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Psychophysiological Impacts Associated with Social Media Use

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PSYCHOPHYSIOLOGICAL IMPACTS ASSOCIATED WITH SOCIAL MEDIA USE

by

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ABSTRACT

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Social media has become increasingly relevant to everyday life since its inception, with new social media applications being created regularly. There has been some research regarding social media use and mental health; with studies finding both negative and positive mental health effects possible. TikTok, one of the newest and fastest growing social media applications has not been studied thoroughly to investigate potential mental health effects. The psychophysiological impacts of social media use have not been explored at all. An initial survey was done to investigate personality and mental health effects of social media use as well as if the reasonings behind social media use played a role in potential mental health effects. The survey data demonstrated that there were significant relationships between personality (specifically neuroticism and extraversion) and several socializing and social media variables; indicating that levels of those personality traits may be crucial to how one socializes and utilizes social media. The survey also found that mental health (via the DASS-21) had significant relationships with several socializing and social media related variables. One important variable found appeared to be using social media to escape their current reality. The pilot laboratory study is the first of its kind; investigating both mental health implications and physiological changes, via heart rate, of TikTok use. Although there have only been four participants thus far, data from the pilot laboratory study indicate that TikTok use may be associated to some changes to heart rate, but changes were unable to be tested using statistical analysis due to the small

sample size. Together, the survey and pilot laboratory study show that this is a viable avenue for research and should continue to be investigated with a larger sample size. The information provided in both chapters of this document displays the potential for significant effects to stem from social media use and how those effects may change based on individual differences in personality traits and mental health. Overall, the information in this document could be used as a guide for future research endeavors within this topic of study and help fill the gap in the research regarding psychophysiology and social media.

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LIST OF ABBREVIATIONS

DASS-21: Depression Anxiety Stress Scale-21
PANAS: Positive and Negative Affect Scale
HR: Heart Rate
BPM: Beats per minute (how heart rate is measured)
FYP: For You Page; a page on TikTok created for each user based on TikTok's algorithm.
ANOVA: Analysis of Variance
MANCOVA: Multivariate Analysis of Covariance

Chapter One Social Media Survey

Introduction

Social support, or the comfort, care, or help one receives from their social networks, is an important part of our daily lives and has shown to have great benefits for our health and overall well-being (Sarafino & Smith, 2017). However, once the COVID-19 pandemic began, many experienced a severe change in how they were able to obtain social support. Instead of seeing our social networks in-person, the pandemic forced us to rely only on seeing our inner circle virtually; this new reality placed a higher importance on the social aspect of social media. The following survey was conducted, in part, to investigate if people were using social media as a safer replacement for socializing during the pandemic and if there were any associations between personality traits, mental health, and social media use. Additionally, this survey also investigated social media habits and applications of choice for specific activities such as communication and sharing posts. However, the primary purpose of the survey was to inform a future laboratory study with the purpose of investigating the overall psychophysiological, including perceived social support and the potential to receive support online, impacts of social media use. This survey allowed the researcher to understand how the current generation of college students was using social media, the reasons they had for using social media, and what applications they were using. This avenue has not been thoroughly investigated and it was vital to run this preliminary survey to understand if this was a potentially viable avenue of laboratory research. The preliminary survey included a mental health survey and a personality assessment, both of which measure variables that have been found to have significant relationships to social media in past research (Shaw, Timpano, Tran, & Joormann, 2015; Barry et al., 2017).

Method

Participants:

Participants were recruited from an online research website from a medium sized university in the Midwest. This study had 283 participants; with an age range of 18 to 53 years old (M=22.39, SD=5.27). Most participants self-identified as white (70.0%) and female (77.4%) and reported living off-campus (81.6%). Participants were asked how many people they were currently living with; most participants reported living with one other person (27.2%), 2 people (26.1%), or 4 or more people (20.1%). Most participants lived either with their friends (or roommates) (40.5%) or parents (or other family members) (40.5%). When asked about how many close friends they perceived having, about 53% of participants reported having between 2 to 4 close friends; 23% of participants reported they had between 5 and 7 close friends. For more demographic information, please see Table 1 in Appendix A on page 38.

When asked to report how many people they talked to regularly on social media, about 39% reported talking to between 2 and 4 people and about 20% talked to between 5 and 7 people on social media. It's worth noting that the next most frequent answer (with about 17%) was 11 or more people. On social media, the most frequent amounts of self-reported friends/followers were between 101 and 500 (32%), 501 and 1,000 (30%), and 1,001 and 5,000 (26%). On average, participants reported having 5 active social media accounts; the top 5 most popular sites for this sample were: Instagram (51%), SnapChat (50%), Facebook (37%), TikTok (30%), and Twitter (25%). The social media site this sample reported spending the most time on was TikTok (30%), followed by SnapChat (22.4%) and Instagram (21%). About 65% of the sample reported SnapChat as the social media site they use to communicate with the most people. Nearly all of the participants (90%) reported checking their social media accounts several times a day and reported spending between 3 to 5 hours a day on social media (54%). However, only 30% of the

sample reported creating and sharing original social media posts less than once a month or never. Almost half of the sample reported having a positive (to some degree; either mostly or somewhat) attitude regarding social media as a whole. The most frequent answer choices for the highest number of friends/followers on social media were 501-1,000 (30%) and 1,000 or more (29%). Most (57%) reported a neutral feeling regarding their friend/follower count.

Survey:

A Qualtrics survey used in the study was a 128-question survey, including a demographics section, a personality assessment (The Big-Five Factor Markers (Goldberg, 1992)) and a mental health assessment (Depression, Anxiety, Stress Scale-21 (DASS-21) (Lovibond & Lovibond, 1995). Additionally, questions regarding their thoughts on social media (e.g., "*how do you feel about the number of friends/followers you have*?"), reasons for using social media (e.g., "*I use social media to escape my current reality*"), and behaviors on social media were asked (e.g., "*I primarily scroll on social media and do not post very often*"). All the questions from this survey, except for the DASS-21, the Big 5 assessment, and most of the demographic questions, were written by the researcher specifically for this survey. There was no previously established social media survey available that was as comprehensive as the Qualtrics survey created by the researcher. The survey took approximately 34 minutes to complete. At the end of the survey, there was information regarding where they could get mental health services if they needed them.

Results

Personality Scores: Socializing and Social Media Use:

A series of nonparametric analyses (Kruskal-Wallis H tests) demonstrated that there was a significant relationship between extraversion total scores and how many close friends participants reported feeling they had, $H(5, n = 277) = 18.03$, $p = 0.003$.

A separate Kruskal-Wallis H test showed that there was a significant difference between the reported number of friends participants talked to daily and total extraversion scores, $H(5, n = 277) = 28.88$, $p < 0.001$.The differences in extraversion scores based on the highest number of reported friends/followers were significant, $H(9, n = 276) = 22.73$, $p = 0.007$. Extraversion scores also significantly differed based on how participants preferred to socialize (either online, in-person, or medium of socializing did not matter to them), $H(2, n = 274) = 8.21$, $p = 0.017$. According to the pairwise comparisons, the significant differences were specifically between the choices "*it does not matter to me*" and online as well as between in-person and online.

Extraversion scores also differed based on what social media site was reported as being the one a participant spent the most time on, $H(9, n = 276) = 24.42$, $p = 0.004$. Additionally, the differences between self-reported attitudes regarding social media and extraversion scores were significantly different, $H(4, n = 276) = 13.07$, $p = 0.011$. Also, it was found that those who felt they had made good friends on social media had significantly higher extraversion scores than those who did not feel that way, $H(4, n = 274) = 9.60$, $p = 0.048$.

Neuroticism also had significant relationships with several variables. As shown by a Kruskal-Wallis H test, neuroticism scores significantly differed by how participants reported preferring to socialize, $H(2, n = 275) = 11.40$, $p = 0.003$. Similar to the extraversion analysis, a pairwise comparison showed the significant differences in neuroticism scores were between "*it does not matter to me*" and online as well as between in-person and online. A separate Kruskal-

Wallis H test showed that neuroticism scores significantly changed based on the number of active social media accounts participants reported having, $H(10, n = 274) = 30.67$, $p < 0.001$. Another Kruskal-Wallis H test demonstrated that the differences between self-reported attitudes regarding social media and neuroticism scores were significant, $H(4, n = 274) = 10.35$, $p = 0.03$. Another important finding was that neuroticism scored differed significantly based on how much time a day participants reported spending on social media, $H(4, n = 274) = 17.58$, $p = 0.001$. Those who were reporting spending the most time on social media were averaging higher neuroticism scores than those reporting less daily time on social media. Also, neuroticism scores differed significantly based on how well participants felt they were coping (i.e., mentally and emotionally) with the ongoing COVID-19 pandemic, $H(4, n = 271) = 72.41$, $p < 0.001$. Those who felt they were not coping well with the pandemic had significantly higher neuroticism scores than the participants who felt they were coping well. Participants who agreed, to some degree, that social media played a large role in their lives had significantly higher neuroticism scores than those who disagreed with that sentiment, $H(4, n = 272) = 16.36$, $p = 0.003$. Those who reported feeling sad or let down when their posts did not get a lot of likes had significantly higher neuroticism scores than those who disagreed with that statement, $H(4, n = 272) = 17.94$, $p = 0.001$. Lastly, participants who reported feeling happy or excited when they felt their post was getting a lot of likes had significantly higher neuroticism scores than those who did not, $H(4, n = 272) = 18.32$, $p = 0.001$.

When asked about the reasons one uses social media, several reasons appeared to have a significant relationship with the personality trait of neuroticism. One of those reasons was using social media to *escape their current reality*; those who reported using social media to *escape their current reality* had significantly higher neuroticism scores than those who did not, $H(4, n =$

272) = 49.09, $p < 0.001$. Additionally, participants who agreed with using social media to "*stay in the loop*" of their social networks' lives had significantly higher neuroticism scores than those who did not, $H(4, n = 271) = 15.53$, $p = 0.004$. A separate Kruskal-Wallis H test using the reason of utilizing social media to compare their diet and/or health with others found that those who agreed had significantly higher neuroticism scores than those who disagreed, $H(4, n = 271) = 9.69$, $p = 0.046$. Also, those who agreed with using social media to get advice or recommendations had significantly higher neuroticism scores, on average, than those who disagreed, $H(4, n = 272) = 11.12$, $p = 0.025$.

Another subsection of personality that appeared to have significant importance regarding social habits and social media use was agreeableness. A nonparametric Kruskal-Wallis H test demonstrated that agreeableness scores significantly differed based on how many close friends participants reported having, $H(5, n = 273) = 14.60$, $p = 0.012$. Agreeableness scores also significantly differed based on how many friends participants reported talking to daily, $H(5, n = 273) = 14.19$, $p = 0.014$. Differences in agreeableness scores based on how participants reported feeling about the number of friends/followers they have on social media in general was significant, $H(4, n = 271) = 16.17$, $p = 0.003$. Those participants who agreed, to some degree, that they will delete and re-post the posts they share if they feel that post did not get enough likes had significantly lower agreeableness scores than those who disagreed, $H(4, n = 270) = 19.35$, $p < 0.001$. For details on average scores for the Big Five Factors assessment please see Table 2 in Appendix A on page 39.

DASS-21: Socializing and Social Media Use:

A Kruskal-Wallis H test demonstrated that participants who felt they were not coping well with the pandemic had significantly higher depression ($H(4, n = 573) = 50.73, p < 0.001$), anxiety ($H(4, n = 273) = 35.75, p < 0.001$), and stress ($H(4, n = 271) = 40.00, p < 0.001$) scores on the DASS-21. Also, depression ($H(4, n = 274) = 36.75, p < 0.001$), anxiety ($H(4, n = 274) = 13.07, p = 0.011$), and stress ($H(4, n = 272) = 22.31, p < 0.001$) scores all significantly differed based on how good of a job participants felt they had done staying connected to their loved ones during the pandemic. Based on if participants reported using social media to *escape their current reality* or not, participants' depression ($H(4, n = 274) = 48.43, p < 0.001$), anxiety ($H(4, n = 274) = 30.02, p < 0.001$), and stress($H(4, n = 272) = 36.94, p < 0.001$) scores significantly changed. Participants who agreed to using social media to escape reality had significantly higher depression, anxiety, and stress scores on the DASS-21.

Depression total scores changed significantly based on whether participants reported preferring to socialize in-person, online, or medium of socializing did not matter to them; those who those who preferred to socialize online had significantly higher depression scores than participants who preferred in-person socializing and participants who did not have a preference, $H(2, n = 274) = 8.21, p = 0.017$. Depression scores significantly changed based on how satisfied participants reported feeling about their number of friends/followers, $H(4, n = 272) = 9.63, p = 0.047$. Depression scores significantly changed based on whether participants felt they had a lot of friends or not ($H(4, n = 274) = 29.20, p < 0.001$); with those who felt they did not have a lot of friends averaging the highest depression scores. Also, depression scores for participants significantly changed based on agreeing or disagreeing to using social media for social comparison regarding their health and diet, $H(4, n = 273) = 12.81, p = 0.012$; those who agreed had the higher depression scores.

Total stress scores changed significantly by the socializing preferences reported by participants; those who preferred socializing online had significantly higher stress scores than those whose preference was in-person and those who did not have a preference, $H(2, n = 272) = 9.64$, $p = 0.008$. Those who reported feeling *they did not spend nearly enough time on social media* had significantly higher anxiety ($H(4, n = 273) = 16.47$, $p = 0.002$) and stress scores ($H(4, n = 271) = 10.09$, $p = 0.039$. Participants' stress score significantly changed based on if they reported on using social media to talk to their friends, $H(4, n = 272) = 9.50$, $p = 0.050$. Stress total scores also significantly changed based on whether participants reported using social media to *share their feelings with others* or not, $H(4, n = 272) = 12.91$, $p = 0.012$. Results of the Kruskal-Wallis test showed that those who agreed to some degree had significantly higher stress scores, on average, than those who did not. Lastly, stress scores significantly changed based on whether participants felt happy/excited when they felt their post was getting a lot of likes ($H(4, n = 272) = 10.94$, $p = 0.033$); those who agreed averaged higher total stress scores.

Anxiety scores changed significantly based on how reported average daily time on social media, $H(4, n = 273) = 11.12$, $p = 0.025$. Results of the Kruskal-Wallis Test showed that the more time participants reported spending daily on social media, the higher their total anxiety score was. Additionally, anxiety scores significantly changed based on how participants answered, "*I would be lost without social media*", $H(4, n = 274) = 10.87$, $p = 0.028$. Participants' anxiety scores significantly changed based on whether they used social media to "*stay in the loop*" of their social network, $H(4, n = 273) = 10.80$, $p = 0.029$. Anxiety scores also significantly changed based on using social media for social comparison specifically regarding their overall health and diet, $H(4, n = 273) = 12.35$, $p = 0.015$. For details on average DASS-21 scores, please see Table 2 in Appendix A on page 39.

Discussion

According to data from this survey, it appears that mental health scores have significant relationships with several variables, depending on which facet of the DASS-21 was being investigated. Some variables with significant relationships with mental health scores included the amount of daily time spent on social media, using social media for social comparison regarding overall health, preference for socializing medium (online versus in-person), and overall feelings regarding the number of online friends/followers they had. As for personality, the two most important traits appear to be extraversion and neuroticism as both of those traits had significant relationships with the highest number of variables when compared to the other Big 5 personality traits. Some of the variables found to have significant relationships with personality traits included preference of socializing medium, number of social media accounts, social media that participants spent the most time on, and daily time on social media. The data regarding mental health and personality traits' relationships with social media use were concurrent with the body of research from this topic.

Overall, this preliminary survey had several findings that were indicative of social media and its potential psychophysiological impacts as a viable avenue for laboratory research. One of the most important findings was the amount of time participants reported spending on social media daily. The most frequent answer was between 3 and 5 hours daily; since people are spending a significant amount of time on social media every day, it makes understanding the potential impacts of social media use that much more important. Additionally, this survey showed that the social media application that the most participants reported spending the most time on was TikTok; which is why TikTok was the application used in the laboratory pilot study. The laboratory pilot had seven hypotheses; most of which were informed, in some way, by the

findings from this preliminary survey. One important variable, according to the data from the survey, was using social media to *escape their current reality*; this variable had significant relationships with neuroticism scores and all three facets of the DASS-21. Therefore, it was emphasized in one of the laboratory pilot study's hypotheses. Additionally, mental health scores (via DASS-21) appeared to have significant relationships with several social media related variables, which led to mental health scores being emphasized in a hypothesis for the laboratory study as well.

Chapter Two Laboratory Pilot Study

Introduction

Social media, since its inception, has become increasingly prevalent in our daily lives. In 2005, PEW Research Center started tracking social media use in the United States and only 5% of adults surveyed stating they had used social media. Now, about 72% of the adults in the United States have stated using social media in some capacity (PEW Research, 2021). Several studies have been done investigating the potential effects of utilizing social media; results of these studies have shown that both positive and negative effects are possible. For example, Burke & Kraut investigated adolescent social media use and found that there was a connect between social media use and negative health behaviors (such as sleep problems and heightened anxiety); however, they also found that there may be some adaptive aspects to utilizing social media as well in the form of perceived connectedness to other people (2016). The initial social media survey from Chapter 1 found that 40% of their sample talked regularly to between 2 and 4 people on social media and that 55% of their sample felt more connected while using social media. This implies that there is the potential for social support to be found via social media; social support is a potential protective factor and has been indicated by past research to be beneficial for one's overall health and well-being (Sarafino & Smith, 2017) and having access to social support can moderate cardiovascular reactivity (including heart rate) during an acute stressor (Uchino & Garvey, 1997).

An important factor involved in mental health effects of social media use appears to be the reason one is using social media. When individuals used social media with the purpose of making meaningful social connections, social media use was shown to enhance well-being (Burke & Kraut, 2016; Clark, Algoe, & Green, 2017; Yu, Ellison, & Lampe, 2018). However,

using social media for entertainment purposes was associated with higher levels of depression for older adults (Fitzgerald, Yue, Wong, & Green, 2022). Media selection for entertainment aspirations tend to be guided by intrinsic motivations as described via the Uses and Gratifications Theory (Knoblock-Westerwick, 2015). According to the Uses and Gratifications Theory, people actively seek out mass media to satisfy their individual needs and people are consciously aware of their motivations for media use; they are aware of why they seek out specific types/genre of media (Knoblock-Westerwick, 2015). There has not been adequate research on Uses and Gratifications Theory in the realm of social media. However, one study focusing on Facebook found that Uses and Gratification Theory had a significant direct effect on intent of using Facebook (Hossain, 2019). This implies that social media users are aware, at least to some degree, of the gratifications they received from spending time on specific social media applications.

Additionally, the way one uses social media, either in an active manner or passive manner, appears to be an important aspect when it comes to social media's potential effects. Research showed those who used Facebook ina more passive manner exhibited more social anxiety than their peers (Shaw, Timpano, Tran, & Joormann, 2015) and experienced a worsened mood compared to those browsing the general Internet (Yuen et al., 2018). Additionally, more passive engagement with social media was found to be associated with less social connection and lower overall well-being; however, the same an additional study found that heavy social media use had a positive effect on social connection when social media was being used in an active manner (Roberts & David, 2022). Being active on social media (i.e. communicating/direct messaging people, sharing posts, commenting on others' posts, etc.) appears to have different psychological outcomes than those who use social media ina more passive manner (i.e. primarily

scrolling through their timelines). Social media is different from other types of media because it allows for a level of self-presentation and social comparison that other media forms do not. Past research has found that those who utilizes social media to compare themselves to others typically experienced decreases in their own self-evaluations (Midgley, Thai, Lockwood, Kovacheff, & Page-Gould, 2020). However, a different study found that participants experienced an improved mood while using social media duirng solitude (Thomas, Carr, Azmitia, & Whittaker, 2021).

Past research on social media focused almost exclusively on Facebook and, more recently, Instagram. However, TikTok, one of the newest social media applications and one of the fastest growing applications in social media history, states to have 1 billion (and counting) users worldwide which, currently, makes it the most popular social media site and therefore an important application to investigate. TikTok is different from past social media applications because it solely focuses on videos; with two pages per account, a For You Page (FYP) and a following page (videos posted from accounts one chose to follow). The FYP consists of some videos from accounts one chooses to follow, but it mostly suggested videos complied based on an algorithm that takes into consideration people you follow, videos you have liked/interacted with, videos you spent the most time on, and videos your friends have sent to you. The following page allows one to show they selective exposure choices (specific acts of choosing what they want to see); the FYP shows the user's selective exposure preferences (the overall general tendencies or preferred types of content) for TikTok (Knoblock-Westerwick, 2015). PEW Research reported that 30% of the U.S. population surveyed stated having an account on TikTok; 10% of those adults reported regularly getting their news regarding current events from TikTok as well (2021). Amongst the 18–29-year-old demographic, about 50% reported using TikTok (Pew Research Center, 2021).

With a past study finding that social media users report using social media 3 to 5 hours per day (Hieber, 2021), it seems to be importance to investigate potential physiological changes one undergoes while using social media in addition to the potential mental health effects. At the time of writing, there has been no published research found that investigates any social media use and physiological changes. Past research has shown that the valence, or emotionality, of content we view can change our heart rate at the time of viewing (Nakajima, Chen, & Fleming, 2017). Therefore, it is important to investigate if taking in content for hours a day on social media could have significant impacts on our heart rate.

Current Laboratory Pilot Study:

Since there is no known research like this current study, this pilot study will be exploratory in nature. This study, in general, is aimed at investigating psychophysiological changes specifically to our cardiovascular system that occur while using TikTok as well as the potential relationship between social media use and mental health. If there are changes to heart rate, the results will elucidate which specific aspects of social media use (i.e., active versus passive use, attitude regarding social media, reasons for social media use, etc.) are associated with those changes. Is the mental health of the participant relevant to what physiological changes they may experience during TikTok use? This study will also investigate self-reported attitudes and frequency/duration of daily social media use and see if they are correlated with physiological changes experienced during social media use. Additionally, this study investigated if the content (and valence of the content) being viewed on social media played a role in physiology and overall mental health scores. Past research has shown that self-reported valence of content (positive vs. negative) can have significant impacts on heart rate (Nakajima et al., 2017). Therefore, this study will utilize the same rating dial from Nakajima et al.'s study to allow

participants to continuously rate the valence of the videos they are viewing throughout their social media use sessions.

Lastly, this study investigated whether watching and liking the videos versus simply scrolling past them influenced one's heart rate. More specifically to mental health, participants' mental health scores, via the Depression, Anxiety, Stress Scale-21(DASS-21) will be evaluated. DASS-21 scores were used as both a potential predictor variable and potential mediator between social media use and physiology. Do DASS-21 scores predict heart rate changes while using TikTok? Additionally, this study investigated perceived social support (and the potential for receiving social support) via social media. If someone perceives high levels of social support from social media, will they report using social media more and have more favorable attitudes regarding social media? Will perceived social support on social media overall be reflected in heart rate changes one experienced while using TikTok? Lastly, mood changes (calculated via PANAS) were tracked to investigate if using social media had any impact on mood. As mentioned before, this study will be an exploratory study since most of these aims have not been investigated in prior research. The present study will evaluate several hypotheses.

Physiological hypotheses:

H1: It is predicted that there will be significant heart rate change while individuals use social media as compared to their pre-social media use baseline heart rate.

H2: It is predicted that social media with different valence will have different impacts on heart rate change. It is predicted that viewing videos with a more negative valence, as indicated by the rating dial, will lead participants to have a lower heart rate. Therefore, more positive videos will be associated with participants having a higher heart rate during those

videos. Also, it is predicted that participants will have a lower heart rate when viewing more serious content due to attending to that video's narrative.

H3: Heart rate change will differ between participants lower vs higher in extraversion when sharing a post with a friend on TikTok. This is thought to be because those who are higher on the extraversion scale are more than likely sending videos more frequently to their friends than those on the lower end of the extraversion scale; therefore, those with higher extraversion scores will have a lower heart rate while sharing a video with friends.

H4: Those who post more frequently on social media will not experience a significant heart rate change when sharing a video with a friend on TikTok. This is thought to be due to habituation; if someone posts very frequently on social media, it would be an activity they are used to doing and therefore would not have a major physiological impact on them.

Social media and mental health hypotheses:

H5: Those who report higher levels of perceived social support on social media will report having more friends/followers and have a higher number of average interactions on their posts. For this study, 'interactions' refers to likes, comments, shares, and views (if it is a video post) individuals receive on posts they share to their pages.

H6: Those who use social media to escape reality will report more frequent social media use and have more positive attitudes regarding social media.

H7: Those who score higher on anxiety, depression, and stress assessments (via the DASS-21) will report more frequent social media use. This is based on the significant relationship between social media use and mental health demonstrated in past research. Several studies have found that those who use social media more frequently and for longer durations typically have worse overall mental health than those who use social media less frequently.

Method

This study obtained IRB approval from the University of Wisconsin-Milwaukee. Data was collected in-person and included a survey completed via Qualtrics; each participant was given a participant number to maintain anonymity and to match data collected in-person/ physical documents and on Qualtrics to the same participant. Before beginning the study, participants were presented with a consent form and asked to confirm they are 18 years of age or older. Participants were also asked to refrain from caffeine consumption at least an hour before their lab session due to the excitatory effects of caffeine on the cardiovascular system and to wear clothing that allows for electrodes to be connected to their wrist and ankles.

Participants

Participants were recruited from University of Wisconsin-Milwaukee's SONA website with the incentive of extra credit for an eligible course. Typically, 0.5% of extra credit is awarded for each hour of research participation. This study took approximately 2 hours to complete. Stipulations for inclusion were being 18 years of age or older, have a TikTok account, have a smart phone to use their TikTok account on in the laboratory, and being able to read and speak English.

This pilot laboratory study included 4 participants; all of whom identified as women between the ages of 18 and 24 ($M = 20.25$, $SD = 2.87$). Half of the sample identified as Black or African-American, one participant identified as Caucasian (non-Hispanic White) and one identified as Middle Eastern or Middle-Eastern American. Two participants reported feeling they had one close friend; the remaining participants stated they had between 2 and 10 close friends. However, when asked how many people they felt they had to rely on when in need, the maximum number chosen was 2-4 (40%). Half of the sample reported seeing their friends in-

person to hang out 1 to 3 days per week while the other half reported only once every other week and all agreed, to some degree, that socializing was very important to them.

Commentary: For this type of research, it would be ideal to have a much larger sample size. The standard of practice for psychology research is thought to be a sample size of 30 per group, dependent upon the effect size anticipated. Additionally, data would be more generalizable if males were also included in the sample.

Procedure

First, participants arrived at the psychophysiology lab on campus and signed the consent form. After the consent form, participants filled out a physical copy of the Positive and Negative Affect Scale (PANAS) (Watson, Clark, & Tellegen, 1988) and the Social Media Information Form (created by the researcher specifically for this study). To complete the Social Media Information Form, participants were asked to open the social media application of their choice and report the chosen site on the form along with how many followers they have on that social media site. The rest of the form had participants describe the content and report the number of likes and comments of their last 5 posts from that site. Participants also reported the date that each post was shared and whether the post was their original post or a repost/share of another person's post. Upon completing the Social Media Information Form, participants were then asked to fill out a Qualtrics survey on a laptop in the laboratory. The Qualtrics survey took about 40 minutes to complete and included the Depression, Anxiety, and Stress Scale-21 (Lovibond & Lovibond, 1995), another PANAS, and a Big Five Factors Personality assessment (Goldberg, 1992) as well as questions regarding demographics, social media habits and attitudes, and reasons they use social media.

Commentary: For future research, one may want to consider adding a TikTok specific Social Media Information Form in order to obtain additional information regarding how their sample uses TikTok. Information to ask about could include how much time one spends specifically on TikTok, percentage of TikTok time used to escape their current reality, follower count, frequency of posting/reposting, etc. Additionally, asking how many people they talk to directly on TikTok, frequency of sharing comments on other user's videos, and if they spend more time on their following page or their FYP. There could then be a comparison between how the sample reports using social media in general and how they report using TikTok; potential differences could be important for implications as well as potential mental health effects.

After participants completed the online survey, they had three electrodes attached to them utilizing the Lead II Configuration; one electrode on their right wrist and one on the inside of each of their ankles about an inch above their ankle bone. The electrode placed on the right ankle served as a ground. The electrodes specifically measured cardiovascular activity via heart rate through electrocardiography (ECG). ECG was recorded via electrodes that were attached to Biopac SS2L transducers (Biopac Systems, Inc., Goleta, CA) and integrated with a Biopac MP35 acquisition device (Biopac Systems, Inc.) at a sampling frequency of 1,000 Hz. The BioPac Systems software allowed for the time-sensitive tracking of the participants' heart rates throughout the social media use portion of the study. After electrode attachment was completed, there was a five-minute baseline period to obtain the participants' average resting heart rate.

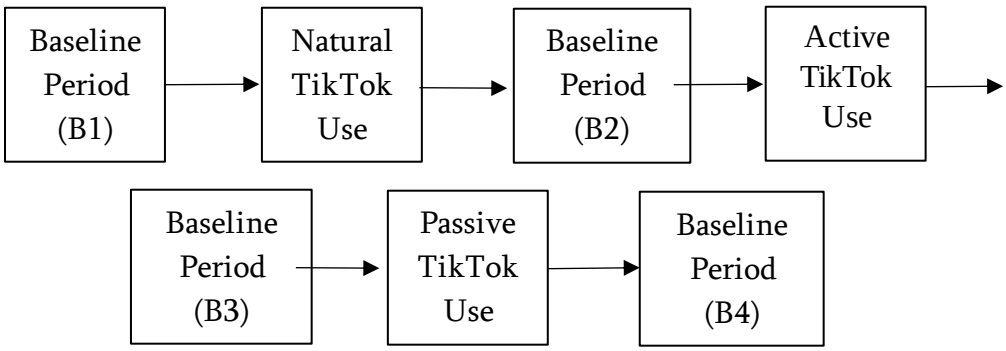
Commentary: Additional physiological measurements may be useful to provide further details regarding potential physiological changes. Physiology is very complex, and it can be difficult to make definitive statements utilizing only one physiological measurement. For this specific

research, adding a measurement of heart rate variability (HRV) would be useful. HRV measures changes in successive heart periods. Knowing one's resting HRV would be useful to put into context any cardiovascular changes. For example, if one only experiences a small change in heart rate while using TikTok, that could potentially fall into their natural HRV and not be a change in heart rate due to TikTok use. Having heart rate and HRV accounted for will help ensure the physiological measurement is valid. Another facet of physiology that could impact heart rate is breathing rate. This is known as respiratory sinus arrythmia. It may be useful to add a breathing rate measurement in order to track if breathing rate changes throughout TikTok use as well as how potential breathing rate changes may in turn impact heart rate. Measuring breathing rate may offer more insight to why potential changes are happening and could show meaning when all three measurements (breathing rate, heart rate, and heart rate variability) are taken together.

Next, participants were instructed to start recording their screens on their phone and open TikTok to their For You Page (FYP). Screen recording was required because it allowed for further insight beyond participants' self-reported valence into the overall genre/content of their FYP; we wanted to see what they were seeing based on TikTok's algorithm and be able to tie specific videos/activities (such as liking a video) to the heart rate of the participant during that time. TikTok has an algorithm that creates each user's For You Page based on who they follow, the type of videos they've liked/shared, and videos they've spent the most time on. Typically, FYPs are composed mostly of other users that they do not follow, but post content similar to what the users have liked and/or watched in the past. Participants were instructed to use TikTok as they naturally would for 10 minutes and to shift the valence rating dial to fit what they feel the emotional valence of each video they view. The rating dial had a pointer that participants could move on a 340-degree scale to line up with the numerical descriptor (ranging from "-7/Extremely

Negative" to "7/Extremely Positive") that they felt best described the emotionality of the video they were currently viewing. The rating dial was connected to a hand switch (SS10L) that allowed it to be connected to the BioPac MP35 system and allowed for time sensitive ratings throughout each TikTok use session. The rating dial changes were read by the Biopac software as "micromhos of skin conductance" at a sample rate of 1,000 Hz and was, upon data analysis, transformed from the skin conductance measurement into the rating scale numerical representation from the rating dial. After the 10-minute natural social media use session, participants had another baseline period. Figure 1 (below) is a graphic of how the procedure of the social media use phases of the study progressed.

Figure 1: Procedure of the Laboratory Study's TikTok Use Phases



Based on prior research, the way (i.e., active vs. passive) that one uses social media, can impact the effects social media may have on someone. Therefore, each participant had a 10-minute active social media session and 10-minute passive social media session (in that order); during each session participants recorded their screens and shifted the rating dial to report the emotional valence of each video they saw; even if they quickly scrolled past a video, they were asked to adjust the rating dial before scrolling away. Active social media use was encouraged by telling participants to like at least 10 posts during that 10-minute session. For the Passive session,

participants were instructed to simply scroll and focus on providing an accurate emotional rating for each video. They were also asked to please refrain from liking/interacting with posts in any way other than viewing them. Each TikTok use session was followed by another return to baseline period to allow any potential heart rate changes or residual arousal due to using TikTok to dissipate before starting the next type of social media use session.

After the completing the passive use social media session, participants had one final return to baseline period because the final baseline period may more accurately reflect one's resting heart rate as they are able to fully relax knowing they were essentially done with the study. Then the participants removed their electrodes and were able to use an alcohol wipe on their wrist and ankles to remove any remaining residue from the electrodes. After which participants were asked to fill out another PANAS. Lastly, participants were debriefed, and their study participation concluded upon the signing of the debriefing form.

Commentary: While 5 minutes is a commonly used length of time for baseline collection, it appeared to be too long with the amount of baseline sessions in this study. While five minutes would still be appropriate for the initial baseline collection, the subsequent baseline sessions should be shortened. There was a lot of movement in the later baseline periods which could impact the heart rate readings. To keep participants comfortable, it may be worth shortening baseline periods to 2- to 3-minute-long sessions. Accounting for the Qualtrics survey, each TikTok use session, and the full-length baseline periods, participants were sitting in the same chair for about 90 minutes (about 1 and a half hours) and that appeared to be too long for the participants to stay comfortable while keeping movements to a minimum. For future research, it may be useful to have a more comfortable chair available and to have participants complete the Qualtrics survey and then be allowed to stand/stretch their legs for a period before having the

electrodes attached. Additionally, in Nakajima et al.'s study, participants were reminded every 30 seconds (if necessary) to move the rating dial; that is a practice that should be utilized in future research of this nature as well.

Survey

The Qualtrics survey used in the pilot laboratory study was a 167-question survey and was extremely similar to the Qualtrics survey used in initial Social Media Survey, including a demographics section, a personality assessment (The Big-Five Factor Markers (Goldberg, 1992)), a mental health assessment (Depression, Anxiety, Stress Scale-21 (Lovibond & Lovibond, 1995), and the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988). Additionally, questions regarding their thoughts on social media (e.g. "*how do you feel about the number of friends/followers you have?"*), reasons for using social media (e.g. "*I use social media to escape my current reality"*), and behaviors on social media were asked (e.g. "*I primarily scroll on social media and do not post very often*"). Some of the additional questions added to the survey for the pilot laboratory study included: "*how many followers on the site you spend the most on?"*, the percentage of time on social media used to escape reality, and "*I use social media out of habit*". The survey took approximately 40 minutes to complete. At the end of the survey, there was information regarding where they could get mental health services if they needed them. Please see Appendix B for the survey used in the pilot laboratory study.

Commentary: Upon analysis of the preliminary survey research, and in consideration with the 4 participants from the in-lab study, it may be worth only investigating two of the Big 5 Personality traits, neuroticism and extraversion, in future research. It also appears that the PANAS on Qualtrics may be unnecessary as participants already fill out the assessment pre- and

post- TikTok use. Additionally, it may be worth adding a reason for using social media regarding "*marketing/promotions*" and/or "*working*" to address those who are potentially only using social media to advertise their business(es).

Data Analytic Plan

In this study, there were several variables investigated and analyzed using SPSS. These variables included demographics, personality, mental health, perceived social support/connectedness, average social media behavior (frequency of posting, type of posts, etc.), social habits (i.e., how often they talk to friends online, what they feel counts as socializing, etc.), reasons for using social media, and overall feelings regarding social media. Data from the BioPac Systems was manually entered into the SPSS file. Since the sample size of the laboratory study was so small, data analysis in SPSS only included collecting frequency data and mean scores.

Commentary: For future research, it may be valuable to create a heart rate change variable to account for the BPM difference from baseline sessions to social media use sessions as well as heart rate change between the different types of TikTok use. Additionally, a PANAS change score to address mood change pre- and post- TikTok use may be a valuable variable to create. Some statistical tests that may be useful to run for this data, once the sample size is larger, include ANOVAs, MANCOVAs, regressions, and Kruskal-Wallis H Tests.

Results

DASS-21, Big 5 Personality, and PANAS:

The DASS-21 questions were answered on the Qualtrics survey; however, one participant skipped questions from the depression questions and another participant skipped questions on

from the stress portion which led to each of their overall scores for the respective sections being omitted from analysis. Therefore, average scores for the depression and stress scales were reported with 3 scores each. The mean Depression score was 6 (SD=3.46) with a range between 4 and 10; the mean score for the sample falls into the normal range. However, the maximum score of 10 fell into the mild range. The Stress scale had a mean of 17.33 (SD=2.31) with a range of 16 through 20; the mean score for the sample for the Stress scale fell into the mild category, with the maximum score meeting the requirements for the moderate range. Lastly, the Anxiety portion (n=4) of DASS-21 had a mean score of 8 (SD=5.16) with a range of 2 to 14; the mean fell into the mild range, while the maximum fell into the moderate range.

Participants answered all of the questions for the Big Five Factors personality assessment via Qualtrics and all five traits include 4 scores (one from each participant). The five personality traits measured included: openness to experience (m= 40.75, SD=2.75), conscientiousness (m=31.75, SD=6.13), extraversion (m=21.25, SD=3.86), agreeableness (m=31.25, SD=5.50), and neuroticism (m=30.75, SD=3.86). For this assessment, the higher the score for each trait, the higher on the spectrum for that trait they fall. For reference, the score for each trait if participants answered 3 (labelled as neither agree nor disagree) would be 24 for extraversion and neuroticism, 27 for agreeableness and conscientiousness, and 30 for openness to experience. Based on the sample average scores for each trait, it appears this sample was on the higher end of the spectrum for every trait except for extraversion. For extraversion, it appears that the sample's mean score would fall on the lower end of the spectrum as the sample average was lower than answering neutral for every question.

The PANAS measures positive and negative affect; the higher the score for each affect, the higher the level for that affect. The average, provided by the developers of the PANAS

(Watson, Clark, & Tellegen, 1988), for Positive Affect (PA) (when asked to evaluate their mood in that moment) was 29.7 (SD=7.9) and for Negative Affect (NA) (also when asked to evaluate their mood in the present moment) was 14.8 (SD=5.4). The possible range of scores for each affect in the PANAS is 10 through 50. For this study, the PANAS was taken three times; once right after consent (referred to as First PANAS), once during the Qualtrics survey (referred to as Second PANAS), and once after the social media use sessions (referred to as Last PANAS), but before the debriefing. For the First PANAS PA, the sample mean was 27.5 (SD=7.05) and the mean for First PANAS NA was 11.75 (SD=1.26). The mean for the Second PANAS PA was 26.00 (SD=7.75) and Second PANAS NA mean was 11.00 (SD=0.00). However, the Second NA mean only includes 3 participants' scores due to one participant skipping a NA PANAS question on Qualtrics. The Last PANAS PA average was 26.00 (SD=7.53) and Last NA average was 11.50 (SD=2.38). The sample, overall, became slightly less positive in affect after TikTok use and stayed about the same for negative affect when comparing pre- and post- TikTok use PANAS scores.

Commentary: For future research, it is believed that only the first and last PANAS are necessary; this means that the PANAS featured on the Qualtrics survey can be deleted. This will help shorten the Qualtrics survey and allow for more time to be spent on non-redundant questions/questionnaires.

Social Media Use and Attitudes:

Regarding social media, participants were asked to report how many people they talk to regularly on any social media applications they had; 50% reported 4 or less, while the remaining 50% reported 8 or more. Only one participant (25%) stated that they felt more connected while

using social media. However, the whole sample felt it was possible to create and maintain meaningful friendships online. The sample as a whole also agreed, to some degree, that there were many benefits to using social media. Implying that the entire sample held a relatively positive attitude regarding social media. The entire sample reported checking their social media accounts multiple times a day. The average amount of social media accounts for this sample was 7 with half the sample reporting their highest friend/follower count as between 101 and 500 while the other half reported 501 or more as their highest amount. Most participants (50%) reported feeling neutral regarding the number of friends/followers on social media, 25% reported being completely satisfied and one (25%) was somewhat dissatisfied with their follower/friend count. 75% of the sample stated they had the most followers/friends on Instagram.

Instagram (50%), SnapChat (25%), and Facebook (25%) were the applications participants reported posting the most on. Participants reported spending between 3 to 6 hours daily on social media; with the most frequent answer being 5 hours (50%). As a whole, the sample agreed (to some degree) of feeling shocked about how much time has passed while they are on social media and that they often use social media for longer than they originally intended to. The entire sample feels they spend, to some degree, too much time on social media. SnapChat (50%) and TikTok (50%) being the two applications that they reported spending the most time on and being the most active on. Additionally, 75% of the sample chose TikTok as their favorite social media site; 25% of participants reported receiving the message that it was time to take a break from TikTok daily and 25% stated they had never received that message (2 participants skipped this question). Only one person (25%) identified TikTok as the social media site that they talk to the most people on.

When asked the reasons for using social media, the most frequently agreed (to some degree) with reasons were the following: to talk to friends (100%), to keep up with current events (100%), to talk with people with similar interests/hobbies (100%), to "*stay in the loop*" of their social network's lives (100%), to get recommendations/advice from others (100%), out of habit (100%), to wind down/relax (100%), for entertainment (100%), to escape their current reality (75%), to "*turn off my brain*" (75%), to keep up with influencers/celebrities (75%), to keep up with the latest health trends (50%), to compare their diet/health to others (50%), and to compare themselves/their life with others (50%).

Commentary: The questions regarding social media use, social media attitudes, and reasons for social media use were all written specifically for the preliminary survey and laboratory study. They were written by the researcher as there is no known survey that investigates reasons for social media use to such a comprehensive degree. As mentioned before, there could be at least one reason that could justifiably be added regarding using social media for their jobs or to promote their own business. As research in this field continues, it would be understandable to continuously add reasons as they arise. Such detailed motives and reasons for social media use have yet to be investigated.

Social Media Information Sheet:

The Social Media Information Sheet was filled out by the entire sample. The participants were instructed to choose a social media application of their choice to write about their last 5 posts on that application. Three participants chose Instagram, and one chose Facebook. The average amount of followers reported for this sample was 444.00 (SD=221.16). The average number of likes reported for the sample's last 5 posts was 106.18 (SD= 91.15) likes per post and

the sample reported receiving about, on average, 19.96 (SD=24.42) comments per post. Lastly, the average amount of time since their last post shared to their social media timeline was 72.75 (SD=77.24) days.

Commentary: The Social Media Information Sheet was created specifically for this study by the researcher. It serves multiple purposes including allowing the research team to see which social media application chose to write about, information on follower count, frequency of posting, and content participants choose to post (this gives valuable insight into participants' online self-presentation).

Natural Social Media Use Session:

The average heart rate (HR) for the sample during their natural social media use sessions was 71.51 BPM (SD= 3.54). For reference, the average heart rate for the initial baseline period (pre-social media use) for the sample was 73.33 BPM (SD= 2.94). The average valence reported for participants' FYPs during the natural use session fell into the moderately positive range. However, the average valence for the videos participants liked during the natural use session fell into the very positive range. This means that, on average, the videos participants were *liking* were much more positive than those videos that participants scrolled past or watched but didn't end up *liking*. If participants did hit the like button during the natural use session, on average it took them 16.24 seconds (SD=6.03) of the video to hit like; the average HR while hitting the like button for the sample during this session was 73.16 BPM (SD=3.95). The average HR while watching a video they went on to *like* was 73.06 BPM (SD=6.47). The average number of likes during the natural use session was 12.25 (SD= 9.00).

However, on a video that participants watched, but did not *like*, average HR for the sample was 71.47 BPM (SD=3.26). On average, participants spent about 49.50 seconds (SD=17.86) in the comment section during this session, with an average of 6.13 seconds (SD=2.30) spent scrolling/reading comments per each separate time they clicked on the comment section. The sample's average HR while in the comment section was 71.86 BPM (SD= 3.33). Lastly, the sample's average HR while scrolling was 70.55 BPM (SD=4.67). The average number of watched (but not *liked*) videos was 5.50 (SD=3.11), the average number of scrolls was 5.75 (SD=3.20), and the average number of comment scrolls was 8.00 (SD=2.94); these are all considered passive social media use. The total active time, on average, for this session was 5.89 minutes (SD=3.95); while the total passive time during this session was, on average, 4.45 minutes (SD=4.22). When asked to use social media naturally participants, on average, spent slightly over half of the session being active participants in their social media use and slightly less than half the session using TikTok in a passive manner.

Active Social Media Use:

During the active TikTok Use session, participants were given 10 minutes to use TikTok as actively as they could; the only instructions given to them were the try to like at least 10 videos during this session. Overall, the average heart rate for the sample during the active use session was 73.19 BPM (SD=2.33). The sample averaged 12.25 (SD=8.88) likes during this session; the average heart rate during those liked videos was 72.88 BPM (SD=2.43) and the average heart rate while tapping the *like* button was 72.29 BPM (SD=2.82). On videos participants *liked* during this session, it took them about 15.07 (SD=8.39) seconds into the video to decide to push *like*. Overall, the participants spent about 8.33 (SD=1.20) minutes of this session on active behaviors.

Of the 1.53 (SD=1.09) minutes the sample spent on passive behaviors, 50.25 (SD=35.89) seconds of their average passive time was spent in the comment section of videos. The average heart rate of the time spent in the comment section was 73.08 BPM (SD=1.78). There was also an average of 3.00 (SD=2.58) videos that participants watched but did not *like*; the time spent on these watched videos made up the remaining average passive time during this session.

Passive Social Media Use:

During the Passive TikTok use session, participants were given another 10-minute TikTok session, but this time they were prompted to only view the videos and not *like* or interact with them in any other way outside of viewing. The average heart rate during the passive TikTok session for the sample was 71.35 (SD=1.80). The average heart rate for videos that participants watched was 74.35 (SD=5.61) BPM while the average heart rate for scrolling during this section was 73.49 (SD=3.91) BPM. Participants watched about 18 (SD=12.68) videos during this section and averaged 5.50 (2.89) scrolls during the passive use session.

During this passive use session, participants, on average, spent about 15.50 (SD=11.15) seconds in the comment section. They averaged about 2.71 (SD=1.19) seconds per time they clicked on the comment section. The average heart rate for the sample while in the comment section was 69.49 (SD=1.47) BPM. In total, participants averaged 5.50 comment scrolls during their passive use sessions.

Discussion

Results from the pilot laboratory study demonstrated that there were different average heart rates displayed for different types of TikTok usage. Active TikTok use had the highest average heart rate followed by natural TikTok use and then passive TikTok use; although it's worth noting that the passive TikTok use average HR was less than 0.5 BPM slower than the

natural use average HR. This pilot sample, although very small, did show that there is a possibility that there could be physiological changes associated with using social media. Another important finding was that the whole sample felt they could potentially make meaningful friendships on the internet; however, only one participant felt more connected while using social media. This disparity in perceived potential for creating connections versus the actual feeling of connectedness may be a very important relationship to investigate further once there is a larger sample available.

The sample also reported spending between 3 to 6 hours daily on social media, with 5 hours being the most frequent answer. This is concurrent with the average daily time spent on social media reported by the initial survey sample. This indicates that participants are regularly spending at least 3 hours per day on social media, even with the COVID-19 restrictions being lifted and many events/activities resuming to their pre-COVID schedules. A new variable added to the survey for the pilot laboratory study was *being shocked about how much time had passed while they were on social media*; this was a sentiment that the whole sample agreed with. Lastly, 75% of the sample chose TikTok as their favorite social media site and agrees with the initial survey reporting spending the most time on TikTok; this shows that as data collection continues, it would be a good idea to stay with TikTok as the application being investigated.

Together, the data from the social media survey and the pilot laboratory study provided evidence that this is a viable topic of study and needs further investigation. As mentioned before, since the sample size of the pilot study was so small, statistical analysis was not able to be done on the psychophysiological data; therefore, none of the hypotheses were able to be tested. Before any of the pilot laboratory data can be properly analyzed, a larger sample size will be needed. As mentioned in a previous commentary paragraph, the ideal number for psychological research is

thought to be 30 participants per group. It will be crucial to obtain more participants as this is a topic that has never been explored and could fill a major gap in the field of psychophysiology as well as media psychology.

Another recommendation for future research on this topic would be to obtain a more diverse sample; the laboratory sample only consisted of females. To make the results of any future study generalizable, it would be important to have a more diverse sample. Also, future researchers would be advised to implement a TikTok specific information page. This page would be very similar to the Social Media Information Page utilized in the pilot laboratory study but would be specific to TikTok. This TikTok information page could include asking participants to report how many followers they have on TikTok and how many people they follow, how often they post on TikTok, how frequently they use TikTok, and which TikTok page (FYP or Following) they spend the most time on. The addition of the TikTok Information Page would allow the researcher to have more of an understanding, outside of the natural TikTok use session, of how participants use TikTok. Another recommendation would be to alternate the order of the active and passive use sessions. The pilot laboratory followed the same procedure across the sample. However, as more participants are found, it may be beneficial to change the order of the TikTok use sessions in order firmly be able to say that any physiological changes were the result of the specific TikTok use session and not the order of said sessions.

For future laboratory sessions, it may be useful to add a couple of additional physiological measures including breathing rate and HRV. Physiology is very complex, and it is difficult to make a meaningful statement regarding changes while using only one physiological measurement. Measuring heart rate, breathing rate, and HRV will allow for further insight on

potential physiological changes experienced while using TikTok. Using multiple physiological measurements may also allow a clearer meaning of each change that may occur.

Some potentially confounding variables were found while doing the pilot laboratory study. The first is that because our physiology overall is very complex, many elements outside of what was being directly measured by the study could have impacted heart rate. This confounding variable can be partially controlled by adding these additional physiological measurements to the future laboratory sessions. However, there are some elements that impact heart rate that are a bit more difficult to control for. For example, participants' overall heart and physical health can impact their heart rates as well as movement during physiological data collection. Another element that could impact heart rate is caffeine; while the researcher did ask participants not to consume caffeine before their laboratory session, there is no way to confirm that participants did not consume caffeine. Caffeine is considered a stimulant and has an excitatory effect on our cardiovascular system; this means caffeine consumption can lead to an elevated heart rate.

Based on the data from the survey and the pilot study, the important factors to investigate more thoroughly regarding social media use and psychophysiology include depression, anxiety, stress, extraversion, neuroticism, and percentage of time used to escape their current reality. Since the survey and pilot laboratory study were the first of their kind, it was exploratory in nature; done to investigate if it is possible that there are relationships regarding social media use and behaviors, mental health (measured in this study by DASS-21), mood (via PANAS), and physiology. Although the sample size of the laboratory study was small, the results, when taken in context with the initial social media survey's results, demonstrated that there were some psychophysiological changes while using social media; thus showing that this direction of research is not only viable, but could very well help fill a major gap in research regarding

psychophysiology and media psychology, if it is continued and obtains a larger sample size. Social media is not a thoroughly investigated research topic but given how social media has become integrated into people's daily lives, it is important to explore all the potential impacts of social media use.

The information provided in both chapters of this document displays the potential for significant effects to stem from social media use and how those effects may change based on individual differences in personality traits and mental health. The commentary sections, written with the benefit of hindsight, provide useful information about how future studies could be improved from the original survey and pilot laboratory study. Overall, the information in this document could be used as a guide for future research endeavors within this topic of study and help fill the gap in the research regarding psychophysiology and social media.

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Appendices

Appendix A: Tables

Table 1

Demographics from Social Media Survey (N=283)

Variables	N (N=283)	Percent
Race/Ethnicity		
White	198	70.0%
Black	19	6.7%
Asian	21	7.4%
Latinx	27	9.5%
Other/prefer not to say	18	6.4%
Gender		
Male	55	19.4%
Female	219	77.4%
Non-binary/prefer not to say	9	3.2%
How many people do you live with?		
Alone	25	8.8%
1 person	77	27.2%
2 people	74	26.1%
3 people	50	17.7%
4+ people	57	20.1%
Who do you live with?		
Friends/roommates	104	40.5%
Significant Other	49	19.1%
Parents/Family members	104	40.5%
Do you live on campus?		
Yes	52	18.4%
No	231	81.6%

Table 2

Average Scores for Assessments

Assessment	Average Score (M)	SD
Big Five Factors		
Extraversion	24.73	7.13
Agreeableness	34.81	5.32
Conscientiousness	31.95	5.83
Neuroticism	27.32	6.69
Openness	36.18	5.78
DASS-21		
Depression	13.15	10.31
Anxiety	10.91	8.32
Stress	16.30	9.58

Appendix B: Survey

1) Would you like to participate in the survey?
2) Are you 18 years of age or older?
3) Do you have at least one active social media account?
4) What is your age in years? For example, if you are 20 years old, please just type 20.
5) What is your race/ethnicity?
6) What is your gender identity?
7) How many people do you live with?
8) Who do you live with?
9) How many close friends do you feel you have?
10) On average, how many friends do you talk to a day online (outside of work and/or school)?
11) How often do you see a friend in-person to hang out (outside of school or work)?
12) Do you feel the pandemic has changed the way you socialize?
13) Do you prefer to socialize in-person or online?
14) About how many people daily do you talk to directly on social media?
15) How many social media accounts do you have?
16) Which of the following sites do you have an active social media account on?
17) Which social media site do you spend the most time on? If they answer TikTok, they will be presented with this question: how often do you get the message from TikTok stating it's time to take a break?
18) Which social media site do you talk to the most people on?
19) What site do you feel you're the most active on (i.e., do the most liking, commenting, sharing posts, etc.)?
20) What social media site do you post most frequently on?
21) What social media site do you consider to be your favorite?
22) On average, how often do you check your social media accounts?
23) How often do you post content (can be an original post or sharing someone else's post) on social media?

24) When is the most recent time you posted on a social media site?

25) How often do you create and share your own, original posts on social media?

26) In general, how would you describe your attitude about social media?

27) What is the highest number of friends/followers you have on a social media site?

28) How many of your social media friends/followers do you communicate with regularly?

29) How many friends/followers do you have on the site you spend the most time on?

30) How do you feel about the number of friends/followers you have on social media in general?

31) How many likes/interactions (i.e., comments, shares, views, etc.) for your original social media posts?

32) How much time, on average, do you think you spend on social media a day?

33) How do you feel about how much time you spend on social media?

34) How do you think Covid has changed the amount of time you spent on social media?

35) Do you feel more connected when you're on social media?

36) How many "groups" are you a member of on social media?

37) Do you consider yourself an active member of these groups (i.e. do you share posts and/or comment/like others' posts)?

38) Do you feel supported and/or well-liked when people interact with your posts?

39) Do you feel it's possible to create and maintain meaningful connections online?

40) How comfortable do you feel sharing personal details about yourself on social media?

41) When you share something that you feel is personal online, do you feel like deleting the post?

Positive and Negative Affect Scale (PANAS)

(Very slightly (1), a little (2), moderately (3), quite a bit (4), and extremely (5))

Please indicate to what extent you feel the following emotion at the present moment:

42) Interested

43) Distressed

44) Excited

45) Upset

46) Strong

47) Guilty

48) Scared

49) Hostile

50) Enthusiastic

51) Proud

52) Irritable

53) Alert

54) Ashamed

55) Inspired

56) Nervous

57) Determined

58) Attentive

59) Jittery

60) Active

61) Afraid

Big Five Factor Markers

(Disagree strongly, disagree a little, neither agree nor disagree, agree a little, and agree strongly)

Please answer the following questions based on the extent to which you agree or disagree with the following statements:

62) I see myself as someone who is talkative.

63) I see myself as someone who tends to find fault with others.

64) I see myself as someone who does a thorough job.

65) I see myself as someone who is depressed, blue.

66) I see myself as someone who is original, comes up with new ideas.

67) I see myself as someone who is reserved.

68) I see myself as someone who is helpful and unselfish with others.

69) I see myself as someone who can be somewhat careless.

70) I see myself as someone who is relaxed, handles stress well.

71) I see myself as someone who is curious about many different things.

72) I see myself as someone who is full of energy.

73) I see myself as someone who starts quarrels with others.

74) I see myself as someone who is a reliable worker.

75) I see myself as someone who can be tense.

76) I see myself as someone who is ingenious, a deep thinker.

77) I see myself as someone who generates a lot of enthusiasm.

78) I see myself as someone who has a forgiving nature.

79) I see myself as someone who tends to be disorganized.

80) I see myself as someone who worries a lot.

81) I see myself as someone who has an active imagination.

82) I see myself as someone who tends to be quiet.

83) I see myself as someone who is generally trusting.

84) I see myself as someone who tends to be lazy.

85) I see myself as someone who is emotionally stable, not easily upset.

86) I see myself as someone who is inventive.

87) I see myself as someone who has an assertive personality.

88) I see myself as someone who can be cold and aloof.

89) I see myself as someone who perseveres until the task is finished.

90) I see myself as someone who can be moody.

91) I see myself as someone who values artistic, aesthetic experiences.

92) I see myself as someone who is sometimes shy, inhibited.

93) I see myself as someone who is considerate and kind to almost everyone.

94) I see myself as someone who does things efficiently.

95) I see myself as someone who remains calm in tense situations.

96) I see myself as someone who prefers work that is routine.

97) I see myself as someone who is outgoing, sociable.

98) I see myself as someone who is sometimes rude to others.

99) I see myself as someone who makes plans and follows through with them.

100) I see myself as someone who gets nervous easily.

101) I see myself as someone who likes to reflect, play with ideas.

102) I see myself as someone who has few artistic interests.

103) I see myself as someone who likes to cooperate with others.

104) I see myself as someone who is easily distracted.

105) I see myself as someone who is sophisticated in art, music, or literature.

Depression, Anxiety, Stress Scale-21 (DASS-21)

(Did not apply to me at all (0), applied to me to some degree, or some of the time (1), applied to me a good part of the time (2), applied to me very much or most of the time (3))

Please read each statement and indicate how much each statement applied to you over the past month.

106) I found it hard to wind down.

107) I was aware of dryness in my mouth.

108) I couldn't seem to experience any positive feeling at all.

109) I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).

110) I found it difficult to work up the initiative to do things.

111) I tended to over-react to situations.

112) I experienced trembling (e.g., in the hands).

113) I felt that I was using a lot of nervous energy.

114) I was worried about situations in which I might panic and make a fool of myself.

115) I felt that I had nothing to look forward to.

116) I found myself getting agitated.

117) I found it difficult to relax.

118) I felt down-hearted and blue.

119) I was intolerant of anything that kept me from getting on with what I was doing.

120) I felt I was close to panic.

121) I was unable to become enthusiastic about anything.

122) I felt I wasn't worth much as a person.

123) I felt that I was rather touchy (e.g., emotionally over-sensitive).

124) I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increases or heart missing a beat).

125) I felt scared without any good reason.

126) I felt that life was meaningless.

For the following questions, please indicate to what degree you agree or disagree with the statements. (Strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, and strongly disagree)

127) I feel I am coping well (mentally and emotionally) with the pandemic.

128) I feel I have done a good job of staying connected with my friends/family during the pandemic.

129) I have socialized less in-person (or not at all) since the pandemic began.

130) Socializing (whether in-person or online) is very important to me.

131) I feel there are many benefits to using social media.

132) I use social media as a way to talk to my friends.

133) I use social media as a way to keep up with current events.

134) I use social media as a way to keep up with the latest health trends.

135) I feel social media plays a large role in my life.

136) I feel lost if I haven't seen my friends in-person for more than a month.

137) I would be lost without social media.

138) I post a lot on social media.

139) I use social media as a way to share my feelings with others.

140) I feel sad/let down if a post I share does not get a lot of likes or comments.

141) I only post when I know a lot of people will be online, so my post will get more likes.

142) If my post does not get enough likes, I will delete the post and/or repost it at a different time.

143) I feel I have a lot of friends online.

144) I feel I have a lot of in real life friends (i.e., friends that I've met in person).

145) I use social media to escape my current reality.

146) Approximately what percentage of time spent on social media is spent to escape your current reality?

147) I use social media to talk with people who have similar interests/hobbies.

148) I use social media to "stay in the loop" of what's going on in my social network's lives.

149) I have made good friends on social media.

150) I use social media to hold myself accountable for following my diet/exercise regime.

151) I use social media to compare my diet/exercise/health to others.

152) I use social media to get advice or recommendations from other people.

153) I primarily scroll on social media and DO NOT post very often.

154) I feel happy or excited when I feel my post is getting a lot of likes/comments.

155) I use social media out of habit.

156) I feel I am missing out when I see people having fun/doing things I want to do on social media.

157) I feel I am a shy person.

158) I am often shocked about how much time has passed when I am on social media.

159) I wish I had more friends.

160) I use social media to compare myself/ my life with others.

161) I use social media to meet new people/make new friends.

162) I feel my social needs can be met entirely by social media alone.

163) I use social media to wind down/relax.

164) How frequently do you post stories?

165) I consider myself friends with people I follow even if I've never met or spoken to them.

166) I use social media to follow/keep up with celebrities and/or influencers.

167) Do you feel closer to celebrities when you see their posts and/or interact with their posts?

168) Do you ever use social media for longer than you originally intended? (Yes or No)