

ABSTRACT

Age Differences in Links Between Social Media Use and Mental Health: Results from a National Sample of U.S. Adults

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Now more than ever, American adults are using social networking sites (SNS). While many studies have examined associations between SNS use and mental health among children and adolescents, few studies have considered potential age differences in SNS use effects. Drawing on nationally representative data collected by Gallup in 2017 (N=1501), I examined associations between time spent on SNS and users' depression and anxiety as well as perceptions of how the Internet affects their social relationships. I also assessed the potential moderating role of age for these associations. Results show that SNS use is unrelated to users' depression or anxiety once adjusting for demographic background, but is related to perceived positive effects on one's social relationships. Meanwhile, I find no significant age differences in these associations, suggesting that while older adults use SNS less often, they are influenced by SNS in ways similar to younger individuals.

Age Differences in Links Between Social Media Use and Mental Health: Results from a
National Sample of U.S. Adults

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A Thesis

Approved by the Department of Sociology

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Submitted to the Graduate Faculty of
Baylor University in Partial Fulfillment of the
Requirements for the Degree
of
Master of Arts

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Accepted by the Graduate School
May 2021

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CHAPTER ONE

Introduction

In the past decade, there has been a tremendous increase in the number of American adults, especially older adults who start to use social networking sites (SNS). People often think of older adults as lagging behind when it comes to adopting digital technologies. Yet, recent statistics show that older adults in the U.S. are moving fast towards the Internet and SNS. Today, over 69% of adults who age 50 to 64 are on at least one social media site, and around 40% of adults who age 65 or above are doing so, representing an eight-fold increase from 5% in April, 2009 (Pew Research Center, 2019).

Despite this dramatic increase, there is not nearly enough research on how SNS might influence the lives of adults. Scholars typically consider the effects of SNS among children and adolescents (Ellison et al., 2007; Primack et al., 2017), who often are deemed the most relevant individuals to study. Meanwhile, existing studies concerning older adults and new technologies mainly focuses on general information communication technologies (ICT), such as the Internet, e-mail, or online video and phone call (Chopik, 2016; Baker et al., 2018; Selwyn, 2004). Among the limited research focusing specifically on SNS, most presents details about older adults' user experience with SNS, but very few studies actually proceed to examine SNS use effects (for reviews, see Leist, 2013; Xie et al., 2012).

Age is closely related to social network size and composition in real life, suggesting its relevance to online social networking. Classic theories of aging predict that

older age is related to decreased social network size due to physical health changes, retirement, bereavement or voluntary emotional selectivity (Cumming et al., 1960; Lemon et al., 1972; Carstensen et al., 1992). More recently, some studies indicate that age has a U-shape relationship with the volume of social activities (Cornwell et al., 2008).

Although SNS are found to have a positive effect on people's networking size and social capital (Ellison et al., 2007), researchers are inconclusive about the relationship between SNS use and mental health. Some studies indicate that young adults who spend a great deal of time on SNS tend to report higher level of depression, lower self-esteem, greater anxiety, and are more likely to feel socially isolated (O'Keeffe et al., 2011; Lin et al., 2016; Neira & Barber, 2014; Vannucci et al., 2017; Primack et al., 2017). Other studies show that using SNS can make people feel less lonely, more connected to their friends and family, and have higher social life satisfaction (Ballantyne et al., 2010; Deters & Mehl, 2013; Bell et al., 2013).

With the development of digital communication, it is important to understand the relationship between age, online social networking, and mental health. Specifically, does the effect of SNS use on mental health vary by age? What is the role of SNS playing in promoting mental wellbeing in an aging society? These questions remain largely unanswered. In this study, I draw on national data collected by Gallup to examine associations between SNS use and multiple mental health outcomes, and whether they vary by age.

CHAPTER TWO

Literature Review

SNS and Mental Health Implications

Social media — also known as social networking sites (SNS) — captivated public attention with the emergence of Web 2.0 in the first decade of the 20th century (Boyd & Ellison, 2007; Kaplan & Haenlein, 2010). SNS are defined as Internet-based applications that facilitate the sharing of personal information with social contacts as well as the creation and exchange of user-generated content (Obar & Wildman, 2015). At present, around seven in ten adults have either a Facebook or YouTube account (Pew Research Center, 2019).

Although it has been widely recognized that SNS use can enlarge people's social network size and provide users with important social capital (Ellison et al., 2007), prior studies are inconclusive about the effects of SNS use on the users' mental health. Since SNS are in many ways designed to facilitate making social connections, users are expected at least in theory to gain more emotional and social support, which might serve as a protective factor for mental health. However, impression management theory and social comparison theory suggest that SNS use will incur upward social comparisons which are detrimental to the users' psychological wellbeing as SNS users tend to share the most positive side of their life online (Appel et al., 2016).

As stated earlier, most research into the relationship between SNS and mental health is focused on children and adolescents. In 2011, the American Academy of

Pediatrics (AAP) released a report on the effects of SNS on children and adolescents. The report suggested that teenagers who spent a lot of time on Facebook exhibited classic depression symptoms (O'Keeffe & Clarke-Pearson, 2011). The term “Facebook depression” thereafter became a hot topic in the public discussion. In the subsequent years, many studies showed that the SNS use, whether measured in terms of number of social media accounts or frequency of site visits, is associated with various mental health problems, including depression (Lin et al., 2016), low self-esteem (Neira & Barber, 2014), loneliness (Brandtzæg, 2012) and anxiety (Vannucci et al., 2017). Some researchers further examined the mechanisms that link SNS use and poor mental health. They proposed that SNS use was related to bad mental health because of online harassment, poor sleep, poor body image, and fear of missing out (FoMO) (Kelly et al., 2018; Barry et al., 2017).

However, some studies showed the opposite effects, again among children and adolescents. Deters & Mehl (2013) found that posting Facebook status updates can significantly decrease loneliness among young adults. It is also found that adolescents who use Facebook had lower depressive symptoms (Frison & Eggermont, 2016). Furthermore, Berryman & Ferguson (2017) pointed out that concerns regarding SNS use may be misplaced. They found that SNS use was not predictive of mental health problems, including loneliness and social anxiety among young adults. More recently, Coyne and colleagues (2020) did an 8-year longitudinal study examining the association between time spent on social media and depression among 500 adolescents. Their results indicate that time on social media is not associated with mental health issues such as anxiety and depression over time.

Life Stage and SNS Use

How relevant is prior research into SNS use among children and adolescents? More specifically, how should we think about SNS use and its consequences across the broader lifespan? To begin, it generally is found that age is negatively related to SNS use. In 2019, American people spend an average of 2 hours and 3 minutes on social media each day. Young adults aged 16 to 29 spend the most time on SNS, and as age increases, SNS use decreases (Hruska & Maresova, 2020; Henderson, 2020). As young adults continue to be the dominant users of SNS, usage by older adults has increased rapidly over the years.

Before examining the question of how SNS use might influence mental health among older adults, an intermediate step is to consider age differences in the adoption of and experiences with SNS, which may lead to differences in time spent on SNS. Drawing on theories and empirical studies from psychology, gerontology, and media and communication studies, four major age-based differences seem vital to understanding potential SNS use effects among older adults: physical state, SNS perceptions, cohort effects, and normative life-course changes in relational goals. While the literature on aging and social networks focuses decidedly on older adults, many of these changes are likely to carry some relevance to adults of varying ages who are experiencing changes in health or social motivations.¹

¹ I return to the issue of potential age and generational differences in Discussion.

Physical State

First, physical conditions of older population are directly related to their use of SNS. Major factors include cognitive abilities, visual abilities and physical mobility. The relationship between age and adoption of technology was found to be mediated by cognitive abilities (Czaja et al., 2006). Various studies have also indicated that impaired eyesight and reduced cognitive abilities affect older adults' use of computers and the Internet. Older adults are also found to have more difficulties in learning new software, navigating, browsing and searching for information on the Internet in comparison to young adults (Xie, 2003). Given these emergent differences in physical limitations, SNS use may be less likely or rewarding in some instances.

SNS Perceptions

Perceived ease of use and perceived usefulness are two fundamental determinants of user acceptance of computers (Davis, 1989). Older adults are found to have less comfort and efficacy about using computers than younger people (Lee et al., 2019). They also generally are less confident in using SNS (Lehtinen et al., 2009). Also, older adults are generally more skeptical about the usefulness and meaningfulness of SNS use. They sometimes perceive SNS communication as cold and narcissistic (Lehtinen et al., 2009; Lüders & Brandtzæg, 2017). As a senior interviewee in Lehtinen et al. (2009)'s study said, "If someone of my age put her photo on the net, I would think she is a little silly and empty." In addition to that, older adults often have more concerns about using SNS. Particularly, they worry about privacy issues of online networking sites (Xie et al., 2012; Lüders & Brandtzæg, 2017; Jung et al., 2017).

Cohort Effects

Any “digital divide” between the old and the young is not merely an issue of individual choices or momentary perceptions. More broadly, SNS use also is about the timing of the rapid technological change within the life course and how this influences acclimation to and inducements toward digital technologies (Friemel, 2016; Loges & Jung, 2001). Young people, presumed part of a “technological generation,” grew up with high Internet penetration. Older adults, in contrast, had less access to the Internet in both work and non-work spheres. They did not have many professional incentives to use the Internet, nor did they have peer encouragement to use SNS from friends in the same age cohort (Paul & Stegbauer, 2005; Selwyn, 2004). As a result, older adults generally have less socialization surrounding SNS. They use fewer SNS platforms and are familiar with only a limited number of the functions of SNS compared to their younger counterparts (Pfeil et al., 2009).

Life Course Changes in Relational Goals

Lastly, older adults may have distinct motivations for using SNS. The Uses and Gratification (U&G) Theory suggests that people are attracted to a certain form of media due to specific motivations associated with personal needs. Major psychological motivations for using SNS include socialization, self-identity development, entertainment, and information seeking (Katz et al., 1973; Whiting & Williams, 2013). Many studies have shown that compared with younger people, older adults put more emphasis on a so-called “socialization” function of SNS in contrast to the other three. For most older adults, a primary reason to use SNS is to keep up with happenings on in the lives of their family and friends (Righi et al., 2012; Erickson, 2011; Jung et al., 2017).

Socialemotional Selectivity Theory (SST) provides some explanations for why older people have different motivations for using SNS. According to SST, as people age, they perceive future time as more limited and it leads to a change in their life goals. Older adults generally are less motivated to obtain new knowledge and develop new skills, and care more about having meaningful relationships. They are also expected to be more interested in spending time with close relationships instead of expanding social network size and making new friends (Carstensen et al., 1992; Carstensen et al., 2003).

The consequences of these life-course changes in relational goals for SNS use are not clear. Older individuals may perhaps use SNS to nurture existing relationships, leading to SNS use frequencies similar to those observed among younger individuals. Or older individuals may prefer in-person social engagement to SNS use, resulting in lower frequency of SNS use.

In summary, the above-mentioned differences in physical conditions, perceptions, resources and life goals correlating with aging are playing a role in older adults' adoption of and experiences with SNS. They also are likely to bear relevance to middle-aged adults, who experience many of the same health and social processes.

SNS Use Effects on Older Adults

Given these four key proposed mechanisms relevant to age and SNS use, should we expect any age differences in SNS use effects? A limited number of earlier studies yielded inconsistent results. Quinn (2018) reported that SNS use was related to improved cognitive functioning in an intervention study involving seven older SNS novices. Hutto et al. (2015) found that Facebook users had higher satisfaction with their social roles compared with non-Facebook users among 269 older adults. A study of 142 older adults

in the metropolitan Atlanta area also showed that older SNS users have higher social satisfaction and confidence with technology (Bell et al., 2013). Moreover, Ballantyne et al (2010) showed that the use of SNS can reduce the participants' loneliness in their intervention study.

While most of the previous studies suggested that SNS use is beneficial to older adults' mental wellbeing, three studies indicated that the use of social media was not predictive of older adult's mental health. They showed that SNS use was unrelated to older users' loneliness, depression (Aarts et al., 2015; Bell et al., 2013) or quality of life (Sundar et al., 2011).

More recently, Hardy and Castonguay (2018) suggested that age may have a moderating role in the relationship between SNS use and mental wellbeing. Using data from the 2016 General Social Survey, they found that the number of social media sites is negatively related to anxiety (measured by respondents reporting that they have felt like they were going to have a nervous breakdown) among those who are 18 to 29 years old, and positively related to anxiety for those who are 30 to 49, and who are 50 and older. Hardy and Castonguay think that different levels of social comparison and the adeptness to multitasking may explain the differences. They raised that middle-aged adults are more likely to have greater social comparison and compared to the Millennials, older adults generally enjoy multitasking less which leads to higher risk of nervous breakdown from using multiple sites.

In summary, existing literature on SNS use effects have yielded mixed results and most of them only focused on younger generations. Few studies explored the influence for people of older ages and even fewer shed light on how age might structure the

association between SNS use and mental health. The mixed findings in previous work could largely be due to a limitation of small and homogeneous samples. As Coto et al. (2017) commented on the current state of this line of research, “there is no predominant research approach for this field of study, samples are generally very small, research efforts are focused on specific domains, and there is a lacking of rigor in the reporting process.”

Overview of the Present Study

In view of the existing research gaps, this paper aims to develop a better understanding of associations between SNS use and mental health in a national sample. First, I will examine whether time spent on SNS is associated with levels of depression and anxiety. Relatedly, I will investigate associations between SNS use and perceptions of the Internet’s influence on social relationships. Finally, I will test whether these associations vary by age.

CHAPTER THREE

Method

Sample

The Values and Beliefs of the American Public Study: A National Study was conducted by the Gallup Organization in 2017, using a self-administered pen and paper methodology with mail-based collection across all 50 U.S. states. The final sample contains 1501 surveys out of an initial 11,000 surveys, leading to a response rate of 13.6%, which is typical for mail-based surveys (Campbell et al., 2018). Although the sample resembles the U.S. population demographically, it has a slightly higher proportion of older adults and socioeconomically advantaged respondents. I implement post-stratification weighting to adjust for sample composition.

Dependent Variables

Depression

Depressive symptoms are an average of 10 items from the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). Respondents indicated how often during the past week (1= *never* to 4 = *most of the time*) they were bothered by things that usually do not bother them, could not shake off the blues, felt they were as good as others (reverse coded), had trouble keeping their mind on what they were doing, felt depressed, felt too tired to do things, felt happy (reverse coded), felt that they enjoyed life (reverse coded), felt sad, and felt that people disliked them ($\alpha = .81$).

Anxiety

The present study measures respondents' anxiety using an average of five items from the Beck Anxiety Inventory (Creamer, Foran & Bell, 1995; Wilkinson 2016). In the survey, respondents were asked to report how often during the past week (1= *never* to 4 = *most of the time*) they had fear of the worst happening, was nervous, felt hands trembling, had a fear of dying, and felt faint ($\alpha = .80$). Again, a higher score indicates a higher level of anxiety.

Perceived Internet Effects on Social Relationships

In order to address the effect of SNS use on respondents' social life satisfaction, three questions are combined to construct a Perceived Internet Effects on Social Wellbeing scale. The survey asked respondents (1) "From your personal experience, do you think your use of the Internet has a very positive, mostly positive, mostly negative, very negative, or has it had no effect on these areas of your life? Social life"; (2) "From your personal experience, do you think your use of the Internet has a very positive, mostly positive, mostly negative, very negative, or has it had no effect on these areas of your life? How close I feel to my family"; and (3) "From your personal experience, do you think your use of the Internet has a very positive, mostly positive, mostly negative, very negative, or has it had no effect on these areas of your life? How close I feel to my friends". The answers of each question ranged from 1 = *very negative* to 5 = *very positive* ($\alpha = .81$).

Independent Variables

SNS Use

The survey asked respondents “On average, how many hours per day do you spend: Using the Internet to access or use social media?” The answers ranged in the following way: 0 = *zero/none*, 1 = *one hour or less*, 2 = *one to three hours*, 3 = *three to six hours*, 4 = *six to nine hours*, 5 = *nine to 12 hours*, and 6 = *more than 12 hours*. Due to the uneven spacing of the current scale, I recoded the SNS use variable to 0 = *zero/none*, 0.5 = *one hour or less*, 2 = *one to three hours*, 4.5 = *three to six hours*, 7.5 = *six to nine hours*, 10.5 = *nine to 12 hours*, and 15 = *more than 12 hours*. I use this as a continuous variable in the analysis².

Control Variables

In this study, I controlled for the respondents’ demographics, household income and education. Age (17 to 98 years) was treated as a continuous variable. Other demographic variables include gender (recoded to 0 = *male*, 1 = *female*), race and ethnicity (recoded to 1 = *non-Hispanic white*, 2 = *non-Hispanic black*, 3 = *non-Hispanic other*, 4 = *Hispanic*), and marital status (recoded to 1 = *single/never married*, 2 = *married*, 3 = *divorced or separated*, 4 = *widowed*, 5 = *cohabitation*).

Respondents reported on their total household income last year (before taxes) from 1 = *\$10,000 or less*, 2 = *\$10,001–\$20,000*, 3 = *\$20,001–\$35,000*, 4 = *\$35,001–*

² In additional analysis, I recoded SNS use into a two-category variable, with 0 indicating “spend 0 hour on SNS per day”, 1 indicating “spend more than 0 hour on SNS per day”. Results remain the same in terms of the associations between SNS use and three outcome variables as well as the interaction between SNS use and age.

\$50,000, 5 = \$50,001–\$100,000, 6 = \$100,001–\$150,000, and 7 = \$150,001 or more. I recoded household income to 1 = \$5000, 2 = \$15,000, 3 = \$27,500, 4 = \$42,500, 5 = \$75,000, 6 = 125,000, 7 = \$175,000 and treated it as a continuous variable.

Also, respondents reported their highest education degree from 1= *no high school degree*, 2 = *high school graduate*, 3 = *some college*, 4 = *four-year bachelor's degree*, and 5 = *postgraduate*. The education variable was treated as a categorical variable.

Analytic Strategy

I utilize multiple regression to estimate associations between frequency of SNS use and mental health outcomes. In initial models (Model 1), I examine the association between SNS use and mental health indicators, controlling for the respondents' demographics, household income and education. Then I specify an interaction between SNS use and the respondent age (SNS use \times Age; Model 2) to investigate the potential moderating role of age in these relationships. SNS use and age are mean-centered. Household income variable is rescaled so that each one-unit change in household income indicates \$1000. As several studies suggest that age is non-linearly related to psychological wellbeing (Blanchflower & Oswald, 2008; López Ulloa et al., 2013), I also include a quadratic effect of age in analysis in order to test nonlinear relationships between age and mental health outcomes. The age squared term is only kept in models when it is significant.

In additional analysis, I specify three age groups in order to test for potential cohort differences, with 1= young adults (17 to 34 years), 2= middle aged adults (35 to 54 years) and 3= older adults (55 and older). This leads to substantive same results. A corresponding table is attached in the Appendix.

All regressions use weighted data to enhance representativeness of parameter estimates. Missing data is handled with full-information maximum likelihood (FIML) estimation (Allison, 2002)³. In addition, diagnostic tests are conducted to examine the multicollinearity in each model. No multicollinearity problem is found, with VIFs for all variables of interest less than 2. Analyses are conducted in Stata 16.0.

³ OLS estimation with listwise deletion has yielded overall the same results. Tables are available on request.

CHAPTER FOUR

Results

Descriptive Statistics and Binary Relationships

Table 1 reports the unweighted descriptive statistics for the sample. Respondents have relatively low levels of depression and anxiety, with an average score of 1.86 on depression and 1.62 on anxiety (both on a 4-point scale ranging from 1=never to 4=most of the time). Respondents generally hold a positive attitude towards the Internet concerning the Internet's effects on their social relationships ($M=3.55$ on a 5-point scale ranging from 1=very negative to 5=very positive). The mean age of the sample is around 55 years, with the youngest being 17 and oldest being 98. Around 58% of the respondents are female, and 41% are male. In terms of race and ethnicity, the majority of the respondents are non-Hispanic white (69%), following by Hispanic (12%), non-Hispanic black (10%), and Other race and ethnicity (8%). Education wise, 32% of the respondents have some college education, following by postgraduate education (27%), bachelor's degree (21%), high school education (15%) and less than high school education (5%). Overall, the sample respondents are doing well financially, with an average household income of \$73,608 ($SD=52,261$). A majority of them (53%) are married, 16% are single, 16% have been divorced or separated, 10% are widowed, and 5% are in cohabitation. Average SNS use is 1.20 hours per day, with a standard deviation of about two hours ($SD=1.93$).

Table 1. Unweighted Sample Descriptive Statistics (2017 Gallup Mail Survey).

Variables	N	Mean / %	SD	Min.	Max.
Depression	1403	1.86	0.50	1	4
Anxiety	1437	1.62	0.56	1	4
Perceived Internet Effects	1413	3.55	0.66	1	5
SNS Use (Hours/Day)	1448	1.20	1.93	0	15
Age	1402	54.95	17.08	17	98
Gender					
Female	854	58%			
Male	613	42%			
Race and Ethnicity					
White	1036	69%			
Black	157	10%			
Other	123	8%			
Hispanic	185	12%			
Education					
< High school	77	5%			
High school	214	15%			
Some college	467	32%			
Bachelor's degree	312	21%			
Postgraduate	399	27%			
Household Income (Thousands)	1417	73.61	52.26	5	175
Marital Status					
Single	235	16%			
Married	780	53%			
Divorced/separated	237	16%			
Widowed	149	10%			
Cohabitation	71	5%			

Table 2 displays bivariate (Pearson) correlations among the key variables. In line with what most previous studies have indicated, age is negatively associated with time spent on SNS ($r = -.30$; $p < .001$). While depression and anxiety show weak positive associations between SNS use ($r_s = .08$ and $.06$, $p < .05$), perceived Internet effects on social relationships are positively related to SNS use ($r = .34$, $p < .001$). Meanwhile, age

is negatively related to depression and anxiety ($r = -.06$ and $-.12$; $ps < .05$), and negatively related to perceived Internet effects on social relationships ($r = -.14$; $p < .001$).

Table 2. Correlation Matrix of Key Variables (2017 Gallup Mail Survey).

Variables	1	2	3	4	5
1. SNS use	1.00				
2. Age	-0.30***	1.00			
3. Depression	0.08**	-0.06*	1.00		
4. Anxiety	0.06*	-0.12***	0.66***	1.00	
5. Perceived Internet Effects	0.34***	-0.14***	-0.07*	0.01	1.00

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Mental Health: Depression and Anxiety

Table 3 displays estimates from multiple regressions of mental health outcomes. Model 1 evaluates whether SNS use is associated with the users' mental health, including depression and anxiety. In terms of depression, results show that SNS use is not significantly related to users' depression symptoms ($b = 0.02$). Coefficients for age and age squared indicate there is a curvilinear relationship between age and depression, controlling for all the other variables (linear age coefficient = -0.002 , $p < 0.05$; curvilinear (age squared) coefficient = -0.0001 , $p < 0.05$).

On average, education is significantly negatively related to depression, holding all other variables constant. Specifically, having some college education ($b = -0.31$, $p < 0.01$), Bachelor's degree ($b = -0.32$, $p < 0.01$) and postgraduate education ($b = -0.27$, $p < 0.05$) are all negatively related to depression, relative to holding less than a high school education. Similarly, household income is negatively related to depression. For example, each \$1,000 increase in household income is significantly associated with 0.002-unit decrease in depression ($p < 0.001$). In addition, married people and those who are in

cohabitation both report significantly lower levels of depression than single respondents ($b = -0.14$ and -0.20 respectively, $p < 0.05$).

Model 2 shows that there is no significant interaction between age and SNS use, suggesting that the association between SNS use and depression does not vary by age (SNS use \times Age: $b = 0.001$, $p > 0.1$).

Regression models for anxiety reveal similar results. As shown in Model 1, SNS use is not associated with respondents' anxiety, controlling for all the other variables ($b = 0.01$, S.E. = 0.01). Age is significantly negatively related to anxiety ($b = -0.004$, $p < 0.01$). Hispanic respondents reported significantly higher level of anxiety, compared to non-Hispanic white respondents ($b = 0.20$, $p < 0.05$). Compared to those who did not finish high school, respondents with some college education ($b = -0.30$, $p < 0.05$) and bachelor's degree ($b = -0.26$, $p < 0.05$) report significantly lower levels of anxiety. Household income is significantly negatively related to respondents' anxiety, with each \$1,000 increase in household income associated with 0.002-unit decrease in anxiety ($p < 0.001$).

Again, Model 2 shows that there is no significant interaction between age and SNS use, demonstrating that age not does moderate the relationship between SNS use and anxiety. (SNS use \times Age: $b = 0.001$, $p > 0.1$).

Perceived Internet Effects on Social Relationships

In the last two models in Table 3, I examined the relationship between SNS use and respondents' perceived Internet effects on their social relationships.

Model 1 indicates that SNS use is significantly related to how positively people think the Internet is influencing their social relationships. On average, each-hour increase

in time spent on SNS per day is associated with 0.10-unit increase in the perceived Internet effects, controlling for the demographic characteristics ($b = 0.10, p < 0.001$). Each standard deviation increase in SNS use is associated with a 0.30-standard deviation increase in the perceived Internet effects.

Age is not related to how respondents perceived the Internet effects after controlling for demographic characteristics. Compared with men, women report significantly higher score in the Internet effects scale ($b = 0.16, p < 0.001$), indicating that women generally hold a more positive attitude towards the Internet in terms of their social life satisfaction. Compared with non-Hispanic white respondents, Hispanic respondents report significantly 0.21 higher score in this scale ($p < 0.05$). In addition, higher educational attainment is related to a more positive attitude towards the Internet effects. Neither household income nor marital status is significantly associated with the respondents' perceived Internet effects.

As was found for depression and anxiety, Model 2 shows no significant age difference in the association between SNS use and perceived Internet effects, meaning that older and younger adults show similar relationships between SNS use and Internet perceptions.

Table 3. Linear Regressions of Respondent Mental Health (2017 Gallup Mail Survey).

Variable	Depression		Anxiety		Internet Effects	
	M1	M2	M1	M2	M1	M2
SNS use	0.02 (0.01)	0.03* (0.01)	0.01 (0.01)	0.02* (0.01)	0.10*** (0.01)	0.10*** (0.02)
Age	-0.002* (0.001)	-0.002 (0.001)	-0.004** (0.001)	-0.004** (0.01)	-0.002 (0.002)	-0.002 (0.002)
Age Squared	-0.0001* (0.0001)	-0.0001 (0.0001)	-	-	-	-
SNS use ×Age		0.001 (0.001)		0.001 (0.001)		0.0002 (0.001)
Gender (female)	0.05 (0.04)	0.05 (0.04)	0.04 (0.04)	0.04 (0.04)	0.16*** (0.05)	0.16*** (0.05)
Race and Ethnicity						
Black	-0.03 (0.06)	-0.03 (0.06)	0.14 (0.07)	0.14 (0.07)	-0.005 (0.07)	-0.0002 (0.07)
Hispanic	0.13 (0.08)	0.13 (0.08)	0.20* (0.10)	0.20* (0.10)	0.21* (0.08)	0.21* (0.08)
Other	-0.01 (0.06)	-0.01 (0.06)	0.01 (0.06)	0.01 (0.06)	0.02 (0.09)	0.02 (0.09)
Education						
High school	-0.18 (0.12)	-0.19 (0.11)	-0.18 (0.13)	-0.19 (0.12)	0.21 (0.14)	0.21 (0.14)
Some college	-0.31** (0.12)	-0.31** (0.12)	-0.30* (0.12)	-0.31* (0.12)	0.27* (0.13)	0.27* (0.13)
Bachelor's degree	-0.32** (0.12)	-0.32** (0.12)	-0.26* (0.13)	-0.27* (0.13)	0.33* (0.14)	0.33* (0.14)
Postgraduate	-0.27* (0.12)	-0.27* (0.12)	-0.21 (0.13)	-0.22 (0.13)	0.31* (0.14)	0.31* (0.14)
Household income	-0.002*** (0.0004)	-0.002*** (0.0004)	-0.002*** (0.0004)	-0.002*** (0.0004)	-0.0004 (0.0005)	-0.0004 (0.0005)
Marital status						
Married	-0.14* (0.06)	-0.14* (0.06)	-0.02 (0.06)	-0.03 (0.06)	0.03 (0.08)	0.03 (0.08)
Divorced/separated	-0.06 (0.08)	-0.06 (0.08)	0.01 (0.08)	0.01 (0.08)	0.05 (0.09)	0.04 (0.09)
Widowed	-0.07 (0.08)	-0.07 (0.08)	0.04 (0.09)	0.04 (0.09)	0.13 (0.11)	0.13 (0.11)
Cohabitation	-0.20* (0.09)	-0.20* (0.09)	-0.11 (0.10)	-0.11 (0.10)	0.02 (0.12)	0.02 (0.12)
Constant	2.34*** (0.13)	2.35*** (0.13)	1.91*** (0.13)	1.94*** (0.13)	3.15*** (0.14)	3.15*** (0.14)
R-square	0.11	0.11	0.09	0.09	0.15	0.15

Note: N=1501. *** p<0.001, ** p<0.01, * p<0.05. Standard errors in parentheses.

CHAPTER FIVE

Discussion

This paper examined associations between social media use and mental health using a large, national sample. While research in this area has focused heavily on adolescents and young adults, whether age matters remains unclear. In the past decade, there has been a tremendous increase in the number of American adults who use social media in the broader population, especially among older adults. It is time to ask about the SNS use effects on people of different ages.

Studies focusing on adolescents and young adults have shown mixed results in terms of the effects of SNS use on mental health. Some indicated that SNS use is associated with reduced loneliness (Deters & Mehl, 2013) and can provide significant social capital, which is especially beneficial to those with low self-esteem and life satisfaction (Ellison et al., 2007). Others suggested that SNS users reported more loneliness, higher depression, higher anxiety, and more perceived social isolation than nonusers (Brandtzæg, 2012; Lin et al., 2016; Neira & Barber, 2014; Primack et al., 2017). Results of this study show that SNS use, indicated by time spent on SNS, is not related to either depression or anxiety among the respondents aged from 17 to 98 once adjusting for demographic characteristics. The results are consistent with findings of Jelenchick et al. (2013) and Berryman & Ferguson (2017). Both studies found that the use of SNS is not predictive of impaired mental health among young adults, including social anxiety and depression.

Meanwhile, age is negatively associated with SNS use (Henderson, 2020; Hruska & Maresova, 2020). I also find that age is associated with perceived negative impacts of the Internet on social relationships. This is consistent with earlier work suggesting that older individuals perceive the Internet to be less useful for social engagement or potentially detrimental to real-life relationships (e.g., Lehtinen et al., 2009; Lüders & Brandtzæg, 2017). However, this age difference in perceived relationship impacts does not hold once adjusting for demographic background. This importantly suggests that prior research examining age differences in Internet attitudes may be confounded by cohort differences in socioeconomic backgrounds. For instance, median levels of education doubled across the twentieth century (Hout 2012).

However, in contrast to what Hardy and Castonguay (2018) have found, this study does not find age differences in the relationship between SNS use and depression or anxiety, or perceived Internet effects on social relationships. This suggests that SNS use does not affect the older population differently in terms of the two mental health indicators. Additional analysis using three age groups also indicate same results in terms of the moderation role of age. Namely, neither middle-aged adults nor older adults are influenced distinctively by SNS use, compared to younger adults. It is important to note that I use different measures of SNS use and anxiety in this study. Hardy and Castonguay measured anxiety by a single dichotomous measure that asked if the respondents felt they were going to have a nervous breakdown, which is a more severe feeling of anxiety. In addition, their SNS use is indicated by number of social media sites rather than time spent on social media. Time spent on SNS may capture a different kind of engagement with digital content than number of platforms used.

In terms of social life satisfaction, this study found that respondents spending more time on SNS tend to have a more positive perception on how the Internet affects their social life. However, this perception measure did not focus on SNS in particular, raising the issue of how older adults perceive the impacts of specific SNS sites such as Facebook. Also, just as previous studies indicated, such relationship is not necessarily predictive or causal. It is likely that people who have positive attitudes are more willing to use SNS. The findings also showed that there are no age disparities in attitudes towards the Internet, though women, Hispanic people and those with more education tend to have a more positive attitude. Across different age groups, reasons associated with a positive belief may be different. Young adults use SNS more often to meet with new people, make new friends and expand network size, while older adults mainly lean on SNS to keep up with family and close friends (Bell et al., 2013).

Previous studies on SNS use were often limited to small samples and qualitative research designs, such as interviews, intervention studies and focus groups. One strength of this study is that it utilizes national Gallup survey data, which helps to depict a more representative picture of potential SNS use effects. Though I didn't find any significant moderating effects of age, this study still has several implications. One important takeaway is that SNS use is unrelated to the users' depression or anxiety, whether among young adults or older adults. For policies that propose using online social networking as a potential way to reduce symptoms of depression or anxiety among older adults, results of this study indicate that such efforts may have limited efficiency, at least in terms of increasing time spent on these particular websites. In contrast, increasing SNS use is potentially associated with higher social life satisfaction and closeness to families and

friends; this could be beneficial to older adults who live in retirement communities or assisted living residences. Finally, because older adults use SNS less often than younger adults, and yet show similar associations between SNS use and mental health outcomes, the reasons for their less-frequent usage may not have to do with any age differences in detrimental impacts to mental health or social relationships. Rather, lower frequency of use in older adults may simply reflect age differences in lifestyle or socialization preferences.

Limitations and Future Research

It is important to note some limitations of this study. First, I used cross-sectional data, thus results of this study should not be interpreted as causal relationships. Studies have shown that attitudes toward computers and the Internet influence technology adoption (Lee et al., 2019; Vošner et al, 2016), it is possible that the perception of Internet may also influence how much time people spend on SNS. A more complex research design and especially longitudinal study is recommended in future research to provide more insights into the causal relationship. Besides, by involving a longitudinal design, researchers will be able to explore how the effects of social media use evolve over time as SNS is entering more people's life.

Second, SNS use was evaluated specifically by time spent on social media platforms. Other indicators might include frequency of site visits, number of social media accounts, and use habits. Some studies have suggested that the relationship between Facebook use and wellbeing depends on the users' interaction behavior online, such as viewing pages, sending targeted messages, or broadcasting updates (Burke & Kraut,

2016; Frison & Eggermont, 2016). Thus, future studies could benefit from a more in-depth exploration in how people use SNS in particularized ways.

Relatedly, the SNS use measure does not distinguish different SNS platforms. Each social media platform has its own distinctive features and drawbacks, and users may have different social networking experiences across platforms. For example, Instagram use is a significant predictor of depression among college students, while such relationship is not significant for Facebook, Twitter, or Snapchat (Donnelly & Kuss, 2017). A more comprehensive investigation of the effects of SNS use might take into consideration the defining features of each social media platform.

APPENDIX

APPENDIX

Table A.1. Estimates with Categorical Age Measure (2017 Gallup Mail Survey).

Variable	Depression		Anxiety		Internet Effects	
	M1	M2	M1	M2	M1	M2
SNS use	0.02* (0.01)	0.01 (0.01)	0.01 (0.01)	-0.0002 (0.02)	0.10*** (0.01)	0.10*** (0.02)
Age						
Middle-aged	0.08 (0.05)	0.06 (0.05)	-0.04 (0.06)	-0.05 (0.06)	-0.01 (0.08)	-0.01 (0.08)
Older	-0.02 (0.05)	-0.03 (0.06)	-0.13* (0.06)	-0.13* (0.06)	-0.04 (0.08)	-0.05 (0.08)
SNS use × Age						
SNS × middle-aged		0.03 (0.02)		0.02 (0.02)		0.0004 (0.03)
SNS × older		0.01 (0.02)		0.03 (0.03)		-0.03 (0.03)
Constant	2.29*** (0.13)	2.29*** (0.13)	2.02*** (0.14)	2.03*** (0.14)	3.20*** (0.15)	3.19*** (0.15)
R-square	0.11	0.11	0.08	0.08	0.15	0.15

Note: N=1501. Standard errors in parentheses.

*** p<0.001, ** p<0.01, * p<0.05.

Control variables are included in regression analysis, but not presented in table.

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