependable hosting environment with continuous deployment features, scalability and content delivery network (CDN) in order to satisfy needs of the prototype.

During the development process, GitHub was used as the version control system and source code repository for the digital detox assistant prototype. By leveraging various features of GitHub, the team was able to work together, keep track of changes, maintain branches and resolve issues or problems. Efficient collaboration was made possible through GitHub's versioning capabilities, branch management and issue tracking system; thus, ensuring that the source code remained intact throughout its development lifecycle.

In conclusion, several technologies were used in developing the digital detox assistant. On one side React provided a strong basis for constructing user interface while Google Firestore acted as a reliable and scalable store. Netlify also enabled seamless deployment and hosting of prototypes that ensured its accessibility to users. In addition to being an efficient version control system, GitHub also served as a platform for collaborating with others and managing source code. With these innovations in place, the team succeeded in coming up with a functional digital detoxification statement that would be useful for students' learning processes and was important for research purposes in masters thesis on the effectiveness of digital detoxification strategies.

4.3 Hardware

For its functionality and interactivity, the digital detox assistant depended on a well selected hardware configuration. In this part, it provides an in-depth explanation about hardware components used in the prototype as well as their roles and key features.

At the heart of the digital detox assistant was Microsoft Surface 2 in 1 PC. This multipurpose gadget combined laptop and tablet functionalities to act as the system's central control hub. Having touch screen interface and supported by powerful processor, Surface gave users user-friendly platform for accessing digital detox features.

The ESP32 microcontroller was a bridge between the digital detox assistant and the hardware configuration, playing a key role in it. This powerful microcontroller, which has an integrated Wi-Fi module, acted as an online server to get notified from Google Firestore database. It enabled the application that was running on Surface to communicate with other segments of the prototype. Also, it

allowed for opening and closing of the shelf by means of solenoid lock. Its multifunctionality and strong communication capabilities made it an important component of the digital detox assistant prototype. The Python programming language was employed in developing web server functionality using ESP32 microcontroller. This is why we selected Python as our development language because it is easy to use and flexible with this board's environment as well as can effectively exchange data over networks.

The ESP32 microcontroller was programmed using python to function as a web server; it was always on, taking instructions from the Google Firestore database, which made the code run. By monitoring certain variables and watching the changes in them, it initiated a binding to the database. When inside the digital detox assistant application a user pressed on "lock" so that an associated variable within the Google Firestore database could be altered then." Following this change, Python code in the ESP32 would have detected the change and sent some triggers towards either opening or closing of a shelf via solenoid lock manipulated by relay.

For accurate shelf access a solenoid lock was fixed in the hardware configuration. ESP32, which controlled the solenoid lock, provided a way of securely locking and unlocking the shelf. To oversee power distribution and control, the relay acted as an intermediate device between ESP32 and the solenoid lock. Through provision of signals to the relay by the ESP32, the latter regulated power supply to the solenoid lock thus locking or unlocking shelves based on input from users via digital detox assistant application.

To provide power for the solenoid lock, relay, ESP32, and Microsoft Surface, a separate 12V power supply was used. This supplied a dependable source of power that would guarantee an uninterrupted operation of the devices. In addition to this, a standard 220V power source was connected to both the Microsoft Surface and the 12V power supply. This allowed for continuous electricity feed and normal functioning of these systems.

In order to ensure the safety of the hardware components mentioned earlier, they were all put in a wooden box which was designed and cut using a laser. The self-designed wooden case was both protective and artistic as it helped us safeguard our hardware from damage. Its primary aim was to match everything within, in order to ensure better air circulation.

To summarize, the digital detox assistant's hardware configuration carefully composed together key components like Microsoft Surface 2 in 1 PC and ESP32 microcontroller. By so doing the solenoid lock, relay and power adapter made it possible to do accurate control and power management hence making it possible for locking or unlocking of the shelf. The successful implementation and evaluation of the digital detox assistant prototype in this Master thesis investigation depended on these hardware components as well as wooden case that formed a comprehensive and functional system foundation.

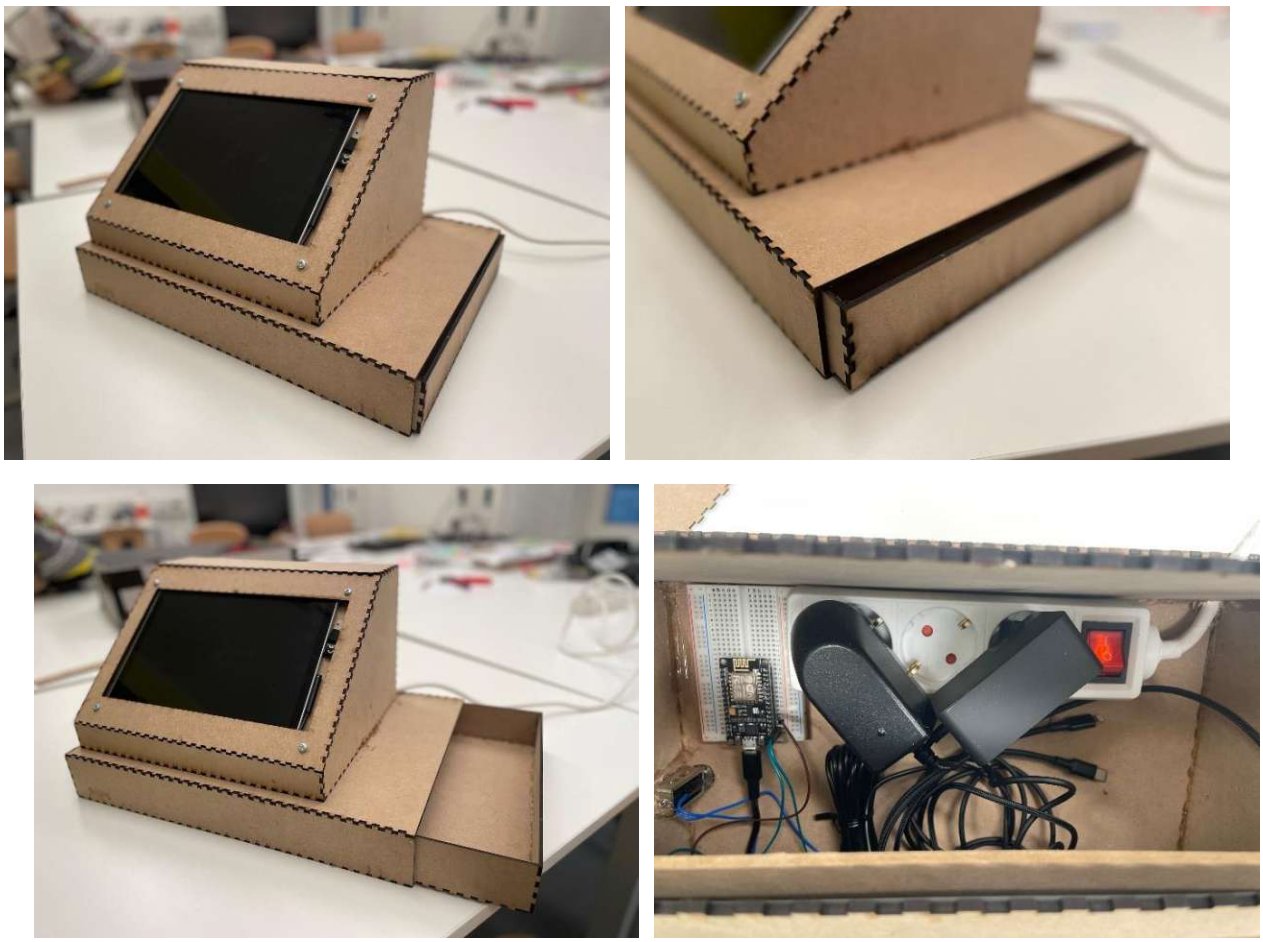


Figure 4.14: Prototype

5 User testing and Feedback

During the testing phase of the digital detox assistant, daily diaries (appendices 9.1) were used as a method to gather detailed and subjective information about participants' experiences and interactions with the prototype on a day-to-day basis. These diaries served as a reflective tool for participants to document their thoughts, emotions, and behaviors related to technology usage and their engagement with the prototype.

A total of seven participants, aged between 22 and 29, with a mean age of 23.2, took part in this study. All participants willingly signed a consent form (appendices 9.2) to participate, clearly outlining the purpose and procedures of the study, as well as their rights and obligations as study participants. This ensured that participants were fully informed about their involvement in the research.

The study began with participants visiting the research lab to collect the digital detox assistant prototype and the accompanying daily diaries. During this initial visit, participants received a detailed

explanation of their responsibilities and the purpose of the study. They were encouraged to seek clarification on any aspects of the study before formally signing the consent form.

Therefore, the next thing was urging participants to try the digital detox assistant prototype for 7 days. The aim of the tool was to control digital habits and make them healthier. They were told to include it in their daily schedules at their convenience with flexibility of using the prototype according to one's individual likes and needs.

The daily diaries consisted of a series of questions that each participant had to respond to for every day of the testing phase. Among many other things, these questions aimed at finding out how often and how long participants switched off their phones and laptops, what they thought about technology usage generally, any successes achieved regarding the prototype use as well as how it made them feel when using it. Participants' recording in diaries provided useful information into practical implications and effects of this digital detox assistant prototype on their every day lives.

In addition to the daily diaries, participant interviews were conducted at the end of the seven-day testing period. The purpose of these interviews was to gather more in-depth and qualitative feedback from the participants. Through the interviews, we had the opportunity to engage in a dialogue with participants, exploring their perceptions, preferences, and experiences in greater detail.

The participant interviews offered several advantages. Firstly, it allowed to gain deeper insights into participants' subjective experiences and their interpretations of the prototype's features and functionalities. The interviews provided a platform for participants to express their thoughts, share their likes and dislikes, and offer suggestions for improvement based on their direct interactions with the prototype. This qualitative feedback was invaluable in understanding the nuances of participant experiences and identifying areas for refinement and enhancement.

Moreover, there were in-depth interviews about how the participants' use of mobile technology changed within these seven days. This also made it possible to reflect on the causes and reasons for the behavior change among participants. It enriched and gave a background to the numbers obtained from the period of testing.

In sum, daily diaries in combination with participant interviews represented a comprehensive and multi-faceted way of capturing participant experiences as well as their feedback. Participants used daily diaries to record their thoughts about relationship with the prototype while interviews allowed for more detailed discussions and inquiries into their beliefs and views leading them to open up more about themselves as human beings. Taken together, these methods enabled understanding of participants as wholes, which was instrumental in guiding iterative development and refinement of digital detox assistant prototype.

5.1 Results

5.1.1 Qualitative Analysis

Summary:

The lock is the most popular feature, according to users. It offers a number of ways to limit distractions and set boundaries to help create healthier habits. These include gentle wake, meditation and

cheer list. The cheer list serves as reminder of all that brings happiness and joy in life. Lastly, water tracker helps in keeping hydrated hence avoiding dehydration and its associated health risks.

The least preferred feature was activity. This feature relied solely on heart rate data thereby making it an incomplete measure of physical activity.

On the whole, there was a marked alteration in patterns of users. They deliberated on the phenomenon of telephone usage, became more mindful and gradually shifted towards using their phone with greater mindfulness. This led to feeling more grounded in one's life with a reduced time spent on screens and having more spare time for reading and family. Improved judgment was also mentioned by the participants, indicating that they locked their phones for extended periods of times, thereby experiencing increased concentration. The Gentle Wake feature had a tremendous effect on their morning routines that made them less reliant on the phone and more conscious about what they do.

The users had suggestions for future implementations that included healthy eating advice on meals to have based on dietary restrictions and preferences; cooking recipes and shopping lists for easier meal planning. Another idea was a feature that will help you set goals such as reading more books, learning a new skill, or saving money and track them. Additionally, a feature that suggests local outdoor activities based on a user's interests and fitness level would boost outdoor engagement. Users also suggested having a feature that enables users find local community events or initiatives, access virtual fitness classes or workouts and get connected with local support groups regarding addiction recovery, mental health, or chronic illnesses. It would be easier for people to remain active indoors if they had more variety in the types of exercises that they do at home.

On another hand, and coupled with other things as well as suggestions for future implementations, this Miro board gave us insights into the phone app popularities from its most loved to most hated features; changes in usage patterns; recommendations made thereof. The findings are indicated by habit forming applications like proper boundary setting tools and meditating minds.

Lock:

Based on user feedback gathered during interviews, the Lock feature of the prototype has received mixed reviews. Some users found it to be user-friendly and beneficial for avoiding distractions, aligning with the goal of reducing digital device usage to achieve a digital detox. However, others found the Lock feature to be inconvenient and challenging, potentially due to the need for advanced planning and adapting to a new routine. One of the participants stated: „*The Lock feature was okay, but I didn't find it particularly helpful. I didn't have any major challenges with it, but I also didn't feel like it made a significant impact on my productivity or focus.*". On the contrary, another participant stated: "*I really enjoyed using the Lock feature. It helped me stay on track and avoid distractions, especially when I was trying to get work done.*".

It's essential to recognize that achieving digital detoxing often requires a significant behavior change, which can be challenging for some users. Interestingly, the impact on productivity varied among users, likely influenced by their work styles and the nature of their tasks. This suggests the need to explore how to tailor the Lock feature to different user types and tasks. One of the participants stated: "*There were times when I really appreciated being able to lock my phone away and focus on other things, but there were also times when I felt like it was more of a hassle than anything else.*".

The Lock feature appears effective in promoting present moment focus and phone detachment, but some users faced situations where they needed urgent device access, indicating that the feature may not suit all users or scenarios. Users with busy schedules found it more challenging to integrate the feature, as it demanded additional planning and effort. Additionally, setting the lock time was perceived as tedious by some, potentially affecting user engagement.

These insights highlight the necessity for further refinement and development of the Lock feature to ensure its usability and effectiveness. While the feedback indicates potential for the Lock feature as a digital detox tool, it also underscores the importance of addressing user-identified challenges and limitations. Future research can play a pivotal role in shaping subsequent iterations of the prototype and enhancing the efficacy of digital detox strategies.

Gentle Wake:

The feedback from users about the Gentle Wake feature of the prototype is generally positive. Users reported experiencing improved focus in the morning, greater consistency in their daily routines, and increased productivity. They also found that the feature helped them steer clear of phone distractions and reduced morning stress. One participant stated: „*The Gentle Wake feature was a great addition to my morning routine. I love being able to focus on my healthy habits without being distracted by my phone.*“.

However, there were some drawbacks mentioned by users. Some found the waiting time frustrating, and adapting to the new routine posed challenges that could affect user engagement, stating: „*I also felt like wasn’t able to fully enjoy my morning routine without my phone, which made the feature feel more like a nidrance than a help.*“. Additionally, there were mixed feelings among users, emphasizing the need to account for individual preferences and routines. Some users even admitted to feeling tempted to unlock their phones during the waiting period, potentially undermining the feature's effectiveness. This underscores the importance of considering user experience and challenges when designing digital detox strategies. One of the participant stated: „*I sometimes found it challenging to resist the temptation to check my phone, even when it was locked away.*“.

Furthermore, the feature didn't suit all users or situations. Some users found it inconvenient at times, suggesting that it may not be a one-size-fits-all solution. Despite these challenges, most users regarded the Gentle Wake feature as a valuable addition to the prototype, appreciating the reduced morning stress and distraction it provided.

Events:

The feedback on the prototype's Events feature was brief but informative. Users found it easy to use and effective for finding nearby events. Some users suggested adding more search filters, indicating room for improvement. This feedback suggests that the Events feature can promote offline activities and reduce digital device usage. It encourages users to discover and book events, fostering in-person experiences. However, the filter suggestion underscores the need to consider user preferences in digital detoxing strategies. Incorporating this feedback can enhance the feature's effectiveness and user experience. One of them said: „*I really liked the Events feature. It was very easy to find and book events near my location. The only challenge I faced was that there weren’t a lot of events available in my area. Also a better filter would be fine.*“.

Water Tracker:

Many Water Tracker users found the feature helpful for staying hydrated and keeping track of their daily water intake. Some users even appreciated it as a reminder to drink more water. However, a few users found it time-consuming and had trouble with the confusing interface, which might affect their engagement with the feature, stating: „*The water intake feature was useful for me because it helped me become more aware of how much water I was drinking each day. However, I found the interface a bit confusing and difficult to navigate.*“.

Additionally, some users suggested improving the feature by integrating it with smartphones to enable water intake logging from anywhere and syncing with fitness trackers. Some users mentioned that manual data entry was required, potentially discouraging their engagement. Moreover, the feature didn't account for other sources of liquids, potentially affecting the accuracy of water intake measurement. Users also noted the lack of notifications as an area for improvement to help them reach their daily water intake goals.

Meditation:

The feedback from users regarding the Meditation feature of the digital detoxing prototype suggests both positive and negative aspects. Users found it helpful for reducing stress and anxiety, as well as a way to relax and clear their minds. Some also mentioned that it gave their day a positive start and helped with a positive mindset. However, some users found it too soothing and repetitive, with a monotone voice. Beginners had a hard time being consistent with the practice, and some mentioned the lack of notifications as an area for improvement to help them stay on track with their meditation goals. One participant: „*It would have been nice if the app could send reminders or notifications to encourage me to use it more often.*“.

This feedback underscores the need to enhance the user experience by considering additional features like different voices, music, or various meditation practices for improved effectiveness.

Cheer List:

For the Cheer List feature the users said that it is simple and fun to create their own lists. Some users also found it interesting and reported that they would recommend it. However, there were some mixed reviews, with some users stating that there was no point in using the feature, and that they would prefer a more personalized approach. Nonetheless, some users reported that they loved the feature and found it to be a nice surprise when they selected a random happy cheer. One participant stated: „*I loved the Cheer List feature! It was a great way to remind myself of the little things that make me happy and it was always a nice surprise when I got a random cheer suggestion.*“.

5.1.2 Quantitative Analysis

For the purpose of finding out the effectiveness of a digital detox assistant prototype, three different types of analysis were conducted in which are Descriptive, T-Test, and NPar Test. In fact, by using Descriptive approach in the analysis one could have an initial understanding of what the dataset looks like. But then its distribution was observed to be significantly deviating from normality. This was evident both on Shapiro-Wilk test results ($p < 0.05$) as well as by simply looking at histogram and normal probability plot with eyes. Deviation from this ideal shape implies that there might be some alternative ways to extract sense from it with statistical methods that are more resistant to outliers.

It was found that the assumption of normality was violated for both Pre-Intervention and Post-Intervention Average Screentime by the Shapiro-Wilk tests (W = 0.105 and W = 0.689). The solution to this problem was to use a non-parametric test to compare the means of variables between groups. For this purpose, the Wilcoxon signed-rank test was applied to investigate any possible differences in the average screentime mean scores before and after research. According to null hypothesis, there were no differences in mean scores while alternative hypothesis states that there were significant differences. As such, a p-value of 0.016 as computed using Wilcoxon signed-rank tests represented a statistically significant difference in mean scores. In addition, it emerged that effect size (r) amounted to [Fill], which indicated existence of moderate effect size. This typifies how locker box is very instrumental in making substantial change on screentime behavior among participants.

In the same vein, it should also be noted that the distribution of Average Device Locking Time was found to be dissimilar from normal (Shapiro-Wilk test: W = 0.345). As a result, a non-parametric approach had to be taken for further study. Thus, by using the Wilcoxon signed-rank test, this research aimed at identifying any significant changes in the average values of locking times. Though there are no detailed statistical findings yet, it can be observed that this method allows for rigorous analysis of how prototype affects the users' interaction with device management.

The purpose of the abstinence chest was achieved as the participants kept on locking it for a considerable long period of time. The mean and standard deviation of the average device locking time were 123.29 minutes and 73.072 minutes respectively, with the lowest and highest being 36 minutes and 216 minutes. The distribution of the average locking time showed negative skewness meaning that the data was skewed in favor of longer locking durations. Participants utilized the mind-fulness-promoting aspect. The mean meditation time reported by participants was found to be 6.00 minutes, with a standard deviation of 3.697 minutes; it varied from zero to ten minutes over participants' records. This can be seen from kurtosis value which indicated slightly negatively skewed distribution pointing out that there were slightly more shorter meditation times than longer ones.

The data did not conform to normality as there was a significant departure from normal in the Shapiro-Wilk test ($p < 0.05$) together with scrutiny of the histogram and normal probability plot. The Pre-Intervention Average Screentime distribution was significantly non-normal, established by a Shapiro-Wilk test (W = 0.105). On the other hand, Post-Intervention Average Screentime distribution was significantly different from its normal distribution based on a Shapiro-Wilk test (W = 0.689). For this reason, we employed non-parametric tests in our analysis. The Wilcoxon signed-rank test was used to determine whether there were significant differences between the mean scores of average screentime before and after the study. There is a statistically significant difference between the mean scores given that the Wilcoxon signed-rank test statistic in this case is equal to -2.410, which also corresponds to p-value of 0.016. The effect size indicated moderate effect size of -2.410. This means that there was a significant decrease in screen time during the 7-day intervention phase, thus providing evidence for its efficacy at reducing screen time for children using an opt-out strategy over Thanksgiving holidays compared to an opt-in only approach. More conscious conduct resulted from deliberate use of locking function for example when students are studying or cooking besides participating in social events or any other tasks one could engage in within his/her life out-side campus; Locking feature was most preferred by participants who made use of it more than any other person with an average duration of 123.29 minutes per day.

In the end, the implementation of sophisticated statistical tests in this analytical framework does not only add to what will be found out during the qualitative exploration of usability of the digital detox assistant but also supports its measurable impacts. The procedures selected, which are based on an understanding of non-normal data distributions, provide a holistic evaluation of how the prototype is affecting participants' technology usage trends. It confirms that the digital detox assistant prototype has a possibility to become an effective tool of cultivating healthier tech habits and emphasizes its significance in a larger dimension of digital wellness.

5.1.3 Design Recommendations for Abstinence Systems

It can be possible to produce a number of design improvements for the prototype that will help users maintain the balance between their digital and real-life experiences more effectively.

In conclusion, it would be better to propose these three areas of improvement for the prototype. Firstly, giving users greater flexibility in setting time limits and customizable options could lead to better convenience. This allows every individual to personalize the application according to their specific needs and preferences. Taking urgent situations into account, an emergency unlocking feature should be built in. It is important since it allows users' device reaccessability while still promoting responsible usage. Similarly, providing different locking modes such as selective app blocking or specific time frames will make the prototype more adaptable and widely desirable among different user groups.

The tool can also include game elements that will ensure users get engaged in a better way. Such features would make setting time limits fun and encourage frequent utilization of the program. Additionally, by displaying visualizations and progress trackers on the tool, users are motivated to track their progress towards achieving digital detoxing goals and maintaining them successfully. Thus, personalization is very significant; hence, it would be good if individuals were allowed to select wake-up sounds and meditation experiences which resonate with them.

Interactive features, e.g. user-generated materials, have the ability to encourage individuals to create a community of like-minded people with common aims that can ultimately make them disengage from their gadgets. Lastly, adding sentiment analysis that gives positive messages pegged on users' feelings helps create individualized approach and further supports users in their online abstinence efforts.

6 Discussion

The objective of this master's thesis is to find out how to make people stop using digital devices too much as they may hinder their well-being in general. It has been hypothesized that the above-mentioned tool can help users quit using their smartphones automatically at night and in the morning. The main idea behind its development was to reduce the number of times people would access their

phones by locking them up throughout the day. Interviews revealed that it served as a concrete reminder for box owners who thought twice before impulsively checking into their phones. On the whole, respondents liked this physical barrier but few encountered difficulties in adjusting to not having instant access to their mobile devices or fight against notifications. Besides, a small group of participants also faced some challenges in arranging their mornings without a phone. Previous studies have shown that both questioning and journaling are useful for stimulating inner thoughts [FF10] [CLK15]. In this regard, participants used printed notebooks as diaries where they chronicled their daily technology use, accompanying emotions and associated thoughts. They also kept records of how they reacted to different situations while using it, specifying which methods worked best for them and which did not. Interviews with participants revealed that the prototype also prompted them to reflect upon their daily phone usage.

People's actions in certain situations are determined by their intention to behave in a certain way according to the Theory of Planned Behaviour [Ajz91], this is influenced by how likely they think it would be for them to achieve their desired results, and also their personal perception of the risks and benefits involved. Among several features, the prototype has meditation, cheer list and gentle wake-up functionality which successfully addresses the capability aspect as described in Fogg's Behavior Model [Fer10].

Some important findings from the study show a decrease in the amount of time people spend on their screens. For instance, before the study, participants were found spending between 150 and 480 minutes on their screens with an average of 252.86 minutes and a standard deviation of 123.520. After the completion of studying this now ranged between 50 to 300 having mean number of 160.00 minutes and standard deviation at 89.815. The locking feature worked effectively in our prototype by continuously motivating users to resist frequently using their devices per day.

When compared to other persuasive technologies, this prototype stands out as a powerful tool for helping users with their main tasks. This is according to Oinas-Kukkonen and Harjumaa's systematic persuasion profiling of 2008 [OH08]. Traditional smartphone detox apps differ from the prototype which uses digital reminders to keep track of screen time by being in the form of a physical container that offers an immediate and tangible reminder that is difficult to ignore. The interactive locking feature makes it possible for its actions to be directly connected with their commitment towards reducing screen time.

Notably, there are more effective approaches than single-feature interventions in addressing various aspects of digital addiction [Boz19]. The product includes features such as gentle wake-up support, meditation assistance, a motivation cheer list, and reminders to stay hydrated hence giving users a complete toolkit for managing different aspects of their behavior. Users liked the gentle wake up feature and meditation as they were instrumental in promoting "me-time" in the morning free from screens and cultivating mindfulness.

According to the study, it is important to personalize interventions as these depend on individual preferences and requirements that can result in effective management of their digital habits. The participants had different suggestions for improving the physical barrier, which showed that they had varying daily routines and lacked consistency. Consequently, such interventions must be tailored differently depending on each individual's behavior and motivation to make them more effective.

However, there are some limitations that need to be considered by the researchers. To start with, the one-week long study as well as a small number of participants may limit generalization of the findings beyond this study sample and form the weakness in this field of research [Sch20]. So, if future examines are going to be more substantial one, they will have to continue longer than one week and include a wider range of respondents. By doing so, we could say that there is no doubt about "whenever" application of behavioral theory elements like incentives or goal-oriented approaches or social support in addition to what has been discussed above in relation to a future upgrade of the prototype aimed at reducing screen time [Fug07].

7 Conclusion

Through this extensive study, the research has effectively evaluated how digital detox assistant influences its users with the target of striking a healthier balance between their digital interactions and real-life experiences. The integration of usability testing, qualitative analysis and statistical examinations has allowed for the intricate understanding of how participants' technology usage patterns change due to the prototype.

The results indicate the promising potential of the detox assistant in reorienting and regulating user screentime behaviors. A remarkable reduction in average daily screen time and increased engagement with locking feature demonstrate effectiveness of the prototype in promoting mindful use of technology. It possesses such attributes as flexible time limits, gamification elements, as well as personalization options which have made it more appealing and usable, addressing different user tastes and preferences.

Having said that, however, it is critical to consider the fact that how much a prototype can be used varies among different people. This needs more study on how it can be refined in its features and functionalities and become a more targeted and more universal intervention. It is important to note that non-normal distribution of some data points calls for further exploration by using larger sample sizes as well as divers user groups. These findings are consistent with an iterative approach needed to confirm and improve the validity of the investigation while at the same time making certain that the digital detox assistant remains applicable to many users and contexts.

In summary, this research has demonstrated how the digital detox assistant can be helpful in encouraging a conscious use of technology. The interplay of digital and real-life experiences is such a tricky affair hence there is need for constant research which will go a long way in refining or expanding this prototype into an adaptable intervention that speaks to different users and addresses problems associated with excessive use of digital devices.

Future Work:

This is not the end of the journey in exploring the potential uses of the prototype as a digital detoxification tool. Further studies in this direction can be focused on:

1. **Long-term effects:** Beyond the first trial, future research should go further and evaluate long-term outcomes of the digital detox assistant. This will involve carrying out longitudinal studies in order to understand how users' digital habits and their general wellbeing changes over a long period. This also exceeds the usability testing, giving insights into what is sustained as well as the impacts of using a prototype.
2. **Diverse user groups:** It is important to have a diversified study participant pool in order to have a better understanding of the resonance of the digital detox assistant across various demographic groups. Further research should look into user groups that include different professions, ages and digital addictions. This holistic view will enable customization of the prototype according to the unique requirements of diverse user profiles.

3. **User engagement strategies:** Another way of exploring future avenues is by increasing user engagement with the digital detox assistant. Such research could be directed towards improving the gamification elements, encouraging a supportive user community or even applying behavioral psychology approaches that would promote continued use of the service. The researchers can enhance the prototype to make it more motivating, interactive and efficient in creating healthy digital behavior if they address user engagement strategies

4. **Machine learning integration:** Other important factors to consider include the incorporation of machine learning algorithms in the digital detox assistant. This modern technology can also provide individual's experiences and recommendations based on their conduct and emotions. Through machine learning, the prototype becomes adaptive to different user requirements, offering a more personalized and meaningful digital detox journey.

5. **Cross-platform compatibility:** To cater for the diverse technology landscape it is crucial to increase the compatibility of the prototype to more devices and operating systems. For future plans, a cross-platform compatibility should be focused on so as to enable users incorporate their digital detox assistant into whatever technological ecosystem they may have preference for, without any hitches.

6. **Privacy and security:** To address privacy and security concerns, continuous efforts should be directed towards robust encryption and authentication measures implementation. Given the sensitive nature of the information handled by the digital detox assistant, safeguarding user data is paramount. Future research should explore and implement cutting-edge security measures to ensure user trust in this tool.

7. **User education:** Finally, it is very important in terms of user education for forthcoming studies to focus on creating comprehensive educational resources and content. These materials will help users acknowledge the importance of digital detoxing and offer them practical tips on how they can develop healthy technology habits. Handing over knowledge and resource for users contribute to digitally well-being as a comprehensive approach to it.

Although the present study attempts to discuss in detail the effects of using digital devices among young adult students while also suggesting a customized remedy for this in form of a digital detox assistant, it is important to identify some limitations. First, the survey as well as expert interviews mainly relies on self-report data and may therefore contain one-sided answers or untruthful responses as a result of participants' opinions or social desirability. The findings can be supported by more advanced methods that involve both qualitative and quantitative approaches.

As an additional point, the research's concentration on a specific age group (23-26 years old) and demographic (students) could limit the results from being applied generally to other populations. To gain better insights into these issues, other research efforts can be carried out with broader categories based on age range and occupation background. Longitudinal studies along with user testing over an extended period could help to determine how effective such solutions are over time. By considering these limitations and taking them into account when planning future projects, further development of digital detox programs suitable for various users and providing long-lasting benefits will become possible.

In conclusion, the digital detox assistant has shown potential to encourage mindful technology use but additional research and development work is required in order to make it perfect and increase its scope. If these future research directions are considered, it would help to endow the ongoing discourse on digital well-being with a more comprehensive perspective and present users with a precious resource capable of enabling them to strike a healthier balance between their online and offline lives.

8 Literature

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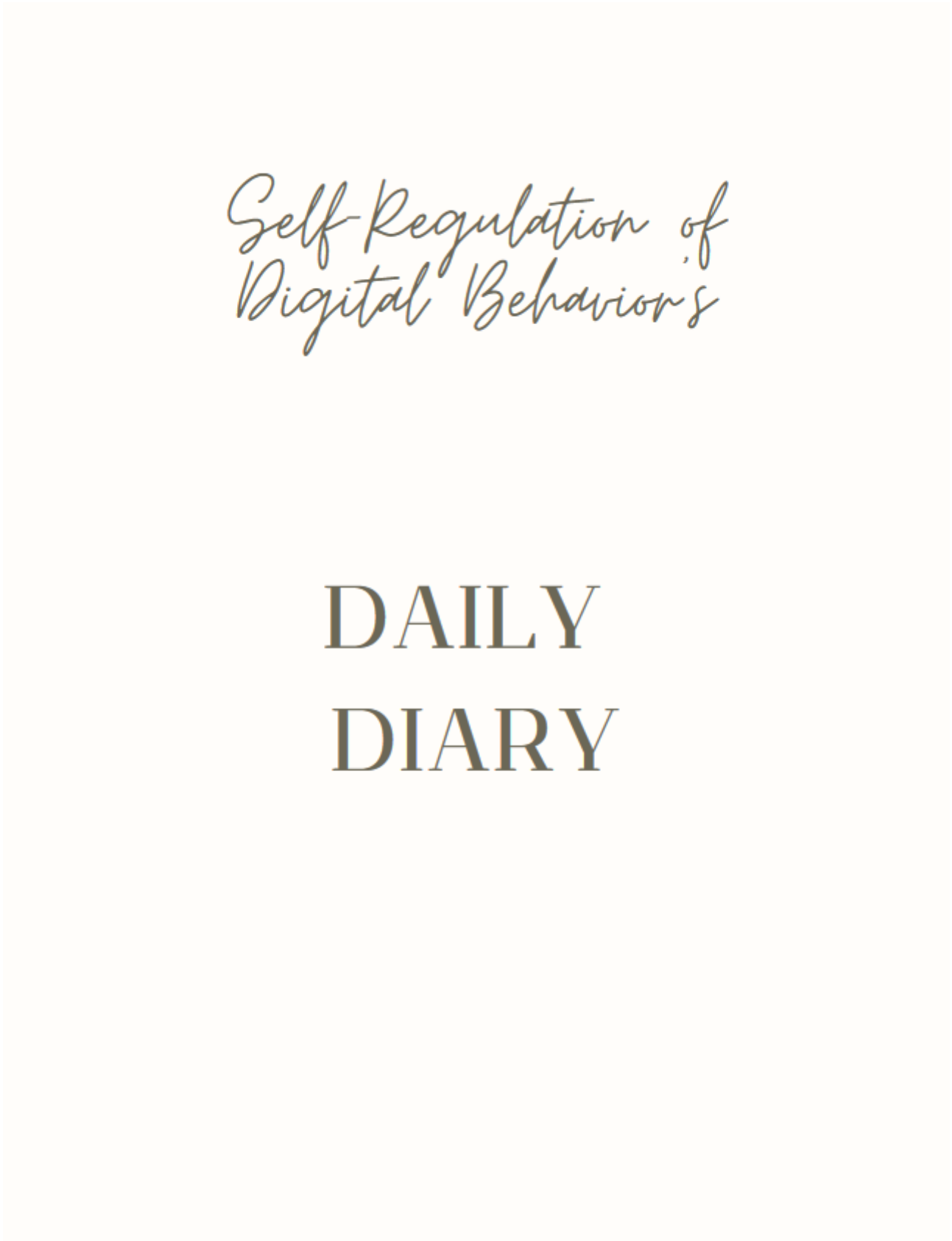
9 Appendices

9.1 Diary's



Daily check in - Day 1

OVERALL FEELING ABOUT TECHNOLOGY UASGE


Awesome ☐


Good ☐


Okay ☐


Not good ☐


Horrible ☐

How long did you lock your phone today:

How long did you lock your laptop today:

What did you accomplish with the prototype today?

Reduce Stress and Anxiety	Recharge Brain	Improve Relationship
Increase Productivity	Free Time	Feel Happier
Increase Creativity	Better Physical Activity	Other -

How did the usage of the prototype made you feel today?

Angry	Happy	Surprised
Annoyed	Sad	Other -

Additional Notes (Optional)...

9.2 Consent form for user study interviews

CONSENT FORM - Self-regulating digital user behavior

Project goal: Digital devices are commonly used for information, entertainment, and communication. However, excessive usage can negatively impact well-being, performance, and social interactions. As awareness of this issue increases, more people may seek ways to limit digital device interference in their daily lives. Effective digital detox interventions are needed to address this issue.

The prototype created aims to address the problem of excessive digital device usage by providing users with a way to reduce their screen time. The prototype enables users to lock their phone for a certain amount of time, effectively limiting the amount of time spent using the device. This serves as a positive and counterproductive tool for digital detox interventions, giving users more control over their digital device usage and potentially improving their well-being, performance, and social interactions.

Procedure: The prototype is a locking box that enables people to practice abstinence by physically separating them from their smartphone and laptop. In laymen's term 'out of sight out of mind'. A brief tutorial will be given to you at the beginning to help you become comfortable with the prototype box and how to use it. You are requested to take the box home and use it for the next 7 days to explore and build a healthier relationship with technology. Data about the app's usage will be recorded while the prototype is being used. Additionally, a diary will be given to you, which you must fill out by the end of each day and record your everyday experiences. In the end, you will be asked some follow-up questions regarding your opinions and your overall experience with the prototype.

The study does not entail any risks.

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Expected Duration: 1 Week

In the following I would like to inform you about the most important points of the research and about the working method:

- You can't go wrong in this research; your honest opinion is important.
- You can act and speak freely during the research.
- The data obtained will be evaluated confidentially and anonymously.
- You can end the research at any time without explanation and without consequences.
- If you want to tell something after the research, you are welcome to contact me

- If you wish, we can send you a summary of the research.

I have been asked to take part in the TU Wien research project specified above. I hereby consent to participate in this study.

I consent to and understand the following:	Yes	No
• My participation is voluntary		
• I have read all points, and I consent to take participation in the study		
• Share images, text, videos where applicable during the study with the investigators of this study.		
• Audio recordings being taken during the interviews		
• The data provided during the study and the recordings of the interviews may be used by the investigators of this project for related future research work and publications.		

Name of participant

Participant signature Date

Participant number: