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The Internet-Extended Mind: The Psychological Ramifications and Philosophical Implications of Cognitive Offloading

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THE INTERNET-EXTENDED MIND: THE PSYCHOLOGICAL RAMIFICATIONS AND PHILOSOPHICAL IMPLICATIONS OF COGNITIVE OFFLOADING

by

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I dedicate this thesis to my mother, my father, and my dog/little brother Apple, who have not only given me solace as I lose my senior year of college, but are also the reason why I was able to attend a school like Scripps College in the first place. Immigrants—we get the job done.

Author's Note

I wrote this partly in response to a significant cultural and technological transformation that happened throughout my adolescence. In fifth grade, I brought my mom's defunct flip phone to class. My mom had disconnected it after getting a new phone, but I, desperate to enter the stratosphere of cool girls whose parents had bought them phones, brought it to school to take pictures, play through each ringtone option, and periodically change the wallpaper. By the time high school rolled around, I had gotten my very own QWERTY keyboard slide phone, iPod Touch, and Samsung smartphone. One day during my senior year of high school, I looked up from my desk and realized that, while waiting for class to start, my Period One Spanish class was completely silent. Everyone was staring at their phones, headphones (still wired at the time) blocking out any surrounding sounds, any semblance of other human presences in the room. I wondered, how did we get here? When did all of this happen? I felt like a huge cultural shift had taken place and, all of a sudden, I had just woken up on the other side of it. I recognized my fifth grade self, so desperate to bring her first flip phone to school, but I also recognized my place in the current moment—amongst my peers, each of us automatically trained to reach for our iPhones during any moment—short or long—of bored silence. It is out of fascination for this moment, which at times I feel like I missed out on and other times I feel like I was at the center of, that I write this thesis about how the electronic devices we always have on hand have become a part of who we are, in mind, body, and behavior.

Abstract

In this thesis, I explore the internet-extended mind through both philosophical and psychological lenses in order to investigate the questions “To what extent is the mind extended onto the internet and, more generally, outside our bodies?” and “How will an increasingly internet-extended brain change the ways in which humans communicate, remember, and behave?”. First, I introduce the idea of a mind that extends out into the world, instead of lying solely in the brain. Then, I outline existing research that introduces the challenges and implications of an internet-extended mind in an ever-changing internet landscape. Next, I discuss how the internet is already changing human memories and behaviors. Lastly, I pose the research question, “Is accuracy of recall better when receiving information about someone through a Facebook page or through face-to-face speech?” and conduct an experiment. In this experiment, all participants experienced a face-to-face and a Facebook condition. The face-to-face condition consisted of a video of an actor who introduced herself as either Taylor or Fran. The Facebook condition consisted of a video screen recording of a Facebook webpage for either Taylor or Fran. After the participant saw both conditions, they were given a mental math distractor task and then recalled the information through a survey. The results corroborated my hypotheses that overall recall would be better for the Facebook condition than the face-to-face condition and that the participants who were more exposed to Facebook in their personal time would have better recall than other participants. I conclude this paper with reflections on the results favoring recall for the Facebook condition and what it means for human minds if information can be stored more accurately on a phone than in the brain.

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1 Introduction

1.1 Purpose of Work and Research Question

> *"I can't go around without a phone. That's like going around without a brain… or shoes!"*
>
> — Hanna Marin, *Pretty Little Liars* (2012)

If I ask you, "Do you know what time it is?", you might be prompted to behave in a number of ways. If you have a watch on your wrist, you might check it and tell me the time. If your phone is in your pocket or within arm's reach, you might tap the phone's screen to 'wake' it and show me the time displayed at the top of your lock screen. These behaviors are things someone might normally do in response to the question, "Do you know what time it is?" However, does accessing the correct time by looking at your phone or your watch count as *your* knowledge? Hanna Marin makes a fair point- without our phones or other time-telling technologies, our knowledge of what time it is essentially disappears. The same may be said about our knowledge of friends' and family members' birthdays. For the particularly forgetful, Facebook is a useful platform that stores and shows us the birthdates of our loved ones, even telling us when to wish them 'happy birthday'. For its users, Facebook provides not just reminders to make a mental note of an aunt's birthday, but more generally, facilitates the use of this knowledge to enact communication. At first glance, it may seem difficult to agree with the idea that our phones and other technologies are parts of our 'knowledge', considering that these mechanisms are not parts of our physical brains. However, technologies that are increasingly ingrained in and adapted to our bodies complicate the intuition that everything that constitutes our human knowledge must exist within the physical boundaries of our brains. In this paper, I analyze the notion that the Internet is an extension of our minds, holding our information

similarly to how our brains store our memories, and explore how information on the Internet may operate as a source of such external memory.

I also explore the influence of the Internet on retention and recall of memories. As the Internet becomes an increasingly integral and entrenched part of daily human activities, its effect on internal the brain, specifically with regards to memory, must be studied. Building on existing research, I conduct an experiment to answer the research question, "How does recall of personal information details differ when participants receive the information through Facebook search versus through face-to-face communication?" In doing this, I hope to gain insight into how the introduction of a technology such as the Internet affects the ways people remember and recall information, so as to critically examine the ways that the Internet may be changing and even shaping our brains. This line of inquiry is relevant because of the increasingly crucial role that technologies play in the lives of individuals and in society as a whole. The purpose of this study is to bring awareness to and mitigate the effects of 'technological somnambulism', a process described by Langdon Winner (2004) in which humans 'sleepwalk' through technological advances, unaware of the sometimes drastic effects these advances have on themselves and society. As Firth et al. (2019) put it, "The unprecedented potential of the Internet to capture our attention presents an urgent need for understanding the impact that this may have on our thought processes and well-being" (p. 120).

2 Extended Cognition and the Internet

2.1 Philosophy of Extended Cognition

Andy Clark and David Chalmers's (1998) piece "The Extended Mind" is one of the most well-known works of extended mind philosophy. In it, Clark and Chalmers (1998) argue that not all cognitive processes are located in the physical brains of humans; some cognitive processes

can be said to operate outside the boundaries of skin and skull. Clark and Chalmers (1998) illustrate their point by posing two scenarios involving Otto and Inga. The first scenario involves Inga, a neurotypical human who remembers that there is a museum exhibit at the Museum of Modern Art that she wishes to attend. Inga recalls that the museum is located on 53rd Street, and using that knowledge, walks to 53rd Street and enters the museum. Clark and Chalmers (1998) then introduce Otto, who suffers from Alzheimer's disease and as a result is unable to store memories in his brain in the same way that Inga is able to. Instead, Otto uses a notebook to store information that he wants to have access to in the future. Clark and Chalmers (1998) explain how the consistency of Otto's notebook serves as a kind of non-biological memory store for Otto:

> Otto carries a notebook around with him everywhere he goes. When he learns new information, he writes it down. When he needs some old information, he looks it up. For Otto, his notebook plays the role usually played by a biological memory. Today, Otto hears about the exhibition at the Museum of Modern Art, and decides to go see it. He consults the notebook, which says that the museum is on 53rd Street, so he walks to 53rd Street and goes into the museum. (p. 13)

Clark and Chalmers (1998) argue that Otto's notebook is functionally identical to Inga's memory. For both Inga and Otto, the memory that the museum is on 53rd Street "was somewhere in memory, waiting to be accessed" (Clark & Chalmers, 1998, p. 12). The only difference is that for Inga, the memory is stored in the brain, and for Otto, the memory is stored in the notebook. Both Otto and Inga know that they have this belief about where the museum is located, prompting this belief to become occurrent in their respective minds. Otto has the occurrent belief that the museum is on 53rd street when he consults his notebook, and Inga has the same occurrent belief when she consults her memory. Clark and Chalmers (1998) draw a comparison between Inga and Otto, two humans, to show that common instances of human neurodiversity complicate the notion that cognition is limited to the physical boundaries of the brain. The separation between Otto and Inga's stores of memory is a distinction of mere physical matter (meat vs.

notebook) and is reason to believe that not all cognitive processes (i.e. recalling that the museum is on 53rd Street) must necessarily occur within the brain. Clark and Chalmers (1998) assert, "the notebook plays for Otto the same role that memory plays for Inga. The information in the notebook functions just like the information constituting an ordinary non-occurrent belief; it just happens that this information lies beyond the skin" (p. 13).

Clark and Chalmers (1998) defend the thesis that the coupling of Otto's notebook, a device that is physically external to Otto, and Otto's brain, which still knows that the location of the museum is written in the notebook, makes "this sort of coupled process counts equally well as a cognitive process, whether or not it is wholly in the head" by invoking comparisons to more typical ways in which the cognitive process is understood (p. 9). Clark and Chalmers (1998) argue that Otto's notebook constitutes an integral part of Otto's overall cognition because "[i]f we remove the external component the system's behavioural competence will drop, just as it would if we removed part of its brain" (pp. 8-9). This analogy of the brain to Otto's notebook, Clark and Chalmers (1998) claim, demonstrates that the notebook is just as much a part of Otto's cognitive process as Inga's temporal lobe (the part of the brain that controls memory) is to Inga's cognitive process. Clark and Chalmers (1998) defend this claim by asserting that removal of Otto's notebook will render Otto unable to recall the location of the museum, just as removal of Inga's temporal lobe will render Inga unable to recall the location of the museum.

Adams and Aizawa (2010) argue that Clark and Chalmers (1998) make the mistake of "coupling-constitution fallacy", misconstruing that simply because "object or process X is coupled to object or process Y does not entail that X is part of Y" (p. 68). Adams and Aizawa (2010) assert that even if a notebook or pencil is used in Otto's cognitive process, the notebook or pencil does not then become *part* of the active thinking process of the person who used them.

Clark (2012) responds to Adams and Aizawa (2010) by clarifying what Clark (2012) believes is a misconception on Adams and Aizawa's (2010) part. Clark (2012) claims the following:

> The appeal to coupling is not intended to make any external object cognitive (insofar as this notion is even intelligible). Rather, it is intended to make some object, which in and of itself is not usefully (perhaps not even intelligibly) thought of as *either cognitive or noncognitive*, into a *proper part of some cognitive routine*. (emphasis in original, p. 87)

According to Clark (2012), it is not the noncognitive pen or notebook that becomes a cognitive entity when coupled with a cognitive entity, such as a human. Instead, it is the function of that noncognitive pen or notebook that plays a role in the human's larger cognitive process and thus constitutes a part of that process. Since the function of the pen, not the pen itself, contributes to Otto's cognition, Clark (2012) asserts that it is clearly incorrect and even irrelevant to consider the pen itself as a cognitive object. Implications for the hypothesis that noncognitive objects can play a role in a cognitive process or state are wide-ranging, especially in the contemporary age of digital devices. If, as Clark (2012) argues, the functions of devices such as a pen or notebook play significant roles in cognition, it seems plausible to then wonder if other, more advanced technologies can play such a role in our cognitive processes and thus be considered a part of our cognition. Using a pen and notebook is one way to store quantities of information, but contemporary manifestations of information systems, such as the Internet, are packed with much more information. This leads to the question posed by Clark and Chalmers (1998): "Is my cognitive state somehow spread across the Internet?" (p. 17).

2.2 Three Criterion for Extended Cognition

If external devices such as neural implants and computer screens can be conceptualized as forms of memory, can the Internet, a place holding a virtually limitless store of information, also be a form of external memory? Clark and Chalmers (1998) argue that three conditions must be met for an external device to be considered a form of external memory: the information in the

device is always available, reliably present and accessible when needed, and automatically endorsed as truth when it is stored. According to these guidelines, they claim that "[t]he Internet is likely to fail on multiple counts, unless I am unusually computer-reliant, facile with the technology, and trusting" (Clark & Chalmers, 1998, p. 17). To answer the question of whether the Internet can be considered a form of external memory by Clark and Chalmers's (1998) standards, we must determine if the Internet meets each of the three aforementioned criteria. Smart (2017) labels these the availability criterion, accessibility criterion, and trust criterion. Smart (2017) also more closely defines the Internet as a "web-based system", which according to Smart (2017), is "any system in which at least some of the constituent elements are Web resources (i.e. resources that form part of the Web)" (p. 361). This definition of the Internet "enables us to treat many kinds of systemic organization as Web-based systems", accounting for the variety of information systems that are associated with the Internet (Smart, 2017, p. 361). Smart's (2017) definition includes both "purely technological" systems, such as software and hardware, and human-generated content, such as Google searches and blog posts, which constitute "materially heterogeneous ensembles involving one or more human agents" (pp. 361-2).

2.2.1 Availability

The first of Clark and Chalmers's (1998) criteria-availability-seems to be met when considering contemporary modes of Internet portability. Our smartphones have wireless Internet capabilities and easily fit in the palms of our hands, making the Internet easily available to us even without a Wi-Fi connection. Smart (2017) agrees, stating, "issues of portability and mobility are relevant to cognitive extension: the more portable something is, the better its candidacy for cognitive incorporation. In this respect, the general thrust of technology development would seem to speak in favor of Web-based forms of cognitive extension" (p. 363).

However, the trouble that arises with the Internet and the availability criterion is that there are many instances when smartphones disconnect from the Internet, such as when one fails to gain service at the top of a mountain or when a Wi-Fi signal is weak. These cases show crucial differences between Otto's notebook and the Internet. The Internet hosts information that is accessed *online*, which may not be available in some situations, while the information in Otto's notebook is available largely without restriction. With an exhausted battery or without Wi-fi connection, a smartphone is completely useless in conveying any necessary information. Smart (2017) further explicates this, stating, "When it comes to issues of availability, therefore, what seems to be of primary importance is not the availability of the resource that is used to mediate access to information (the notebook or smartphone); rather, what matters is the availability of the information itself" (p. 364). This distinction between the physical vessel of the information (smartphone) and the information itself is an important distinction to make in extended mind theory because without it, the Internet may not be considered a form of external memory when it is not connected to a wireless signal.

While Smart (2017) makes a thoughtful distinction between smartphones and Otto's notebook, Smart (2017) fails to consider how the failings that he details about the smartphone may also apply to Otto's notebook as well. It is true that the smartphone may lose battery or a Wi-Fi signal, but Otto, too, may forget his glasses or his flashlight while trying to read in the dark, rendering the information in his notebook unavailable. It is therefore unclear that Otto's notebook is the paradigm of availability because in certain situations, the information in Otto's notebook may be unavailable even when the vessel of the information, the notebook, is available. The distinction between information and its vessel are thus applicable to Otto as well.

2.2.2 Accessibility

Smart (2012) contends that the current format of HTML documentation for Internet websites prohibits the Internet in its current form from achieving the accessibility criterion. Smart (2017) later expands this argument, claiming that looking at long HTML webpages for information necessitates the onerous task of "scroll[ing] through the Web page and process[ing] large amounts of largely irrelevant content in order to identify the small amount of information that is actually needed" (pp. 452-3). For example, if I wanted to learn what city the singer Jeon Jungkook of BTS was born in, I would type the web address for Wikipedia, search "Jeon Jungkook", and briefly read through the section that details his early life and childhood until I found what I was looking for. This differs from the process that Otto uses in finding information in his notebook because while the notebook's information is automatically accessible, the information from the Internet takes multiple steps to be accessed and is often "embedded in a mass of other distracting information" (Smart, 2017, p. 453).

Ludwig (2015) objects to Smart's argument, asserting that sifting through pages of HTML-formatted text on a webpage is not a necessity for every Internet search. Ludwig (2015) proposes the following example:

> Consider the belief that Charles Darwin was born in 1809. Laura does not have to scroll through the article and process large amounts of information to access this information. As an experienced Wikipedia user, Laura knows that she'll find Darwin's birth date in the first sentence of the Wikipedia article on Darwin… In the case of Darwin's birth date, Laura's access to information from Wikipedia will be at least as quick and reliable as Otto's access to information from his notebook. (p. 361)

Ludwig's (2015) example demonstrates that the Internet *can* function similarly to Otto's notebook. Smart (2017) points to the "locational lability" of content on the Internet; on various devices, such as a smartphone or a smartwatch, the design of the website and its information may be formatted differently than on a computer (p. 367). Therefore, there is no guarantee that the

birth city of Jeon Jungkook, which may be clearly displayed on the right side of the screen on a smartphone, will be in the same location, in a similarly easy-to-observe way, when the same information is accessed through an Apple watch. Smart (2017) suggests that it is this uncertainty regarding where and how one will be able to access information on the Internet that "undermines Ludwig's attempt to defuse claims regarding the (in)accessibility of online information" (p. 367).

My response to both Smart (2017) and Ludwig (2015) is that they both consider the accessibility criterion too narrowly, focusing on the specifics of webpage design and interface, when the concept of accessibility must be defined and discussed before ruminating on details. I do not think that the extra time a user takes to sift through a Wikipedia page to find the hometown of her favorite singer disqualifies the Internet as a source of accessible external cognition. If this extra time is reason to say that the Internet is not accessible, Otto's notebook may, at some point, also be considered inaccessible. If, while trying to find directions to the grocery store, a 75-year-old Otto takes extra time to sift through his notebook because it has accumulated many pages of notes after decades of jotting down memories, Otto's notebook has become just as, if not more, inaccessible in comparison to the Wikipedia page. Otto may also have written his notes in long paragraphs, preferring prose to bullet points. This may further render Otto's notebook inaccessible in the same way that the Wikipedia page is considered inaccessible. If this does not disqualify Otto's notebook from the accessibility criterion, the definition of accessibility must be framed more clearly to be fairly applicable to all forms of external memory, including both Otto's notebook and a Wikipedia webpage.

2.2.3 Trust

The third and final criterion brought forth by Clark and Chalmers (1998) is that the user of the external memory device must trust the information that is included in the device and that

the information must be automatically endorsed when it is used. Clark (2010) posits that accessing Google on a smartphone would fail the trust criterion because not everyone automatically endorses the information that they see on Google. Smart (2017) recognizes this, claiming that "what seems to be fueling Clark's unease with the Internet is tied to the fact that we often have very little control over what appears online" (p. 365). This, Smart (2017) contends, demonstrates a need for clarification on whether "Web users really subject online information to the sort of critical evaluation that would undermine their status as Web-extended cognizers?" (pp. 365-6). There are, certainly, many people who routinely read information on the Internet and automatically endorse it to be true because they believe that whoever is writing the information is an expert on the given topic in a way that the reader is not, they trust the source or platform providing the information, or for some other reason. These Internet users may more easily meet the trust criterion than their more skeptical counterparts.

The trust criterion is the one that most complicates the Internet-extended mind theory. While there are clear ways in which online information can be available and accessible, it is less clear whether the Internet meets the trust criterion. In many ways, the nature of the Internet prohibits automatic endorsement. If my weather app says that it is currently snowing in my city when, in reality, I see that it is sunny, my brain automatically *un*-endorses the information I see online. Not everything on the Internet is something that I believe. This is where I consider the Internet to fail in meeting the trust criterion. Otto's notebook is his alone. Otto is able to determine what he writes in his notebook, and as a result, is able to determine what beliefs he endorses. However, the Internet does not belong to one individual, but many individuals, all of whom who have about the same amount of widespread access as each other. Therefore, the Internet is a space for truths, lies, and drastically different opinions to be shared, allowing

dissonance between what I believe, such as that it is sunny and bright outside, and what I read on the Internet, such as that it is snowy and cold. For online information to be automatically endorsed, there must not be any dissonance between what I believe and what the Internet says. This dissonance is not be possible in a single, unified mind. One neurotypical mind cannot simultaneously believe that the museum is on 53rd Street and that the museum is *not* on 53rd Street. However, an Internet user may know that the museum is on 53rd Street and also find a blog post written by a well-meaning tourist who incorrectly wrote after visiting MoMA once during a vacation that it is located on 54th Street. Just because the information is on the Internet does not mean that it deserves automatic endorsement, nor does it often receive such automatic endorsement. For this reason, I agree with Smart (2017) and Clark (2010) that the Internet performs more weakly when tested for the trust criterion compared to the other two criterion and that, in Smart's (2017) words, the trust criterion is "one of the more problematic criteria confronting the Web-extended mind hypothesis" (p. 365).

2.3 Conclusion

The three criterion for extended mind, especially the trust criterion, are difficult to reconcile with the modern Internet. However, as much as there are problems in considering the Internet as extended mind, this study also reveals problems with Clark and Chalmers's (1998) original example-Otto's notebook- as an example of extended mind. Clarifications about terms such as 'accessibility' and what it exactly means for a device to be 'accessible' are necessary to push forward in the study of technologically-enabled extended minds. Conceiving of the Internet as extended mind is still a contentious issue. If the three criterion are adequately met, however, there might still be a chance for the Internet, in some version different from the one we know today, to be a form of extended mind. An Internet extended mind has immense implications for the fundamental nature of human knowledge and communication. If the Internet can be

considered a part of the mind, it may become difficult to determine where the contents of a biological mind stops and where the contents of an Internet mind starts. Platforms such as Facebook may not just become places where we wish each other happy birthday and write lengthy posts about our political views; it may become the source of most or all of the information we use to navigate the world.

If, in the future, the Internet meets the three criterion laid out by Clark and Chalmers (1998) and we are to take the Internet as extended mind thesis seriously, we must consider the ways that the Internet as extended mind can tangibly affect people and the world. One way of doing this is to consider the kinds of mind that we are sure we do have--brains, the biological manifestations of the mind that are conveniently stored within our bodies. Cognitive offloading onto the Internet has strong implications for the brain. In the following sections, I will introduce research that demonstrate that some capabilities of the brain, namely the ability to retain memories, are significantly weakened due to the influence of the Internet. Therefore, cognitive offloading is not just a philosophical problem, but a psychological one. In the following sections, I will present and analyze existing research on the Internet's effects on the processes internal to the brain.

3 The Internet's Effects on Cognition

3.1 Existing Research on Cognitive Offloading

Marsh and Rajaram (2019) postulate that at least ten properties of the Internet have consequences for memory and cognition. Some of these properties involve Internet content and the authors of Internet content, such as the "many pictures, ads, [and] hyperlinks" that are strewn throughout Internet content and the anonymity and accessibility of Internet content authorship (Marsh & Rajaram, 2019, p. 2). Other properties involve internet usage- how the Internet "[d]oes

not require tech-savviness" and is "available to many" (Marsh & Rajaram, 2019, p. 2). For instance, Marsh and Rajaram mention research done by Schonpflug (1986), which demonstrates that people are more likely to choose printing a text than memorizing it. Marsh and Rajaram (2019) note that the growing intuitiveness of the Internet will likely increase people's reliance on the Internet for information, while decreasing their reliance on their memories. Another question that Marsh and Rajaram (2019) pose with regards to the speed of Internet searching is "whether fast results from internet searches 'feel truer' than results of other more time-consuming searches for information; it takes more time to call a friend than to quickly google a piece of information" (p. 5). Marsh and Rajaram (2019) contend that aspects of the Internet, such as its "[u]nlimited scope", "[i]naccurate content", "[r]apidly changing content", and "[m]any distractions and choices" have far-reaching consequences for memory and cognition in humans (p. 2).

One of the hypotheses that previous research in this subject evidence is that people recall information more accurately if they are given access to an external device and believe that they will later have access to this device during recall. Sparrow et al.'s (2011) research builds on Schonpflug's (1986) research by demonstrating how people rely on the Internet as opposed to their memories for information during recall tasks. Sparrow et al. (2011) conducted an experiment that tests memory of information when participants expected to be able to search this information on Google during recall versus when participants expected no assistive tools during recall. Among the participants in Sparrow et al.'s (2011) experiment, all of whom were tasked with typing out the answer to a trivia question on a computer, half believed that the computer would erase their answer, and the other half believed that the computer would save their answer. Their results showed that participants who thought that they would not be able to rely on the computer had better recall compared to participants who believed that the computer would serve

as their source of stored information (Sparrow et al., 2011). This result is in direct opposition to a similar experiment done by Hertel and Holamon (1993) using index cards. The participants in Hertel and Holamon's (1993) study were college students who memorized obscure historical facts about a historical figure, their accomplishment, and where this accomplishment took place. Each fact was written on an index card and stored in a box. Hertel and Holamon (1993) told some participants that the index cards would be available for them to use during the test and told the remaining participants that the index cards would not be available to them. Their results demonstrated that, when asked to recall the names of the figures after hearing cues of the accomplishment and location, those who were not allowed access to the index cards had worse recall of names (30%) than those who thought they were allowed access but were tested before they were actually given this access (34%) (Hertel, 1993). The experiments of Sparrow et al. (2011) and Hertel and Holamon (1993) showed opposing results from different versions of external memory- Google and index cards.

Existing research has also shown evidence that participants who use the Internet to search for answers to a question in their first task will more likely want to use the Internet again in the following task than counterparts who were only allowed to use their memories. Research conducted by Wang et al. (2017) reveals heightened impulses to use Internet search in participants who, in a forty question pre-test, were given access to an Internet search engine, then were later denied this access in a post-test questionnaire. These results were corroborated by participant reports of "stronger impulses to search the Internet in post-test comparing to pre-test", suggesting that training participants to use the Internet in the pre-test correlates to the desire to replicate such behavior in subsequent tests (Wang et al., 2017, p. 6). Storm et al. (2017) conducted a similar experiment, using trivia questions to test how Internet usage during one

question-answer task will affect participants' likelihood of using the Internet in a later question-answer task if they are able to. The results of Storm et al.'s (2017) study demonstrate that participants who were assigned to answer the first set of trivia questions using the help of the Internet continued to use the Internet on subsequent trials, even when the trivia questions were easier, 23% more frequently than participants who answered the first set of questions without the Internet. Moreover, participants who were given access to the Internet in the first task were, on average, 1.54 seconds faster in touching the computer keyboard to start their Google search than those who were only allowed to use their memories in the first task (Storm et al., 2017).

Storm et al.'s (2017) study further builds on that of Wang et al. (2017) by observing that even when engaging in the Google search was more inconvenient than using their memories, participants who had used Google in the first task were still more likely to use Google in the second task than those who had used only their memories in the first task (Storm et al., 2017). When access to an Internet-capable device was relatively convenient (the participant used the computer at the desk that they were sitting at), the likelihood of conducting a Google search was about 20% higher for those who used the Internet in the first task than for those who used their memories (Storm et al., 2017). However, when access of the Internet-capable device was relatively inconvenient (the participant had to get off of the sofa that they were sitting on to walk to the opposite side of the room to access either an iPod or a computer), those who used Internet in the first task were still significantly more likely to use the Internet than those used their memories in the first task (Storm et al., 2017).

In addition to behavioral impacts, the Internet has corresponding impacts on the neurobiology of its users. Small et al.'s (2009) studies of the fMRI scans of "Net Savvy" and "Net Naïve" participants show that, as opposed to fMRI scans of people who read text on a

computer screen, fMRI scans of people who performed an Internet search demonstrated "increases in signal intensity in additional regions controlling decision making, complex reasoning, and vision, including the frontal pole, anterior temporal region, anterior and posterior cingulate, and hippocampus" (p. 116). Wang et al.'s (2017) experiment shows "enhanced brain activations" in the anterior cingulate cortex and dorsolateral prefrontal cortex of participants who had "more search impulse" to use the Internet on the second task after they had used it on the first (p. 6). Bush et al.'s (2002) research on the anterior cingulate cortex (ACC) shows that the ACC controls reward-based decision making. Further research done by Curtis and D'Esposito (2003) shows that the dorsolateral prefrontal cortex (DLPFC) "plays a crucial role in working memory", especially "during the retention interval of delayed response tasks" (p. 415). One way to interpret this neuroscientific research is that memory of Internet usage from the first task in Wang et al.'s (2017) experiment may be the reason why search impulses are detected in the participants during the second task. Activation of the ACC may also play a role in this process, as, similar to the tasks of Small et al.'s (2009) experiment, the tasks of Wang et al.'s (2017) experiment prompted participants to change their method of answer retrieval from Internet dependence to memory dependence if they wanted to succeed in the task. When people seek out the easiest method of accomplishing the experimental task, which participants decide is the use of the Internet instead of biological memory, and use their memory of previous use of the Internet, areas such as the ACC and DLPFC may be activated.

The impacts of technology-assisted cognitive offloading are already appearing in human behaviors. According to a report by the Kaspersky Lab (2016), 53% of consumers use the notes function on their phones to remember information, as opposed to the 21% of consumers who just use their memories. This is an issue that is especially pressing for younger, rather than older,

generations. The Kaspersky report (2016) states that 27% of 18-22 year old individuals expressed fears about the increasingly important role that communications technology is playing in their lives, while 35% of 56-65 year old individuals reported that they were unconcerned with these issues. These worries may stem from a growing dependence on the Internet and digital devices as sources of information, which, without these tools, are easily forgotten or lost. A corresponding study by the Kaspersky Lab (2016) reports the following:

> A third (32%) of consumers in the study admitted that their digital devices act as an extension of their brain or memory and a third (30%) even say that their digital devices are more reliable than their own memory. Half (52%) trust their smartphone to remember the things they cannot. (p. 8)

Kaspersky Lab (2016) coined the term "Digital Amnesia" to describe "the experience of forgetting information you trust a digital device to store and remember for you" (p. 2). However, this 'amnesia' is not just a product of the burgeoning digital age, but a consequence of having tools to store information. As people grew accustomed to immortalizing their thoughts through pen and paper, Socrates aptly predicted that people would become "less dependent on the contents of their own memory" (Carr, 2011, p. 159). As print resources became more widely distributed, books and journals became "supplements to the brain's biological storehouse" (Carr, 2011, p. 159). The Internet and smartphones are modern manifestation of these books and journals, serving as devices that store memory in places other than the brain. With the rapid development of technologies that humans are increasingly dependent on and that are ingrained in humans' daily lives, the societal and philosophical implications for the extension of the mind will continue to reach new heights.

3.2 Perspectives on the Internet's Effects on Cognition

Discussions of the Internet's effects on cognition have largely focused on the negative consequences that the Internet has on the brain, namely the inability to store new memories in

the brain. Ward (2013) stipulates that the combination of the ease with which people can store their memories on the Internet and the subsequent difficulty that people have in distinguishing between their internal and external memories may "interfere with people's motivation and ability to form new memories and process incoming information" (p. 344). Ward (2013) also posits that cognitive offloading onto the Internet may prevent the creation of memory schema that are necessary to forge networks of new memories. According to Ward (2013), existing memory networks allow new information to be encoded and stored, so if a certain network of related memories is stored online, "people may lack the schematic structure necessary for forming new memories related to that domain" (p. 345). Heersmink (2016) agrees with Ward on this point, elaborating that "[a]n important property of human brains is that they continue to process information in memory long after it is received, integrating it with other relevant information stored in memory" (p. 5). This important property of brains is not present in the Internet or computer systems, and thus, such memory schema are not created when people engage in cognitive offloading onto the Internet. Therefore, not only is the brain not being used for memory storage, but the ability to establish networks between nodes of memory and build mental representations of the world in the brain deteriorates the more that someone depends on the Internet to store their knowledge (Heersmink, 2016).

Another negative effect of the Internet on cognition is a result of 'media multi-tasking', the act of engaging with multiple media-enabled devices or sources of media at once. Firth et al. (2019) made the following observations regarding media multi-tasking:

> Functionally, those who engage in heavy media multi-tasking perform poorer in distracted attention tasks, even though exhibiting greater activity in right prefrontal regions… the observed increases in recruitment of these regions alongside poorer performance suggests that heavy media multi-taskers require greater cognitive effort to maintain concentration when faced with distractor stimuli. (p. 121)

Besides difficulty maintaining concentration, media multi-tasking is also associated with greater symptoms of depression and social anxiety, according to a study by Becker et al. (2013). These effects are particularly dangerous for students. Loh and Kanai (2016) report in their study of Internet multi-tasking that "engagement in a secondary task would reduce the brain activations involved in the primary task", potentially leading to decreased brain activity in students who use such media-enabled devices for their schoolwork (p. 512). Loh and Kanai (2016) also report that media multi-tasking habits are observable in Internet addicted individuals, who "show poorer abilities in controlling or inhibiting their responses", corroborating the findings made by Firth et al. (2019) (p. 514).

Despite the many negative consequences that research has shown, Ward (2013) argues that the Internet may also have positive implications for memory. One positive consequence that Ward (2013) mentions is that offloading memories and information from the brain to the Internet may free up space in the brain for more memories, thus expanding the overall capacity of information that a human can retain in her brain. Using both the Internet and the brain as stores of memory may allow people to "perform a wide variety of mental operations that would have been impossible without the additional cognitive resources released as a result of offloading information" (Ward, 2013, p. 346). Another positive result of cognitive offloading that Ward (2013) mentions is that information will be accessible from a source that is not subject to distortion or inaccuracy, unlike the brain, which can forget and inaccurately remembers things (p. 346). In this case, the Internet provides a reliable source of information that presents the memory exactly as it was, without the memory being forgotten or remembered incorrectly. The accuracy afforded by the Internet may prove especially useful when it is necessary to recall memories as precisely as possible.

The wide-ranging effects of the Internet on cognition have led to a plethora of reactions about how, if at all, these findings can be applied to actual human lives. Heersmink (2016) claims that "it is very likely that using the Internet as an external memory system transforms our biological memory in important ways, but the experiments done by Sparrow et al. do not actually demonstrate such effects" (p. 6). Heersmink's (2016) criticisms of the Sparrow et al. (2011) experiments does not lie in the experiment itself, but the hypotheses made from it. Echoing a common criticism of cognitive psychology, Heersmink (2016) points out that Sparrow et al.'s (2011) participants, students at Harvard, largely adhere to the WEIRD (Western, Educated, Industrialized, Rich, Democratic) demographics, writing, "My point is not that the Internet does not transform memory and cognition, rather my point is that the research… is not based on ecologically-valid data, but on experiments in highly controlled laboratory settings of which we do not know yet whether they are generalizable to the Internet within and between different cultures" (Heersmink, 2016, p. 7). Heersmink (2016) argues that using "information in folders on a desktop computer in a psychology laboratory" is not obviously similar enough to actual situations in the daily lives of people who use the Internet, demonstrating that there must be a bridge to close this gap between the experiment and its real-life implications (p. 6). Although Heersmink (2016) makes a strong case for why these experiments may not be entirely applicable to the real world, it is important not to dismiss these findings, since they are representative of how the brain may *begin* to be affected by the Internet. If, in a controlled environment with a limited amount of external forces, the participants show significant results regarding memory recall, their interactions with the Internet in the real world may be even more impactful on their cognition without these restrictions. These experiments thus serve as an important foundation upon which further studies of 'real-world' Internet usage effects on cognition can be conducted.

4 Social Interactions and Memory

4.1 Face-to-Face versus Online Interaction

In the experimental portion of this paper, I focus on memory recall differences from online social media versus in-person information stimuli. In previous sections, I discussed the effects that various functions of the Internet, such as search engines, have on different aspects cognition, such as memory and attention. In this section, I will specifically focus on Internet-based social media platforms and their effects on memory, in order to preface a similar study in my experiment.

Mickes et al. (2013) tested sixteen undergraduate students for memory recall of faces and Facebook status updates, or "microblogs" (p. 484). Participants in this study looked at a set of 200 Facebook posts that they had not seen before (the Facebook condition) and a set of 200 neutral faces selected from the Color FERET database (the face condition) (Mickes et al., 2013). For each condition, 100 targets were presented for 3,000 milliseconds each, followed by a blank screen for 250 milliseconds. After this, participants took a recall test that consisted of the 100 targets randomly intermixed with 100 lures, shown one at a time. Each participant took a test that consisted of a randomly ordered mix of the 100 targets and 100 lures and asked them to indicate how confident they were that they had either seen or not seen the stimulus in the training set using a 20-point rating scale. '1' on the scale meant that the participant was 100% sure that they had not seen the stimulus before, and '20' on the scale meant that the participant was 100% sure that they had seen the stimulus before. Mickes et al.'s (2013) results showed that participants had better recall for Facebook posts than for faces. Mickes et al. (2013) provide multiple possible explanations for these results. They first propose that "[t]he posts may naturally elicit social thinking and lead to stronger encoding of the posts, whereas… unknown neutral faces may be less likely to naturally elicit such encoding-enhancing elaboration" (Mickes et al., 2013, p. 484).

Another explanation that Mickes et al. (2013) offer is that the "more gossipy nature of the Facebook posts may have been inherently more interesting to participants" and thus enhanced participants' memories for them (p. 484). Both of these explanations have merit; they both address the 'social' aspect of Facebook microblogs that is exempt in the study of unknown faces. While a face of an unknown person may incite some biased opinions of the person based on gender, racial, and ethnic stereotypes, a microblog written by a person allows for a more substantive assessment of the person's character. If the microblog details a person's opinions on the upcoming election, the reader may infer other details about the writer from the content, such as what political party or affiliation the writer might have or what kinds of lived experiences and demographics the writer might identify with. These multitudinous connections can be made by the participant when reading someone's microblog on Facebook, but they cannot be made as fruitfully when looking at a picture of someone's face.

Ekeocha and Brennan (2008) conducted a series of experiments that suggest that face-to-face interaction is significantly more effective in the content recall of a movie than electronic communication. Participants in this study first watched a movie and recalled it individually, then recalled it in either a face-to-face discussion group, in which participants talked to other participants in a discussion circle, or an electronic group, in which participants communicated with other participants through a text-based messaging platform on a computer. After discussing it with larger groups, each participant recalled it individually once again. Ekeocha and Brennan's (2008) results showed that recall for the movie's details was better for the face-to-face groups than for the electronic groups. Ekeocha and Brennan (2008) report that after conferring with a larger group, participants who engaged with the larger group face-to-face recalled 15.46 more items on average than participants who engaged with the larger group electronically.

Furthermore, when comparing the face-to-face groups' and the electronic groups' performances for individual recall after group recall, the electronic group recalled 11% fewer items after discussing with the group than before, whereas the face-to-face group recalled 6% more items after discussing with the group than before (Ekeocha & Brennan, 2008). To explain this difference between electronic and face-to-face communication, Ekeocha and Brennan (2008) offer the following hypothesis:

> "When the currency of interaction is text, producing an utterance and completing a conversational exchange takes more time and effort than does speaking. And when partners are not co-present to one another's intonation or facial expressions, their nonverbal cues are limited". (p. 257)

Ekeocha and Brennan's (2008) hypothesis addresses a key difference between face-to-face versus electronic communication- text-based electronic communication, such as emails or text messaging, lacks the visual aid that comes with face-to-face interaction. Text-based electronic communication—the medium used by one of the groups in Ekeocha and Brennan's (2008) experiment—provide only the visual stimuli of words on a screen. Contrastingly, face-to-face conversation—the medium of communication used by the other group in Ekeocha and Brennan's (2008) study—provides both a visual and an auditory stimuli for its participants. Participants not only hear the words that others are speaking, but also see their facial expressions and hand gestures, which can accentuate the point that someone is trying to make as they speak. Therefore, the face-to-face group is at an advantage because it is given more stimuli that may help participants remember the content that was discussed. Ekeocha and Brennan's (2008) study elaborates on the findings of Mickes et al. (2013). The difference between seeing pictures of faces in the Mickes et al. (2013) experiment and seeing faces speak and move in the Ekeocha and Brennan (2008) experiment demonstrates that not all images of faces affect memory recall equally. In Mickes et al.'s (2013) experiment, recall was worse for the faces than electronic text.

However, when those faces were not mere images on a computer screen, but the faces of real people in the physical world, attached to autonomous bodies and used for speaking and communication, recall for the content shared through this face-to-face communication was better than that of electronic text. When compared to each other, the Mickes et al. (2013) study and the Ekeocha and Brennan (2008) study exemplify the notable differences that must be taken into account when comparing online (electronic) communication and in-person (face-to-face) communication.

4.2 Social Media, Internet, and Extended Cognition

In my literature review, I included literature written from both philosophical and psychological perspectives on the mind. The purpose of this is to provide both theoretical and experimental surveys of the Internet as extended mind. Not only do the philosophical studies and psychological studies of the extended mind inform each other on whether we *can* conceive of the extended mind, but the psychological effects of the technologically extended mind are also crucial to the understanding of whether we *should* embrace the idea of an extended mind, allowing philosophers of mind to grapple with emerging ethical concerns for the study of the extended mind.

One of the implications that I consider in my research is that if there is sufficient reason to believe that the Internet is a form of extended mind, online social media may also constitute a part of that extended mind. As mentioned before, there is difficulty in establishing the Internet and online content as part of the extended mind, especially because of its incongruence with the requirements of the trust criterion. However, looking at specific facts on social media pages, such as the ‘About Me’ section on a person’s Facebook profile, may mitigate the problems with the trust criterion if, first, the profile has been created by a human being whose purpose in

creating the Facebook profile was to share true facts about themselves, and second, if the information on the Facebook profile was foundational enough for the person to report these facts about themselves, to the best of their own knowledge with an extremely low probability for inaccuracy. For instance, if I want to create a Facebook page for myself, I might share on my profile that I identify as a woman and that I attend Scripps College. These are basic facts about my identity that I am certain about, and I am arguably the most knowledgeable person in the world about these facts. If these conditions were met, the trust criterion, within the narrow boundaries that I have established, may be met. If the trust criterion, along with the accessibility and availability criteria, is met, the specific content of social media that I have pointed to may qualify as a part of the extended mind, according to the definition put forth by Clark and Chalmers (1998). The philosophical question that I pose through this discussion of a social media extended mind is, "If I have a reliably trustworthy, accessible, and available Facebook in the pocket of your jeans as I walk around the world, am I walking around with an extended mind of names, hometowns, schools, anniversaries, etc. of everyone on my 'Friends' list?"

Most importantly, I wish to consider why it matters that it may be possible to have a social media extended mind. The answer to this lies as much in the psychological as it does in the philosophical, hence the combination of both philosophical and psychological literature in this literature review. As the research demonstrates, social media and external memory devices already show significant effects on people's memory and behavior. Changing our human relationship to social media from a handy tool that is accessed when necessary to a constant extension of our minds may exacerbate the negative consequences on brain memory functionalities that were researched in the existing literature. Moreover, if humans continue to depend on their devices and the Internet for information, this form of memory offloading may

become so integral to our daily lives and experiences that we cannot remember things without our smartphones at all. Socially understood notions of communication, such as bowing, shaking hands, or making eye contact, may be replaced by a Facebook friend request, if people become dependent on learning about a person from a quick scroll through their Facebook profile, instead of a face-to-face conversation.

5 The Current Study

5.1 Experimental Approach

This experiment measured the accuracy of recall for two conditions—a Facebook condition in which information about a fake person is presented to the participant through a visual representation of a Facebook profile webpage, and a face-to-face condition in which information about a fake person is presented to the participant through a video of an actor speaking to the camera as if she is introducing herself to the participant in conversation. Participants experienced both conditions with either the face-to-face condition first or the Facebook condition. In each of the two conditions that each participant experienced, they saw each condition with a different fake person. For example, one participant received the face-to-face condition first by watching a video of Taylor, then received the Facebook condition second by watching a screen recording of a Facebook profile for Fran. After undergoing both conditions, each participant did a brief distractor task that involved them counting backwards from 100 and then answered questions in a survey about what they remembered about Fran and Taylor. The independent variables in my proposed experiment are the information presented in the Facebook condition and the information presented in the face-to-face condition. The dependent variables are the rates of recall for target information from the Facebook condition and the face-to-face condition, as well as participant responses to the question about how often they use Facebook.

5.2 Hypotheses

Although existing research leads me to the hypothesis that different conditions will lead to different levels of recall, other considerations complicate this view. Based on the research of Mickes et al. (2013), I hypothesize that overall recall of the actor's personal information will be better for the Facebook condition group, where participants are able to read and process the information about the person for a longer period of time, rather than in the face-to-face condition, where participants can only listen to the participants speak about their information very briefly. The Facebook condition allows the participant to return to the information in the thirty second span of time that they have to memorize the information. For instance, if a participant reads that the actor's name is "Fran Lim-Davis", reads that Fran's hometown is San Francisco, CA, and then forgets what Fran's last name is, the participant can look back at the section of the page that lists Fran's full name. On the other hand, the information in a verbal introduction is presented serially, with the actor saying their name, then saying their hometown, and so on. Therefore, the participant is exposed to each piece of information for longer during the Facebook condition, compared to the face-to-face condition, so I hypothesize that the recall for the Facebook condition will be better than recall for the face-to-face condition across both actors and for all orderings of the conditions.

However, as demonstrated in Ekeocha and Brennan (2008), the ability to see the moving faces of the people who are speaking about themselves in the face-to-face condition may allow for stronger connections between information and the associated faces than in the Facebook condition, where participants receive the information through an electronic, text-based platform. The advantage that the face-to-face condition has is that the participant may pick up on and remember non-verbal facial cues that the actor uses while speaking. These cues may allow participants to associate spoken information with certain memorable facial cues and therefore

benefit recall. For instance, a participant might recall that Fran smiles when she says that she is newly engaged and use this added memory to assist their recall of the information they are asked about. Nevertheless, the survey is presented without the images of the actors' faces, and the participants must answer recall questions based on what they remember about the actors' names. If the survey required participants to match facts about the actor with their faces, I hypothesize that the face-to-face condition would have led to better recall rates. These considerations complicate my original hypothesis and are reasons not to assume that the Facebook recall will automatically be better than face-to-face recall in the experiment.

Furthermore, I hypothesize that recall rates will be better for those participants who more frequently use Facebook in their personal time. I hypothesize that participants who indicated that they go on Facebook at least once every day of the week (EDOW) will have better recall rates for the Facebook condition than participants who do not use Facebook as frequently (LESS). Because the EDOW group will have more frequent experience navigating the layout of Facebook, I believe they will be more acclimated to reading and processing information on Facebook than the LESS group. I propose that this will give the EDOW group more ease in recalling the information later in the memory task.

6 Experimental Methods

6.1 Participants

Twenty-eight participants participated in this experiment. They differed in age, with two participants identifying as fifty years old or more, and twenty-six participants identifying as ranging from eighteen to thirty years old. Sixteen participants identified as female, eight identified as male, two identified as women, one person identified as non-binary, and one participant chose not to self-identify. They also ranged in their level of exposure to social media,

specifically Facebook, with some participants not using Facebook at all to some participants using it several times a day, every day. This variety of exposures to Facebook is beneficial to my study because if too many of the participants are experts at using Facebook, their recall rates could have skewed in favor of Facebook in a way that did not actually reflect their recall of the information presented in the experiment. Participants were, however, required to have some grasp of internet-based surveys in order to participate in this experiment because the experiment was done completely online, through Qualtrics.

The participants were also required to understand English because the questions and experiment materials, including a video in which an actor speaks to the camera, were presented completely in English. Participants were recruited solely through word of mouth, and the experiment was sent out to participants who agreed to participate through email link. Of the twenty eight participants, seven of them took a survey with the Facebook condition first, with Taylor, and the face-to-face condition second, with Fran. Another seven took a survey with the Facebook condition first, with Fran, and the face-to-face condition second, with Taylor. Another seven took a survey with the face-to-face condition first, with Taylor, and the Facebook condition second, with Fran. The last seven took a survey with the face-to-face condition first, with Fran, and the Facebook condition second, with Taylor. Therefore, there was an equal distribution of participants across each of the different orderings of the conditions.

6.2 Materials

The materials for this experiment consist of a computer with reliable internet connection, an actor who filmed two videos—one as Taylor and one as Fran, two Facebook profile pages for both fake characters (Fran and Taylor), four videos that were filmed through Zoom screen recording and a smartphone camera, headphones used by the participants if they chose to use

headphones to listen to the videos, and an online Qualtrics survey on which the experiment took place.

Each participant will undergo the Facebook condition once and the face-to-face condition once. To facilitate the Facebook condition, I first created two fake Facebook profiles for two characters (Fran and Taylor) using stock photos for their profile pictures and filled out their 'About' sections with random facts about their family, places lived, education, and background. Then, I used the screen sharing and screen recording functionalities on Zoom to project the Facebook profiles onto the screen and then recorded the screen for each of their Facebook profiles as I clicked through their 'About' sections. To facilitate the face-to-face condition, I filmed a video of an actor who introduced herself as Taylor in one video and introduced herself as Fran in the second video. In each video, the actor introduces herself as either Fran or Taylor and then introduces the same facts about either Fran or Taylor that are listed on their respective Facebook profiles.

Both the stock photo used in the Facebook profile picture and the actor in the face-to-face videos are of South Asian women. This was done intentionally to feature two characters—Taylor and Fran—who share similar physical traits. The purpose of having these two characters share similar physical traits is so that differences in racial and gender identity across the characters have minimal effect on the memory recall of participants of various racial and gender identities. By making the two characters of Fran and Taylor share similar racial and gender identities, the effect that differences in racial and gender identity may have had on this study, which is not measuring memory recall as it relates to racial and gender identity/expression, is neutralized.

6.3 Procedure

This was a within-subjects experiment in which each participant experienced two conditions—a Facebook condition and a face-to-face condition. In the Facebook condition, they watched a video of the 'About' section of a Facebook profile for either Taylor Neiman-Lee or Fran Lim-Davis, both of whom are fake people whose Facebook profiles I have created solely for the purpose of this experiment. Each participant watched a video of a screen recording of a computer screen that first shows the Facebook profile of either Fran or Taylor and then goes through the different sections under the 'About' section of either Fran's or Taylor's Facebook page. The participant first saw the landing page of the Facebook profile, then they saw the 'Overview', 'Work and Education', 'Places Lived', and 'Family and Relationships' sections in that order. Each page was on the screen for thirty seconds. In the face-to-face condition, participants saw a video of an actor who is playing either Fran or Taylor, depending on which version of the experiment the participant received. The actor introduced herself and told the viewer basic information about herself as either Fran or Taylor—i.e. the same kinds of information that was presented on the Facebook profile.

A quarter of the participants saw the face-to-face condition with Fran and then the Facebook condition with Taylor. Another quarter saw the actors switched between conditions but with the same order of the conditions, so that they see the face-to-face condition with Taylor and the Facebook condition with Fran. Another quarter saw the order of conditions switched, so that they saw the Facebook condition with Taylor and the face-to-face condition with Fran. The last quarter of participants saw the conditions in this order but with the actors switched, such that they saw the Facebook condition with Fran and the face-to-face condition with Taylor. The information disseminated about Taylor and the information disseminated about Fran did not differ across mediums, so a participant who learned about Taylor through her Facebook and a

participant who learned about Taylor through the actor's portrayal of her received the same information that Taylor's hometown is St. Louis, Missouri.

After undergoing both of these conditions, the participants did a distractor task that asks them to count backwards by three's starting from 100. After the participant did the distractor task, they took a survey on Qualtrics in which they answered recall questions about the information they received for both Taylor and Fran, as well as questions about their level of exposure to and comfort with social media and their demographic information. For example, one question that was asked about Taylor was "What city is Taylor's hometown?". To ask about participants' social media preferences, I asked them "How comfortable were you with the layout of the Facebook page that you saw in the video?" and "How many times a week do you use Facebook?". These questions were fill-in-the-blank and multiple choice. For the fill-in-the-blank questions, the answer is correct if the spelling of the answer is correct or if the spelling is incorrect but it is clear that the answer the participant was trying to provide is the same as the correct answer. Whether an incorrectly spelled answer is correct is determined by if at least 50% of the letters in the correct spelling of the answer are reflected in the participant's answer. Therefore, if the spelling of a participant's response does not match at least 50% of the spelling of the correct answer or if they leave the answer blank, their response is incorrect.

7 Results

For overall accuracy of recall between the Facebook condition and the face-to-face condition, the results showed that, on average and across Facebook conditions in which both Taylor and Fran were introduced, participants responded more accurately (58.67%) to the questions asked about the information from the Facebook condition than the face-to-face condition (37.24%).

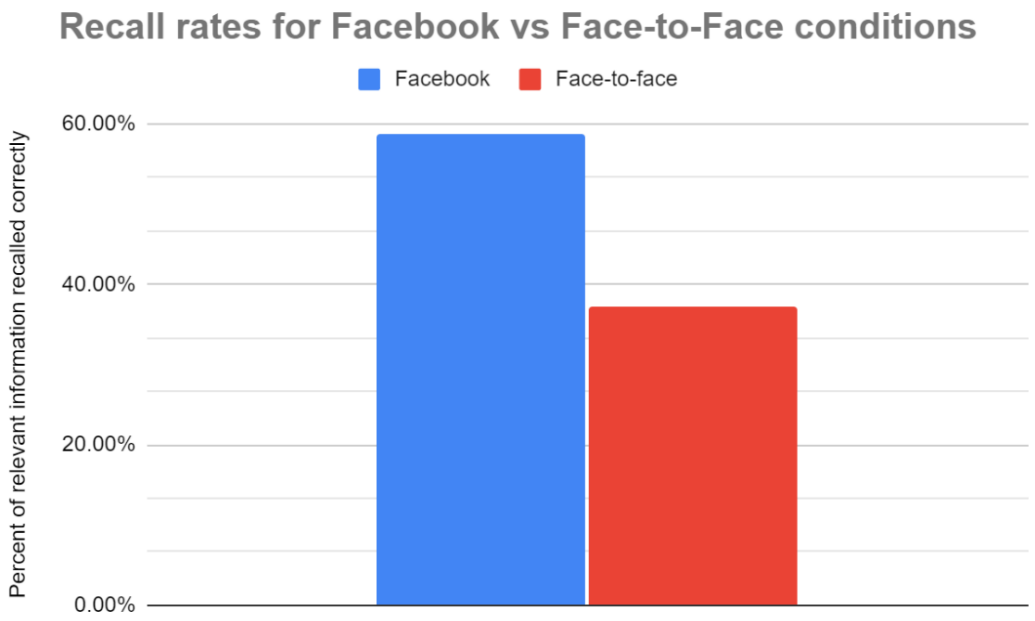

Figure 1. Overall recall rates for information presented through Facebook and face-to-face.

A paired-samples t-test revealed that there was a significant difference between the Facebook and face-to-face conditions for overall recall, $t(27)=2.77$, $p=.010$. On average, when given questions about the person who was presented to them in the Facebook condition, participants recalled this information more accurately (M=4.11, SD=1.87) than when they were given questions about the person who was presented to them in the face-to-face condition (M=2.61, SD=2.15). The means for each of these conditions was out of seven because each participant saw seven questions about the Facebook condition and seven questions about the face-to-face condition.

Another metric for the results was the difference in accuracy of recall for the Facebook condition between the participants who indicated that they use Facebook at least once a day, every day of the week (EDOW), and the participants who indicated that they use Facebook less frequently than once a day, every day of the week (LESS). Nine of the 28 participants were in

the EDOW group, and the remaining 19 were in the LESS group. An independent-samples t-test revealed a significant difference in overall recall between participants who used Facebook more frequently in their personal lives (the EDOW group) than participants who used Facebook less frequently in their personal lives (the LESS group), $t(26)=2.45$, $p=.022$. Participants in the EDOW group, on average, recalled more information about the actors in the Facebook conditions that they received (M=5.33, SD=1.32) than participants in the LESS group (M=3.53, SD=2.01). Among the EDOW group, the rate of recall accuracy for the information presented in the Facebook condition, across both characters Taylor and Fran, was 76.19% correct. Among the LESS group, the rate of recall accuracy for the information presented in the Facebook condition was 50.38% correct.

Lastly, I conducted an independent-samples t-test to compare recall accuracy for the order of the face-to-face condition, in order to examine if the distractor task did what it was intended to do and minimized recency effects. This test compared recall accuracy for the information presented in the face-to-face condition when the face-to-face condition was presented first, before the Facebook condition, (Round 1) and when the face-to-face condition was presented last, after the Facebook condition (Round 2). The t-test did not reveal a significant difference between the two different orders, but there was a trend suggesting better recall for the Round 1 group, when the face-to-face condition was first, $t(26)=1.78$, $p=.087$. Participants who saw the face-to-face condition first, for both Taylor and Fran (Round 1), had, on average, better recall (M=3.14, SD=1.55) than participants who saw the face-to-face condition second (Round 2) (M=2.14, SD=1.30). Overall, participants in the Round 1 group recalled information they received from their face-to-face conditions with 44.90% accuracy, and participants in the Round 2 group recalled this information with 30.61% accuracy.

8 Discussion

The results for overall recall between the Facebook condition and the face-to-face condition support my hypothesis that recall for the Facebook condition would be better with statistical significance. With the same number of questions for each condition (seven), 58.67% of the total responses to the Facebook condition and 37.24% of the total responses to the face-to-face condition were correct. I believe that the results supported my hypothesis for several reasons. First, the participants had more time to register the information in the Facebook condition compared to in the face-to-face condition. The screen showed the same page of information for thirty seconds in the Facebook condition, to mimic the length of time someone may take to read through the information on another person's 'About Me' page, whereas in the face-to-face condition, participants had only one chance to hear the information.

Also, because the survey measuring participants' recall required participants to type their answers out onto the computer screen, the Facebook condition had an advantage because, by allowing participants to see the information written out on a screen, participants already had a mental image of what the correct answer typed out on a screen should look like. I hypothesize that this type of pre-conditioning before the recall task contributed to the advantage of the Facebook condition. Already seeing the information written on a screen probably made it easier for participants to recall that information on a similar type of online text medium. This was not the case for the face-to-face condition, where participants heard the information fleetingly and could not return to, look at, or hear it for a prolonged period of time. Here, the experiment diverts from the model pursued by Ekeocha and Brennan (2008) in that the face-to-face condition was not actually held in-person, but through a video recording. This may be why the effects of

Ekeocha and Brennan's (2008) experiment, in which participants were shown to have better recall when placed face-to-face with another person, did not fully apply.

The results of my experiment also demonstrated statistical significance to support my second hypothesis—that those with more frequency using Facebook in their personal time would have better recall rates for the information given during the Facebook condition. Participants who reported that they use Facebook every day of the week (EDOW) had a correct response rate of 76.19% to questions about the person they saw in their Facebook condition, whereas participants who reported that they use Facebook less frequently than every day of the week (LESS) had a correct response rate of 50.38%. The correct response rate was measured for just the Facebook condition because I predicted that those with more exposure to Facebook would have better recall for the Facebook condition specifically. I hypothesized that participants who engaged with the Facebook webpage platform more frequently were likely to have better recall because participants would have been more familiar with the process of reading and processing information about other people through the Facebook webpage medium. This hypothesis stems from existing research done by Stafford and Grimes (2012). Stafford and Grimes (2012) argue that "[t]he fact of having already encountered something encourages future preference, a phenomenon known as the mere exposure effect (MEE)" (p. 995). Stafford and Grimes (2012) posit that MEE "is typically found after brief, repeated exposure to an audience with low levels of attention and involvement; conditions that often characterize our increasingly cluttered media and consumption environments" (p. 995). According to this research, repeated exposure to a media environment such as Facebook would have inclined the EDOW group to strongly prefer and thus remember items from the Facebook condition.

The results also demonstrated that recency effects did not take place for the different orderings of the two conditions. There was no statistical significance found in this test, with p=.087. This seems to align with and accomplish my goal of minimizing recency effects for the conditions through the inclusion of the distractor task after the second condition in each iteration of the experiment. It seems reasonable that there is no statistical significance showing that recency effects took place when the face-to-face condition was first, compared to when it was second, because I included the distractor task with the hope of minimizing recency effects across the different orders. The lack of statistical significance corroborates my hypothesis that recency effects would not take place across the two groups (Round 1 and Round 2) if I included a distractor task before the recall survey in each experiment. Furthermore, recall for the Round 2 group was actually worse than for the group that received the face-to-face condition first (Round 1). Recall for the Round 1 group (44.90% correct) was better than for the Round 2 group (30.61% correct). I predict that this difference in accuracy could be due to a random occurrence, which is a likely possibility because there was no statistical significance in the results.

Future research that replicates this experiment may not need to replicate it with a larger sample size because statistical significance was reached in the tests for which statistical significance was desired—namely the first test, which measured overall recall between Facebook and face-to-face, and the second test, which measured recall for Facebook between the EDOW group and the LESS group. In this implementation of the experiment, the two tests measuring recall reached statistical significance, and the one test measuring whether recency had an effect on recall did not reach statistical significance. All three of these results were desirable because they demonstrated that the two independent variables—type of condition (Facebook or face-to-face) and level of exposure to Facebook were significantly correlated with better and worse rates

of recall. However, future implementations of this experiment should attempt to have a more diverse set of participants. Nearly 93% of the participants in this study were in the age range 18-29, and most of them were recruited through word of mouth across American college campuses. Diversifying the participant population outside of these demographics could lead to more holistic and realistic results.

One way that the data in this experiment can be made more accurate is by conducting the face-to-face condition with actual in-person conversations, instead of through a recorded video of a person talking to the participants. This was not possible due to timing and budget restraints, as well as due to the health and safety restrictions of the COVID-19 pandemic. Not only will conducting an in-person face-to-face condition adhere more closely with the purpose and intent of the experiment, but it will also allow for more accurate and significant sets of data to be garnered from the participants' involvement. Furthermore, to incorporate more realistic and detailed measurements of participants' Facebook use, researchers should ask more specific questions about what mediums the participants use Facebook on. The difference in page and information layouts between Facebook on a mobile phone and Facebook on a desktop or laptop could have a significant impact on what kinds of information participants remember.

9 Conclusion

The implications for the current and previous research presented in this thesis are far-reaching for the fields of human psychology, communication studies, and philosophy. If the experiment is done with a larger sample size, this may leave room for significance to be discovered in all the results. These future results, if they continue to show that memories learned through social media are retained better than memories learned through face-to-face conversation, may be used to respond to interesting questions about how and where human

memory can be defined. If people continue to live their daily lives constantly attached to their smartphones and have Facebook functionality almost always by their side or in their pockets, the degree to which we may decide that the information on Facebook is a *part of* and not just a *tool used by* humans may be significantly increased.

The results of the experiment demonstrate with statistical significance that memory for information learned through Facebook is more accurate than information learned through face-to-face communication. If these results are replicated in larger scale implementations of this experiment, they could demonstrate that, across large populations of humans, the phone is a more reliable source of information recall than the brain. In keeping with this result, more people may embrace this finding by deciding not to commit information to their biological memory at all and instead write down information in their phones or search up the information every time they need it. We already see this happening when people open the 'Notes' app in their phones to write down passwords, notes, grocery lists, and any other things that they want to keep in their memories. After all, if there is compelling evidence that shows that memories on a phone are more reliable than memories in the brain, someone who is intent on remembering certain things would be wise to keep them stored, not in the head, but on their device. Especially if there comes a time when a person commits more of their memories to their phone, which they are constantly able to access, than to their brain, I would argue that there is no reason why we cannot say the phone is a *part* of this person, just like the brain is. If the phone is acting, in large part, like the brain, it seems plausible to give it some of the same characterizations we give the brain.

As the results of the experiment demonstrate, memory for information garnered through Facebook is better than memory for information garnered through face-to-face conversation. In light of these results, we must ponder whether we are willing to make this trade-off between

better online memory and worse offline memory. Are we willing to forgo the biological processes and traits of memories in favor of artificial, yet longer-lasting and more factually accurate, memories? Furthermore, if we do favor online memories over offline ones, what does that mean for the human mind, if this is where we understand our memories to be traditionally stored. This could mean that we should conceive of the human mind as 'extended'—that is, the human mind does not just exist within the body, inside the brain and skull, but outside of the body and out in the world as well. This is further complicated by the notion of an *internet*-extended mind, in which memories can be stored, not just in a notebook like Otto's, but across the multitudinous and limitless internet, with its vast stores of data and information.

As both the philosophical and psychological sides of this novel topic demonstrate, the complexities of an internet-extended mind are far-reaching and will only advance with new inventions in internet-based technology. As these new technologies develop, it is crucial to the well-being of the humans who will end up using these technologies to ponder their psychological effects, as well as their philosophical implications. Increased access to Facebook was only made possible very recently, with the advent of internet access tools, such as internet hotspots and 4G internet connection. My hope is that this research serves as a blueprint for other scholars to consider what it means for a mind not to exist solely in the body, but also on our devices—whether those devices be hi-tech smartphones or the pen and paper we use to write our grocery lists—and what it means for the mind to exist specifically on *online* databases such as Facebook, which houses a seemingly infinite amount of personal data. This level of cognitive offloading deeply shapes and will continue to shape the ways in which humans remember things about themselves and each other, as well as the ways in which humans communicate with each other. If humans increasingly receive their information through their phones, rather than from each other,

the entire nature of simple face-to-face conversations is changed. I pose these open-ended questions to scholars, students, and interested readers alike, and I encourage each reader to ponder to what extent they have their own internet-extended mind. Perhaps your mind extends out into the world more than you might think!

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