Student Social Media Usage and Its Relation to Free-recall Memory Tasks

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Abstract - Some studies reported that higher usage of social media is associated with lower performance in memory or other cognitive ability tests or lower academic achievement. The purpose of this research was to provide descriptive data regarding student social media usage and examine the relationship between the amount of time and frequency a certain platform was checked with the performance of memory tasks. The participants were high-school and university students aged between 16 and 20. They took part in a free-recall working memory task (WMT), after which they completed a Social Media Questionnaire (SMQ). Using regression analysis, it was found that Facebook/Instagram usage could not predict the task result and neither could the frequency of checking. Models tested separately for high-school and university students and found that frequent Instagram checking was a positive predictor of the free-recall task for university students. Additionally, Facebook usage related to Instagram usage and the frequency of Facebook checking related to Instagram checking. The results did not provide evidence to support the idea that social media is damaging to cognitive abilities, quite the opposite in the instance of Instagram checking by university students. A consensus on this topic is yet to be made and there is more research to be done.

Keywords - Social media; memory; cognitive abilities; Instagram; Facebook

I. INTRODUCTION

A. Theoretical background

The Internet and social media has become an important part of modern-day communication, especially amongst young people. Research explores relation between frequency and duration of internet and social media usage and other variables such as cognitive ability, memory capacity and academic performance. Social media usage and completing school work at the same time requires some multitasking skills. Media multitasking includes engaging in more than one media or non-media activity simultaneously [1]. Engaging in Facebook, texting and using instant messaging while trying to complete schoolwork means that students are multitasking [2].

Different scientists have provided a variety of result in this research field. Research conducted by [3] found that university students who multitask and use social media for academic purposes have the same academic performance as students who do not multitask with social media. However, students who multitask and use social media for non-academic purposes such as gaming have a lower academic performance. Researchers [2] have found that college students who multitask with ICT by using Facebook (FB) and texting during school work have a lower academic performance when measured by GPA. According to [4], there are some differences between academic performance and interpersonal relationships for students who are heavy and non-heavy internet users. Heavy internet users are more depressed, physically ill, lonely and introvert than non-heavy users. The same authors found that non-heavy internet users have better relationships with academic staff, better academic grades and have more learning satisfaction than heavy internet users. Additionally, some research has found that students who multitask are very often less efficient. But, in instances where students use appropriate learning platforms, their successful learning strategies can enhance their acquisition of knowledge [5]. In general, high-school students consider social media a useful learning tool [6].

Research that focused on the link between memory capacity and the frequency and duration of social
media usage showed that social media has differing impacts. Those impacts depend on variety of variables, such as personality traits, motivation, purpose of viewing and other factors. One of the positive effects of social media usage is that young people who used FB for more than a year had better results when tested for verbal ability, working memory and spelling, while the impact of social networks when measured by frequency of checking was not related to cognitive scores [7]. Research conducted by [8] showed differing Big Five personality traits between FB users and non-users. Facebook users aged 19-44 are more extravert and narcissistic in comparison to FB nonusers. Additionally, FB users have lower results on the conscientiousness dimension and are socially lonely. Additionally, FB viewing strategy is linked to the motivation of FB users. Participants reported that they are more focused on instances when they are searching the profiles of their friends. If they are looking for potential employees however, they are more focused on text content [9].

An important research question is whether social media has any effects on memory capacity ability to provide different answers and this depends on variety of factors. Some research proved that there is no relation between multitasking and free recall testing or memory capacity. The free recall test means the participants need to write down all the stimuli from the task, without any cues given. This type of task will be used in this research as a type of working memory task. For example, [10] proved that is no ‘google effects’ on the memory of social media users, meaning that viewing text messages and Snapchat does not reduce memory capacity. On the other hand, respondents’ cognitive self-esteem is positively related to the memory of social media users, which means that respondents with a higher level of self-esteem have better results in memory tasks. Multitasking is not related to working memory capacity, but young adults who multitask have divided attention [11]. Memory capacity measured by the dynamic of free recall is value-directed and depends on the importance of information, as people better encode and remember information that is important to them [12]. On the other hand, there are negative relations between multitasking and memory capacity. For example, [13] found that students who multitask, meaning they sent instant messages during school work, needed more time to read texts in comparison to students who did not multitask during reading activities. Furthermore, students who multitasked on Facebook for one or more hours per day and used social media during classes have lower results on the free recall test [14]. Divided attention and encoding reduced free recall memory [15]. Student working memory capacity, storage information, processing information and academic achievement can be increased while students are relaxed [16]. To conclude, and overview of available literature performed by [1] suggested that there is a gap in research results that explained the relation between multitasking and cognitive control.

While the majority of researchers proved that media multitasking is associated with failures of everyday executive functioning and changes in cognitive control, some researchers proved that people who are multitasking have better cognitive control. This area of research needs to be further investigated and explored.

B. Research Goals and Hypothesis

Four hypotheses were made for the purpose of this research:

a) Students who spend more time per day on Facebook and Instagram will remember less words in WMT.

b) Students who check Facebook and Instagram more frequently per day will remember less words in WMT.

c) Students who spend more time on Facebook per day also spend more time on Instagram per day.

d) Students who check Facebook more often per day will also check Instagram more often per day.

The first two hypotheses relate to social media usage and Working Memory Task (WMT), while the other two correlate the time spent and the frequency of checks made by students on two popular social media platforms - Facebook and Instagram.

I. METHODOLOGY

A. Participants

There were 117 participants with a mean age 17.33 years (SD=1.6). Most participants were male (M=100, F=12, undefined=5). Participants were students of:

a) The Varaždin Electromechanical School, ESS (86 students, 72.3%), or
b) The Faculty of Organization and Informatics, University of Zagreb FOI (31 students, 26.1%)

All ESS students were in the same program (IT specialist) and all FOI students were in the same program (Applied informatics in business). The ESS and FOI programs were somewhat similar.

B. Data collection

The participants were told that the research was examining technology usage and its connection to memory. First, they were presented words - nouns in the Croatian language (WMT) - after which there was a short math task which was used to “empty” the working memory so it can be examined how many words are retained in long-term memory. Participants had to write down all the words from the list that they remembered. The whole task was repeated. After the memory task, participants completed a technology and social media usage questionnaire.

C. Instruments

Social Media Questionnaire
A questionnaire featuring 24 questions was created for the purpose of this research. Initially students answered questions relating to their gender, age, their previous year’s GPA and what number their school/college program was on their priority list of possible programs. Also, students were asked if they owned a personal computer, a smartphone or had internet access. All students answered “yes” on those three questions. Students answered questions separately for each of the three popular social networks (Facebook, Instagram and Snapchat). They were asked if they have a “XY” profile, how much time do they spend on it (in minutes) and how often they checked “XY” (in minutes). Also, they were asked if there was another social media platform where they spent a significant amount of time. Other questions related to checking social media accounts while studying or in class, reading habits and taking notes, but they do not form the topic of this paper.

Working Memory Task (WMT)
The words presented were all nouns of the Croatian language. There were 35 words in both tasks and one word was presented for three seconds. None of the words from first list were repeated in the second list. Before writing down words they remembered, students completed short math problems (addition). Following this, participants free-recalled the nouns presented to them.

II. RESULTS AND INTERPRETATION

A. Social Media Usage - Descriptive Analysis

Facebook
As expected, almost all participants had a Facebook profile (98.3%, N=115). On average, they had had a Facebook profile for 6.55 years (SD=2.87). Most students claimed they spent less than 1 hour on Facebook per day (41.2%) and 36% claimed they spent 1-2 hours. On average, students checked their Facebook/Messenger every 64.6 minutes (SD=87.61).

Instagram
The majority of participants had an Instagram profile (81.2%, N=95). Most of those students (49.5%) spent 1-2 hours on Instagram per day and 26.3% spent less than 1 hour. Interestingly, 16.8% of students claimed they spent more than 3 hours on Instagram per day. On average, students checked Instagram every 92.06 minutes (SD=206.24).

Snapchat
Snapchat was a somewhat less popular than Facebook and Instagram. 38.5% of students (N=45) had a Snapchat profile, 61.5% of students (N=72) did not have a Snapchat profile, which made Snapchat the least-used media platform in comparison to Facebook and Instagram. Most students who had a Snapchat profile (62.2%) spent less than 1 hour per day using the app and 24.4% spent 1-2 hours. On average, students check their Snapchat account every 309.74 minutes (SD=625.23).

TABLE 1. PERCENTAGE OF STUDENTS HAVING A CERTAIN SOCIAL MEDIA ACCOUNT, TIME SPENT, AVERAGE CHECKING TIME (M) AND STANDARD DEVIATION (SD) OF M CHECKING TIME

<table>
<thead>
<tr>
<th></th>
<th>Facebook</th>
<th>Instagram</th>
<th>Snapchat</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Students Using It</td>
<td>98.3%</td>
<td>81.2%</td>
<td>38.5%</td>
</tr>
<tr>
<td>&lt; 1 Hour</td>
<td>41.2%</td>
<td>26.3%</td>
<td>62.2%</td>
</tr>
<tr>
<td>1-2 Hours</td>
<td>36%</td>
<td>49.5%</td>
<td>24.4%</td>
</tr>
<tr>
<td>3-4 Hours</td>
<td>12.3%</td>
<td>16.8%</td>
<td>11.1%</td>
</tr>
</tbody>
</table>
The details of descriptive analysis are shown in Table 1; the percentage of students having a certain social media account, time spent, average checking time (M)* and standard deviation (SD)** of M checking time.

<table>
<thead>
<tr>
<th>Checking Time (Min.)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6 Hours</td>
<td>5.3%</td>
</tr>
<tr>
<td>&gt;7 Hours</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Checking Time (Min.)</th>
<th>Average Time (Min.)</th>
<th>Average Time (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>64.4</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>87.61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>206.24</td>
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</table>

The regression model regarding Facebook checking per day could not predict the task result. The regression model regarding frequency of Instagram checking could not predict the result (F(1,109)=.57, p>.05), but neither could the model regarding frequency of Instagram checking (F(1,92)=.04).

When the regression models were tested separately for high-school and university students, it was found that frequency of Instagram checking was a significant predictor of WMT for university students (F(1,25)=4.98, p<.05) - those who checked Instagram more frequently had a better result on the WMT (β=-.41). The given result could be considered somewhat surprising and certainly opposite to the stated hypothesis. A correlational analysis was made to test hypotheses c) and d). Students’ average usage of Facebook per day was positively correlated with students’ average Instagram usage per day (r=.46, p<.01). Students’ average frequency of Facebook checking per day was positively correlated with students’ average Instagram checking per day (r=.26, p<.01)

C. Discussion

With the rapid rise of social media over the past 10 years, research on these topics also had to rise. It needs to be taken into consideration that, with time, social media and technology did not become more popular or widespread, but rather they became more complex and sophisticated, with new features appearing almost daily. That aspect of rapid change made the job more difficult for researchers - keeping up with social media and technology – and has become a serious challenge for experts in various fields. Various hypotheses have been posed regarding the effects of social media and technology on cognition, memory and various other aspects of behavior. The research conclusions that have been
made are not necessarily congruent and there is no clear consensus regarding effects of social media and technology on our cognition.

However, the results of previous research are more in favor of the negative effects of technology than not. The research team [14] examined the effects of Facebook usage on memory and found that high-level Facebook users had worse performance in the memory task than low-level Facebook users. The authors divided their participants into two groups - high and low Facebook users. That was not the case in this research so that the somewhat arbitrary divide of participants into two groups could be avoided. Consequently, the chosen statistical test was regression analysis and not a t-test because the participants were not divided into two arbitrary groups which would be suited for t-test. The regression analysis was used to possibly predict student performance in memory task based on their reported social media usage and their frequency of checking. They [14] published their paper in 2013 when Facebook was by far the most popular network and Instagram was not as popular. Today, the situation is significantly different and it was necessary to include Instagram and other social media platforms. Another novelty which has appeared over the past 6-7 years is the fact that all apps are now available on smartphones and are used primarily on smartphones. That means that the question is not how much time you spend on XYZ per day, but how often do you check XYZ? In instances of certain people and social media, it is a matter of minutes. For that reason, both aspects were covered in this research, namely the amount of time spent and frequency a certain social media was checked. The results did not confirm the hypothesis which was, in general, that social media is somehow damaging to our cognitive abilities. It cannot be said that results proved the opposite because, on the basis of the results in this research, social media has no effects on our memory abilities, at least not in the aspect of working memory capacity measured in WMT.

However, the limitations of this study should be mentioned. The first limitation was the mere fact that it is questionable how accurate the participants were when estimating their hours of usage and frequency of checking certain social media platforms. Some people were certainly more precise and accurate than others and the effects of possible social desirability should be mentioned as well. Some participants probably reduced the actual amount of time they claimed to have spent on social media in order to appear more conscientious, responsible, self-controlled or less “addicted” to the Internet and social media. Furthermore, it should be noted that although it may be true that social media usage does not affect cognitive processes included in this particular memory task, it is possible that the effects are more complex and are affecting parts of our cognition in ways we have yet to hypothesize. Also, it is worth mentioning that it is possible that any disturbing activity (e.g. frequent TV watching) would negatively affect the working memory capacity, but this paper focuses on social media.

The analysis in this research was primarily based on Facebook and Instagram and it should be noted that social media or smartphone usage in general has become a continuing process throughout our daily routine, with various apps overlapping and “fighting” for parts of our attention. It is suggested that researchers should find a more precise way of measuring user engagement with smartphones - in general and separately for various social media. Equally, engagement time could be measured through the app itself and not by asking the participant to make an estimation. Instagram is already offering that type of data for its users. This research showed that time spent on Facebook was positively correlated with time spent on Instagram and the same was found for checking frequency, which means that people who spent a lot of time on one network had a tendency to spend a lot of time on the other and vice versa. That is why it would be very useful to have a unique measurement of total social media usage. Interestingly, when separate analyses were made for high-school and university students, the higher frequency on Instagram checking predicted a better result on the memory task. This notion brings us to the matter of causality in this instance. If it was true that individuals who checked social media more often had a better working memory capacity, then a question presents itself - which came first: the chicken or the egg? Do students who engage more in social media multitasking have a bigger working memory capacity exactly because their cognitive abilities allow them to do so, or did the frequent multitasking somehow positively affect the cognitive abilities related to memory? This question still remains unanswered and there is a lot of research yet to be done in this field.

D. Conclusion

In conclusion, the results did not provide evidence to support the idea that social media is damaging to cognitive abilities. Based on the results of this research, a conclusion can be made that there is no connection between the time spent or the frequency
of checking social media on working memory capacity. In the case of university students, the result was just the opposite of the research hypothesis – the frequency of Instagram checking was found to be a positive predictor of memory task results. Positive correlations were found between the time spent on Facebook with the time spent on Instagram and the frequency of Facebook checking with the frequency of Instagram checking. A consensus on this topic is yet to be made and consequently there is much more research to be done.

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