

# An inquiry into the effects of smartphone use on reading comprehension

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## Abstract

There are many positive aspects to the growing popularity of smartphones. Increased access to interpersonal communications, increased safety capabilities, and access to the World Wide Web are just a few of the positive aspects that the burgeoning technology brings to society. As with most things, there are also negative aspects to the persistent technology. The bulk of research on the topic of smartphones has revolved around distraction, reaction times, and overall safety in regards to automotive usage. This report attempts to consolidate some of the pertinent information regarding smartphone use and its impact on reading comprehension. Studies have shown that high reading comprehension levels are an indicator of academic success. Four key aspects of reading comprehension, repetition, organization skills, cognitive skills, and metacognitive skills, are all greatly affected by the types of distraction caused by smartphone usage. Included are analyses of recent studies that show that simply having a smartphone nearby may cause a 10% reduction in working memory ability. Data regarding smartphone usage trends, user attitudes and perceptions, distraction, reduction of cognitive abilities, and task switching strongly imply that smartphone use is responsible for a significant negative impact on reading comprehension. There are several opportunities for future research into the topic. Specifically, the need for intrasubject research may better measure the effect of smartphone usage at the individual level. Both long-term and short-term studies can better provide information to consumers and students about the possible negative effects of smartphone usage.

*Keywords:* reading, technology, smart phones

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## Introduction

Smartphone technology has forever changed the way humans communicate with one another. The smartphone has made it faster and more convenient to access the World Wide Web, friends and colleagues from around the globe, and interact with social media. Without a doubt, smartphone use has solved some societal problems. Conversely, smartphone use may have created many some problems to solve in their place. With respect to literacy, what are the effects of smartphone use on students? There is a need for better understanding of the impacts of smartphones use on reading comprehension.

Strong reading comprehension skills are one of the most important tools to aid the success of a student. The ability to read and comprehend a variety of textual elements is a fundamental foundation on which most educational institutions build. In early studies, researchers have found that skilled silent reading skills were a key factor in academic success in college. Broom and Porter (1934) declared that xrf “results of the two quantitative evaluations of the contribution of silent reading to college academic effects emphasize the

importance of reading as a study tool.” A more recent study, conducted in part due to a “preliminary finding that low NET reading comprehension scores were associated with higher rates of attrition” in specific nursing programs (Symes, Tart, & Travis, 2005). Within the study, Symes, Tart, and Travis discovered that “reading comprehension score was almost twice the correlation of graduation with the math score, admission GPA, and science GPA” (2005). Due to the proliferation of smartphone use, there is a need for further research on the effects of the technology on reading comprehension.

Current trends in education are showing that institutions are abandoning their fight to keep social media use from intruding into the classroom and are instead embracing its use as an educational tool. Educators are now attempting to integrate the use of Twitter, YouTube, and Facebook into their lesson plans (McMeans, 2016, Poore, 2013). While there are several benefits to using a multimedia approach to learning, such as the ability to incorporate audio and video aids, increased communication abilities, and the ability of the internet to expand on learning concepts, without careful

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implementation, social media as an educational tool can be more distractive than effective (Poore, 2013).

There is data that suggests that, when given the chance, most students would prefer access to their smartphone during class (Grinols & Rajesh, 2014). Many of the students underestimated their own ability to focus on their academic tasks effectively while in the classroom with many smartphones in use (Grinols & Rajesh, 2014). As social media and smartphones become a larger part of the learning process, it would be beneficial to fully understand the level of impairment that multitasking or task switching that this technology is having on students.

While reading is a universal skill, the type of text being read may change the specific techniques that a reader may employ. Various types of text such as science, mathematics, history, literature, and philosophy each require their own suitable reading speed, repetition of reading of passages, and knowledge of vocabulary to properly comprehend. Four key subsets of skills are useful in forming proper study habits. Repetition, or rehearsal, of information, both in absorption via reading and in expression via notetaking or vocal expression, aids in the storage of information in long-term memory for later recall. Organizational-based study skills allow students to set aside adequate time, in a proper environment, to reduce the number and intensity of distractions from studying. Cognitive study skills allow the new information to become associated with existing information already stored in long-term memory. Finally, metacognitive skills allow the student to apply the information in the correct time and place (Gettinger & Seibert, 2002). Unfortunately, smartphone use has the ability to interfere with all four subgroups of study skills.

There is alarming data that suggest that most college students do not recognize smartphone use as reading (Nadelson et al., 2013). A majority of participants did not consider text messaging, social media and gaming as reading activities (Nadelson et al., 2013). With students oblivious to the fact that they are reading while using a smartphone, the habits of multitasking and task switching will proliferate.

Mokhtari, Reichard and Gardner (2009) demonstrated that college students are spending a large percentage of their time using the internet. Participants reported spending an average of 2.47 hours per day using the internet, 2.17 hours per day engaged in academic reading, and just 1.14 hours per day engaged in recreational reading (Mokhtari, et al., 2009). The study also found that 85% of participants classified using the internet as an enjoyable experience (Mokhtari, et al., 2009). As smartphones provide mobile and

immediate access to the internet, the opportunity for students to choose the internet over academic reading is present at all times.

Unfortunately, the Mokhtari, Reichard, and Gardner (2009) study did not take into account the effects of multitasking or task switching.<sup>1</sup> The negative effects of task switching are discussed by Rogers, Monsell, and Hunt (1995). Participants who engaged in task switching needed time to readjust the mental control setting that dictated the rules for completing the task as well as dealing with the effects of errors caused by attempting a new task while still using outdated mental rule sets. Two of the largest negative effects of task switching are an increase in overall time to complete all tasks and an increase in errors (Weinschenk 2012).

David and colleagues (2015) discovered that college students who multitask prefer to utilize music, text messaging, and social media. Of those surveyed the participants who self-reported high levels of addictiveness to their smartphone also reported a high amount of multitasking while engaging in academic reading (David et al., 2015). The trend of smartphone use in an academic setting is implied in a study of pharmaceutical students' use of social media in the classroom (Weiler, et al., 2015). Participants reported spending an average 8.46 minutes of a typical 50-minute class on a social media platform (Weiler, et al., 2015). The same study showed that 47% of participants agreed or strongly agreed that social media is a distraction while studying at school (Weiler, et al., 2015). The percentage of participants increased to 56.3% when agreeing or strongly agreeing that social media is a distraction while studying at home. While Weiler and colleagues focused on social media rather than the platform of smartphones, social media access is a key feature of smartphones.

Working memory has been shown to be a key component of reading comprehension. As we read items, the information from the reading is placed into working memory until it can be properly stored into long term memory for recall (McVay, Kane, & Gauthier 2012). Distraction, while information is in working memory is a key cause for improper long term storage. McVay, Kane, and Gauthier (2012) establish a strong link between working memory, attention control and reading comprehension. Interruption experiments using various methods have been consistent in showing that reading comprehension is negatively impacted. The types of interruption have includes mathematical problems, unrelated text passaged, and pressing a key on a keyboard (Foroughi, Werner, Barragán, Boehm-Davis,

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<sup>1</sup> Multitasking is defined as performing two or more tasks simultaneously while task switching is defined as the immediate switching of one task to another. It is believed that true multitasking

does not exist. When an individual is multitasking they are essentially performing task switching at a very rapid pace.

& Gauthier, 2015). Rehearsal, the act of mentally reviewing and refreshing information, is an important aid in memory retention. Decay, the act of time passing, has a negative effect on memory. Interruption too plays a key role on causing impairment on the ability to recall information (Farrell et al., 2016). While both factors, decay and interruption, can cause a participant to forget information, the active use of a distractive element, such as a smartphone, may have a greater impact than simply decay.

Other outside studies also highlight the negative effect of just having a smartphone nearby when trying to study. Ward, Duke, Gneezy, and Bos (2017) show compelling evidence that cognitive abilities suffered and attention spans decreased in participants that kept their smartphones within the same room as the cognitive and memory measurements. Participants who had their phone in their pocket or bag had an approximately 8% decrease in working memory capacity while those who had their phone on the desk and visible had a 10% decrease in the same metric. (Ward, Duke, Gneezy, & Bos, 2017). A similar study, involving text message interruptions while viewing a video lecture confirmed that participants who received text messages during the lecture scored lower, by a full letter grade, than those who did not receive messages (Lee, Kim, McDonough, Mendoza, & Kim, 2017). Due to the conditions of this experiment, participants who did not have access to their phone, while scoring higher in academic metrics, reported higher levels of anxiety than those who had their phones.

Smartphones have clearly established themselves as regular tools in the daily lives of many. The impact of smartphone activities is difficult to quantify. Does smartphone use immediately after reading cause a significant amount of distraction to affect the ability to recall key details and themes from the reading? Does the use of a smartphone affect everyone in a similar manner? Do all levels of reader suffer the same effects of loss of literacy skills due to smartphones? Is it possible for individuals to task switch from reading to smartphone use without a loss of literacy skills?

While distraction and task-switching experiments have been shown to reduce reading comprehension abilities and smartphone usage is often a distractive element that utilizes task switching, there is little direct research into the relationship between reading comprehension and smartphone use. Ideally, better understanding of the topic may come from intrasubject studies. These types of studies could better record the type of change that smartphone use has on an individual's reading comprehension ability. As smartphone use increases, both inside of and outside of

the classroom, a better understanding of the effects of smartphone use reading comprehension is necessary.

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