

Social Media Usage Behavior - Does a break for impulse control between the stimulus to open a social media app and the actual response to open the app reduce the total time spent using a social media app?

Franziska Goll

Technische Hochschule Würzburg-Schweinfurt
Würzburg, Deutschland
Franziska.goll@study.thws.de

Karsten Huffstadt

Technische Hochschule Würzburg-Schweinfurt
Würzburg, Deutschland
Karsten.huffstadt@thws.de

Abstract— This study investigates people's unconscious behavior of opening social media apps based on the stimulus-response schema from psychology. The goal is to find out whether an automatic break between the stimulus of wanting to open a social media app and the reaction of actually doing so could reduce the usage time of these apps. The study quantitatively tests how the usage time of the social media app Instagram changes in 37 subjects if they use Instagram for one week with the preceding app "one sec" that induces such an interruption, compared to normal usage.

Keywords- Social media, time of use, stimulus-response schema, impulsivity, interruption.

I. INTRODUCTION

When looking at current data on social media, it is noticeable that social media enjoy great popularity. According to a data survey published by Statista, 4.76 billion people worldwide used social networks in January 2023 [1]. According to the German Federal Statistical Office, the world's population in 2023 will amount to more than eight billion people [2]. This means that more than 50 percent of the world's population uses social media. According to projections, the social media platform Instagram has 1.48 billion active users worldwide [3]. In Germany, 14- to 29-year-olds spend 29 minutes a day on Instagram [4], and as of 2021, Germans spend a total of 89 minutes a day on various social media [5].

The reasons for using social media platforms are manifold. Some of them are to find out what friends are doing, to stay in touch, to be inspired by important and interesting personalities and to keep up to date with current events [6]. However, even if the motivations to use social media are positive, too much

consumption can have negative effects. For example, behaviors such as less physical activity or higher levels of depression and stress, as well as poorer academic performance, correlate with high Internet use [7].

More and more adolescents are exhibiting addictive behavior when using social media [8]. Similar to the use of alcohol or drugs, the brain releases the hormone dopamine when using social media. However, not everyone who uses social media on a daily basis is immediately addicted. Most people go on social media rather mindlessly. People tend to open the app unconsciously, without any real reason to do so [9].

If this behavior is abstracted and slightly modified, the stimulus-response scheme known from psychology [10] seems to be applicable to this phenomenon as well. It assumes that an unspecified conscious or unconscious stimulus occurs, which is followed by a reaction that leads to opening the social media app without really being aware of this action. Interrupting this reaction could lead to better impulse control and pave the way for a conscious review of whether the upcoming reaction is actually useful or whether it can be dispensed with.

The aim of the scientific work is to find out whether an automatic interruption with a phase of awareness between the stimulus to open a social media app and the reaction to actually do so could be a proven means to reduce the actual usage time of this app.

To test this hypothesis, the app "one sec" will be used, which induces an automatic interruption between stimulus and reaction. To this end, an empirical study will quantitatively test how the usage time of the social media app Instagram changes in 37 subjects who use Instagram as usual for one week compared to when they use Instagram for one week with the "one sec" app upstream. The significance of the quantitative study is then tested using a paired-samples T-test.

The subsequent sections of this research work delve into the core components of the study. Section II provides an in-depth exploration of the theoretical framework. In Section III, the research methodology and design are elucidated, including an examination of the functionality of the "one sec" app in its free version and the rationale behind selecting Instagram as the

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primary social media platform. Furthermore, various limitations associated with the study design are delineated. Thereupon, in Section III, the data collected in the study is prepared and presented. The data is analyzed in Section IV. Section V offers an interpretation of the findings and addresses the research hypothesis. Finally, both the study and its implementation are critically reviewed and recommendations for action are made for work with similar questions.

II. THEORETICAL CONSTRUCT

The theory of behaviorism, which influenced the social sciences worldwide in the years between 1900 and 1960, forms the basis for the stimulus-response model. Behaviorism assumes that human actions are due to external stimuli, and always produce a measurable response. Accordingly, human consciousness is not a significant influencing factor as far as human actions are concerned.

Probably the most famous experiment in this regard was conducted by the Russian scientist Ivan Petrovich Pavlov (1849-1936). He conditioned dogs to eat every time a bell was rung. Dogs start salivating when they get food. This is a natural innate reflex of dogs. After some time of conditioning, the dogs from Pavlov's experiment started salivating when they only heard the bell without being given food. Thus, the innate reflex of salivation was coupled to a new stimulus [11].

The constant repetition of the ringing of the bell, which was then followed by the food, has led dogs to develop an automatic habitual reflex, also known as a conditional reflex. Humans also have habits that help them cope with life. An example of this is getting dressed in the morning, which everyone learns in childhood and then does automatically throughout their lives without having to think about it. But not every habit is positive. The so-called "flowing band disease" is a prime example of negative habits. This is suffered by workers who have always performed the same manual operations on the assembly line for a very long time. Even when they no longer perform this work, they fall back into the same movement patterns again and again. This is evidence that when you've done something repeatedly for a long time, eventually you can't stop doing it. And so "every addiction has one of its roots in habit" [12].

Activities of everyday life that are performed without really appearing in consciousness are also called dynamic schemas, scripts, or event concepts. Through such reaction patterns it is possible for humans to live in a world full of stimuli, without stimulus overload [13].

Stimuli are not always consciously perceived as such. Just look at the way social media apps work. Likes, clicks and text messages are perceived as rewarding. They make you feel happy and satisfied. However, this feeling of satisfaction is short-lived, which is why people try to recreate this state. However, the positive stimuli only occur at random intervals. Thus, smartphones must be checked regularly by users to see if an opportunity has arisen that allows this reward effect to be produced again. The neurotransmitter dopamine is responsible for the feeling of satisfaction. Dopamine is released by neurons and sends signals to nerve cells in the central nervous system. In the functioning of social media apps that exploit human innate systems, the construct of the feedback loop plays a crucial role. The user expects positive stimuli from the social media app, just as a gambler does when gambling. The dopamine neurons are

very active during this anticipation phase. However, this activity is only temporary and subsides when the expected positive stimulus does not occur. This is where the so-called "variable reward schedules" of social media apps come into play. The user is exposed to stimuli, the social media app, at regular intervals. These are mostly neutral and rarely positive. But the rarely occurring positive stimulus ensures that dopamine is released and the user experiences a high feeling again. Thus, the user is kept in the feedback loop where dopamine is released and slowly degraded. During the degradation, the user tries to release dopamine again by periodically accessing the social media app to check whether an appropriate stimulus has occurred that can generate this high feeling again [14].

This results in a high usage time of social media apps. In 2021, the daily time spent on social media networks in Germany was 89 minutes per day, while the global average was as high as 147 minutes per day [15].

Studies suggest that there is a link between the amount of time spent using social media networks and depression. For example, one study found that a higher usage time of one hour increased the depression score by 0.84 percent. Therefore, it is concluded that social media usage time is a reliable indicator of depression severity [16]. Furthermore, studies show that excessive Internet use goes hand in hand with negative effects, both socially and physically. Among them are stress, behaviors that negatively affect health, and poorer academic performance [17]. Another study proves that the reasons for using Instagram specifically, applied to the benefits and needs theory, differ based on gender, field of study, and time a person spends on Instagram. Male students, according to this study, are more likely to use Instagram to showcase themselves, while female students often use Instagram to escape from uncomfortable situations. In addition, female students notice Instagram posts more often than male students. Usage time correlates with the desire to document the experience, which was not found to be as pronounced in other subjects with lower usage time [18]. Although there is a correlation between too much internet and social media use with negative physical and mental consequences, a 2018 qualitative study found that of the respondents who self-rated their social media use as problematic, 92 percent would not give up social media [19].

Therefore, there are already scientific approaches to regulate social media consumption and enable the user to make more conscious and freer decisions about whether they really want to use social media apps consciously in specific situations or whether this is done more unconsciously. Since the decision to open a social media app is usually an impulsive decision, interrupting before actually opening the social media app allows the user to consciously reconsider the decision and thus prevent impulsive use. The combination of delaying the opening of the app, the triggering of conscious reflection on the intention triggered by a message and the possibility of not opening the app via button click, which is all realized by the app "one sec", have already proven their effectiveness. A study shows that in a period of six weeks, the number of attempts to open the app fell by 57 percent [20].

Impulsivity seems to play a central role in Internet addiction [21], of which social media addiction is a subcategory [22]. Internet addiction, for which there is as yet no agreed definition, was for a time classified under psychiatric disorders, like

impulse control disorder [23]. However, it is now more likely to be located among the addictive disorders because Internet-related disorder, as Internet addiction is also known, has many addiction-like characteristics. Namely, its use can reach harmful, risky, and abusive levels [24]. Research approaches to addictive disorders in general, take the approach that addiction is facilitated by a dysfunction between the neural system responsible for decision making and the amygdala, which controls short-term impulses related to pleasure and pain. A healthy person can consciously control a decision-making process because the two neural systems interact. The research approach assumes that this interaction does not work properly and excessive activity of the impulsive system, ensures that no long-term decisions can be made with the help of the reflected part of the brain and thus also cannot be controlled consciously enough, how often one uses social media [25].

The approach of interruption for better impulse control is an aspect that is already used more often in practice. Here, it is often recommended to take a deep breath or count to ten in order to achieve interruption and create a moment of reflection before reacting to an impulse. This is all part of the concept of mindfulness, which can lead to better impulse control [26]. The frequent practice use of mindfulness suggests that even when the impulse is to want to open a social media app, this approach ensures that one uses the app less overall, as it brings about impulse control.

III. EMPIRY

A. Study design and methodology

The quantitative study deals with the recording and change of the usage time of a social media app using the concrete example of Instagram in connection with an interruption of the opening process of the social media app caused by the app "one sec". For this purpose, 37 subjects will use Instagram as usual for one week. The first week will start on Monday (May 1, 2023) and end on Sunday (May 7, 2023) at 8 pm. The usage time will be recorded automatically by Instagram itself as well as by the app "one sec", and the smartphone. The usage times of the week are transmitted via screenshot. The Android users take the screenshot of the usage time captured by "one sec" and the iOS users take the screenshot of the time captured by the smartphone. The reason that iOS users cannot take the screenshot of the usage time captured by "one sec" is that "one sec" on iOS devices captures the usage time only from the time when the app is also activated. Since the app is not yet activated in week one, the usage time cannot be recorded by "one sec". In the following week, the same 37 test subjects will use Instagram in conjunction with the free version of the "one sec" app. This app, when activated, ensures that the Instagram opening process is interrupted. After clicking on the Instagram app icon, "one sec" becomes active and causes Instagram not to open immediately. Instead, you are prompted to take a deep breath. Only after about 10 seconds is it possible to confirm the opening again and thus access the platform or refrain from using it. The second week begins on Monday (May 8, 2023) and ends on Sunday (May 14, 2023) at 8 pm. The transmission of the usage data of the second week is analogous to the first week. Subsequently, all usage times are recorded and entered into Excel. The evaluation with

the test for significance by means of T-test for paired samples is carried out with the help of the program SPSS from IBM.

B. Apps used

Instagram is the most widely used social network in the 14 to 29 age group [27], and since the intended subjects are all in this age group, Instagram seemed an obvious choice. Also, a small research, which included a survey of some of the potential subjects (about 15), revealed that Instagram is actively used by all of them. In comparison, only about half said they actively use TikTok, for example. In addition, it was mentioned more frequently during the interviews that Instagram would often be opened thoughtlessly and unconsciously in everyday life. They reported that they would only become aware that they were currently on the platform after several minutes in the app. Since this is a large part of the underlying research question, the social media app ultimately chosen was Instagram.

To automatically create the interruption for impulse control, the app "one sec" was used. It delays the opening of another app and is available for both Android and iOS devices. In its free version, "one sec" can be placed in front of another app and intervenes when that app is to be opened in three steps. First, the consumer is interrupted by the display of "Take a deep breath..." and asked to pause for a moment. In the second step, a screen animation delays the opening by 10 seconds, and in the third step, the consumer can click a button to decide whether he really wants to open the app or not. In addition, "one sec" shows how many times the consumer has tried to open the app in the last 24 hours [28].

C. Implementation of the study

To conduct the study, it was first necessary to find suitable subjects. A suitable test person is characterized by the fact that he or she uses Instagram on a daily basis and is in the age group 14 to 29. Furthermore, the course of the study had to be planned precisely. For this purpose, a suitable period was selected in which Instagram could first be used as usual for one week and then in conjunction with the app "one sec" in the following week. Since the study aims to capture usage behavior that is as natural as possible, at least in the first week, the time period did not have to meet any special criteria. Therefore, the start date for the first week was May 1, 2023. In order to inform the subjects comprehensively about the study, they were contacted via WhatsApp and received a detailed information letter, because in the study it was important to communicate everything transparently. On May 1, 2023, the subjects were informed that the first week would now begin. During this week, everyone used Instagram as usual. 39 subjects started the first week. As the subjects were already informed, the first week ended on May 7, 2023, at 8 pm. At this time, the subjects were again informed by text message to now submit their usage time data via screenshot and in the course of this also to activate "one sec" in order to then start the second week of the study. Some of the test persons had difficulties with the installation, which could be solved by support. The second week ended on May 14, at 8 pm. At the end of this week, subjects were again asked to submit their usage time data via screenshot via text message. 37 subjects shared their usage times via screenshot. Two subjects did not continue the study after the first week due to technical problems. After the 37 subjects had submitted their usage data, the statistical analysis of the data followed.

Among the 37 subjects who had completed the study to the end, the average age was 23 years. The youngest subject was 19 years old, and the oldest subject was 29 years old. Thus, the subject group as a whole ranged in age from 14 to 29 years. 24 subjects were female, and 13 subjects were male. This was a randomly selected group consisting of high school students, college students, and employees. Nevertheless, the group of subjects was a homogeneous group with respect to the research question. All subjects were in the same age bracket, they had all used Instagram regularly prior to the study, meaning that they had similar experiences and habits in using this app, and they had all not heard of "one sec" before. In addition, all study participants had either completed vocational training or technical college entrance qualifications, which is why they all had a similar level of education. Furthermore, all places of residence were in the northeast of Baden-Württemberg or in the Würzburg area.

D. Data presentation

The following table shows the usage times of the 37 subjects. The times are summed up in minutes per weekday and broken down by week. For better comparability, the two weeks with the respective weekdays are shown next to each other.

TABLE I. USAGE TIMES

| Day of week | Week 1 (in minutes) | Week 2 (in minutes) |
|-------------|---------------------|---------------------|
| Monday | 2003 | 1451 |
| Tuesday | 1670 | 1310 |
| Wednesday | 1881 | 1167 |
| Thursday | 1743 | 1327 |
| Friday | 1841 | 913 |
| Saturday | 1373 | 1193 |
| Sunday | 1592 | 890 |
| Total | 12103 | 8217 |

^aTime of use of the subjects divided according to days of the week and week.

These values show that the test subjects used Instagram for an average of just under 47 minutes per day in the first week. In week two, the average usage time per day is just under 32 minutes, a difference of 15 minutes per day compared to week one. From this data, it appears that usage time decreased by 32 percent from week one to week two.

IV. EVALUATION

Based on these data, a T-test for paired samples can now be performed, since the group of subjects is homogeneous. These are paired and dependent samples, respectively, since they are the same group of subjects in week one and week two [29]. Therefore, t (dependent) can be determined by the following formula:

$$t = \frac{\bar{x}_d - \mu_d}{\hat{\sigma}_{\bar{x}_d}},$$

where \bar{x}_d represents the average of differences between paired observations, μ_d is the theoretical average of these differences, and $\hat{\sigma}_{\bar{x}_d}$ stand for the standard deviation of the average differences [30].

The null hypothesis is that the use of "one sec" has no effect on the subjects' usage time. Accordingly, the working hypothesis is that "one sec" reduces the subjects' usage time. Running the T-test with a 95 percent confidence interval of the difference yields the values shown in Table II.

Evaluating the paired-samples T-test for the summed usage times of all subjects in the first week compared to the summed usage times of all subjects in the second week, which can be found in Table II under Total, yielded an average difference of minus 105.02703, a reduction of 105 minutes, rounded. The standard deviation of the differences was 128.73605, indicating a considerable dispersion of the differences. The standard fault of the average was 21.16408, indicating that the estimated average of the differences is relatively accurate. The 95 percent confidence interval of the difference is between minus 147.94976 and minus 62.10429, and there is a 95 percent probability that the true mean lies within this range. Based on the degrees of freedom of 36, the difference was found to be statistically significant, as the T-value is minus 4.963 and both the one-sided and two-sided p-values, which is not shown in Table II, are less than 0.001. Thus, there is a 95 percent probability that the result is not due to chance or measurement error.

In summary, the results of the paired-samples T-test support the hypothesis that usage time differs significantly between the two weeks, rejecting the null hypothesis of the T-test that "one sec" has no effect on subjects' usage time. Usage time was lower on average in the second week than in the first week, and this difference, at the 95 percent confidence level, is statistically significant.

In addition, Table II also includes the values of the T-test for each day of the week. Thus, it is possible to evaluate from day to day how "one sec" has affected usage patterns. Statistics suggest that social media usage time varies by day of the week. For example, in a survey conducted in 2019, 26 percent reported using social media more intensively on Saturdays than on other days [31].

When statistically analyzed by day of the week, the values again paint the overall picture that the reduction in usage time is highly significant and not due to chance or sampling error. With an average value of minus 25.08108, the difference related to the days of the week of the two weeks is highest on Fridays. Saturdays have the smallest difference with an average of minus 4.86486. All other average values of the weekday comparisons are in between. The standard deviations of the weekdays range from 26.27462, which is the lowest value for Thursdays, to 43.67581, which was obtained for Fridays and is the highest value. All T-values range from minus 0.831 to minus 3.615. Since all p-values except the one from Saturdays are less than 0.05, all values have a very high statistical significance at a 95 percent confidence interval. Only the values for Saturdays, with a p-value of 0.206, do not have sufficient statistical significance, so that on this day it cannot be completely ruled out that the difference could have come about by chance. The not-so-high statistical significance of Saturdays, which is presumably due to the fact that usage time decreased by only 180 minutes from week one to week two, is consistent with the values collected by Statista 2019 to the extent that social media usage time on Saturdays differs from the other days of the week. A clue for a possible explanation could be provided by the catchment area of the subjects. All subjects live in the north-east of Baden-Württemberg or in the Würzburg area, which is why they all had similar weather when the study was conducted. It is striking that in the first week, the duration of use for a Saturday turned out to be very low. Looking at the weather for that Saturday, which was

TABLE II. PAIRED SAMPLES T-TEST

| | Average | Std.- Deviation | Std.- Fault Average | Lower Value | Upper Value | T | df | Unilateral p |
|-----------|------------|--------------------|---------------------------|----------------|----------------|--------|----|-----------------|
| Total | -105,02703 | 128,73605 | 21,16408 | -147,94976 | -62,10429 | -4,963 | 36 | < ,001 |
| Monday | -14,91892 | 34,85157 | 5,72956 | -26,53901 | -3,29883 | -2,604 | 36 | ,007 |
| Tuesday | -9,72973 | 34,46951 | 5,66675 | -21,22244 | 1,76298 | -1,717 | 36 | ,047 |
| Wednesday | -19,29730 | 32,46951 | 5,34021 | -30,12774 | -8,46685 | -3,614 | 36 | <,001 |
| Thursday | -11,24324 | 26,27462 | 4,31952 | -20,00364 | -2,48285 | -2,603 | 36 | ,007 |
| Friday | -25,08108 | 43,67581 | 7,18026 | -39,64332 | -10,51884 | -3,493 | 36 | <,001 |
| Saturday | -4,86486 | 35,60053 | 5,85269 | -16,73467 | 7,00494 | -,831 | 36 | ,206 |
| Sunday | -18,97297 | 33,72642 | 5,54459 | -30,21792 | -7,72802 | -3,422 | 36 | <,001 |

^bT-test with paired samples divided according to time of use of the days of the week and total time of use.

May 6, 2023, in that corner of Germany, we find that it was relatively warm and sunny for early May, while a week later, on Saturday, May 13, the weather was not as good, and the maximum temperature dropped by four degrees Celsius [32]. This could be an explanation for the special value that was found for Saturdays.

Nevertheless, due to the high statistical significance of the other days of the week and the very high statistical significance of the entire usage time evaluation, it can be assumed that the interruption between the stimulus of wanting to open a social media app and the reaction to actually doing so, which was brought about by "one sec", had an influence on the usage time of the subjects and led to a significant reduction in Instagram usage time from week one to week two by 32 percent.

V. CONCLUSION

This study has demonstrated the short-term effectiveness of "one sec" related to a reduction in usage time. This proves the hypothesis that a short interruption between the stimulus to open a social media app and the reaction to actually do so causes a kind of impulse control, thereby reducing the actual usage time. The subjects' usage data from week one show that Instagram usage time is enormous, averaging 47 minutes per day, and that Instagram has considerable addictive potential. A reduction of 32 percent from week one to week two is a great success. However, it should be noted that this only proved short-term effectiveness. Since "one sec" was only used for one week, no statements can be made about whether the interruption of the app opening process created by "one sec" would still lead to better impulse control after a longer period of time and could thus reduce usage times or whether the effect of the interruption wears off over time. This would have to be investigated in a long-term study to be able to make a scientifically sound statement here. It should also be noted that test subjects subsequently reported that only their Instagram usage time had been reduced, but that their total smartphone picture usage time had not decreased. Instead of using Instagram, as they normally do, they simply switched to other apps, according to their own statements. Furthermore, it must be mentioned that hardly any study participants continued to use "one sec" after the study. Most of the test subjects were extremely happy about the end of the study and thus no longer having to live with the interruption caused by "one sec" before Instagram. This suggests that the long-term effect of "one sec" could be limited, as users must freely choose to have their opening process interrupted. Further studies could investigate whether subjects would also

voluntarily endure such interruptions for longer if they were not forced to do so by the study's framework. Regarding the framework of the study, it must be noted that subjects knew from the beginning that their Instagram usage times were at stake. In this context, some subjects expressed the suspicion that their Instagram usage time could have been subconsciously influenced by this knowledge. Therefore, in future scientific studies in this area, care should be taken to set the framework conditions differently so as not to possibly indirectly influence the subjects as a result. It must also be critically mentioned that test subjects sometimes had technical problems that simply appeared from moment to moment. One example of this is that "one sec" did not cause the desired interruption of the opening attempt once, but then did so again the next time. If one does not want to use an external app that may cause technical problems, another research avenue for a follow-up study arises from the muscle memory of the thumb. Little-researched theories assume that the movement toward the Instagram icon or another frequently used app icon is stored in the thumb's muscle memory, so that the thumb automatically falls back into this movement again and again. Quite in the sense of a dynamic schema. Therefore, the interruption for impulse control could be created by moving the corresponding app icon to another place on the screen, so that when you unconsciously want to open the app, you click on the empty spot on the screen. On the one hand, this would have the effect that the interruption for impulse control could be created in a natural and possibly less annoying way by not being able to open an app because there is no app icon at this location. Secondly, no technical problems with an external app could arise, since no additional app would be needed. Thus, as with "one sec," the user could go through a conscious decision-making process for app use in the specific respective situation without being guided by impulses.

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