WELL-BEING AND PHONES: A REVIEW OF THE LITERATURE

Jordan A. Hammond

TC 660H

Plan II Honors Program

The University of Texas at Austin

13 May 2020

_____

Caryn L. Carlson, Ph.D.

Department of Psychology

Supervising Professor

_____

Samuel D. Gosling, Ph.D.

Department of Psychology

Second Reader

ABSTRACT

Author: Jordan A. Hammond

Title: Well-Being and Phones: A Review of the Literature

Supervising Professor: Caryn L. Carlson, Ph.D.

The rise of cell phone technology was synchronous with troubling trends including a rise in depression and suicide attempts and a simultaneous decline in well-being (Twenge & Campbell, 2019). Some believe that a causal relationship exists between phone use and well-being—that is, that phones have caused these concerning shifts. There are reasons to believe that phones could improve well-being, such as increased connectivity, creativity, and efficiency. There are also reasons to believe that phones could harm well-being, from decreased sleep to FOMO or "fear of missing out." A better understanding of the relationship between phones and well-being can inform best practice behaviors that may make our society happier and healthier.

This thesis is a systematic literature review with the goal of examining all of the empirical data concerning phone use and well-being that has been collected to date. It relies on empirical research from many fields—including psychology, sociology, economics, communication studies, and business—published in peer-reviewed academic journals.

Taken together, this research body is largely equivocal. There are, however, some specific contexts in which phone use is significantly associated with enhanced well-being and other contexts in which phone use is correlated with impaired well-being. Overall, it seems that context is the determining factor. Encouragingly, it seems possible that people can learn how to interact with their phones in an adaptive manner that maximizes the psycho-social benefits while minimizing the potential harm.

ACKNOWLEDGMENTS

So many people have helped me bring this thesis from an idea to a final product. I would first acknowledge Dr. Caryn Carlson and Dr. Samuel Gosling for their expertise and patience throughout this process. Their advice has been invaluable, and I am better for having had the opportunity to work with them. I would also like to thank my family and friends for their endless support and encouragement. Finally, I would like to thank the Plan II Honors Program for defining my academic experience at the University of Texas. Plan II gave me the freedom to explore my interests, and I would not be where I am today without it.

TABLE OF CONTENTS

INTRODUCTION

In September 2017, San Diego State University Professor of Psychology, Jean Twenge, penned an article provocatively titled "Have Smartphones Destroyed a Generation?" According to her analysis of four large-scale datasets, the invention of the smartphone prompted radical changes in every facet of adolescents' lives (Twenge, 2017). More shocking was her claim that there is considerable evidence that phones and the apps they run are seriously compromising young people's happiness (Twenge, 2017). Rather than adding a caveat, Twenge doubled down, claiming that there are no exceptions to this rule, that all digital engagement is associated with decreased happiness, and all non-screen pursuits are associated with enhanced happiness" (Twenge, 2017).

Other scholars had researched the psychological effects of screen time for years, but it was Twenge's work that captivated concerned parents and educators. By publishing her research in The Atlantic rather than an academic journal, she broadened her readership. The informal tone of her piece gives the impression that Twenge is just another mother at the playground or supermarket, casually sharing her thoughts with the others. She managed to garner extensive media coverage and her research was broadcast far and wide.

Twenge's article brought implications for the technology world at large, prompting executives from leading technology companies like Google, Facebook, and Apple to speak out about the inner workings of their businesses. Sean Parker, the first President of Facebook, admitted that the company intentionally targets weaknesses in the human psyche to try to make users addicted to the website (Anderson & Rainie,

2018). Chamath Palihapitiya, a former executive at Facebook acknowledged that technology companies are fully aware that the dopamine driven digital experience that they have crafted is harmful to society as a whole (Anderson & Rainie, 2018). Former Google executive, Tristan Harris, left his position at the company to start a nonprofit that is trying to stop technology companies from "hijacking our minds" (Anderson & Rainie, 2018). A shocking number of technology company employees recognize that there is currently a serious issue in the way that their companies are intentionally manipulating users, and that their work may be materially damaging society as a whole (Anderson & Rainie, 2018).

Unsurprisingly, Twenge's research received mixed reviews from the academic community—particularly those who also study the psychological outcomes of digital media. Some experts fiercely criticized her work, calling it nothing more than vacuous click-bait (Collier, 2017). They accused Twenge of cherry-picking data to support her own contrived narrative of reality and ultimately inciting "generational alarmism" (Collier, 2017). Some publicly reprimanded her for ignoring critical contextual factors and individual differences in favor of making sweeping generalizations about an entire generation (Collier, 2017). Many wrote off her findings altogether, stating that her assessments were blatantly incorrect and that she had grossly oversimplified matters (Collier, 2017).

Still others have spoken out in support of Twenge's claims. Many researchers who study the effects of engaging with technological devices have argued that their findings corroborate those detailed in Twenge's work—including that technology use decreases well-being, social connectedness, and empathy (Anderson & Rainie, 2018).

With so many differing opinions, it is not surprising there is little consensus as to the psychological effect of technological devices in general, including videogames, phones, apps, and computers. Constant argumentation has situated people in distinct camps. As technological proliferation has increased since the publishing of Twenge's articles over two years ago, this divide has only become more pronounced. Experts across a wide array of fields have published research on the matters, causing disjointedness. These new publications have done little to clarify the issue. A Pew Research Center asked scholars, technology researchers, and health scientists how they think technological innovation will impact individuals' well-being. Almost half of the experts believed that the benefits of technology will outweigh the potential harm that it may cause (Anderson & Rainie, 2018). About one-third believe that technology will have largely negative effects on individuals' well-being (Anderson & Rainie, 2018). The remaining 21% believe that well-being will not change dramatically in either direction.

One of the most significant subsets of the larger technology debate is: *how do cell phones impact well-being*? There are reasons to believe that phones could improve wellbeing, such as increased connectivity, creativity, and efficiency. There are also indications that phone use could impair wellbeing, from decreased sleep to cyberbullying to FOMO or "fear of missing out." This question is important to clarify because it has far-reaching implications for modern life. Technology is here to stay. So, it is critical that we better understand the impact our phones have on us and adjust our behaviors accordingly. A better understanding of the relationship between phones and well-being can inform best practice behaviors that may make our society happier and healthier.

Thesis Description

This thesis is a systematic literature review with the goal of examining and analyzing the empirical data concerning cell phone use and well-being that has been collected to date. This review will also make it possible to delve into the nuanced nature of phone use and to consider how different contextual elements may differentially impact well-being.

To provide context for the discussion, the following section provides pertinent information regarding the history of phones, the study of well-being, and the intersection of phones and well-being.

The third section details the literature search procedures used to gather and analyze the existing literature.

The fourth section gives a general survey of the literature reviewed. It addresses trends in the years the articles were published, study designs, samples, and countries studied. In terms of phone use and well-being, it explores the different dimensions of phone use studied, phone use assessment methods, dimensions of well-being studied, and well-being assessment methods.

The fifth section delves into the empirical findings. It addresses some of the concrete ideas that have been explored—in terms of cyberbullying, economic considerations, face-to-face considerations, night-time phone use, social pressure, motivation, social connectivity, and phone use in general.

The final section gives recommendations and directions for future research. The previous sections provide the basis for making such recommendations.

BACKGROUND

A Brief History of Phones

Almost 150 years ago, Alexander Graham Bell radically altered the future of human communication. In 1876, he made the first phone call ever—to his assistant in another room of the same building. He said only two, short sentences: "Mr. Watson, come here. I want to see you" (Davidson, 2016). Thirty-nine years later, Bell made the first transcontinental phone call—from San Francisco to New York City (Davidson, 2016). These revolutionary developments laid the groundwork for the limitless possibility of telecommunication.

About a century after Bell made that first phone call, a Motorola engineer named Martin Cooper made the first phone call from a mobile phone; the device he used weighed one and a half kilograms (Davidson, 2016). The first commercial cell phone hit the market in 1984. By 2003, phones could be used to text, answer emails, update calendar appointments, take pictures, and browse the web. And in January of 2007, Steve Jobs made a controversial claim about his new invention, the iPhone: that "Every once in a while, a revolutionary product comes along that changes everything." Over a decade later, personal phones—and smartphones in particular—are an essential component of modern life, an ever-present extension of our very beings. Phones have revolutionized how people work, entertain themselves, and interact with others. The personal phone has, as Jobs predicted, changed everything.

Today, 96% of Americans own a mobile phone (Pew Research Center, 2019). As technology has become more sophisticated, smartphones have grown in popularity. In 2011, only 35% of Americans owned smartphones (Pew Research Center, 2019). Today,

81% own smartphones (Pew Research Center, 2019). This growth is projected to continue, with 40% of the world's population projected to own a smartphone by 2021 (Holst, 2018).

Smartphones cost about $1000, so it is no surprise that this technological proliferation has quickly established a multi-billion-dollar industry. This elaborate telecommunications supply chain drives entire economies (Accenture Strategy, 2018). In the United States alone, the wireless industry contributes $475 billion in GDP, supports 4.7 million jobs, and generates $1 trillion in economic output (Accenture Strategy, 2018). The telecommunications industry is an integral component of the U.S. economy, and it continues to evolve on a daily basis.

A Brief History of Well-Being

Scholars have studied "the good life" for centuries; the foundations of well-being research can be traced back to Ancient Greece (Stoll, 2014). The focus of this research topic has changed with the times; the most dramatic transition came with the age of the Age of Enlightenment. That era transformed the study of wellbeing from a religious pursuit to a secular one, bringing well-being to the minds of biologists, philosophers, and psychologists (Stoll, 2014).

A new era in wellbeing research was ushered in almost 20 years ago when three psychologists—Kahneman, Diener, and Schwartz— "proposed a new science of well-being focused on explaining positive states of mind and taking seriously people's expressed subjective assessments of their own emotions and quality of life." (Western & Tomaszewski, 2016). This initiative became known as well-being psychology, and the

establishment of this new field of study reinvigorated attempts to study well-being scientifically (Western & Tomaszewski, 2016).

Renowned psychologist, Martin Seligman, has led this charge since 2000; he is credited with founding the field of Positive Psychology. In the late 1990's Seligman recognized that the field of psychology had altogether neglected an entire facet of human experience—namely, human strength and skill (Seligman & Csikszentmihalyi, 2000). Seligman's claims increased scientific interest in exploring these matters and blossomed into an entire field of study focused on the "psychology of positive human functioning" (Seligman & Csikszentmihalyi, 2000).

Out of this increased research has come the differentiation of distinct varieties of wellbeing. The first—*subjective well-being*—is grounded in the hedonic tradition which maintains that one's goal in life should be to maximize the amount of pleasure you experience (Ryan & Deci, 2001). In line with that philosophical orientation, subjective well-being consists of three main components: satisfaction with life, positive mood, and the lack of negative mood; together, these are thought to represent happiness (Ryan & Deci, 2001). As the name suggests, subjective well-being depends on a person's subjective assessment of their own life rather than an outwardly observed, objective assessment (The Lee Kum Sheung Center for Health and Happiness, 2017). Interestingly, though, subjective well-being encapsulates both affective components such as positive emotion and cognitive components such as life satisfaction (Ryan & Deci, 2001).

Another dominant well-being construct, *psychological well-being*, is grounded in the eudaimonic tradition. This philosophical orientation is built on Aristotle's presumption that genuine happiness comes out of living virtuously (Ryan & Deci, 2001).

Further, eudaimonic well-being—and its accompanying sense of authenticity and vitality—purportedly occurs when one's everyday actions are aligned with their deeply held, personal convictions (Ryan & Deci, 2001). Therefore, psychological well-being is often associated with optimal human functioning or flourishing (Ryan & Deci, 2001).

Emotional well-being is even more ambiguous than subjective and psychological well-being; some maintain that it is "deliberately vague" (Eaude, 2009). Broadly, emotional well-being is associated with positive feelings about oneself, self-awareness, awareness of others' emotions, and emotional regulation (Eaude, 2009).

All three forms of well-being described above are inherently multi-dimensional and, therefore, difficult to discuss categorically (Dodge, Daly, Huyton, & Sanders, 2012). This ambiguity has complicated analyses of demographic trends in well-being. Some experts believe that well-being is on the rise while others are convinced that it is declining in the modern age.

The Intersection of Phones and Well-Being

Phones have infiltrated every fiber of modern-day life, and humans instinctively act to maximize their own happiness. Given the relevance of both phones and well-being—and their intersection—experts spanning many fields have contributed to the research literature. Specifically, experts in the fields of psychology, sociology, leisure studies, economics, communication studies, business, human computer interaction, and education have published research concerning phones and well-being. While all of these publications are valuable additions to the knowledge base, this heterogeneity has resulted in fragmentation in the literature.

Another factor contributing to the disjointed nature of this debate is the sheer number of non-scientific commentaries on these matters. The Internet has made writing, publishing, and blogging incredibly easy. While this is often positive, in certain cases, it can facilitate the destructive dissemination of unsubstantiated conjecture and misinformation. There are, for example, an incredible number of articles on well-being and technology in circulation currently. A simple Google search for "'phone' and 'well-being'" yields 216,000,000 results. The problem is that this sort of journalistic blog posting is often based only on anecdotal evidence that does not reflect the true essence of the issue and is often not supported by scientific research.

LITERATURE SEARCH PROCEDURES

Search Criteria

To my knowledge, this is the first systematic literature review that examines the relationship between phones and well-being. Therefore, I was interested in producing as broad a review as possible—by attempting to capture all relevant research. To qualify for this review, publications needed to (1) specifically examine both mobile phone use and well-being, (2) publish empirical data in a peer-reviewed academic journal. The rationale for these criteria is detailed below.

Limitations and Justification of Search Criteria

I concede that there are limitations of the search criteria that I have devised for this literature review. I believe, however, that these carefully justified decisions will allow for the best outcome.

First, only articles that investigated phones were included in this review. This, by definition, means that articles written on any other form of technological devices are not considered in this work. Because of these omissions, this paper can only grant insight into the effect of phones on well-being, rather than that of technology at large. My rationale for excluding articles written on any form of technological device—such as laptop computers, smart watches, gaming consoles, and televisions—involved both theoretical and practical considerations.

My primary motivation for focusing on phones in this review is that mobile phones are the most-used technological devices in existence (Tsirulnik, 2017). I wanted to explore the effects of the most prolific technological devices and reasoned that an

initial, quality analysis of the well-being effect of phones could serve as a model for future investigations into the well-being effects of other technological devices.

I also chose to exclude articles exploring the well-being effect of specific smartphone applications. I came across several studies that examined the efficacy of applications specifically designed to improve well-being. These articles were excluded on the grounds that they were an examination of the efficacy of the apps themselves—the interface, measures, and monitoring mechanism—rather than the effects of participant phone use. Writing a comprehensive literature review on the well-being effect of all technological devices was not realistic. There are simply too many publications written on well-being and technology to have composed any sort of concise, coherent review.

The search criteria also stipulated that I evaluate articles examining only well-being rather than any other outcome. This meant that papers that examined other constructs—like loneliness, fulfillment, physiological health—were excluded from this review, even if those dimensions were related to well-being. My rationale for excluding articles on other outcomes was primarily a result of the multifaceted nature of well-being (Dodge, Daly, Huyton, & Sanders, 2012). Unlike more uni-dimensional constructs, well-being encapsulates satisfaction with life, growth, security, relationships, and autonomy (Dodge, Daly, Huyton, & Sanders, 2012). Well-being is a widely studied construct, and many methods exist for measuring it reliably. These considerations taken together make it a rich and meaningful construct to examine in tandem with phone use.

I also decided to only include articles published in peer-reviewed academic journals that include empirical data. Although other forms of writing have certainly informed my understanding of this issue, most simply lack the scientific grounding of

peer-reviewed publications. The proliferation of non-scientific articles on phones and well-being has diluted the empirical findings. The goal of this paper is to clarify a highly debated issue, so I felt that drawing only from the highest-quality sources--rather than anecdotal evidence--was of paramount importance to the integrity of this work and allows for more realistic, evidence-based conclusions to be drawn.

Search Procedures

My process of surveying the existing literature consisted of two steps. First, I searched databases (PsychInfo, Pubmed, and Web of Science) for publications fitting my inclusion criteria. This search was completed on October 2, 2019. I searched for articles using the following strings: "phone or smartphone or smart phone or mobile phone or cell phone and wellbeing or well-being." This yielded a pool of articles that were potentially relevant to my review. More articles were added when I reviewed the bibliographies of seemingly relevant articles.

The second step of the literature search procedure involved reviewing the publications in the pool of potentially relevant articles. I carefully reviewed the abstract of each article in the preliminary pool. Abstracts that indicated that the article was not relevant to my review were excluded. Then, I read each full-text article to determine whether or not it met the inclusion criteria. Articles that did not specifically examine mobile phone use or well-being, written in a language other than English (with no translation available), or that did not report empirical data were excluded in this final screen.

A second literature search—following the same process detailed above—was performed on March 20, 2020. This search was done to double-check for articles that

may have been published after the completion of the first search. Checking the

bibliographies of these new sources added several more papers for consideration.

GENERAL SURVEY OF THE LITERATURE

After excluding papers that did not meet the inclusion criteria, I was left with the 44 studies (42 articles; two articles included two studies that met the inclusion criteria) included in this review. This section of the thesis will analyze the existing literature along several dimensions: year published; study design; sample; country studied; the study of phone use; and the study of well-being.

Year Published
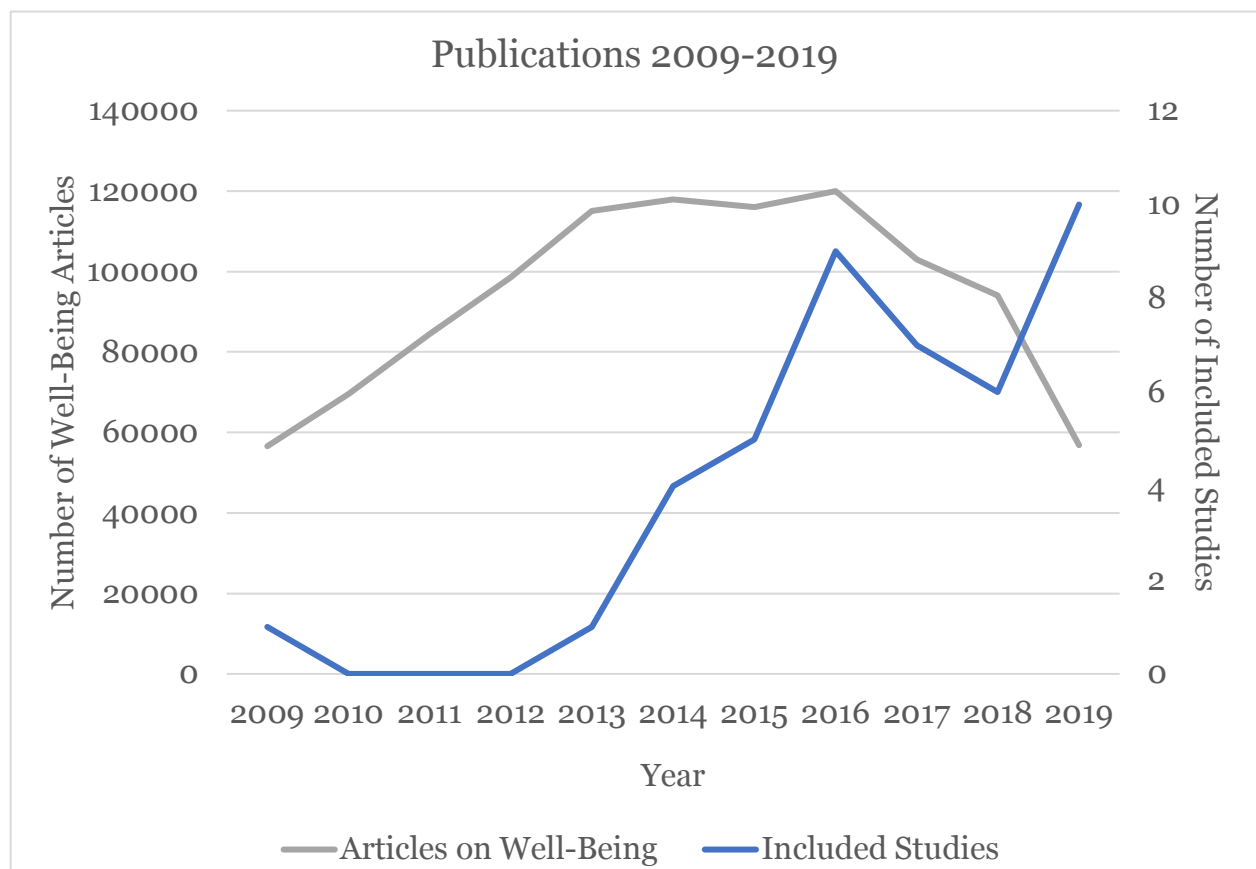
The number of articles published has generally increased since 2009, for an overall percent change of 900% between 2009 and 2019. This is likely due to the fact that phones have been increasing in number and importance since the early 2000's.
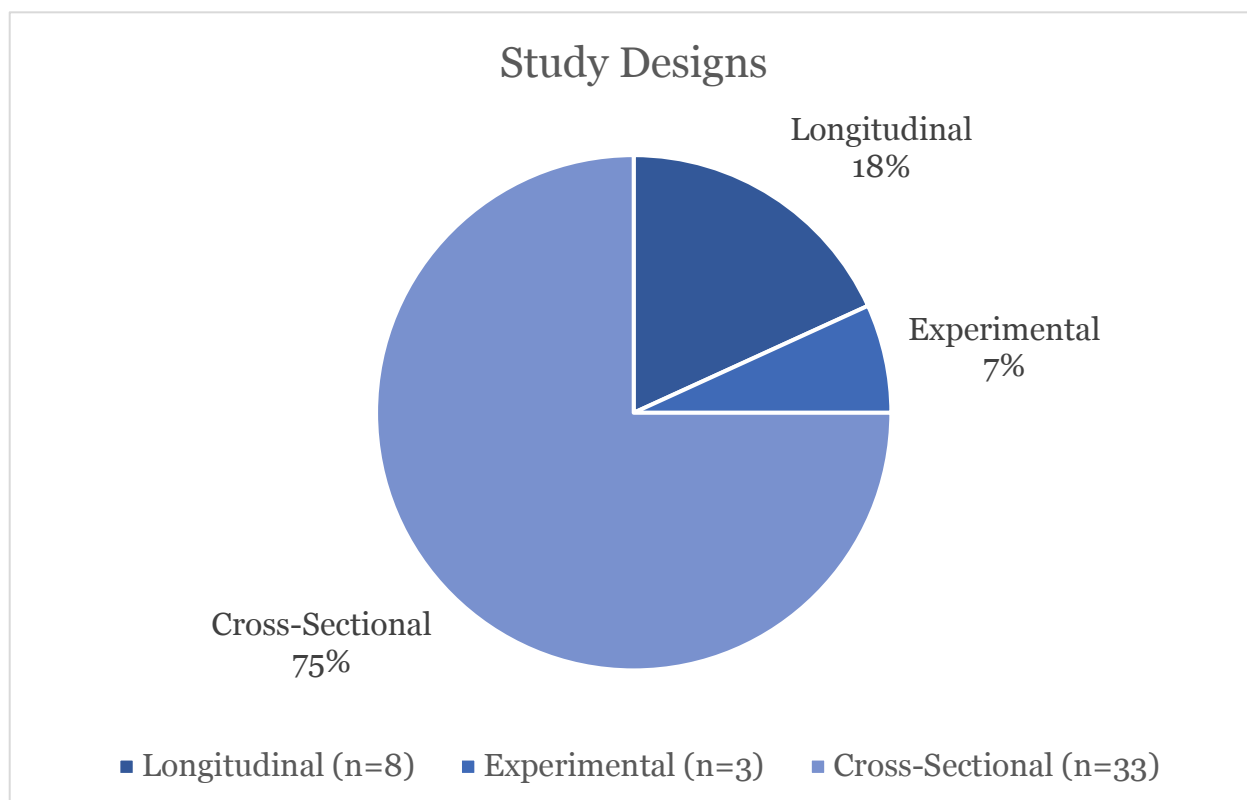
This increase cannot be attributed to the rise in interest in well-being over the years. Papers published on well-being in general have increased by only 0.53% over the last 10 years. Well-being research saw a surge in terms of number of studies published between 2009 and 2014. Since 2016, however, the number of papers published on well-being has declined precipitously.
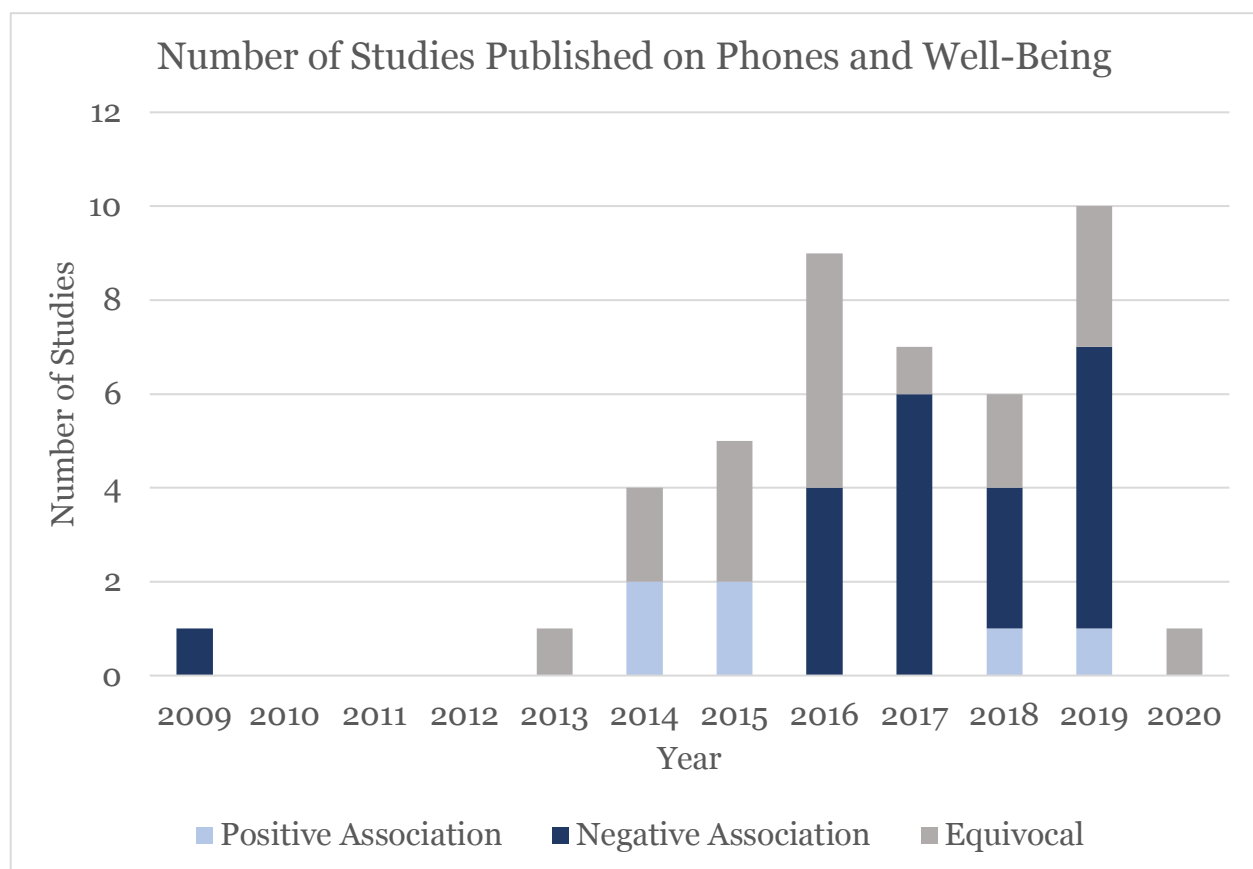
Study findings have shifted over the years. Most notable is the prevalence of equivocal findings. This is interesting to consider in light of the strong stances that researchers take regarding their own research. Many fail to consider how their findings fit into the sea of equivocal findings.

Also notable is the large proportion of studies that find a negative association between phone use and well-being from 2016 to 2019. These findings reinforce—and in some cases, validate—the increasing concern with the potential negative outcomes of phone use. It will be interesting to see if this trend continues with the papers published throughout the rest of 2020.

Study Design

Study Designs

Longitudinal
18%

Experimental
7%

Cross-Sectional
75%

■ Longitudinal (n=8)　■ Experimental (n=3)　■ Cross-Sectional (n=33)

The research that has been done in this research area is overwhelmingly cross-sectional. This, by definition, means that no causal links can be drawn from phone use to well-being. This reality is interesting to consider in light of the hard stances that researchers have taken with respect to their findings. For example, almost all include the statement, "Because this research is based on cross-sectional data, no causal links can be drawn," followed by paragraphs clearly implying that a causal link exists.

There is a sizable subset of longitudinal studies included in this review, including experience-sampling, diary, and cohort studies. The longitudinal studies also range in length--from one month (Gao, Li, & Zhu, 2014) to several years (Twenge & Campbell, 2019). Although longitudinal studies do not allow causal links to be drawn, they do provide more information in terms of developmental trends, giving better insight into the long-term impacts of engaging with phones.

The gold-standard in research, randomized controlled trials, are less common. Some have noted that this is due to participants' unwillingness to go for extended periods without their phones in experimental trials, making both long- and short-term interventions difficult to execute. Others have added that although experimental studies allow causal links to be drawn, experimental manipulations can bring about "artificial short-term effects" that may not occur in real world settings (Halfmann & Rieger, 2019).

In spite of this difficulty, three studies included in this review investigated the relationship between phone use and well-being experimentally. Each adopted a slightly different experimental approach: one instructed the experimental group not to use their phone in their bedroom; another randomly assigned participants to a "phone" or "phone-less" condition; the third randomly assigned participants to either the low- or

high-pressure condition, determining the settings they would use for the ringtone, vibration, and phone alarm functions (Hughes & Burke, 2018; Dwyer, Kushlev, & Dunn, 2017; Halfmann & Rieger, 2019). The interventions also varied in length, ranging from the duration of one meal to seven days (Dwyer, Kushlev, & Dunn, 2017; Hughes & Burke, 2018).

With these research constraints comes opportunity to develop new, innovative paradigms in phone research. It is possible that borrowing ideas from other fields--specifically ones that deal with other hard-to-quit activities like drinking, smoking, or gambling—could breathe new air into the technological issue at hand.

Samples Studied

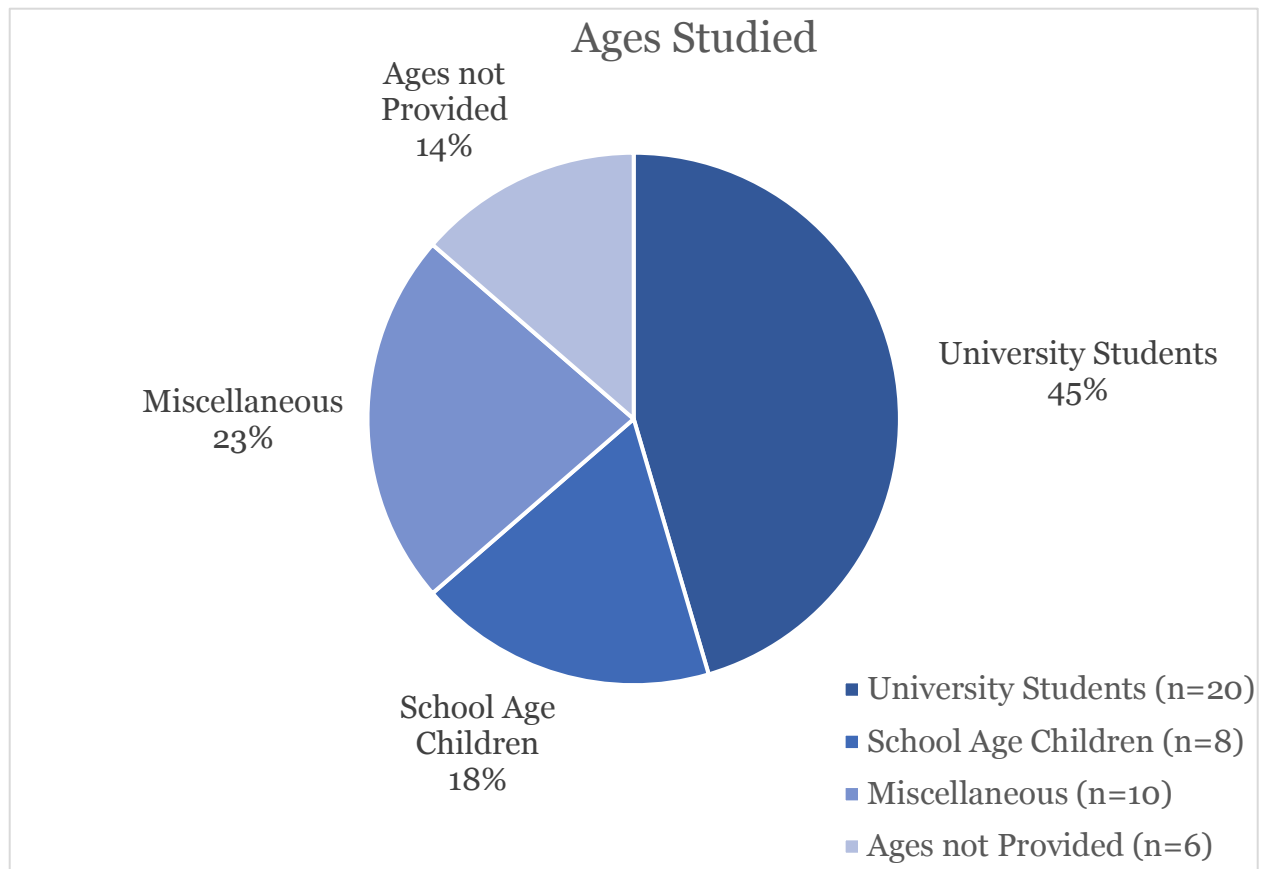| Publication	Number	Sex	Age	Country
Bae, 2019	Sample 1: n=2,110 Sample 2: n=2,067 Sample 3: n=2,002	Sample 1: 1024 females; 1086 males Sample 2: 1001 females; 1066 males Sample 3: 963 females; 1039 males	Sample 1: 5th grade students; M = 10.98 ± 0.18 Sample 2: M = 11.96 ± 0.178 Sample 3: M = 12.98 ± 0.179	Korea
Bartikowski, Laroche, Jamal, & Yang, 2018	n=15,349	NA	NA	Cross-cultural
Beranuy, Oberst, Carbonell, & Chamarro, 2009	n=365	274 females; 91 males	University students; M = 21.37 ± 5.463	Spain

Calpbinici & Arslan, 2019	n=426	211 females; 215 males	14-18 year olds attending 9th to 12th grade; M = 16.05 ± 1.26	Turkey
Chan, 2015	n=514	NA	NA	China
Chen, Huang, Gao, & Patrick, 2017	n=500	262 females; 238 males	19-55 years old	Taiwan
David, Roberts, & Christenson, 2017—Study 2	n=132	60% female	University students; 18-21 years old	United States
Dayapoğlu, Kavurmaci, & Karaman, 2016	n=353	274 females; 79 males	University students; M = 20.65 ± 1.65	Turkey
Dwyer, Kushlev, & Dunn, 2017—Study 1	n=304	64% female	University students and adults from Vancouver; 19-69 years old; M = 29.9 ± 10.6	Canada
Dwyer, Kushlev, & Dunn, 2017—Study 2	n=123	69% female	University students; M = 18.6	United States
Emelin, Rasskazova, & Tkhostov, 2017	n=274	174 females; 100 males	M = 25.8 ± 11.8	Russia
Ganju, Pavlou, & Banker, 2015	NA	NA	NA	Cross-cultural
Gao, Li, & Zhu, 2014	n=98	38.78% female; 61.22% male	18-32 years old; M = 23.5 ± 2.48	China
Halfmann & Rieger, 2019—Study 1	n=61	30% male	19-56 years; M = 25.11 ± 7.23	Germany
Halfmann & Rieger, 2019—Study 2	n=197	67% female	17-61 years old; M = 25 ± 7.10	Germany
Hoffner & Lee, 2015	n=287	177 females	University students; 16-29 years old; M = 19.7 ± 2.04	United States

|				
Hoffner, Lee, & Park, 2015	n=272	167 females; 105 males	University students; 17-38 years old; M = 20.16 ± 3.19	United States
Horwood & Anglim, 2019	n=539	79% female	University students; M=25.1 ± 7.8; 18 to 65	Australia
Hughes & Burke, 2018	n=95	67% female	NA	United Kingdom
Kaboudi, Sharma, Ziapour, Dehghan, & Abbasi, 2019	n=269	162 females; 107 males	Second grade students; 10-18 years old	Iran
Kang & Jung, 2014—Study 2	Sample 1: n=565 Sample 2: n=376	Sample 1: 329 females; 236 males Sample 2: 212 females; 164 males	Sample 1: University students; M = 27 ± 9.01 Sample 2: University students; M = 23 ± 2.29	Sample 1: United States Sample 2: South Korea
King & Dong, 2017	n=118	74 females; 44 males	University students; M = 24.42	United States
Kumcağiz & Gündüz, 2016	n=408	303 females; 105 males	NA	Turkey
Lachmann et al., 2018	Sample 1: n=612 Sample 2: n=304	Sample 1: 26% female Sample 2: 68% female	Sample 1: university students; M = 22 Sample 2: university students; M = 24	Sample 1: China Sample 2: Germany
Lepp, Barkley, & Karpinski, 2014	n=536	370 females	University students; M = 21	United States
Li, Lepp, & Barkley, 2015	n=516	80% female	University students; 18-29 years old; M = 20 ± 1.48	United States

Lucas-Molina, Pérez-Albéniz, & Fonseca-Pedrero, 2018	n=1,664	53% female	14-19 years old; M = 16.12 ± 1.36	Spain
Murdock, 2013	n=83	56 females; 27 males	University freshmen; 18-21; M = 18.41 ± .58	United States
Murdock, Gorman, & Robbins, 2015	n=142	112 females	University students; 18-22 years old; M = 19.58 ± 1.30	United States
Ohly & Latour, 2014	n=1,714	1,118 males	M = 39.96 ± 8.52	Germany
Pearson, Mack, & Namanya, 2016	n=92 (households)	NA	NA	Uganda
Przybylski & Weinstein, 2017	n=120,115	NA	15 year olds	United Kingdom
Roberts & David, 2016—Study 2	n=145	55% female	United States adults	United States
Roser, Schoeni, Foerster, & Röösli, 2016	n=412	61% female	7th, 8th, and 9th grade students; M = 14 years	Switzerland
Rotondi, Stanca, & Tomasuolo, 2017	n=148,088	51% female	Representative sample of 16-75 year olds	Italy
Samaha & Hawi, 2016	n=249	46% female	University students; M = 21	Lebanon
Stein, Osborn, & Greenberg, 2016	n=326	203 females; 123 males	University students from intact families; M = 19.3 ± 1.2	United States
Tangmunkongvorakul et al., 2019	n=800	405 females; 395 males	University students; 18-24 years old	Thailand

Twenge & Campbell, 2019	Dataset 1: n=120,115 Dataset 3: n=41,866	NA	Dataset 1: 15 year olds Dataset 3: 8th, 10th, and 12th graders	Dataset 1: United Kingdom Dataset 3: United States
Vernon & Modecki, 2018	n=1,101	43% male	Year 8 students; M = 13.5	Australia
Volkmer & Lermer, 2019	n=461	71.4% female	15-77 years old; M = 30.00 ± 11.97	Germany
Vorderer, Krömer, & Schneider, 2016	n=178	69% female; 32% male	16-33 years old; M = 22 ± 2.47	Germany
Yang, Asbury, & Griffiths, 2019	n=475	209 females; 266 males	University students; 16-27 year olds; M = 19.77 ± 1.11	China
Zhang, Yang, Tu, Ding, & Lau, 2020	n=265	130 males; 125 females	University students; 17-21 years old; M = 18.9 ± .72	China

There is great variability in terms of the sample sizes used in the included research. Quantitatively, they range from n=61 to n=148,088 (Halfmann & Rieger, 2019; Twenge & Campbell, 2019). The median sample size is 365. I calculated the average sample size to be 10,885.19 with a standard deviation of 37,092.88 (Ganju, Pavlou, & Banker, 2015 was excluded from this calculation because it does not provide the sample size). Given the large range of sample sizes and the presence of several outliers, this average and standard deviation are not particularly illuminating.

Ages Studied

Ages not Provided
14%

University Students
45%

Miscellaneous
23%

School Age Children
18%

- University Students (n=20)
- School Age Children (n=8)
- Miscellaneous (n=10)
- Ages not Provided (n=6)

The included studies also examine a wide range of age demographics. Unsurprisingly—considering the general overrepresentation of college students as research participants—almost half (n=20) of the included studies examined phone use and well-being in university students. About one-fifth of the studies (n=8) addressed phone use and well-being in school age children, ranging from 10 to 18 years old. The remaining studies (n=10) used varied methods to recruit a broader range of participants, including online platforms like MTurk, social networks, and smartphone ownership data; these sample participants ranged in age from 15 to 77 years old.
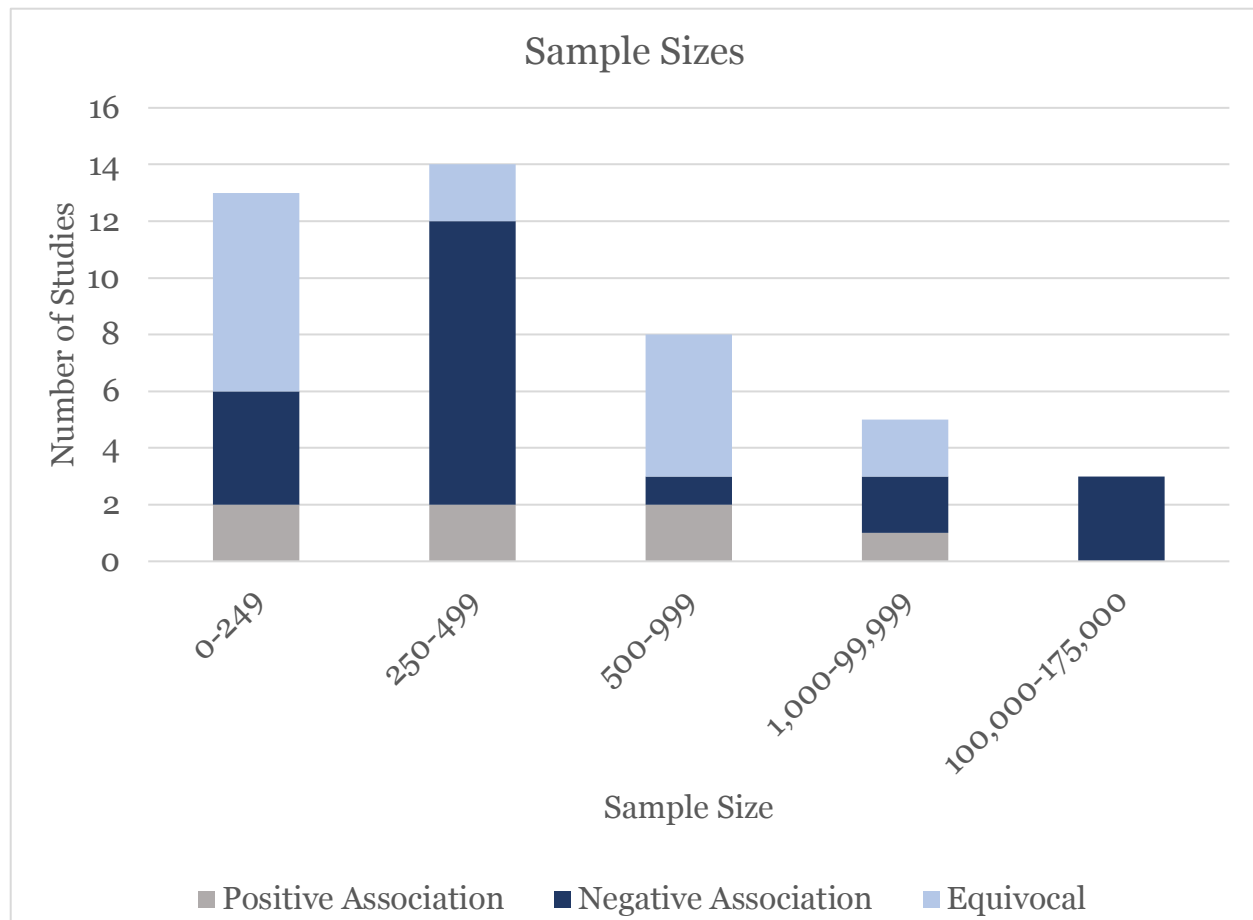
Ganju, Pavlou, & Banker, 2015 is excluded from this figure because it does not report sample size.

Comparing sample sizes and study outcomes—in terms of the conclusion it draws regarding well-being and phone use—brought one particularly interesting trend to light. Three studies relied on large-scale datasets in their analyses, with sample sizes of 161,981; 148,088; and 120,115 (Twenge & Campbell, 2019; Przybylski & Weinstein, 2017; Rotondi, Stanca, & Tomasuolo, 2017). All three of these studies found a significant negative correlation between phone use and well-being. Given that larger sample sizes yield more reliable results and greater precision, this trend lends weight to these findings.

Interestingly, 71.43% of the studies with 250 to 499 participants found significant, negative associations between well-being and cell phone use (as compared to about 47% overall).

Countries Studied

Country	Number
United States	13
Germany	6
China	5
United Kingdom	3
Turkey	3
Spain	2
Korea	2
Australia	2
Cross-cultural	2
Iran	1
Thailand	1
Italy	1
Uganda	1
Switzerland	1

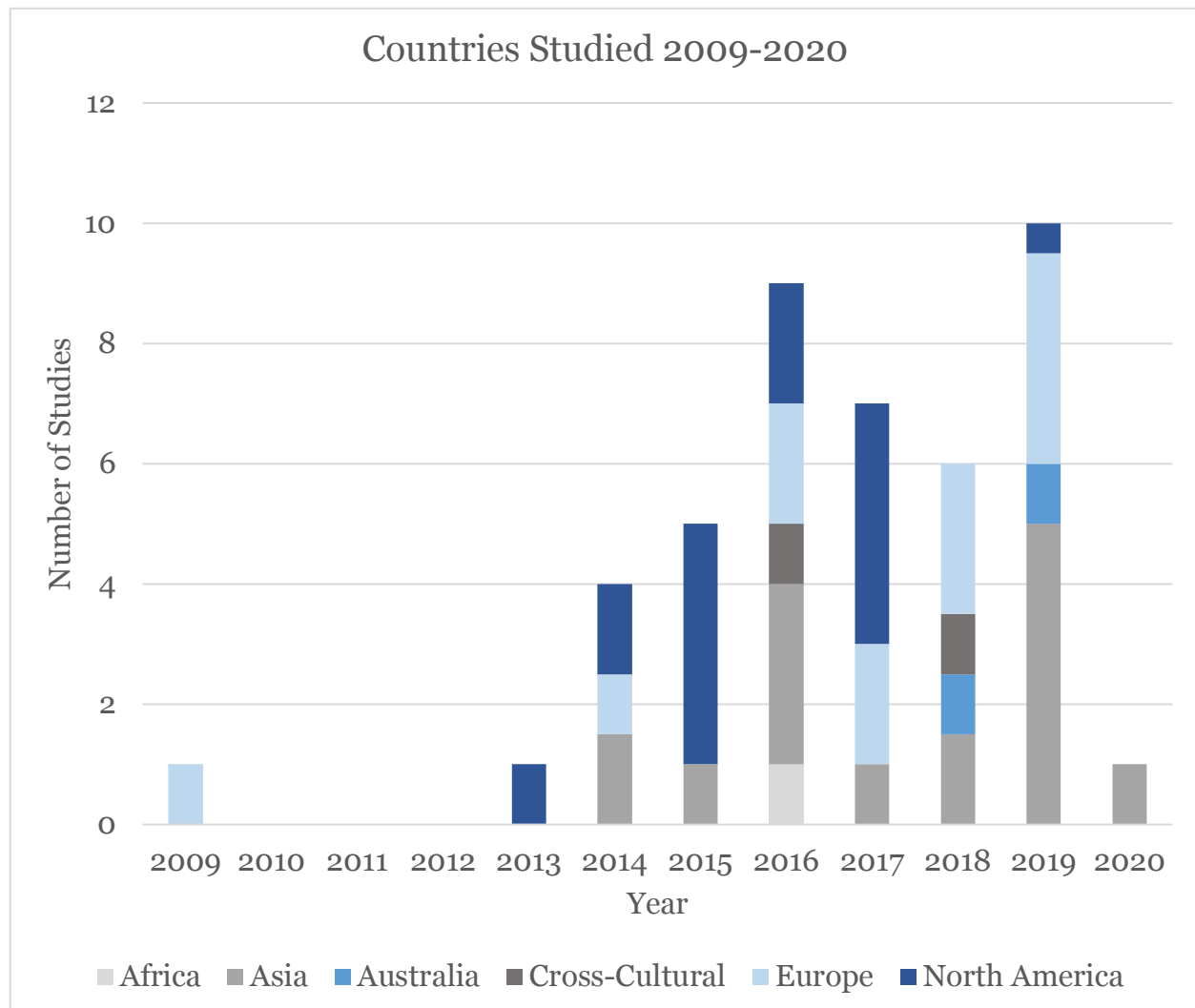| Russia	1
Lebanon	1
Canada	1
Taiwan	1
Total	**47**

Three articles study two samples from different countries. Articles that use data from more than two countries are labeled as "cross-cultural."

The studies included in this review span 17 discrete countries. This is a testament to the truly global presence of phones. It is also indicative of the concern that people have regarding the effect phones are having on individuals' well-being.

In spite of the *global* interest in this debate, most of the research has centered on United States samples (n=13). Five studies on well-being and phone use have studied German samples.

Five studies have examined phone use and well-being in China; this is important because there is evidence to suggest that "problematic smartphone use may be a particular problem in China" (Lachmann et al., 2018). This concern is evident in the publications studying Chinese samples; of the five studies: 2 examine problematic phone use; 1 examines phone addiction; and (the earliest published) 2 examine general phone use. Quantitatively: 40% of the Chinese studies examine problematic phone use (as opposed to 22.7% of the studies included in this review); 20% of the Chinese studies examine phone addiction (as opposed to 9.1% of the studies included in this review); and 40% of the Chinese studies examine phone use generally (as opposed to 68.2% of

the studies included in this review). This trend may indicate that there are growing

problems in China concerning maladaptive phone use and its well-being effects.

Three articles study two samples from different countries. For the sake of simplicity, in those three cases, each country was weighted as ½ for representation in the chart above. The two studies that explored many different countries are labeled as "cross-cultural."

This graph visually depicts the global interest in this debate. It also illuminates

the growing body of work focusing on Asian and European countries.

The Study of Phone Use

Kind of phone use	Number
Phone use	30
Problematic phone use	10
Phone addiction	4
Total	**44**
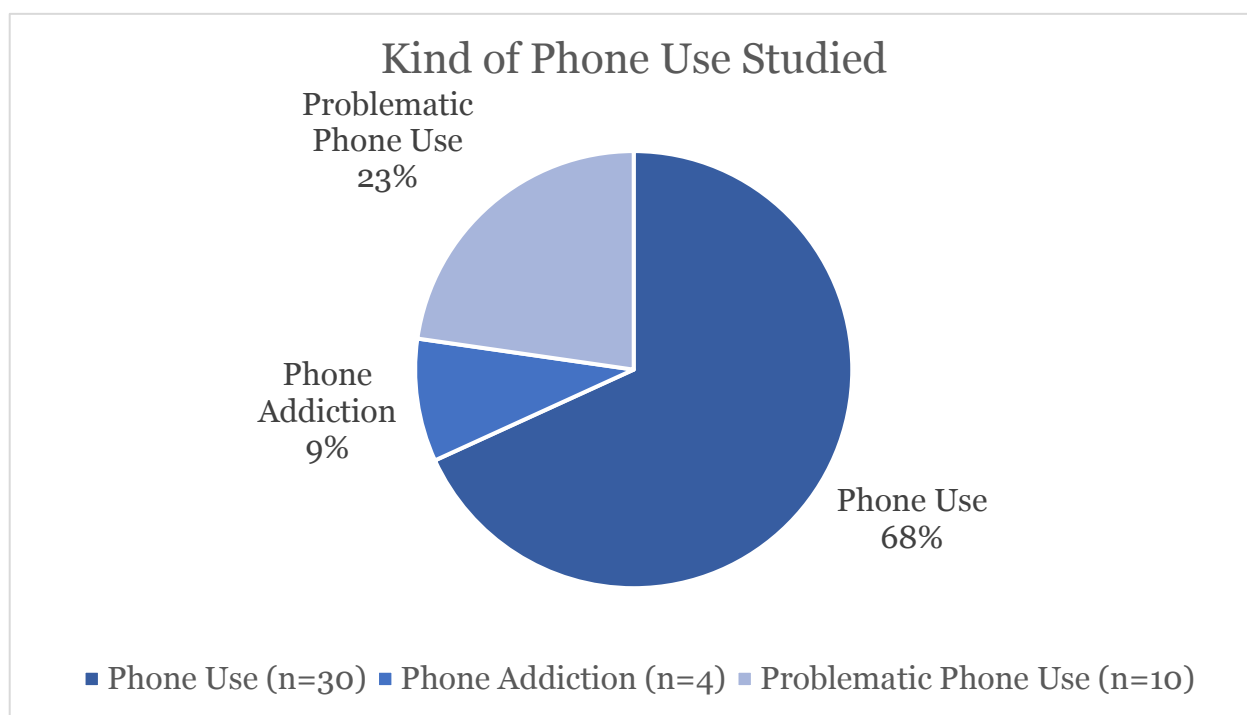
Phone addiction is a relatively new concept and is poorly defined in the literature. In general, phone addiction is considered to be a behavioral addiction and is thought to involve elements associated with more traditional addictions—like functional impairment, tolerance, salience, and withdrawal (Panova & Carbonell, 2018).

Although phone addiction is not included in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), recent studies have demonstrated that phone addiction can lead to an onslaught of psychological disorders (Samaha & Hawi, 2016).

Problematic mobile phone use is similarly ambiguous. In general, problematic mobile phone use—as the name suggests—focuses on the problematic, maladaptive aspect of the phone use rather than simply the amount of time spent on a phone. Generally, problematic phone use is associated with a desire to escape from problems, craving phone engagement, and bringing about negative real-world consequences (Roser, Schoeni, Foerster, & Röösli, 2016).

The studies included in this review predominantly examine phone use in general (n=30). A smaller subset of studies (n=10) has examined problematic phone use. Considering the novelty of the concept of technology addiction, it is not surprising that a small portion of studies address phone addiction (n=4).

Instrument used to measure phone use	Number
Amount of time spent on various phone functions—*Likert scale*	14
Amount of time spent per day spent on various phone functions--*estimate*	6
Smartphone Addiction Scale Short Form (Kwon et al., 2013)	5
"Do you use your phone to..."—*dummy variable*	4
Phone data	4

Number of texts sent and received per day—*Estimate*	4
Mobile Phone Problem Use Scale (Forester et al., 2015)	2
Cuestionario de Experiencias Relacionadas con el Móvil (Questionnaire of Experiences related to mobile phone use)	1
Measure of Cell Phone Conflict (Roberts & David, 2016)	1
"Rating of country-level ICT connectivity"	1
Mobile Phone Problem Usage Scale (Bianchi & Phillips, 2005)	1
Smartphone Usage Measure (Van Deursen et al., 2015)	1
Cell-Phone Over-Use Scale (Jenaro et al., 2007)	1
Smartphone Addiction Measure (Turel and Serenko, 2012)	1
Cyberbullying Questionnaire (Smith et al., 2006)	1
Phone ownership—*Dummy variable*	1
Measure of Pphubbing (Roberts & David, 2016)	1
Frequency and Type of Contact Scale	1
"Timing of phone use"	1

Short Version Test of Mobile Phone Dependence (Chóliz, 2012)	1
Mobile Phone Addiction Tendency Scale (Xiong et al., 2012)	1
Young's Diagnostic Questionnaire for Internet Addiction	1
Total	**54**

Seven studies use two instruments to measure phone use. One study uses four instruments to measure phone use.

The studies included in this article employ 22 different instruments for evaluating participants' phone use. The most popular method asks participants to report their frequency of use of various phone functions on a Likert scale (n=14).

One glaring limitation of the literature is the relatively widespread use of self-report estimates for measuring the amount of time spent per day spent on various phone functions and the number of texts sent and received in a day (n=6 and n=4, respectively). It is clear that the amount of time spent engaging with a phone is important to gauge in the context of this research, this data collection method is bound to be unreliable and undermines the research entirely. First, people are generally bad at gauging the amount of time they spend on a particular task. This weakness is only exacerbated when considering tasks that often involve Mihaly Csikszentmihalyi's famed flow state which is often associated with loss of time (Alter, 2017). Further, phones are unique in that people engage with them in micro-segments; that is, it is common for individuals to use their phone for very short intervals (Alter, 2017). Studies have found that on average, people touch their phones 2,617 times per day, bringing the average phone-time to a precise 145 minutes per day (Winnick & Zolna, 2016). Heavy users, on

the other hand, touch their phones 5,427 times per day for an average of 225 total minutes per day (Winnick & Zolna, 2016). Taken together, these realities suggest that numerical estimates of screen-time are unlikely to be accurate.

One avenue for combatting this difficulty is—ironically—through advancements in technology. That is, as technology advances, researchers will have more tools at their disposal to more accurately gauge individuals' phone use behavior. In 2018, Apple launched a new iPhone function called "Screen Time" that creates weekly reports about an individual's technology usage ("Use Screen," 2020). Although it was designed to help consumers make better-informed decisions in their own lives, Screen Time and other similar programs may be of particular value to researchers ("Use Screen," 2020). A number of articles included in this review (n=4) use this kind of phone data in their analyses. The data is collected through the phone itself as it records the duration of engagement and the functions utilized. This approach gives more accurate phone usage values, thereby strengthening the statistical analyses.

The Study of Well-Being

Kind of wellbeing	Number
Subjective	33
Psychological	12
Emotional	3
Total	**48**

Four studies measure two varieties of well-being.

Kind of Well-Being Studied

Psychological
25%

Emotional
6%

Subjective
69%

■ Psychological (n=12) ■ Emotional (n=3) ■ Subjective (n=33)
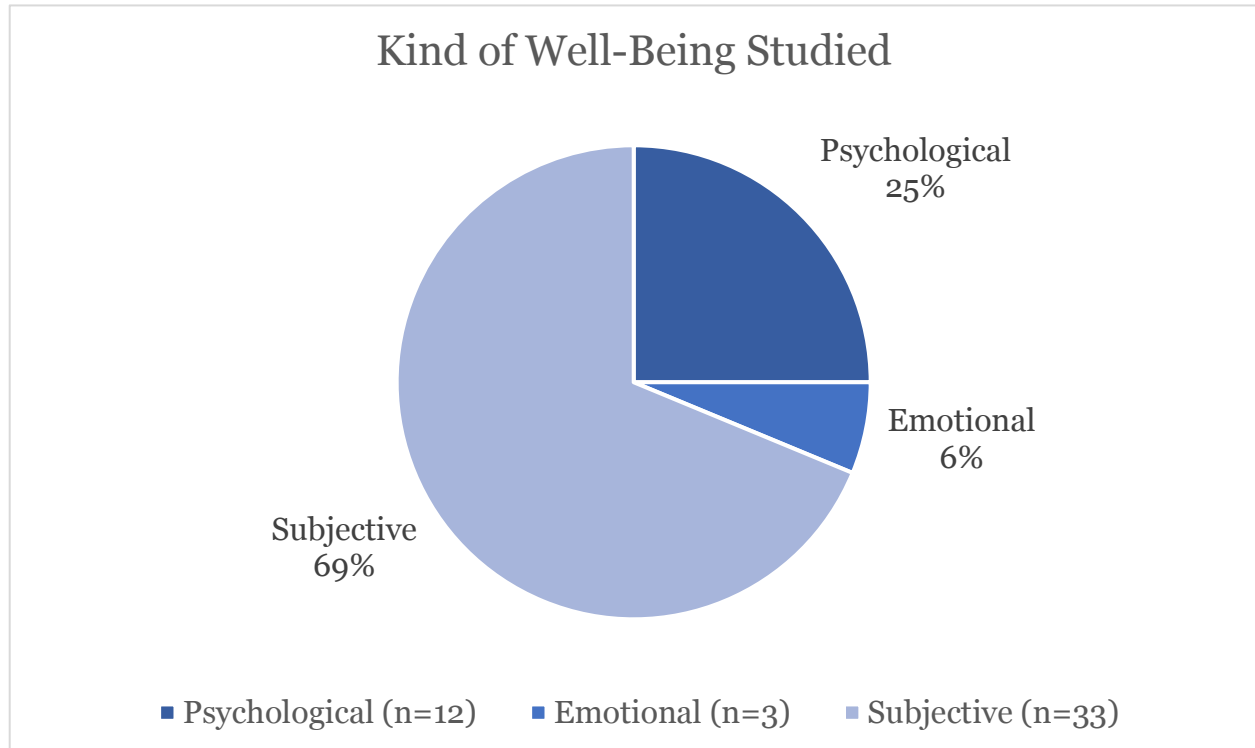
The articles included in this review analyze three varieties of wellbeing: subjective well-being, psychological well-being, and emotional well-being.

It is worth mentioning that there is considerable ambiguity and overlap in terms of the kind of well-being measured. In several instances, for example, studies claimed to be examining subjective well-being, yet they gather quantitative data using the Flourishing Scale--which is considered a measure of psychological well-being. These inconsistencies cause disjointedness, and researchers should use proper terminology when discussing these constructs. When this kind of contradiction arose, I categorized them by my understanding of the concept (rather than theirs).

Instrument used to measure wellbeing	Number
Satisfaction with Life Scale (Diener et al., 1985)	13
1 item measure of life satisfaction	5
Positive and Negative Affect Schedule (Watson et al., 1988)	4
Mental Health Continuum—Short Form (Keyes, 2005)	3
Flourishing Scale (Diener et al.)	3
Psychological Well-being Scale (Ryff)	3
Symptom Checklist-90-R (Derogatis & Salvitz, 2000)	2
Psychological Well-Being Scale (Diener et al., 2009)	2
"social connectedness, affect, opportunity costs, interest/enjoyment, distraction, perceived control, time perception, and boredom" (Dwyer, Kushlev, & Dunn, 2017)	2
Warwick-Edinburgh Mental Well-Being Scale (Tennant et al., 2007)	2
3-item measure of Satisfaction with lLfe	1
Brief Symptom Inventory	1
Scale of Positive and Negative Experience (SPANE) (Diener et al., 2009)	1

PHQ-4 (Kroenke 2009)	1
Subjective Happiness scale	1
Quality of Life Scale	1
Life satisfaction questions from Germany Socio-Economic Panel (Siedler et al., 2008)	1
Personal Wellbeing Index—School Children (PWI-SC; Cummings and Lau, 2005; Tomyn et al., 2013)	1
KIDSCREEN-52 (Ravens-Sieberer et al., 2008)	1
5 items from Michigan Study of Adolescent Life Transitions	1
WHO-Five Well-being Index (Brähler, Mühlan, Albani, & Schmidt, 2007)	1
9-item Index of Well-being (Campbell and Suh, 1976)	1
Total	**51**

Three studies use two instruments to measure well-being. One study uses three instruments to measure well-being.

The studies included in this article employ 22 different instruments for evaluating participants' phone use. The most popular instrument is the Satisfaction with Life Scale (Diener et al., 1985) (n=13). Also popular is a 1-item measure of satisfaction with life (n=5).

The number of different instruments used to evaluate well-being—and their apparent overlap—may contribute to the disjointedness of this body of research and

drive some of the contradictions that are so apparent in the literature as a whole. In other words, it is possible that the apparent contradictions are simply just a consequence of using different instruments to measure well-being.

EMPIRICAL FINDINGS

To tease more informative insights out of this complicated matter, I divided the articles into eight categories based on the contextual elements of the study. The eight categories are (1) Cyberbullying (2) Economic Considerations (3) Face-to-Face Interactions (4) Night-Time Phone Use (5) Social Pressure (6) Motivation (7) Social Connectivity (8) In General.

Cyberbullying

Since the advent of digital technologies, cyberbullying has become a serious concern and focus for parents, teachers, administrators, and policy makers--particularly because its outcomes can be deadly. Cyberbullying includes any *intentional* and *aggressive* action taken with the intent of humiliating, excluding, or intimidating an individual or group (Calpbinici 2019). Research has demonstrated that cyberbullying can have serious negative effects on mental health, sometimes causing isolation, loneliness, depression, and suicidal ideation (Calpbinici 2019).

These outcomes are troubling to consider in light of the prevalence of cyberbullying. A recent study found that 49% of adolescents had enacted some form of cyberbullying and 61% had been exposed to cyberbullying (Calpbinici & Arslan, 2019).

Two studies included in this review examine the relationship between cyberbullying via mobile phone and well-being. Both studies find statistically significant associations between cyberbullying and well-being (Calpbinici & Arslan, 2019; Lucas-Molina, Pérez-Albéniz, & Fonseca-Pedrero, 2018). Both *performing* cyberbullying and merely *being exposed* to cyberbullying was significantly and negatively associated with

adolescents' subjective and psychological well-being (Calpbinici & Arslan, 2019; Lucas-Molina, Pérez-Albéniz, & Fonseca-Pedrero, 2018).

There is some indication that girls are particularly susceptible to negative outcomes of cyberbullying. Mediation analyses revealed that subjective well-being mediates the relationship between cyberbullying and suicidal ideation in girls (Lucas-Molina, Pérez-Albéniz, & Fonseca-Pedrero, 2018). That is, cyberbullying victims were predisposed to suicidal ideation due in part to the negative effect of cyberbullying on their well-being (Lucas-Molina, Pérez-Albéniz, & Fonseca-Pedrero, 2018). At least in theory, girls are more sensitive to the effects of cyberbullying, because of both of its direct effect on suicidal ideation as well as its influence on one's level of well-being (Lucas-Molina, Pérez-Albéniz, & Fonseca-Pedrero, 2018).

Economic Considerations

The digital divide—the gap that exists between those who can readily access the Internet and those who cannot—has been of interest since the advent of the internet in the 1990's (Bartikowski, Laroche, Jamal, & Yang, 2018). As phones have increased in number, researchers have started to investigate a new form of digital divide, one that exists between those who *have a mobile phone* and those who *do not*. Researchers beleive that this divide may be associated with changes in well-being.

From an economic perspective, phones are an efficient means of handling business and keeping in touch with others when physical distance is a barrier to engagement; these qualities make phones a particularly valuable tool in countries with emerging economies. Two studies included in this review examine the well-being effects of mobile phone engagement from this economic development perspective. Each relied

on a different approach, but both found statistically significant correlations between mobile phone engagement and well-being.

Both studies find that mobile phones are significantly associated with enhanced well-being—but only in poorer, less developed countries (Ganju, Pavlou, & Banker; Bartikowski, Laroche, Jamal, & Yang, 2018). Mediation analyses revealed that perceived economic situation, trade, education, inequality, and health mediate the relationship between mobile phone connectivity and well-being (Bartikowski, Laroche, Jamal, & Yang, 2018; Ganju, Pavlou, & Banker). Phones are both a status symbol and an efficient means of accessing information; these aspects of phone use are associated with improvements in subjective well-being.

These studies point to opportunity for exploring the role that phones can play in promoting well-being in developing economies. They also demonstrate that a "one- size-fits-all" strategy for promoting well-being through the dissemination of mobile phones will not benefit all countries in the same way or to the same extent (Ganju, Pavlou, & Banker).

From a broader, systems-level perspective, this research has also illuminated the existence of another kind of digital divide—one in which some are dependent on their phones for accessing the Internet and others have a plethora of tools at their disposal to access the Internet (Bartikowski, Laroche, Jamal, & Yang, 2018). Smartphones are inherently less apt for certain online activities, so consumers' sole dependence on them may become problematic in the future (Bartikowski, Laroche, Jamal, & Yang, 2018). This new digital divide may have serious consequences for individuals' economic stability and satisfaction with life (Bartikowski, Laroche, Jamal, & Yang, 2018).

Face-to-Face Interactions

Some have examined how phone use is related to the quality of individuals' face-to-face interactions. Four studies included in this review examine the well-being effects of mobile phone engagement from this perspective. All four found that mobile phone use has a significant negative effect on subjective well-being (Rotondi, Stanca, & Tomasuolo, 2017). Notably, one of these studies examined a nationally representative sample, lending weight to its findings.

Mediation analyses revealed several pertinent findings. The relationship between phone use during face-to-face interactions--often called *phubbing*--and well-being is mediated by distraction and relationship satisfaction (Dwyer, Kushlev, & Dunn, 2017; Roberts & David, 2016). That is, using a phone during a face-to-face interaction leads individuals to feel distracted (Dwyer, Kushlev, & Dunn, 2017).. This distraction, then, is associated with diminished well-being (Dwyer, Kushlev, & Dunn, 2017).

Overall, these findings indicate that phone use undermines the positive impact of face-to-face interactions on well-being (Rotondi, Stanca, & Tomasuolo, 2017). Although digital natives may *believe* that their phone engagement does not influence their interpersonal interactions, a wealth of research demonstrates that no one is good at multi-tasking (Rotondi, Stanca, & Tomasuolo, 2017). These studies emphasize that phone use—even at moderate levels—undermines the positive outcomes of interacting socially with others (Rotondi, Stanca, & Tomasuolo, 2017).

Night-Time Mobile Phone Use

It has been suggested that phone use is seriously compromising sleep quality. Researchers have theorized that phones impact sleep in several possible ways: by

impacting one's circadian rhythm by compromising the body's melatonin production; causing auditory or emotional disturbances in the night; or by displacing time that should be used for sleep (Vernon, Modecki, Barber, 2018).

Diminished sleep quantity and quality can have serious emotional and developmental impacts including negative mood, irritability, and impaired self-esteem (Vernon, Modecki, Barber, 2018). These changes can spiral into more serious psycho-social problems including mental health disorders (Vernon, Modecki, Barber, 2018).

Two studies included in this review consider phone use and wellbeing as they relate to sleep. Each relied on a different approach, but both found statistically significant correlations between sleep and well-being.

One study experimentally examined subjective well-being, smartphone addiction, and sleep in 95 participants in the United Kingdom. The researchers determined that restricting bedroom phone use for seven days was associated with a (small to moderate) statistically significant increase in subjective well-being as well as a (small) statistically significant decrease in smartphone addiction (Hughes & Burke, 2018).

Additionally, it was found that there exists a significant positive relationship between an individual's initial amount of night-time cell phone use and emotional well-being one year later, and this relationship was mediated by sleep (Vernon & Modecki, 2018). That is, those who engaged in high levels of night-time cell phone use generally had poorer sleep behaviors which, in turn, predicted statistically significant decreases in emotional well-being (Vernon & Modecki, 2018).

Together, these studies demonstrate that heavy, night-time cell phone use is significantly associated with declines in both emotional and subjective well-being,

particularly when it displaces time that would otherwise be spent sleeping (Vernon & Modecki, 2018).

Social Pressure

Some have theorized that phones inherently bring an element of social pressure that can negatively affect well-being. Four studies included in this review address phone use and well-being in the context of social pressure (Murdock, 2013; Murdock, Gorman, & Robbins, 2015; Halfmann & Rieger, 2019)

According to these papers, social pressure and stress are not significantly associated with well-being in general. They are, however, significantly negatively related to emotional well-being for those with high and average (but not low) texting frequency (Murdock, 2013). In a more specific context, it was noted that interpersonal stress was significantly negatively correlated with well-being for those that engage in moderate and high levels of co-rumination via cell phone (but not those that engage in low amounts) (Murdock, Gorman, & Robbins, 2015).

Related experimental research demonstrates that competence, autonomy, and self-control mediate the relationship between social pressure and subjective well-being (Halfmann & Rieger, 2019).

Taken together, this research suggests that moderate to heavy engagement with cell phones may expose the user to undue amounts of social stress (Halfmann & Rieger, 2019; Murdock, 2013). This exposure can—at certain levels of phone use—diminish one's feelings of competence, autonomy, and self-control, thereby causing significant declines in subjective well-being (Halfmann & Rieger, 2019; Murdock, 2013).

Motivation

Some have hypothesized that motivation is an important element in determining whether or not phone use will have positive or negative consequences. Six studies in this review addressed the motivational factors that play a role in this debate.

Active and passive phone engagement for the purpose of staying connected to work was significantly positively related to life satisfaction; interestingly, though, those who did stay connected to work were generally wealthier and more educated—which might explain why they were more satisfied with life (Chen, Huang, Gao, & Patrick, 2017).

Two studies found that using a phone for its *affective* properties—that is, using it to regulate negative emotions—was associated with positive well-being outcomes. Specifically, using the phone to regulate negative emotions was significantly positively associated with well-being (Hoffner & Lee, 2015). It was also found that using a cell phone to facilitate *self-expansion* was significantly correlated with increased subjective well-being (Hoffner, Lee, & Park, 2015). Together, these findings confirm that the phone can be used as a sort of affective technology and that it has the potential to improve well-being (Hoffner, Lee, & Park, 2015).

It also seems that phones can fulfill basic human needs. Analyses revealed that one of the strongest motivating factors for phone use is the desire to fulfill safety and belonging needs (Kang & Jung, 2014). Further, using the smartphone to address safety and belonging needs was significantly correlated with increased subjective well-being (Kang & Jung, 2014).

These findings can extend to a discussion of internal versus external locus of control. One study found that sleep quality and GPA mediate the relationship between

locus of control and subjective well-being (Li, Lepp, & Barkley, 2015). That is, those with an external locus of control may experience difficulty limiting their cell phone use whereas those with an internal locus of control may be able to regulate their cell phone use more effectively (Li, Lepp, & Barkley, 2015). This difference suggests that those with an internal locus of control may avoid the possible negative outcomes of phone use that their external counterparts cannot (Li, Lepp, & Barkley, 2015).

Another study found that *autonomous motivation* for phone engagement is significantly positively correlated with well-being (Ohly & Latour, 2014). Controlled motivation, on the other hand, was found to be significantly negatively associated with well-being (Ohly & Latour, 2014).

Together, these results suggest that it is important to differentiate motivational factors as they relate to phone use and well-being (Ohly & Latour, 2014). It also reinforces the idea that the outcomes of engaging with a phone is dependent on contextual factors.

Social Connectivity

A key component of well-being is a sense of belonging and connection with others; therefore, some have speculated that cell phone use can bolster well-being by connecting people with others and facilitating meaningful relationships (Hughes & Burke, 2018).

Closely related to interpersonal connectivity is *social capital*, an abstract idea based on the premise that a person's relationships bring resources that they can draw on for all sorts of gains—including both emotional and economic gains (Chan, 2015). Social capital is thought to come out of social interactions, so some have noted that the

flexibility and efficiency of the cell phone makes it particularly apt for maintaining or even enhancing social capital (Chan, 2015). Others have theorized that social capital is closely linked to well-being—in that phones may increase well-being by enhancing one's social capital.

Five studies in this review addressed the use of phones to maintain social relationships or enhance social capital in conjunction with well-being. The findings of these studies are equivocal when considered together.

One of these five studies found no significant correlation between communicating with a parent via mobile phone and psychological well-being (Stein, Osborn, & Greenberg, 2016).

The other four studies identified significant correlations between phone use for mobile communication and well-being (Pearson, Mack, & Namanya, 2016; Horwood & Anglim, 2019; Chan, 2015; Bae, 2019). These studies—each built on a different methodological approach–found that mobile communication could sufficiently foster meaningful relationships and, in turn, were associated with increased well-being.

Among these studies, it is worth noting that a study of households in Uganda determined that having a phone was associated with a statistically significant increase in subjective well-being only for those households that *did not* have family living nearby but not for households with family living nearby (Pearson, Mack, & Namanya, 2016). In this context, it seems that mobile phones certainly can be used to foster familial relationships among physically distanced relatives, particularly those in remote, impoverished locations (Pearson, Mack, & Namanya, 2016). This finding also reiterates the idea that not all mobile communication is equal in terms of well-being effects; context is a determining factor.

Interestingly, there appear to be different well-being outcomes associated with phone use for mobile communication versus *entertainment usage.* That is, using a phone to mindlessly pass time, entertain oneself, or relax is significantly negatively correlated with well-being (Horwood & Anglim, 2019; Chan, 2015). Researchers have speculated that this negative correlation relates to some individuals' tendency to isolate themselves; this isolation may limit their in-person interactions and bring about feelings of loneliness or guilt (Horwood & Anglim, 2019).

In General

The remaining 19 articles examined phone use and well-being more generally. I divided these 19 articles into three groups based on the kind of phone use they examined: phone use, problematic phone use, and phone addiction.
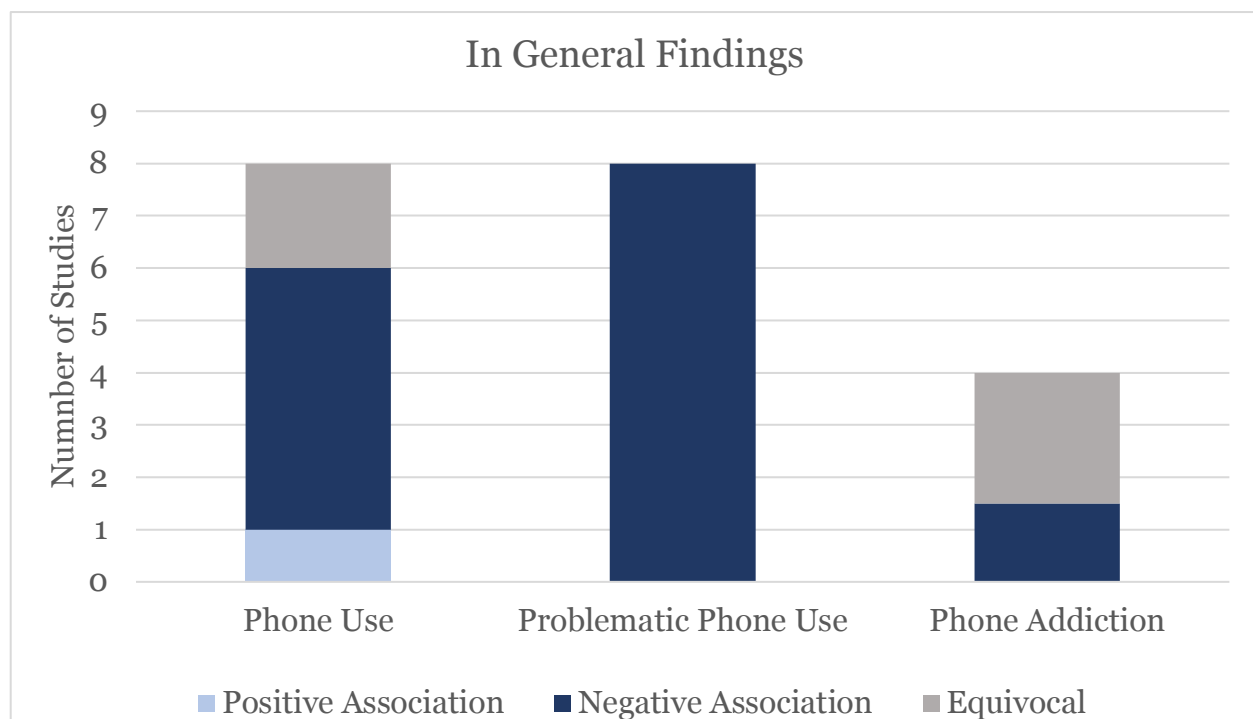
Seven articles examined well-being and phone use (in general). Taken together, the findings are mixed. Two of the studies found no significant correlation between phone use and well-being (Vorderer, Krömer, & Schneider, 2016; Lepp, Barkley, & Karpinski, 2014). Notably, though, one of these studies gauges phone use in terms of participants' estimate of the number of minutes spent on a phone per day and the number of texts sent and received per day; it is plausible that these self report measures were drastically off-base and muddied the statistical analyses.

The other five studies did find significant negative correlations between phone use and well-being at moderate to high levels of phone use, suggesting that as mobile phone use increases, well-being decreases—though the correlations are generally quite small (David, Roberts, & Christenson; Gao, Li, & Zhu, 2014; Przybylski & Weinstein, 2017; Twenge & Campbell, 2019; Volkmer & Lermer, 2019). Notably, two of these studies use large-scale datasets and two others use phone data, confirming the particular strength of these studies.

Several researchers have theorized that the linear associations are weak because low levels of phone use may be positively correlated with well-being (Przybylski & Weinstein, 2017; Twenge & Campbell, 2019). That is, while high levels of phone use are associated with diminished well-being, low-level use may enhance well-being (Przybylski & Weinstein, 2017; Twenge & Campbell, 2019).
Eight articles examined problematic phone use and well-being. All eight found significant negative correlations between problematic mobile phone use and well-being—although for one article, the relationship was only significant for one of the well-being constructs being studied. Taken together, these findings show considerable

support for the notion that problematic mobile phone use and well-being are significantly negatively correlated.

A discrepancy worth noting is the difference in *time spent* engaging with mobile phones and the inherently *maladaptive* aspect of problematic phone use. One study pointed out that no significant correlation exists between time spent on a mobile phone and well-being (Tangmunkongvorakul et al., 2019). Nonetheless, a significant negative relationship between *problematic* phone use and well-being was identified (Tangmunkongvorakul et al., 2019). This distinction lends credence to the notion that it is the *manner* in which people engage with their technological devices that determines the well-being outcomes rather than simply the amount of time spent.

Four articles examined phone addiction and well-being. Of this subset, three studies—one of which relied on smartphone usage data—yielded equivocal findings (King & Dong, 2017; Samaha & Hawi, 2016; Lachmann et al., 2018). One of these studies did find a significant negative correlation, albeit a small one, between phone addiction and well-being, but it was only significant for one of the samples studied (the Chinese sample, not the German sample) (Lachmann et al., 2018). The fourth article examining phone addiction and well-being determined that there is a significant negative correlation between phone addiction and well-being (Kumcağiz & Gündüz, 2016).

RECOMMENDATIONS

Completing a systematic review of the literature brought several important recommendations to light. Some of these recommendations suggest strategies for engaging with phones in an adaptive manner as well as potential ways to mitigate the negative effects of phone use. Other recommendations serve to direct future research.

Practical Considerations

The unequivocal findings—and potential danger—surrounding the negative effects of cyberbullying suggest that action should be taken to limit its detrimental effects. Realistically, barring children from using technological devices is impossible; it may even bring about negative outcomes, causing them to miss out on social interactions and opportunities for psycho-social development (Przybylski & Weinstein, 2017). Nonetheless, parents, teachers, and administrators should monitor adolescents' on-screen behaviors, ensuring that cyberbullying does not occur.

The research on night-time phone use, sleep, and well-being is also straightforward. This research suggests that parents should closely monitor their children's night-time phone use and sleep habits (Vernon, Modecki, Barber, 2018). It may also be useful for parents to implement "digital curfews" so that there are strict limits imposed on night-time screen use (Vernon, Modecki, Barber, 2018).

One proposed avenue for addressing both cyberbullying and night-time phone use is implementing health education programs designed to educate children, teens, and young adults about the potential dangers of phone use in these contexts (Vernon, Modecki, Barber, 2018). This sort of program may be able to teach people how to

healthily engage with their phones while minimizing the risks associated with problematic usage. More research is needed to investigate the efficacy of this kind of program in a variety of settings—from the home to school to online platforms (Vernon, Modecki, Barber, 2018).

Entertainment use seems to be largely associated with declines in well-being, suggesting that phone use is not an adaptive way to pass time, escape problems, or distract onesself. Rather, people should look for other ways to entertain themselves— like evidence based well-being enhancing activities like spending time outdoors, exercise, or reading (Horwood & Anglim, 2019).

Given the largely negative association between phone use and the quality of face-to-face interactions, people should make a conscious effort to live in the moment when in the presence of others. A wealth of research has demonstrated the value of interpersonal interactions for well-being; therefore, people should embrace face-to-face interactions rather than engaging in phubbing. People should consider intentionally leaving their phone out of sight when engaging with others in an effort to maximize the satisfaction gained from the social interaction. This approach may extend to multi-tasking more broadly; that is, it is possible that putting the phone aside periodically— say, while working or cooking dinner—can maximize the well-being effects of those activities as well.

Perhaps most encouragingly, the literature demonstrates that phones can serve as a powerful tool for keeping people connected in meaningful ways. This is the very reason that phones were developed—to facilitate purposeful connections when physical distance is a barrier. Individuals should make a conscious effort to use phones to foster their relationships, minimize psychological distance, and check up on one another.

Whenever possible, people should call their contacts—rather than texting—because voice calls are more strongly correlated with enhanced well-being (Chan, 2015).

Recommendations for Future Research

This thesis revealed several questionable phone use measures used in this body of research. Six studies gauge phone use with participants' estimates of the number of minutes they spend on their phone per day. Four studies ask participants to report the average number of texts they send and receive per day. Fourteen studies ask participants to report their amount of daily phone use on a Likert scale. These estimates are inherently problematic because they rely on very specific responses that are likely inaccurate.

A much better alternative to these estimates is using phone usage data recorded by the phone itself, as four studies included in this review do. This software comes pre-installed on many cell phone models, and it is constantly running in the background. This makes phone data reports non-invasive, accurate, and precise. Future research should use this data.

Advancements should also be made in terms of sample sizes used. Over 60% of the included studies have a sample size of less than 500. Only four use sample sizes of over 10,000. As this body of research continues to grow—and data regarding phone ownership and use becomes more readily available—more studies should look to this kind of large-scale dataset. The Centers for Disease Control, for example, has administered four large-scale surveys measuring well-being in recent years: National Health and Nutrition Examination Survey (NHANES), National Health Interview Survey (NHIS), Behavioral Risk Factor Surveillance System (BRFSS), and Porter Novelli

Healthstyles Survey ("Well-Being Concepts," 2018). These datasets—and others—may hold valuable information regarding the relationship between phone use and well-being.

Furthermore, researchers should look to expand the age demographics of participants being studied; phone use persists across the lifespan and may impact people of different ages differentially—but an astounding 45% of the papers included study university students. Future research should expand this participant pool to reveal more informative insights about how phone use is related to well-being in people of different ages.

The literature also suggests that researchers should adopt new paradigms in this space. Only three studies in this review (7%) employ an experimental design. The general focus on drawing a causal link between screen time and well-being necessitates a particular research design—namely one that is not cross-sectional. In the future, researchers should consider conducting experimental studies in which a causal link between phone use and well-being can be drawn.

Experiments can, for example, be designed to specifically address considerations raised in this literature review. Ideally, researchers would recruit a large, diverse sample—one not comprised solely of college students. Participants could then be randomized into three groups: a no-phone group, limited phone group, and control group. No-phone group participants would go without their phones for seven days. Limited phone group participants would have limited access to their phones—with restrictions on night-time phone use, cyberbullying behaviors, amount of use, and phone use while engaging with others face-to-face. Control group participants would use their phones normally throughout the seven-day span. Theoretically, a week-long intervention would be long enough for potential changes to emerge but short enough

that the experiment would be practically feasible. Throughout the week, researchers could send out subjective, psychological, and emotional well-being questionnaires to participants via text. At the end of the experiment, researchers would be able to download each participant's Screen Time data. Then, they could perform statistical analyses comparing the three groups' phone use and well-being changes throughout the week and looking for correlations between phone use and well-being. If the limited use group shows the most positive outcome, subsequent research could systematically manipulate each of the elements to assess which components or combination of components accounts for the improvements. Notably, this study design would allow for causal links to be drawn between phone use and well-being.

CONCLUSION

As a whole, the research examining well-being and phone use has yielded largely equivocal findings. I hope that systematically bringing together all of the research that has been done on well-being and phones to date has brought some clarity to the issue.

This topic certainly is marked by debate. Two articles analyzing the very same large-scale dataset come to different conclusions regarding the well-being effects of screen time (Przybylski & Weinstein, 2017; Twenge & Campbell, 2019). In fact, their analyses somehow perfectly coincide with the very theoretical orientation that they each subscribed to at the outset of each respective data analysis process. This situation speaks to the bitterness of the debate and also gets at the larger issue of confirmation bias.

In general, it seems that context is everything. As some scholars have said, "Not all phone use is created equal." There seem to be instances in which phones can promote well-being—such as through mobile communication and economic development. There also appear to be contexts in which phone use is unequivocally detrimental to well-being—such as cyberbullying and impaired sleep hygiene.

It is the manner in which people interact with their phones that determines the well-being outcome. It seems possible that people can learn how to healthily interact with their phones and that this kind of adaptive engagement can maximize the psychological benefits of phones while minimizing the potential harm (Hoffner & Lee, 2015).

REFERENCES

Accenture Strategy. (2018). *How the wireless industry powers the U.S. economy*.

Alter, A. L. (2017). *Irresistible: The Rise of Addictive Technology and the Business of Keeping Us Hooked*. New York, NY: Penguin Press.

Anderson, J., & Rainie, L. (2018, April). *The Future of Well-Being in a Tech-Saturated World*.

Bae, S.-M. (2019). The relationship between smartphone use for communication, social capital, and subjective well-being in Korean adolescents: Verification using multiple latent growth modeling. *Children and Youth Services Review*, *96*, 93-99. https://doi.org/10.1016/j.childyouth.2018.11.032

Bartikowski, B., Laroche, M., Jamal, A., & Yang, Z. (2018). The type-of-internet-access digital divide and the well-being of ethnic minority and majority consumers: A multi-country investigation. *Journal of Business Research*, *82*, 373-380. http://dx.doi.org/10.1016/j.jbusres.2017.05.033

Beranuy, M., Oberst, U., Carbonell, X., & Chamarro, A. (2009). Problematic Internet and mobile phone use and clinical symptoms in college students: The role of emotional intelligence. *Computers in Human Behavior*, *25*, 1182-1187. https://doi.org/10.1016/j.chb.2009.03.001

Calpbinici, P., & Arslan, F. T. (2019). Virtual behaviors affecting adolescent mental health: The usage of Internet and mobile phone and cyberbullying. *Journal of Child and Adolescent Psychiatric Nursing*, *32*, 139-148. https://doi.org/10.1111/jcap.12244

Chan, M. (2015). Mobile phones and the good life: Examining the relationships among

    mobile use, social capital and subjective well-being. *New Media & Society*, *17*, 96-

    113. https://doi.org/10.1177/1461444813516836

Chen, C.-C., Huang, W.-J., Gao, J., & Patrick, J. F. (2017). Antecedents and

    consequences of work-related smartphone use on vacation: An exploratory study

    of taiwanese tourists. *Journal of Travel Research*, *57*(6), 743-757.

    https://doi.org/10.1177/0047287517714907

Collier, A. (2017, August 12). The generation-destroying smartphone: Researchers push

    back [Blog post]. Retrieved from https://www.netfamilynews.org/generation-

    destroying-smartphone-researchers-push-back

David, M. E., Roberts, J. A., & Christenson, B. (2017). Too much of a good thing:

    Investigating the association between actual smartphone use and individual well-

    being. *International Journal of Human–Computer Interaction*.

    https://doi.org/10.1080/10447318.2017.1349250

Davidson, J. (2016, August 16). The Telephone Revolution: A Communication History

    Timeline [Blog post]. Retrieved from Vast Conference website:

    https://www.conferencecalling.com/blog/the-telephone-revolution-a-

    communication-history-timeline

Dayapoğlu, N., Kavurmaci, M., & Karaman, S. (2016). The Relationship between the

    Problematic Mobile Phone Use and Life Satisfaction, Loneliness, and Academic

    Performance in Nursing Students. *International Journal of Caring Sciences*,

    9(2), 647-652.

Dodge, R., Daly, A. P., Huyton, J., & Sanders, L. D. (2012). The challenge of defining wellbeing. *International Journal of Wellbeing*, *2*(3), 222-235. https://doi.org/10.5502/ijw.v2i3.4

Dwyer, R., Kushlev, K., & Dunn, E. (2017). Smartphone use undermines enjoyment of face-to-face social interactions. *Journal of Experimental Social Psychology*. https://doi.org/10.1016/j.jesp.2017.10.007

Eaude, T. (2009). Happiness, emotional well-being and mental health -- what has children's spirituality to offer? *International Journal of Children's Spirituality*, *14*(3), 185-196. https://doi.org/10.1080/13644360903086455

Emelin, V. A., Rasskazova, E. I., & Tkhostov, A. S. (2017). technology-related transformations of imaginary body boundaries: Psychopathology of the everyday excessive internet and mobile phone use. *Psychology in Russia: State of the Art*, *10*(3), 177-189. https://doi.org/10.11621/pir.2017.0312

Ganju, K. K., Pavlou, P. A., & Banker, R. D. (n.d.). Does information and communication technology lead to the well-being of nations? A country-level empirical investigation. *MIS Quarterly*, *40*(2), 417-430.

Gao, Y., Li, H., & Zhu, T. (2014). Predicting subjective well-being by smartphone usage behaviors. *Proceedings of the International Conference on Health Informatics*, pp. 317-322. https://doi.org/10.5220/0004800203170322

Halfmann, A., & Rieger, D. (2019). Permanently on call: The effects of social pressure on smartphone users' self-control, need satisfaction, and well-being. *Journal of Computer-Mediated Communication*, *24*, 165-181. https://doi.org/10.1093/jcmc/zmz008

Hoffner, C. A., & Lee, S. (2015). Mobile phone use, emotion regulation, and well-being. *Cyberpsychology, Behavior, and Social Networking*, *18*(7), 411-416. https://doi.org/10.1089/cyber.2014.0487

Hoffner, C. A., Lee, S., & Park, S. J. (2015). "I miss my mobile phone!": Self-expansion via mobile phone and responses to phone loss. *New Media & Society*, *18*(11), 2452-2468. https://doi.org/10.1177/1461444815592665

Horwood, S., & Anglim, J. (2019). Problematic smartphone usage and subjective and psychological well-being. *Computers in Human Behavior*, *97*, 44-50. https://doi.org/10.1016/j.chb.2019.02.028

Hughes, N., & Burke, J. (2018). Sleeping with the frenemy: How restricting 'bedroom use' of smartphones impacts happiness and wellbeing. *Computers in Human Behavior*, *85*, 236-244. https://doi.org/10.1016/j.chb.2018.03.047

Kaboudi, M., Sharma, M., Ziapour, A., Dehghan, F., & Abbasi, P. (2019). Pathology of cyberspace: A study of the detrimental effects of mobile phones on students' psychological well-being. *International Journal of Pediatrics*, *7*(9), 10077-10085. https://doi.org/10.22038/ijp.2019.39704.3381

Kang, S., & Jung, J. (2014). Mobile communication for human needs: A comparison of smartphone use between the US and Korea. *Computers in Human Behavior*, 376-387. https://doi.org/10.1016/j.chb.2014.03.024

King, R. C., & Dong, S. (2017). The impact of smartphone on young adults. *The Business & Management Review*, *8*(4), 342-349.

Kumcağiz, H., & Gündüz, Y. (2016). Relationship between psychological well-being and smartphone addiction of university students. *International Journal of Higher Education*, *5*(4), 144-156. https://doi.org/10.5430/ijhe.v5n4p144

Lachmann, B., Sindermann, C., Sariyska, R. Y., Luo, R., Melchers, M. C., Becker, B., . . .

> Montag, C. (2018). The role of empathy and life satisfaction in internet and
>
> smartphone use disorder. *Frontiers in Psychology*, 1-11.
>
> https://doi.org/10.3389/fpsyg.2018.00398

The Lee Kum Sheung Center for Health and Happiness. (2017, March). Measurement of

> Well-Being. Retrieved December 6, 2019, from Harvard T.H. Chan School of
>
> Pubic Health website: https://www.hsph.harvard.edu/health-
>
> happiness/research-new/positive-health/measurement-of-well-being/

Lepp, A., Barkley, J. E., & Karpinski, A. C. (2014). The relationship between cell phone

> use, academic performance, anxiety, and satisfaction with life in college students.
>
> *Computers in Human Behavior*, *31*, 343-350.
>
> http://dx.doi.org/10.1016/j.chb.2013.10.049

Li, J., Lepp, A., & Barkley, J. E. (2015). Locus of control and cell phone use: Implications

> for sleep quality, academic performance, and subjective well-being. *Computers in*
>
> *Human Behavior*, *52*, 450-457. http://dx.doi.org/10.1016/j.chb.2015.06.021

Lucas-Molina, B., Pérez-Albéniz, A., & Fonseca-Pedrero, E. (2018). The potential role of

> subjective wellbeing and gender in the relationship T between bullying or
>
> cyberbullying and suicidal ideation. *Psychiatry Research*, *270*, 595-601.
>
> https://doi.org/10.1016/j.psychres.2018.10.043

Maurya, P., Penuli, Y., Kunwar, A., Lalia, H., Negi, V., Williams, A., & Thakur, V. (2014).

> Impact of mobile phone usage on psychosocial wellbeing of student nurses.
>
> *Journal of Nursing and Health Science*, *3*(6), 39-42.

Murdock, K. K. (2013). Texting while stressed: Implications for students' burnout, sleep, and well-being. *Psychology of Popular Media Culture*, *2*(4), 207-221. https://doi.org/10.1037/ppm0000012

Murdock, K. K., Gorman, S., & Robbins, M. (2015). Co-rumination via cellphone moderates the association of perceived interpersonal stress and psychosocial well-being in emerging adults. *Journal of Adolescence*, *38*, 27-37. https://doi.org/10.1016/j.adolescence.2014.10.010

Ohly, S., & Latour, A. (2014). Work-related smartphone use and well-being in the evening: The role of autonomous and controlled motivation. *Journal of Personnel Psychology*, *13*(4), 174-183. https://doi.org/10.1027/1866-5888/a000114

Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of Behavioral Addictions*, *7*(2), 252-259. https://doi.org/10.1556/2006.7.2018.49

Pearson, A. L., Mack, E., & Namanya, J. (2016). Mobile phones and mental well-being: Initial evidence suggesting the importance of staying connected to family in rural, remote communities in Uganda. *PLoS ONE*, 1-11. https://doi.org/10.1371/journal.pone.0169819

Pew Research Center. (2019, June 12). Demographics of Mobile Devices. Retrieved December 6, 2019, from Pew Research Center website: (https://www.pewresearch.org/internet/fact-sheet/mobile/

Przybylski, A. K., & Weinstein, N. (2017). A large-scale test of the goldilocks hypothesis: Quantifying the relations between digital-screen use and the mental well-being of

adolescents. *Psychological Science*, *28*(2), 204-215.

https://doi.org/10.1016/j.amepre.2009.12.030

Roberts, J. A., & David, M. E. (2016). My life has become a major distraction from my cell phone: Partner phubbing and relationship satisfaction among romantic partners. *Computers in Human Behavior*, *54*, 134-141. http://dx.doi.org/10.1016/j.chb.2015.07.058

Roser, K., Schoeni, A., Foerster, M., & Röösli, M. (2016). Problematic mobile phone use of Swiss adolescents: Is it linked with mental health or behaviour? *International Journal of Public Health*, *61*, 307-315.

Rotondi, V., Stanca, L., & Tomasuolo, M. (2017). Connecting alone: Smartphone use, quality of social interactions and well-being. *Journal of Economic Psychology*, *63*, 17-26. https://doi.org/10.1016/j.joep.2017.09.001

Ryan, R.M., & Deci, E.L. (2001). On happiness and human potentials: a review of research on hedonic and eudaimonic well-being. *Annual review of psychology, 52*, 141-66.

Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior*, *57*, 321-325. http://dx.doi.org/10.1016/j.chb.2015.12.045

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist, 55*(1), 5-14. https://doi.org/10.1037/0003-066X.55.1.5

Sirgy, M. J., Lee, D.-J., Kamra, K., & Tidwell, J. (2007). Developing and validating a measure of consumer well-being in relation to cell phone use. *Applied Research in Quality of Life*, 95-123. https://doi.org/10.1007/s11482-007-9033-3

Stein, C. H., Osborn, L. A., & Greenberg, S. C. (2016). Understanding young adults'

　　reports of contact with their parents in a digital world: psychological and familial

　　relationship factors. *Journal of Child and Family Studies*, *25*, 1802-1814.

　　https://doi.org/10.1007/s10826-016-0366-0

Stoll, L. (2014). A Short History of Wellbeing Research. In D. McDaid & C. L. Cooper

　　(Eds.), *Wellbeing: A Complete Reference Guide, Economics of Wellbeing* (Vol.

　　V). Retrieved from https://www.oreilly.com/library/view/wellbeing-a-

　　complete/9781118716281/9781118716281c02.xhtml

Tangmunkongvorakul, A., Musumari, P. M., Thongpibul, K., Srithanaviboonchai, K.,

　　Techasrivichien, T., Suguimoto, S. P., . . . Kihara, M. (2019). Association of

　　excessive smartphone use with psychological well-being among university

　　students in Chiang Mai, Thailand. Retrieved from PLoS ONE database.

Tsirulnik, G. (2017). Mobile phone ranked most used electronic device. Retrieved

　　December 6, 2019, from Mobile Marketer website:

　　https://www.mobilemarketer.com/ex/mobilemarketer/cms/news/research/747

　　3.html

Twenge, J. M., & Campbell, W. K. (2019). Media use is linked to lower psychological

　　well-being: Evidence from three datasets. *Psychiatric Quarterly*, *90*, 311-331.

　　https://doi.org/10.1007/s11126-019-09630-7

Use Screen Time on your iPhone, iPad, or iPod touch. (2020, March 24). Retrieved April

　　14, 2020, from https://support.apple.com/en-us/HT208982

Vernon, L., & Modecki, K. L. (2018). Mobile phones in the bedroom: Trajectories of

　　sleep habits and subsequent adolescent psycosocial development. *Child

　　Development*, *89*(1), 66-77. https://doi.org/10.1111/cdev.12836

Volkmer, S. A., & Lermer, E. (2019). Unhappy and addicted to your phone? – Higher

    mobile phone use is associated with lower well-being. *Computers in Human*

    Behavior, *93*, 210-218. https://doi.org/10.1016/j.chb.2018.12.015

Vorderer, P., Krömer, N., & Schneider, F. M. (2016). Permanently online – Permanently

    connected: Explorations into university students' use of social media and mobile

    smart devices. *Computers in Human Behavior*, *63*, 694-703.

    http://dx.doi.org/10.1016/j.chb.2016.05.085

Well-Being Concepts. (2018, October 31). Retrieved from https://www.cdc.gov/

    hrqol/wellbeing.htm

Western, M., & Tomaszewski, W. (2016). Subjective wellbeing, objective wellbeing and

    inequality in Australia. *PLoS ONE*, *11*(10), 1-20.

    https://doi.org/10.1371/journal.pone.0163345

Winnick, M., & Zolna, R. (2016, June 16). Putting a finger on our phone obsession

    mobile touches: A study on how humans use technology. Retrieved April 14,

    2020, from https://dscout.com/mobile-touches

Yang, Z., Asbury, K., & Griffiths, M. D. (2019). An exploration of problematic

    smartphone use among Chinese university students: Associations with academic

    anxiety, academic procrastination, self-regulation and subjective wellbeing.

    International Journal of Mental Health and Addiction, *17*, 596-614.

    https://doi.org/10.1007/s11469-018-9961-1

Zhang, G., Yang, X., Tu, X., Ding, N., & Lau, J. T.F. (2020). Prospective relationships

    between mobile phone dependence and mental T health status among Chinese

    undergraduate students with college adjustment as a mediator. *Journal of*

    Affective Disorders, *260*, 498-505. https://doi.org/10.1016/j.jad.2019.09.047

BIOGRAPHY

Jordan Hammond was born in Houston, Texas on May 1, 1998. She enrolled in the Plan II Honors Program at the University of Texas in 2016 and studied at University College London during her junior year. In college, Jordan was a member of Kappa Kappa Gamma sorority. She worked in several research labs throughout her time at the University of Texas. During her senior year, Jordan served as a Plan II Physics tutor. She graduated in 2020 and will attend Columbia University in the fall to pursue a Master of Public Health.