

Smartphones, Personality, and Life Satisfaction

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Abstract

In recent years, smartphones have become deeply embedded in the fabric of our lives. Research suggests that these devices can foster poor mental health and weakened cognitive abilities (Ward, Duke, Gneezy, & Bos, 2017). This part-correlational, part-case study explored specific elements of personality (reward interest, goal-drive persistence, reward reactivity, and impulsivity) and life satisfaction as they relate to the amount of time users spent using common smartphone apps (applications). The focus apps included Instagram, Snapchat, Facebook, Twitter, calling, messaging, email, web browsing, photos, music playing and notes. Sixty-three Connecticut College students completed the revised Flourishing Scale (FS), the Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ), and reported the amount of time spent on each of the apps based on their phone batteries' 7-day report. The data suggests impulsivity is helpful in predicting usage of mail apps (negative association), reward interest explains some of the variation in web browser usage (negative association), and goal drive persistence is useful in understanding Notes usage (negative association). From the correlational study, four case study participants were selected (two of them with high amounts of usage, and two with moderate amounts of usage). These case study interviews suggested that social success and boredom are at the heart of college student drives to engage with smartphones.

Keywords: mobile computing, usage time, life satisfaction, personality

Introduction

Human beings did not evolve alongside the information technology of the 21st century. If one of our ancient ancestors were to find an iPhone, they would surely think it was the belonging of a witch or some great deity. Even to those of us living, smartphones often seem all powerful and limitless in their applications. While our ancestors might approach smartphones with cautious awareness that usage consequences are unknown, we are often entirely desensitized to how truly irregular smartphones are from other objects. In 2018, smartphone ownership and usage are almost indispensable, yet usage can be damaging to mental health and cognitive processing. Recent research supports the assertion that heavy smartphone users, on average, have worse mental health and weakened cognitive abilities than do moderate users or those without smartphones (Ward, Duke, Gneezy, & Bos, 2017).

Technology creators have access to vast datasets on smartphone use, so it is more than likely that they are aware of potential harm to users. Yet, there is still a focus on optimizing the amount of usage (the addictive properties), rather than user wellbeing. Ethical considerations are second to economic gain and competitive drives. Offering such a valuable mode of advancement, data-technology creators have risen to hold monopolies over the data representations of various sectors of life. Social media apps (applications) hold representations of how people interact. Dating apps hold representations of users' romantic and sexual interests. From so many angles, real people are represented in the form of data. Users are conditioned to willingly surrender these representations, which further improve the creators' ability to understand and manipulate them. Living in a corrupt and competitive technologically-unkept world, users fail to acknowledge that dependence on data technology (primarily social media) breeds vulnerability. In large part, this has to do with the fact that human beings have never spoken the language of data; interactions with a screen's bubbly user interface are deceptively simple, bright and friendly. Governing forces can fail to protect their people from unintentionally sacrificing data-encoded versions of

themselves. The acting president of the United States illegally obtained user data from the largest social media provider to essentially rig his election. Sociopolitical forces, which are meant to defend people's wellbeing, are corrupt, powerless, or sometimes woefully unaware.

Simultaneously, the technologies which power data communications are presented to users as life-enhancing. Indeed, smartphones are critical to many users' careers, time conservation (with software utilities that connect to technological systems such as transportation), and relationship maintenance. Online services even facilitate the start of the majority of marriages. Smartphones have an undeniably positive impact in even wider realms. For example, new imagined communities arise, allowing for new kinds of industry and greater specialization. Smartphones give disenfranchised people a medium to voice their struggles to the global community. There is greater creativity and generativity in every industry. Enhancement does indeed occur: there is a universe of information, connectivity and functionality several taps away. There is also greater and more directed sharing and processing of information, which is much more efficient than the past modes of distribution in which information underwent a slow diffusion from its source. From almost every angle, data seems to be a language for powering previously-unseen collective learning ability and functionality.

However, as users spend increasing amounts of time using smartphones, they can undergo psychological changes mirroring substance addiction (Matar Boumosleh et al., 2017). The full range of side effects is unknown, but it is clear that this range includes a decrease in mindfulness, attention span, and other characteristics of mental health such as self-esteem (De-Sola et al., 2017; Titilope, 2014). Users are largely unaware that their information and addiction processes are being invaded. Those who are aware, are most often forced to engage with the technology regardless. Disconnecting poses serious consequences, as those who leverage the benefits of information technology have more social and professional opportunities. There is a need for deeper understanding of how serious these consequences can be. Ideally, technology creators could tweak smartphone attachments to optimize users' lives in light

of these negative consequences. If the creators were armed with a better understanding of how to avoid the negative consequences (without necessarily sacrificing their economic gain), society would benefit greatly. Perhaps this is the long-term intention of the technology creators.

Mobile computing technology, which powers smartphones, is incredibly new. Not only is it incredibly new, but it is also rapidly evolving—so much so, that any literature review is already semi-outdated. Researchers have only touched the surface of what is an extraordinarily dynamic and variant source of psychological insight. There is a lot to be understood about the relationship between human beings and their smartphones, which are essentially digital companions which define—what the brain might understand as—a new kind of interpersonal relationship.

Existing research in this field attempts to establish a connection between smartphone usage, addiction processes, and other factors of mental health. A particularly harmful kind of attachment to smartphones has been identified: one in which users become dependent on digitally-sourced validation. This behavior impacts self-esteem in a cyclically destructive process (De-Sola et al., 2017). When smartphone users are dissatisfied with their non-digital, real-world selves, they often turn to their digital lives, which make them more prone to being let down by future real-world relationships. Other research suggests causal relationships, wherein heavy smartphone usage manifests in users as depression, anxiety, compulsive behavior, and functional impairment. This research even pinpoints symptoms of tolerance and withdrawal as caused by heavy usage, which suggests chemical dependency as a potential consequence (Matar Boumosleh et al., 2017). Past research has identified generally-negative psychological characteristics, such as a low emotional intelligence and attachment anxiety, as predicting high smartphone usage (Gao, et al., 2017; Han et al., 2017). Similar research supports a causal relationship wherein loneliness, boredom, egoism, independence, and love-affair, and work-related stress predict high usage (Titilope, 2014; Kuang-Tsan & Fu-Yuan, 2017). It would stand to reason that this usage can reinforce the dysfunction. Although there is likely a way to eliminate problematic usage without

disconnecting entirely, there is a lot of research to suggest that eliminating or reducing smartphone usage offers quite a few mental gains (Carr, 2017).

Past research has explored this topic primarily through identifying relationships between engagement with smartphones and both temporary psychological states, and more chronic psychological disease. A critical shortcoming of this research, however, is that the target of data collection is outdated during or soon after analysis; interactions with smartphones change rapidly as technology creators iterate on their products and submit app updates. Early studies looked at uses such as SMS, calling, and changing phone background wallpaper (Blaszczynski, Butt, & Phillips, 2008). Many users are driven to get the latest smartphones as soon as they are released. In 2018, software developers have access to create systems integrating countless subsystems. Smartphones come with a myriad of sensors, including fingerprint readers, facial recognizers, proximity detectors, front and back-facing cameras, and microphones that can pick up on more detail in sound waves than the human ear. Developers can include artificial intelligence and machine learning in their creations. There are millions of free-to-use APIs (pre-created, plug and play functionality) that allow for technology creation and variation that grows exponentially. The limits and engagement patterns of technology are unclear to say the least. A smartphone is not a combination of pre-defined functionality; it is a platform for the creation of endlessly varying tools, systems, and information processing. This makes understanding the rules and exceptions of smartphone interactions rather complex. Yet, it is absolutely necessary to have this understanding, for without it, there's little way to prevent a future that devalues real-world connection.

This research lays the foundation for solutions in industry. For example, it is possible to devise an algorithm, based on this kind of correlational research, that sends users notifications when their interaction patterns align too closely with that of someone with an unhealthy mental characteristic. While helping users weed out consequential smartphone usage seems to be a task for lawmakers and educators, the more effective solutions might exist in industry. Such solutions would need to focus on how enduring

characteristics, specifically personality factors, mediate smartphone usage. Research shows that not all smartphone users are equally susceptible to the negative side effects associated with the addiction.

Therefore, solutions must be tailored to specific individuals. The research even suggests that some users are not experiencing the “addiction” at all.

The precursor to this study was a 2017 correlational study, conducted by myself, using the Center for Epidemiologic Studies Depression Scale, the Rosenberg Self-esteem Scale, and the Problematic Mobile Phone Use Scale, along with screen time measures of Snapchat, Instagram, Facebook and Email. The results suggested that Snapchat usage time was negatively correlated ($r(70) = -.292, p=.014$) with depression. Such results hinted at the possibility of withdrawal (not getting as much screen time could cause symptoms of withdrawal), but no causation was tested. The study also showed that self-perceptions of technology addiction were associated with email screen time ($r(70) = -.232, p=.053$). While depression and self-esteem are the more outspoken consequences of heavy smartphone usage, personality is a critical area for future research. The aim of the current study is to understand how several personality factors predict engagement with popular smartphone applications. Following this, the aim is to allow researchers to offer insights that helps safeguard, from several possible angles, against addiction and destructive behavior. Specifically, the current project expands the previous study by analyzing usage as it relates to reward interest, goal-drive persistence, reward reactivity, impulsivity, fight-flight-freeze system, and behavioral inhibition system and life satisfaction.

Method

Research Design

This research was broken up into two stages:

The first stage was a correlational study to investigate associations between app usage, life satisfaction, and personality traits. The research hypotheses were:

- a) Total application screen time will predict life satisfaction. Specifically, users reporting relatively high screen times will report lower life satisfaction.
- b) Reward interest, goal-drive persistence, and reward reactivity scores will predict Utility app (such as Uber, Calendar, Google Docs, etc.) screen time. Specifically, participants with relatively high scores on these personality traits will have higher screen times for the Utility apps. □
- c) Impulsivity scores will predict social media and communication app (such as iMessage, Instagram, Facebook, Facebook □Messenger, Snapchat) screen time. Specifically, participants with relatively high impulsivity scores will have higher screen times for social media and communication apps.

The second stage was a case study of four users selected through the initial □study (stage 1). Two of the four were relatively high in their usage, and two were relatively moderate. The goal was to gain a deeper insight into how extreme app usage affects life satisfaction and vice versa, as well as exploring some of the potential ways that past experiences, current priorities and future goals mediate social media interactions and app usage.

Participants

The subject pool was comprised of 63 Connecticut College students who were iPhone users. The participants were found through SONA and were likely Psychology students looking to fulfill course requirements. Participants were selected without regard to demographic background, gender, nor age. The second stage of the study was composed of 4 participants selected from the initial study based on degree of app usage.

Materials

Stage 1 Informed Consent (*Appendix A*)

Stage 2 Informed Consent (*Appendix B*)

Flourishing Scale (FS) (*Appendix C*)

Participants' life satisfaction was measured using the Flourishing Scale (FS). The brief 8 question scale asks about leading a purposeful and meaningful life, the quality of social relationships, and engagement in daily activities. The composite score can range from 8 to 56, with lower scores indicating lower life satisfaction (Diener et al., 2010).

Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ) (*Appendix D*)

Personality traits were assessed using the Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ), which is based on the Approach Avoidance Theory of Personality. This 79 question scale measures various personality traits including reward interest, reward reactivity, impulsivity, obsessive thoughts and behavioral disengagement. All questions are scored positively, so a high score indicates a strong tendency for that personality trait.

MC Usage (*Appendix I*)

Using an online portal, participants input the time they spent using the focus apps.

Demographics Questionnaire (*Appendix E*)

Case Study Semi-structured Interview (*Appendix F*)

Debriefings□

Stage 1 Debriefing (*Appendix G*)

Stage 2 Debriefing (*Appendix H*)

Procedure

First stage

Once enrolled, participants attended a half hour session in a computer lab in Bill Hall, at Connecticut College in New London, Connecticut. They were instructed to navigate to a Qualtrics survey online. The first form on the Qualtrics survey was the informed consent. Next, participants completed the FS and RST-PQ in a counterbalanced order. Following the completion of the two scales, participants filled out a demographics questionnaire. They were then instructed to go to the app usage report in their iPhones, and transcribe the amount of time they spent on each of the selected apps. Upon submitting this, they were redirected to the debriefing form. Finally, participants notified the researcher of their name and were marked present to receive credit through SONA. There was no use of deception, nor was there a cover story. Participants were given no context.

Second stage

Four users, who marked themselves as willing to participate in the case study, were contacted for participation. They then made appointments to meet with the researcher. In these meetings, participants were asked a set list of questions to gain deeper insight into how app usage affects or is affected by life satisfaction. This involved understanding how particular personality types mediate interactions with social media. This stage also provided the flexibility to ask questions of a more descriptive nature, rather than pursuing such research through metrics of psychological scales and statistical tests. Each participant attended a one hour-long session, during which the researcher audio-recorded the semi-structured interview.

All data were anonymized and its availability was restricted to the analysis process. The ethical issues were limited to requesting participants to reflect on their life satisfaction and behavioral tendencies.

Results

Descriptive statistics were used to explore the range of screen time on the focus apps. Two participants, who reported no data on the app usage form, were excluded from all analyses. Given that not everyone uses every app, usage reporting was optional for every app. The mean time spent on individual apps ranged from 0.3 hours (in the case of the Notes app), to almost 4 hours (in the case of Instagram) over the course of one week. However, there was considerable individual variation in reported screen times as the standard deviation was often similar to the mean or even exceeded it for a single app. The greatest individual variability existed for time spent using Facebook and music playing apps (see Table 1).

Table 1. Descriptive Statistics for App Screen Time

App	Mean Screen Time (hours)	S.D.
Instagram	3.94	2.76
Snapchat	2.64	1.70
Facebook	1.66	2.70
Twitter	1.34	1.66
Calling	1.87	2.01
Messaging	3.13	3.09
Email	0.55	0.35
Web browsing	1.06	0.99
Photos	0.58	0.43

Music	2.55	4.93
Notes	0.30	.21

Overall, participants reported high, and relatively invariant, life satisfaction scores ($M=49.61$, $SD=5.89$), regardless of the wide range of total reported screen time (1.9 hours – 31 hours). The first hypothesis, that total reported screen time would predict life satisfaction as measured by the Flourishing Scale, was not supported. Time spent on individual apps was also not a significant predictor of life satisfaction.

Participant scores on the six personality factors varied, with the behavioral inhibition system exhibiting the most variability ($M=36.56$, $SD=12.69$, see Table 2).

Table 2. Descriptive Statistics for Personality factors

Personality factors	Mean Score	S.D.
Reward interest	13.41	3.91
Reward reactivity	20.07	4.82
Impulsivity	12.52	4.52
Goal drive persistence	15.57	3.83
Behavioral Inhibition System	36.56	12.69
Fight Flight Freeze	15.93	6.542

In terms of the second and third hypotheses, personality factors did not significantly predict overall screen time, social media app screen time, nor utility app screen time. However, some personality factors were significant predictors of individual app screen times. Reward interest scores significantly predicted reported web browser screen time, $\beta = -.34$, $t(60) = -2.72$, $p < .01$, and reward interest also explained a significant proportion of variance in browser screen time, $R^2 = .119$, $F(1, 55) = 7.34$, $p < .01$ (see Figure 1).

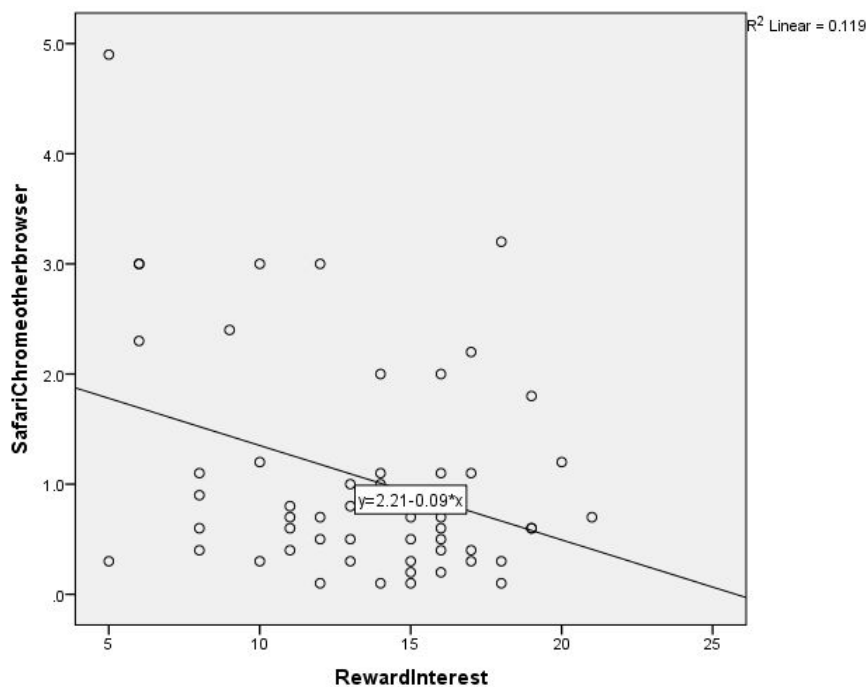


Figure 1. Reward interest score and Web browser usage time (hours)

Goal drive persistence scores significantly predicted Notes screen time, $\beta = -.513$, $t(60) = -2.16$, $p = .05$, and goal drive persistence also explained a proportion of variance in Notes screen time, $R^2 = .263$, $F(1, 13) = 4.65$, $p = .05$ (see Figure 2). Impulsivity scores significantly predicted reported email screen time, $\beta = -.36$, $t(60) = -2.74$, $p < .01$, and impulsivity also explained a significant proportion of variance in Email usage, $R^2 = .110$, $F(1, 52) = 7.53$, $p < .01$ (see Figure 3).

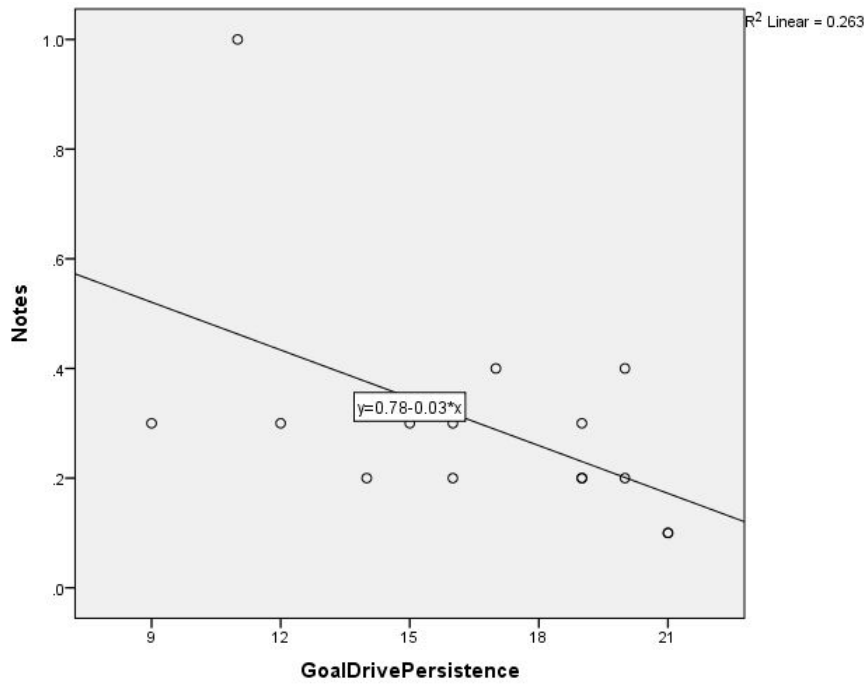


Figure 2. Goal-drive persistence score and Notes screen time (hours)

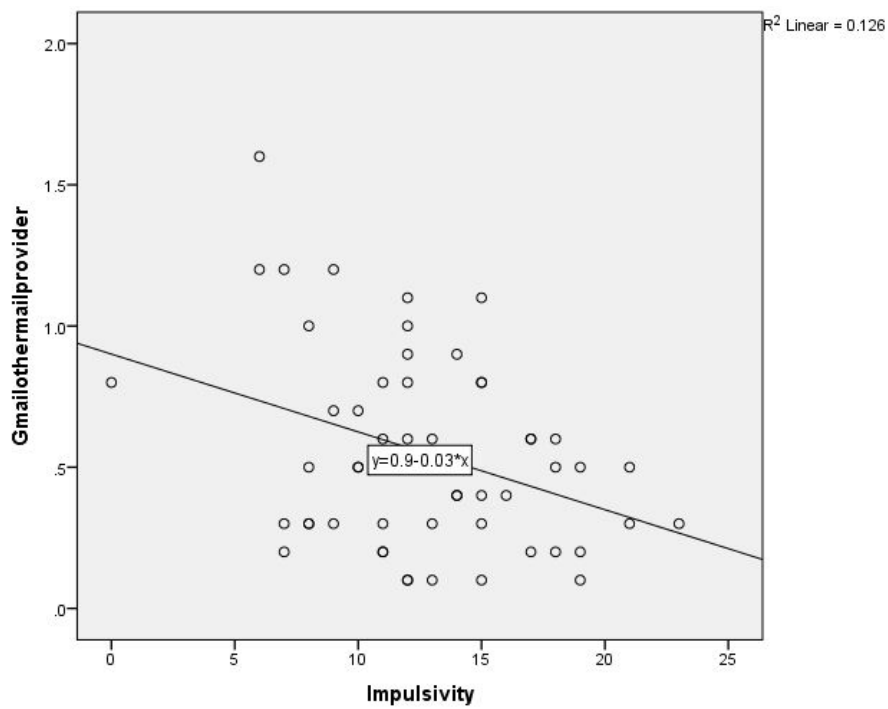


Figure 3. Impulsivity score and email screen time (hours)

Discussion

Correlational Study

There was no support for the first hypothesis, that app usage time would predict life satisfaction as measured by FS scores. Individual app screen times were also not significant predictors of FS scores. While FS scores were relatively high and invariant for participants in this study ($M=49.61$, $SD=5.89$), app screen time varied widely across individuals. This limited the power of app screen time as a predictor of life satisfaction. It is possible that the FS was simply too short and did not provide enough information to separate out differences in life satisfaction among the participants. It is also possible that there was some sort of self-reporting bias, in the sense that participants wanted to view themselves or be viewed as living lives that were high in satisfaction.

The second hypothesis focused on personality factors as predictors of utility app screen time. Given that participation was limited to 30 minutes, it was important to decide which application screentime measurements were of highest priority. Although the IRB research proposal listed Uber, Calendar, and Google Docs as desired screen time measures, they were not included in the final version of the questionnaire that was given to participants. Using Uber involves payment, and therefore could create a bias toward students from families of high income. Calendar apps and Google Docs were also discarded. The only utility apps measured were the Notes and web browsing apps. The original utility-related hypothesis stated that high reward interest, goal-drive persistence, and reward reactivity scores would be predictors of utility app screen time. There were two parts of this hypothesis that were supported. First, reward interest predicted web browsing app usage ($\beta = -.34$, $t(60) = -2.72$, $p < .01$). Specifically, those scoring higher in reward interest tended to report less time web browsing. This suggests that web browsing is potentially perceived as less capable of providing reward to users. It also suggests that those more sensitive to the opportunity for reward are more willing than others to seek out

reward on web browsers. The second finding was that goal-drive persistence predicted usage of the Notes app ($\beta = -5.13$, $t(60) = -2.16$, $p = .05$). This finding suggests that the less people used the Notes app, the more goal-drive persistence was reflected in their RST-PQ responses. Perhaps this is due to the fact that writing down your goals with the Notes app is less of a formal statement of your goals than is a specialized goal-management app.

The third hypothesis, that high impulsivity scores would predict high social media and communication app screen times, was not supported. On the contrary: impulsivity scores predicted email usage, but in the opposite direction as hypothesized ($\beta = -.36$, $t(60) = -2.74$, $p < .01$). The more time users spent on email, the less they reported characteristics of impulsivity in the RST-PQ. Email, as a medium, is very work-oriented, and deals primarily with academics and professional communications. While difficult to state with certainty, the priorities of many college students likely lay in the social realm when interacting with their smartphone. This tendency may be, in part, a reflection of impulse control. This association was not included in the research hypotheses, but comes as no surprise given the nature of college student drives and the widely-perceived role of email.

Case Study

Every effort was made to ensure each participant was given no signal (such as judgement or agreement) that could create a bias. No ideas were dismissed or invalidated. Yet, all participants were aware of heavy smartphone usage as problematic (and even described how this manifests in their lives). It is impossible to distinguish between pre-existing attitudes, and attitudes that were formed as the result of participation in the first stage (correlation study) of this research. Given that all participants viewed their usage as at least somewhat harmful, it is likely that there was some bias-inducement in the correlational study procedure (entering usage times perhaps) and therefore, bias was inherent in the participant selection process.

The goals of the case study was (A) open-ended exploration, as well as (B) to see if Connecticut College students' smartphone usage and self-perceptions fit into the larger narrative of technological progress. The following analyses of the four case study interviews draw on attachment and object-relations theories, which describe personality and attachment style as developing from relationship experiences early in life. These experiences mold an expectation of relationships, which manifest in interpersonal behaviors.

Participant A

Participant A was selected because of her relatively high levels of social media usage. The conversation began with a discussion of early perceptions of phones. Participant A, from a young age, viewed phone ownership as “cool” and immediately placed value on phones as a tool for viewing and creating “status.” She went on to describe how her first uses of a phone were primarily centered around satisfying boredom (games such as brickbreaker) and even quelling feelings of powerlessness that come with being a child (and therefore subject to the control of teachers and adult caretakers). Entertainment remained the main use case into the early-teen years. Soon after, the first forms of social media (Facebook) and phone-camera implementations resulted in a new use case which has since taken priority: social networking. Participant A described the onset of social media as “a seduction.” She, “in high school, presented [herself] in a much different way on social media than [she] did in person: more confident and oriented towards partying”. Even today, participant A says that she would “feel weird and regretful if [she were to] go to a party and [not] post a picture.”

This particular participant had some experiences with traveling to other countries where cellular reception or government censorship resulted in an inability to use data-dependent apps (and therefore social media). Participant A states that she realized it would be possible and even easy to live without a phone, but that it would make her feel stressed if she were “out of the loop.” It didn't seem that real interactions are as critical to participant A's social satisfaction as is the *illusion* of connectedness. Being

in the loop seemed to contribute heavily to participant A's sense of her own social power—so much so, that she even described a common posting habit of hers that supports this view: “I feel like I comment on people's photos that I don't really know”. Participant A stated that she has, at many times in the past, thought about these interactions as being “weird fake comments on people's photos,” and yet, there has been no behavioral change. This suggests that social media satisfies her need for affiliation, regardless of the fact that, by her own standards, the affiliation does not extend beyond a “follow” and “comment” relationship. Her behavioral self-awareness also covers the potential gains to be had from eliminating such usage: “If I were to get rid of my phone, I think I'd have more personal interactions with people that I'm really close to [and] less with people that I don't really know.”

Beyond a lingering desire to eliminate those less-meaningful interactions, participant A commented on the nature of privacy as an area that made her feel unsafe. “My Instagram is public because that gives me more followers, but at the same time, I get creepy messages all the time... I should probably be more concerned about that, and yet, I'd rather get the likes and feel noticed than put my own personal safety and privacy as a priority.” At this point, it was clear that smartphone interactions are a building block of participant A's sense of self. Viewing herself through the eyes of others, or as a collection of images on a screen, allows participant A to try and understand her worth, relative to the profiles of others. To her, Instagram isn't just a tool for social exposure and opportunity-seeking, but it is also a mode of self-improvement (to be based off the feedback of her peers). When she posts an image of herself in a given outfit, or environment, or next to a friend, she receives feedback, which gets internalized and translated into a new sense of self (therefore defining constraints for future social media interactions, and potentially limiting the amount to which her previous self is expressed). Participant A perceives a lot of this self-defining feedback as shallow, and yet it is important enough to her that she places its value over feelings of safety; the risk of being visible to cyber-predators is worth receiving a

crowdsourced guide of potentially-faulty self-improvement cues. It seems as if participant A is very self-aware, even as she is motivated to fit into a profile that isn't necessarily true to her real self.

Participant B

Participant B, the only male in the case study, was selected because of his moderate amount of usage. He described his attachment to a phone as being linked more so to creativity and self-expression than to insecurity or boredom.

He got his first phone at age 12 and used it strictly for calling and texting. A few years later, he got a smartphone, and began playing games off the App Store. In his early teens, his friends encouraged him to join Facebook. He wasn't very involved in contributing to this kind of social media. Next he joined, Snapchat, which he originally had no interest in using. The participant stated that "[he] wasn't in a rush to compare [himself] to peers," yet the key motivation for using social media was in fact to satisfy a social expectation that you were on it in the first place (it did not matter if you were active or not). Nowadays, the participant does not use Snapchat, nor Facebook, but enjoys using Instagram for the sake of engaging with artists and content creators.

The participant does believe that, when used for social-advancement purposes, Instagram can benefit users with confidence and self-exploration: "If you post something you think is cool and you get 5 likes, then you're like 'okay,' people didn't really like that. If you post something you think you look good in or is agreeable, and you get 200 likes... it says something else. It helps you think about yourself in the scope of others, which people say shouldn't matter... people say you should only care about yourself... but at the end of the day, what other people think does matter and it's fair to consider what those people think." This adds a bit of nuance to the ideas underlying the discussion with participant A: constructing your identity, at least in part, based off of the reactions of your peers, is valuable. As we mature, the feedback we get from others can help to define our sense of self. This does not mean that we

are not autonomous, nor that we surrender must-have elements of identity. On the contrary—participant B believes that social media can be a powerful tool for maturation.

Still, he discusses instances where a dependence forms in which unhealthy attitudes toward self-exploration come through in social media presences. Participant B believes that some unhealthy attitude formation stems from over-comparisons: “the most common usage of these things is to compare yourself to your peers.” Participant B believes that social media is most commonly used to “show people what you’re worth.” He stated that it is easy for those with insecurity to “create an online personality that makes [them] feel better than [their] real-life personality.” This could be a serious impediment to necessary self-improvement and self-realization.

Participant B also sees social media as being an impediment to genuine connection and politeness. He reports many instances of friends with whom he cannot make plans, because they will inevitably find “better” plans and cancel on him at the last minute. From participant B’s perspective, breaking plans on a whim has become socially acceptable. Before having an ability to text a cancellation, breaking plans might mean making the other person wait on you when you’re never going to show up, which is a sign of major disrespect and can be relationship-altering or even relationship-ending. The participant agrees that it is sometimes important to have the ability to cancel on short notice, but that it is commonly abused, especially within his small college’s social environment.

The participant was asked about how life without a smartphone would make him feel, to which he responded “relieved.” He feels immense pressure to do more to connect with people: “there’s always more we could be doing. We could be reaching out to so many people. I feel an obligation to people because they’re one text away.” Digging deeper into this though, the participant acknowledged that he likes having a small network and that he regrets allowing social media to make him feel inadequately social: “There are plenty of people that I think I’d like if I made an effort, but there are already so many people in my life. I don’t feel like I need to do it.”

When asked to describe where this attitude comes from, the participant described his relationship with his twin brother: “He is my best friend forever... and I know that I’ll never like or get along with anyone as much as I do with him.” Participant B seems to have a very secure attachment style and a relationship that brings him a lot of joy and comfort. “A lot of people struggle with that, like ‘who’s my best friend.’” For participant B, this relationship is an incredibly defining element of identity. He’s not trying to be anyone else, nor is he trying to piece in his confidence, fears of rejection, nor past social failures. This is likely the key difference between participants A and B. Participant B’s confidence in the state of his relationships affords him the mental freedom to not care about (what he perceives as) less meaningful social interactions. His only social regret, with regards to phone usage, is that he sometimes checks his phone at family dinners. This participant places greater value in specific real-world relationships than in online communities or “flakey”, Snapchatting peers. It’s likely that this is what allows him to live without engaging in heavy smartphone usage behavior.

Participant C

Participant C reported relatively high usage across most apps (especially social media). Throughout our conversation she spoke as if she were somewhat distanced from social media. She would follow up statements such as “conversation is so much more valuable without phones” with statements such as “when I’m with my friends, we’re on the phone more than we talk.” Participant C provided somewhat conflicting information about her experiences with a smartphone, but the ultimate source of truth seems to tie into her early experiences with social media, and to her seemingly-ambivalent attitudes toward her friends.

Joining Instagram and Snapchat at age 12, participant C witnessed multiple friends of hers undergo serious struggles with body dysmorphia. From the conversation, it sounds as if the friends of participant C would use Instagram as a tool to garner pity and encouragement. Participant C’s first experiences with Instagram involved a feed full of posts relating to eating disorders and crippling

insecurity. Concerned for her friends, participant C brought their posts to the attention of her teacher, who then prompted serious in-school discussion about the uses and implications of social media.

Nevertheless, her friends continued using platforms to distribute highly personal information (at one point this included a picture of participant C's best friend on the toilet). "[Her] friends would spend 20 minutes editing a pic that they know people will like online... so that they can get the kind of feedback they want, and then do it again and again and again... and if they don't get the feedback they want, they remove the photo." At this point, participant C seemed to enjoy herself as she repeatedly criticized the phone-related behaviors of her (supposedly) close friends: "a lot of them even have followers that they bought... they don't even know them!"

When speaking about herself, however, participant C described usage behavior as minimal. She even stated the following: "I've come to a point in my self-awareness where I know when it's right to be on my phone and when it's not." Simultaneously, she openly admits that her usage (which is very high relative to her peers) keeps her from being productive and experiencing the world. Participant C is driven by a desire for loyalty from her friends, but heavily criticizes them, and passes up opportunities for real-life engagement (opting instead to "slump in bed and live vicariously through [her friends]"). She ignores all phone calls, opting for text messaging as her preferred mode of communication. This mode makes it easier for her to calculate every communication (in hopes that it will give her more control over the outcome). She describes this effort as stemming from worry that she won't be witty enough to make good conversation in real-time.

She described her relationship with her best friend, who goes to school across the country. Participant C believes that social media is a good way for the two to stay in touch, yet she has extreme anxiety whenever she or the friend fail to respond (they're both inconsistent in their responding patterns). The anxiety about maintaining her relationship with her best friend might reflect on participant C's attachment style. She described herself as the perfect friend, and then went on to describe numerous

disappointments when her best friends grew distant and branched off. It is as if participant C believes that failure to text, comment, or like friends' posts will result in a real-life "de-friending."

She believes that her friends do not prioritize her friendship. This becomes clearer as participant C describes her disappointment when planmaking falls through. She believes it is always the other person's responsibility to follow up about plans that are roughly outlined in person. During the discussion, participant C sounded rather upset as she described how such friends make her feel: "it's like they don't care enough about hanging out with me to follow through with plans unless I text them." The interview culminated with more descriptions of her friends as "sad" and "insecure" and more descriptions of herself as "loyal" and "caring."

The appearance-fostering nature of Instagram seems to shine through into the real-world interactions of participant C. She seems to have trouble connecting on a deep level, presumably because she does not trust others to be good to her (she emphasizes her friends' lack of "loyalty") and would rather experience relationships as carefully-crafted appearances. This cycle of prematurely giving up on friends and of even viewing them as unworthy of her friendship, creates more disappointments whenever she tries to re-engage. No real-world relationship is as perfect as the ones she sees in her Instagram feed. Her disappointments have likely built up, worsening her interactions in a cyclical pattern (perhaps fostering increasingly unhealthy defense mechanism), making it difficult for her to find real-world social satisfaction.

Participant D

Participant D was selected because of her reporting of moderate phone usage. She received her first phone in the 7th grade. Describing her first device, she stated that it "couldn't access the internet" and that this made that period in her life "a better time." She went on to describe the sources of phone-related anxiety that eat at her on a regular basis: participant D is afraid that she will accidentally disclose private information as she did once before in a friendship-ending mistake: she was discussing the

quality of her relationships in a Facebook messenger chat. Later on in the conversation, the friends about whom she spoke were added to the chat, and were able to see the chat history where participant D had come clean about her honest, yet hurtful feelings towards them. Since then, participant D often turns her phone on airplane mode. She mentioned that, when speaking about private topics, she's afraid that she'll pocket-dial someone who would take offense. She prefers calling for the sake of avoiding a digital record on another person's device.

Her caution is perhaps inspired by her mother, who demanded access to all her social media accounts up until the end of highschool. The parental monitoring-association could be a part of why social media apps cause her anxiety. Participant D compulsively maintains Snapchat "streaks," a feature that tracks how many days in a row two users communicate. Even with "people [she] met in some random place, [she'll] start a streak, send random things to [them] everyday, and [not] really talk or have a relationship beyond that." She even stated that allowing a streak to go away would make her sad, as if a friendship was lost.

It became apparent very early on in the conversation that participant D is highly organized. She is hyper-aware of how digital systems capture and expose data to other users. Participant A uses geolocation services to share her whereabouts while on dates. She checks in regularly with the recipient of the location stream. When the date is over, she disables geolocation services. Nevertheless, she frequently checks to see the locations of friends who've permitted tracking. She rarely checks Facebook because the service shows when users were last active, and Participant D does not want other users to have that information. She makes sure that her device is always fully-charged—not out of fear of losing battery, but out of a desire to be prepared for any situation that might come her way. The pragmatism of her approach to making the most of her phone extends to, what is for the most part, a disciplined approach to limiting social media usage.

Her preferred uses of her phone are FaceTime (for the most in-person-like communication you can get from a smartphone), Google Maps (an essential navigation utility), The New York Times, and music playing. Her view of social media apps is that “they’re just time filler, and don’t provide anything of real substance.” Participant D does still use Instagram and Snapchat, but is very careful about the specific dosage: “when I’m studying, I allot 5-minute phone breaks at regular intervals.” She describes her view that “using technology sparingly is key.”

Unlike previous discussions, this one branched off into potential futures. Participant D wants to have children one day, and has resolved to keep them off of social media for as long as she can. She believes that “all of this technology, data, and advancement is going to lead to disconnect... I think this is a really big problem, especially since we’re already so divided on many different levels.” Participant D foresees a future in which “kids will grow up interacting with each other solely through phones and laptops and iPads.”

Participant D holds extreme views of the pitfalls of device usage, but her approach to using technology is informed and deliberate. Within the social dynamic of Participant D’s college, “what people put on instagram or snapchat is what they want to show you... and it’s not what’s actually happening behind the scenes... it’s a facade.” Participant D sees upward comparison as the most problematic element of social media. She does, however, believe that receiving likes can have a positive impact on one’s mental health, as it makes the person feel seen or heard (even if it is in the form of a 2-second scroll and tap). Participant D continually emphasized the importance of maintaining balanced usage.

Conclusion

The main shortcoming of the correlational study was the availability of participants. Additionally, the participant pool was composed of more females than males, which can lead to confounding data. Other shortcomings were tied to the measures. There is no programmatic access to app usage data, which means that participants had to enter the amounts of time manually. Not only is this prone to human error, but it also opens the door to biased reporting. Two participants decided to leave the app usage questionnaire blank, which meant that they had to be excluded from analysis.

The apps that were included in the questionnaire were but a sliver of all smartphone apps. This questionnaire took into account the amount of time spent using the app, as opposed to the particular use case. For example, texting with an enemy will produce a different feeling of life satisfaction than will texting with a loved one. In the case of web browsing, a negative association was found with reward interest. The internet does not deal with a single kind of information, communication, or functionality. The actual web locations and activities were undisclosed. Regardless, this association was significant, and indicated that web browsing might be perceived as less capable of providing reward to the user. Still, there are elements of this association that go unexplained. The methods of the study lack the necessary further experimental exploration.

The precursor to this study identified some forms of social media usage as having a negative association with depression. This loosely suggested that users had become dependent on usage for feelings of wellbeing, and that failure to satisfy the drive to engage would result in symptoms of withdrawal. This correlational study, on the other hand, did not see app usage as predicting life satisfaction. This could be due to the fact that the Flourishing Scale, consisting of 8 questions only, was not detailed enough to provide the variation necessary for statistical significance.

The other most critical measure, the RST-PQ, excluded the potential for exploring associations between smartphone app usage and other elements of personality and functioning. This, combined with

the unlimited range of possible apps, their specific usage, and the mindsets of users engaging with them, describe many essential variables that could not be included in a single study. It seems as if this research cannot be efficiently pursued through external data collection, but would be best pursued through obtaining a license to the technology creators' data sources. Unfortunately, this is likely prohibited by their privacy policies and business principles (staying as the single carrier of the raw data is more lucrative).

Setting these research method shortcomings aside, the correlational study identified a significant negative association between usage of the Notes app and goal-drive persistence, as well as a significant negative association between email usage and impulsivity scores. Notes usage as a predictor of lower goal-drive persistence suggests that notes is worse for goal organization than is a dedicated application for working with goals and tasks. Email usage as a predictor of lower impulsivity suggests that those who frequently use email (for what are likely academic or professional communications) are more capable of delaying gratification.

The correlational study likely created bias that carried over into the case study. Another source of potential bias for the case study is researcher (or interviewer) identity. The researcher was a student on the same college campus as the participants. Most students on the campus were aware of most other students. Whether or not the researcher and participants shared relationships, there was still a social dynamic at play, which inevitably has implications for how open and honest the participants engaged with the case study. This could have worked in the favor of the study, as most students are motivated by social life and could want to open up to and be understood by peers, likely more so than they would with a complete stranger.

The two high-usage case study participants were quite aware of negative consequences of their usage, yet they had rarely, if ever, made behavioral changes. The two moderate-usage case study participants were also aware of the consequences, but their reported behavior reflected a desire to mitigate

the side-effects. Participant attitudes toward smartphones and social media gravitated to coexisting appreciation and rejection of their social-value-establishing properties. These technologies are viewed as helping people explore and establish themselves, and also as perpetuating insecurity through too much upward comparison.

Future directions for this research could implement experimental research methods to establish further causal relationships. There are so many variables at play in one's interactions with a smartphone. This research, along with much of future research, likely faces severe limitations: this topic and its subtopics require much exploration, and it is difficult to know which will kinds will best illuminate answers to the growing problems of mobile computing and information technology in general. The solution might lay more so in personality disorder treatment, rather than in smartphone interaction adjustment alone.

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