Discrepancies between Objectively Assessed and Self-Reported Daily
Social Media Time in the Age of Platform Swinging

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Abstract

Building on Junco's (2013) study examining the accuracy of self-reported computer-specific time on Facebook, the current study investigates the accuracy of self-reported time on multiple social media (SM) platforms across multiple electronic devices and evaluates whether reporting accuracy is systematically associated with participant sex, individual SM platform in question, or total number of SM platforms used. Participants were 320 college students who downloaded software on their computers, tablets, and smartphones to track their active use of Facebook, Twitter, Instagram, and Snapchat over a 2-week surveillance period and then self-reported their daily average minutes on each platform immediately after. Larger proportions of students over-estimated than under-estimated their use, with the largest overestimations found on Snapchat and Instagram. Relative to males, females logged significantly more SM time and were less accurate in reporting. Overall, the likelihood of substantial inaccuracies in reporting total SM time and time on most individual platforms increased with each additional SM platform participants reported using. Findings from this study cast further doubt on the validity of self-report SM measures in the present SM landscape and underscore the need for either data analytic strategies to adjust for systematic reporting biases or a shift towards objective time-tracking methods.

Keywords: social media use, objective assessment, self-report assessment

1. Introduction

Social media (SM) has become an increasingly important aspect of young adulthood, providing young people with opportunities for bonding and bridging social capital, peer interaction, identity expression, and connection to others outside of their immediate environments (Jarman et al., 2021; Phua et al., 2017; Tandoc et al., 2019). Yet, research has also highlighted potential dark sides of SM, with numerous studies linking SM usage to poor mental health and health-risk behaviors, including depression (e.g., Ivie et al., 2020; Lin et al., 2016), body image concerns (e.g., Marengo et al., 2018; Rodgers et al., 2020), sleep disturbance (Alonzo et al., 2021; Levenson et al., 2016), and alcohol use (e.g., Hormes, 2016; Ng Fat et al., 2021). However, most studies examining these relationships have relied on survey items to retrospectively assess daily or weekly time on a specific SM platform or across all SM used, acknowledging that the accuracy with which young adults are able to self-report these behaviors is unclear. While commonly identified as a study limitation, other recent work has argued that reporting errors in the domain of SM time are likely to be random rather than systematic (Johannes, 2021), and therefore should not be of great concern to the survey researchers asking these questions. Given increasing empirical interest in health-related correlates of SM, the present study employs improved methods to further this debate. Consistent with the tendency to regularly use multiple SM on multiple electronic devices among modern young adults (Anderson & Jiang, 2018; Villanti et al., 2017), this research employs cross-device objective time-tracking software to evaluate and compare the validity of young adults' self-reported daily time on four widely used SM platforms of interest to health researchers. Also examined are three novel factors that may be associated with increased likelihood of inaccurate self-reports in the context

of social identity and the evolving SM landscape: the particular SM platform in question, the sex of the participant, and total number of SM platforms used by the participant.

1.1. Previous Research

Among the first to consider the potential for inaccuracy in retrospective reporting of SM time was Junco (2013). A software program was installed on the personal computers of participating college students to monitor the minutes per day they spent on Facebook over a 30-day period. Results revealed that students substantially overestimated their Facebook use, self-reporting an average of 145 minutes per day of active use while objectively logging only an average of 26 minutes. This study was limited in that it objectively tracked Facebook time on students' computers but not on other devices (i.e., smartphones, tablets), and included a small sample ($N=49$) of mostly female (73%) students preventing examination of sex differences. Moreover, fewer than half of the students who completed the baseline survey (which comprised only 17% of students to whom it was sent) agreed to install the computer tracking application, further limiting generalizability. In recent years, several studies have revisited the issue of self-report accuracy in the context of SM use, generally replicating two findings with larger samples: reporting inaccuracies are common, and they tend toward the direction of over-reporting (Ernala et al., 2020; Sewall et al., 2020). However, these studies still share substantial limitations with Junco (2013) including the assessment of SM time on a specific electronic device (iPhones; Sewall et al., 2020), a single platform (Facebook; Ernala, et al., 2020), or lumping time on multiple SM platforms together (i.e., total SM time, Johannes et al., 2021; Sewall et al., 2020). These limitations are problematic for a number of reasons. For instance, in single device studies, some portion of participants' reporting error may be attributed to difficulty cognitively separating SM time on a specific device (i.e., iPhone) from total SM time across electronic

devices (e.g., iPhone, tablet, and computer). Thus, participants may report total time across devices while only time on a specific device is tracked, artificially leading researchers to observe over-estimation. Further, findings from studies investigating self-report accuracy for total time across a broad category of SM have unclear implications for health researchers who tend to be interested in time on specific SM platforms (e.g., LaBrie et al., 2021a; Marengo et al., 2018) in order to inform the development of platform-specific health interventions (e.g., Blackstone et al., 2020; Vogel et al., 2020). These studies require the assumption that self-report accuracy is consistent across SM platforms used more and less frequently used by participants, despite some evidence that heavier SM use affords greater opportunity for reporting error (Sewall et al., 2020). Additionally, few studies have investigated platform or participant-level factors that may increase the likelihood or degree of inaccuracy or over-reporting. Meanwhile, greater insight into these factors may help SM researchers relying on self-report identify limitations or potentially reduce error via improved self-report assessments and analytic techniques.

1.2. Explanations for Over-Reporting and Potential Predictors

Social desirability (Dodou & Winter, 2014; Durmaz et al., 2020), careless responding (McKay et al., 2018; Ward & Meade, 2018), the construction of self-report assessments (Hill et al., 2019; Weaver et al., 1997), and social identity related self-perception (Brenner, 2012; 2016; 2017) are common explanations for measurement error in survey research. Although youth are likely to perceive adult researchers to find their spending less time on SM more desirable than more time, adolescents and emerging adults have been found more likely to over-report this behavior, suggesting that social desirability concerns may not explain SM reporting inaccuracies well. However, recent findings suggest that careless responding may play at least some role in the inaccuracy of SM use estimations among adolescents and emerging adults. Sewall et al.

(2020) highlighted associations between depressed mood, heavier iPhone specific SM use, and larger discrepancies between objective assessment and self-reported iPhone specific time on SM. Thus, depressed mood appears to be one factor that may lead to inaccuracy potentially through a lack of motivation. Building on this work, this research examines how identity processes, self-perception, and use of specific SM platforms may also be implicated in the accuracy of self-reported use time and the direction of discrepancies.

1.2.1. SM Platform

Recent surveys of American adolescents and young adults have revealed patterns of frequent and heavy use of Snapchat and Instagram coupled with dwindling Facebook and Twitter engagement (Auxier & Anderson, 2021; Boyle et al., 2017; Hoelzel, 2015; Neal, 2014). Meanwhile, research in the domain of behavior measurement suggests that self-reports of behavioral data are often inaccurate especially if the behaviors in question comprise habitual and indistinct events such as frequency of anger, drinking alcohol, and smartphone use (Schwarz & Oyserman, 2001; Staddon et al., 2013; Tourangeau et al., 2000). Given that recent data suggests that young adults may engage in habitual use of some SM platforms (Instagram, Snapchat) more than others (Facebook, Twitter), it follows that there may also be platform-based differences in the accuracy with which students self-report their use. Likewise, Junco (2013) proposed that students' estimates of their Facebook use may have been inflated by stereotypes and media depictions of young adults as heavy Facebook users. However, since 2013, stereotypes around SM use have shifted considerably with Facebook now recognized as tremendously popular with older adults, and consequentially, less frequented by young people (Gramlich, 2019). In contrast, today's news stories, song lyrics, and television shows more frequently reflect the popularity of Instagram, Snapchat, and other image-based platforms among young people (Djafarova &

Rushworth, 2017; Lim, 2017) potentially making young adults more likely to over-estimate their own use of these popular SM platforms. This prediction is consistent with the finding that behaviors recognized to be normative in the peer group are commonly over-reported in surveys due to identity processes and self-perception. (Brenner, 2012; 2016; 2017).

1.2.2. Reporter Sex

Participant sex and gender may similarly impact the reliability of reporting on SM related behaviors through identity related processes. Females reliably self-report more time on SM than do males (Bányai, et al., 2017; Knight-McCord et. al, 2016; Madden & Zikhur, 2011; Nesi & Prinstein, 2015). However, it remains unknown whether these sex differences in self-reported SM use coincide with objective reality or reflect artifacts of gendered self-perception. For instance, previous findings suggest that females devote more of their online time to maintaining and cultivating interpersonal relationships whereas males tend to be more focused on information-seeking and non-social tasks (Muscanell & Guadagno, 2012). Further, females tend to derive a greater sense of self through the strengths of their social ties and relationships than do males (e.g., Park & Lee, 2014). Thus, it stands to reason that heavy SM use may be perceived as more normative among college females than males, potentially making college females more likely to over-estimate their SM time.

1.2.3. SM Platform Swinging

The majority of young adults today engage in platform swinging, a term coined by Tandoc and colleagues (2019) to describe the regular use of multiple SM platforms and the routine rotation or cycling of engagement between platforms. As a large proportion of the SM research conducted to date has focused on one platform (i.e., Facebook), very little research has examined the cognitive effects of platform swinging. For instance, it is unknown whether

platform swinging reflects habitual behavior or more deliberate and conscious processes. Also unknown is the extent to which platform swingers are able to cognitively distinguish between their time on different platforms. Thus, with regard to SM research methods, a critical question lies in whether platform swinging impedes young adults' ability to accurately report their time across the multiple SM platforms they use. That is, just as multi-tasking on mobile devices has been found to increase recall biases for different app usage categories (Deng et al., 2019; Lee et al., 2017) cycling engagement between a greater number of SM platforms may result in decreased accuracy when self-reporting time on individual platforms.

1.3. The Current Study

Building on Junco (2013), this study recruited a large sample of college students and utilized novel software to track students' active minutes per day of using Facebook, Instagram, Snapchat, and Twitter across their electronic devices (personal computers, tablets, smartphones). Informed by Junco's findings, we predicted that students would exhibit sizable inaccuracies in their self-reported use across platforms (**H1**) with students more likely to overestimate than underestimate their daily use (**H2**). Guided by research on the impact of identity and self-perception in the survey measurement context, poorer accuracy and greater over-estimations of use were expected for Instagram and Snapchat, relative to older platforms Facebook and Twitter, due to heavier actual use of these newer platforms by participants and media representations of young adults as heavy users (**H3**). Extending the same logic, we also predicted that female students would be more prone to inaccuracies and more likely to over-estimate their SM use than male students (**H4**). Finally, we hypothesized that self-reporting use of a greater number of SM platforms during the surveillance period would increase the likelihood of substantially over-estimating time across SM platforms and on any given platform (**H5**).

2. Methods

2.1. Participants

Participants were 320 matriculating college students recruited as part of a larger study investigating SM influences among first-year students at a private, mid-sized western US university. Recruitment took place over a two-week period in July, prior to matriculation. To be eligible for the larger study, students had to be registered as an incoming first-year student, 18 years of age or older, in possession of an Apple or Android smartphone, active on at least one SM platform, and planning to live on campus during their first year. Interested students meeting eligibility requirements were invited to complete baseline assessments until the 320 spots in the study were filled, which occurred in approximately one week. The study's sample was representative of the freshman class at the host university as the mean age of the sample was 18.06 years ($SD = .26$), 63% were female, 48% were Caucasian, 15% were Asian, 10% were African American, 17% were Hispanic, and 9% were multi-racial or other.

2.2. Recruitment and Study Procedures

Prior to the start of the fall semester, the Registrar's office emailed incoming first-year students a link to the larger study's informational website, which detailed all study procedures and included a link to a screening survey that allowed interested students to assess their eligibility. Eligible students were invited to participate and, after providing informed consent, completed a baseline survey. At the end of the baseline survey, participants were prompted to install a custom version of the software application, RescueTime, onto their smartphones, tablets, and personal computers to track their Facebook, Instagram, Snapchat, and Twitter use over a two-week surveillance period. Blind to the RescueTime data being collected from their devices

during this time, participants were texted and emailed a link to complete a short survey at the end of the two-week period. The first page of the survey prompted students to estimate their average daily minutes spent on each of the four SM platforms (Facebook, Instagram, Twitter, and Snapchat) over the previous 2 weeks. Upon submission, participants with Android phones were directed to a personalized dashboard at which they could view their RescueTime SM time tracking data. However, as the RescueTime software application was not fully compatible with iPhones, participants with iPhones were first directed to a survey page which provided instructions for navigating to the application battery usage screen of their iPhone, using battery screen settings to display active SM application use data in minutes per day over the previous 2 weeks, taking a screenshot of the data displayed, and uploading this screenshot into the survey. Following submission, they advanced to the RescueTime dashboard. The university's Institutional Review Board approved all study procedures and measures.

2.3. Measures

2.3.1. Demographics

Participants reported basic demographic information including sex, age, race, and ethnicity.

2.3.2. Objective Daily Time on SM

A custom research version of RescueTime, a commercially available cross-device time management software program, was used in this study to track participants' total minutes of active Facebook, Instagram, Snapchat, and Twitter use on their personal computers, tablets, and smartphones. Participants were required to install the custom application on at least two electronic devices (i.e., personal computers, tablets, smartphones) to track their SM use over a surveillance period spanning the first 2 weeks of August, prior to matriculation. During the

surveillance period participants could not view any of their RescueTime use data. Meanwhile, a data dashboard allowed the research team to check device installs for each participant and export CSV files detailing each participant's total minutes spent actively using Facebook, Instagram, Snapchat, and Twitter applications and related websites across devices. Following the surveillance period, this data was exported and total minutes of active use on each SM for each participant was divided by 14 to calculate an objective measure of average daily minutes spent on each SM platform during the 2-week period. In addition, average daily minutes on each SM were summed to derive an objective measure of total minutes per day on SM.

2.3.3. Supplemental Battery Screen Data (iPhone owners only)

As the RescueTime software application was not fully compatible with iPhones, iPhone owners were required to follow additional steps to ensure that the time they spent actively using the four SM platforms from their phones during the surveillance period could be combined with the data from their other electronic devices logged by RescueTime. After self-reporting their SM use at the end of the surveillance period, iPhone users were directed to a second survey page which provided detailed step-by-step instructions for navigating to the application battery usage screen of their iPhone, manipulating the battery screen settings to display active SM application use data in minutes per day over the previous 2 weeks, taking a screenshot of the data displayed, and uploading this screenshot into the survey. Battery screen data documenting each iPhone user's total minutes of active Facebook, Instagram, Snapchat, and Twitter IOS app usage over the 14-day period was pulled from these screenshots and added to each participant's RescueTime derived total minutes of active use across their other devices (computers, tablets), prior to computing average daily use for each platform.

2.3.4. Self-reported SM use and daily SM use time

Immediately following the surveillance period, participants were sent a brief survey which prompted them to indicate the SM platforms they actively used during the previous 2 weeks from a list which included Facebook, Twitter, Snapchat, and Instagram. Then, for each platform they reported using, participants were prompted to estimate their average minutes per day of active use over the previous 2 weeks. Platform specific daily minute estimates were used individually in analyses, and were also summed to create a composite measure of self-reported daily total time on SM.

2.4. Analytic Plan

First, patterns of SM platform use according to self-report and objective measures are examined via descriptive statistics and t-tests. Then, the prediction that students would exhibit significant inaccuracies in estimating their daily SM use (H1) is dually examined via paired sampled t-tests focused on discrepancies between measures of SM time and bivariate correlations between measures. Next, tests of directional hypotheses H2-H5, which focus on the likelihood of problematic overestimation versus underestimation versus accurate reporting of daily SM time, are evaluated by more meaningfully classifying of participants based on the size and direction of their reporting discrepancies. For each platform and across platforms, participants who self-reported use within +/-9 minutes of their objective assessment are classified as “Accurate”, those who self-reported time 10 or more minutes less than their objective assessment are classified as “Underestimators”, and those who self-reported time exceeding their objectively logged time by 10 minutes or more are classified as “Overestimators”. The predictions that participants would be more likely to overestimate than underestimate their use overall (H2) and be more likely to overestimate their daily time on newer platforms relative to older platforms (H3) are evaluated by comparing proportions of participants classified as Underestimators, Overestimators, or Accurate

Reporters via Chi-Square Goodness of Fit tests. Then to evaluate H4 and H5, multinomial regression models predicting participant accuracy classification (i.e., underestimator, overestimator, or accurate reporter) are examined for each SM platform and across all SM as functions of participant sex (H4) and the total number of SM platforms participants reported using (H5).

3. Results

3.1. Preliminary Analysis

Figure 1 compares the “users” of each SM platform in terms of the percentages of participants who self-reported active use versus objectively logged minutes of active use. Striking here is the observation that greater numbers of participants self-reported active use of Facebook ($n=289$) and Twitter ($n=199$) than objectively logged any time on these platforms (Facebook $n=206$; Twitter $n=150$) during the surveillance period. Meanwhile, for Instagram and Snapchat, which were more widely used in the sample, similar numbers of participants self-reported (Instagram $n=304$; Snapchat $n=297$) and objectively logged use (Instagram $n=301$; Snapchat $n=296$).

Figure 1. Percentages of the sample self-reporting versus logging active use of each SM

As proportionally depicted in Figure 2, the number of SM platforms used by participants significantly differed by assessment type, $t(318)=12.14, p <.001$, with the number of SM platforms used according to self-report ($M=3.41, SD=.77$) exceeding those used according to objective data ($M=2.97, SD=.87$). By sex, male ($M=3.38, SD=.84$) and female ($M=3.43, SD=.72$) participants did not significantly differ in the number of SM platforms they self-reported using, $t(318) = -.61, p=.54$. However, objectively, males ($M=2.84, SD=.95$) logged time on significantly fewer platforms than did females ($M=3.06, SD=.80$).

Figure 2. Number of SM platforms “used” assessed via self-report and objectively logged time

Table 1 presents raw means and standard deviations for objectively assessed and self-reported minutes per day on each SM. Within sets of self-reports and objective assessments, paired samples t-tests examined platform-based differences in minutes per day of active use with significant differences flagged in the overall column. Consistent with recently published SM trends among adolescents and young adults based on self-reported data (Auxier & Anderson, 2021), both sexes self-reported and objectively logged greater daily time on Snapchat and

Instagram than they did on older SM platforms, Facebook and Twitter. Within measurement sets, independent samples t-tests also examined sex-differences in minutes per day of use by SM platform and overall. Consistent with previous self-report findings, relative to males (objective: $M=87.84$ $SD=75.85$), females objectively logged ($M=110.60$ $SD=99.32$) significantly greater daily time on SM, $F(1, 318) = 4.69, p = .03$, with females' greater time on Instagram and Snapchat primarily driving these differences. A parallel but slightly more extreme pattern of sex differences was observed among self-report estimates.

Table 1
Objectively assessed and self-reported daily minutes of active SM use and discrepancies between measures overall and by sex.

	Overall (N=319) <i>M (SD)</i>	Males (N=121) <i>M (SD)</i>	Females (N=198) <i>M (SD)</i>
<u>Objective Measure</u>			
Facebook ^A	11.49 (18.26)*** ^{C, D}	10.34 (20.51)	12.19 (16.75)
Twitter ^B	14.32 (33.65)*** ^{C, D}	14.25 (29.01)	14.36 (36.20)
Instagram ^C	34.42 (37.49)*** ^{A, B}	27.60 (28.12)	38.58 (41.71)
Snapchat ^D	41.75 (43.09)*** ^{A, B}	35.65 (36.43)	45.46 (46.37)
Total SM	101.99 (91.70)	87.84 (75.85)	110.60 (99.32)
<u>Self-Report Measure</u>			
Facebook ^A	18.28 (30.12) *** ^{C, D}	17.00 (29.58)	19.07 (30.49)
Twitter ^B	20.69 (32.75) *** ^{C, D}	18.93 (29.35)	21.76 (34.69)
Instagram ^C	49.96 (52.12) *** ^{A, B}	31.56 (27.82)	61.21 (59.82)
Snapchat ^D	57.51 (68.08) *** ^{A, B}	42.31 (43.18)	66.80 (78.21)
Total SM	146.38 (129.54)	109.80 (87.01)	168.74 (145.44)
<u>Mean^{diff}</u>			
Facebook ^A	-6.83 (28.62)***	-6.65 (27.76)**	-6.93 (29.21)***
Twitter ^B	-6.34 (35.68)**	-4.70 (28.89)	-7.34 (39.29)**
Instagram ^C	-15.53 (55.28)***	-3.95 (29.72)	-22.60 (65.28)***
Snapchat ^D	-15.98 (65.10)***	-6.66 (37.25)	-21.67 (76.87)***
Total SM	-44.60 (137.79)***	-21.95 (78.50)**	-58.45 (162.44)***

Notes. Objective measure and Self-Report Measure blocks in first column indicate significant differences between time spent on the four platforms overall.

In the Mean^{diff} block across the bottom of the table, significant mean differences between Objective and Self-Report Measures

(computed as Objective minus Self-report) are flagged. * $p < .05$, ** $p < .01$, *** $p < .001$ throughout).

3.2. Accuracy of Self-Reported Daily SM Time (H1)

Tests of the mean differences between self-report and objective measures are presented in the bottom of Table 1. Indicating support for H1, overall participants exhibited significant discrepancies in their self-report estimates of SM time overall and on each platform. Although measurement discrepancies went in both the directions, the negative values of discrepancies indicate that the average participant overestimated, rather than underestimated their use of each platform. Correlations provided in Table 2 between self-report and objective measures of daily SM time overall and by sex offer additional support for H1. Tests of differences between male and female-specific correlations by platform and overall are presented in the right-most column of Table 2. The relationship between self-reported and objectively assessed total daily SM time was significantly weaker among females than males ($Z=3.79, p < .001$) and this was primarily driven by females' weaker correlations between measures of daily Instagram ($p=.01$), Snapchat ($p=.003$) time. Thus, females were less accurate than males in reporting their total daily SM time, and this was primarily driven by females' poorer accuracy in reporting their Instagram and Snapchat use.

Table 2.
Bivariate correlations between retrospectively self-reported and objectively assessed daily minutes spent on SM among all participants and self-reported users overall and by sex.

	Overall <i>R</i>	<i>R</i> Males	By Sex <i>R</i> Females	<i>Z</i> Sex <i>R</i> ^{diff}
Facebook	.39***	.43***	.35***	.81
Twitter	.42***	.51***	.38***	1.39
Instagram	.27***	.44***	.21**	2.22**
Snapchat	.32***	.57***	.32***	2.70**
All SM	.26***	.54***	.16*	3.79***

* $p < .05$, ** $p < .01$, *** $p < .001$

3.3. Major Versus Minor Inaccuracies in Self-Report Overall (H2) and by SM platform (H3)

In contrast to raw discrepancies and correlations between measures, our classification of participants as accurate reporters, under-estimators, and over-estimators more meaningfully identified the proportions of participants who substantially and problematically mis-reported their SM time in either direction relative to those who were inconsequentially off only a handful of minutes (See Figure 3). In support of H2, a significantly larger percentage of participants substantially over-estimated (59%) than substantially under-estimated (23%) or accurately reported (18%) their total SM time, $\chi^2(2) = 95.14, p < .001$. Providing support for H3, relative to the numbers of participants who substantially over-estimated their time on older, lesser used platforms, Facebook ($n=80, 25.1\%$) and Twitter ($n=85, 26.6\%$), nearly twice as many over-estimated their time on newer, more heavily used platforms, Instagram ($n=145, 45.5\%$) and Snapchat ($n=157, 49.2\%$), all $ps < .001$.

Figure 3. Percentages of students under-reporting, accurately reporting, and over-reporting their social media use by platform and across all platforms among all participants.

3.4. Is Sex (H4) or # of SM used (H5) related to Likelihood of Over/Under-estimation?

Table 4 presents results from multinomial regression models examining the relative impacts of female sex and the number of SM platforms participants reported using on the likelihood of substantially under-estimating or over-estimating (relative to accurately reporting) total SM time and time on each individual platform.

Table 4

Multinomial regression models predicting the odds of self-report classification (relative to Accurate) for each SM platform as a function of participant sex and total number of SM platforms used.

Platform	Outcome	Predictors	OR	95% CI [OR]	Psuedo R ²
Facebook	Under-estimator	Female Sex	.89	.39 – 2.03	.01
		Number of SM platforms used	1.01	.59 – 1.72	
	Over-estimator	Female Sex	1.36	.79 – 2.33	
		Number of SM platforms used	.96	.69 – 1.35	
Twitter	Under-estimator	Female Sex	1.08	.44 – 2.67	.26
		Number of SM platforms used	6.07**	2.14 - 17.21	
	Over-estimator	Sex	1.19	.67 - 2.13	
		Number of SM platforms used	7.94**	4.10 – 15.37	
Instagram	Under-estimator	Female Sex	1.22	.64 - 2.31	.07
		Number of SM platforms used	1.06	.72 - 1.57	
	Over-estimator	Sex	2.15**	1.29 - 3.59	
		Number of SM platforms used	1.51**	1.08 - 2.10	
Snapchat	Under-estimator	Female Sex	1.92*	1.01 - 3.64	.09
		Number of SM platforms used	1.69*	1.08 - 2.66	
	Over-estimator	Female Sex	2.26**	1.35 – 3.79	
		Number of SM platforms used	1.43*	1.03 – 2.00	
Total SM	Under-estimator	Sex	1.28	.63 – 2.58	.06
		Number of SM platforms used	1.38	.91 – 2.08	
	Over-estimator	Sex	1.43	.78 – 2.62	
		Number of SM platforms used	1.82**	1.26 - 2.60	

* $p < .05$, ** $p < .01$, *** $p < .001$

Suggesting a lack of support for H4, being female was not significantly associated with over-estimating (relative to accurately reporting) total daily SM time when number of SM platforms used was held constant. However, female sex was associated with increased odds of over-estimating daily time on Instagram and both over-estimating *and* under-estimating time on Snapchat. Meanwhile, female sex was not related to likelihood of over-estimating or underestimating time on less used platforms Twitter or Facebook. In support of H5, holding constant sex, reporting use of a greater number of SM platforms was related to significantly greater odds of substantially over-estimating (relative to accurately reporting) total daily time on SM. Results varied somewhat by individual platform. Consistent with H5, using a greater number of platforms was associated with an increased odds of substantially over-estimating daily time on Instagram. Meanwhile, using a greater number of SM platforms was significantly associated with increased odds of both substantially over-estimating *and* under-estimating daily time on Snapchat and Twitter. In sum, as the number SM platforms participants reported using on a daily basis increased, so did the likelihood of committing substantial inaccuracies in self-reporting total SM time as well as time on 3 of 4 the individual SM platforms of focus in this study.

4. Discussion

This study compared objective cross-device SM time-tracking data to self-reported daily SM time in order to investigate whether systematic reporting biases may obscure our understanding of relationships between SM time, wellness, and health behavior in young adults. First, examining the accuracy of self-reported daily time spent on four popular SM platforms individually across electronic devices yielded results largely consistent with those from previous studies focused on use of a specific SM platform on a specific device (e.g., Junco et al., 2013):

inaccuracies were abundant and tended to be in the direction of over-estimation. However, in contrast to recent findings suggesting that inaccuracies in self-report are random and should not be of concern in survey research (Johanannes et al., 2021), this study revealed the likelihood of meaningful overestimation to be a function of both specific SM platform in question and participant sex. As expected, participants were more likely to overestimate time spent on the platforms they used more heavily (e.g., Instagram and Snapchat) relative to those used less (e.g., Facebook and Twitter). Thus, platform-based differences in the accuracy of self-report may simply be a function of daily time spent on a platform (e.g., spending greater time on Instagram and Snapchat may make it more difficult to accurately report daily time on these platforms) rather than cognitive factors or platform characteristics. However, these findings are also consistent with the implicit theory explanation introduced by Junco (2013) nearly a decade ago as well as sources of survey measurement error rooted in social identity and peer norms (Brenner, 2012; 2016; 2017). That is, because pop culture depictions of young people as particularly heavy users of Instagram and Snapchat are plentiful, young adults' estimates of their daily time on these platforms may also be inflated by perceptions of normative use among in-group peers. Similarly, results revealed that females spent more time than males on SM platforms considered normative amongst youth (Instagram and Snapchat) and are also more likely to overestimate their daily time on these SM. These findings are not surprising given that these SM platforms may help satisfy psychological needs that are typically stronger in females than males: cultivating interpersonal relationships (Muscanell & Guadagno, 2012) and deriving a greater sense of self through social ties (e.g., Park & Lee, 2014). Thus, females' greater tendency toward over-estimation may be explained both by their greater time spent on particular SM and perceived gender-specific norms regarding use of those platforms.

Given the ever-expanding SM landscape and young adults tendency toward platform swinging (Tandoc et al., 2019), this study's most important finding may be the link between number of SM platforms used and accuracy of self-reported time on individual platforms. In sum, as the number SM platforms participants reported using increased, so did the likelihood of committing substantial inaccuracies in self-reporting total SM time as well as time on 3 of the 4 individual SM platforms assessed. Thus, it appears that platform swinging does indeed impede young adults' ability to accurately estimate the time they spend on individual SM platforms since cognitive bleed occurs between these online activities. These findings are consistent with those from previous studies linking greater cycling between mobile applications to greater recall bias (Deng et al., 2019; Lee et al., 2017) and taken together suggest that the phenomenon of misremembering time spent on SM may be a broader issue associated with multi-tasking on electronic devices.

4.1. Implications for Social Media Researchers

This study was designed to closely map onto the self-report bias concerns of psychologists and health behavior interventionists increasingly interested in the degree to which cross-device time on one or more popular SM platforms are associated with mental health or health behavior (e.g., depressed mood, disordered eating, high-risk drinking, etc.). Findings suggest that self-report validity concerns in this literature are very much warranted as inaccuracies in self-reported SM time were found to be systematically related to specific SM platform in question, participant sex, and the number of SM platforms used regularly by participants. These findings are concerning as such systematic biases in self-report data may obscure the true relationships between time on SM, wellness, and health behaviors among young adults. For instance, the larger project from which the current investigation was derived

examined prospective relationships between daily time on the four SM platforms during the transition into college in relation to subsequent perceptions of peer drinking norms and drinking behavior later in the school year. When objective data were used in analyses as planned the theorized model was fully supported (see LaBrie et al. 2021a). However, when the model was re-run using self-report survey data from the same participants several key linkages were no longer supported (results available upon request) presumably due to the noise created by the reporting biases identified in the present study. Underscoring the importance of objective assessment in the SM use domain, reliance on only self-report measures would have led to the incorrect conclusion that daily SM time is *not* a predictor of college drinking.

Fortunately, compared to Junco (2013), where less than half of the participants who completed baseline installed the time-tracking software on their computers, the current sample was easily recruited despite objective time-tracking requirements and no participants withdrew from the study due to this or other SM privacy invasive aspects (see also LaBrie et al., 2021b). This suggests that SM privacy concerns among young adults may have faded considerably since 2013 and should encourage researchers to find cost-effective ways to objectively track SM platform time across students' electronic devices. Beyond increased measurement precision, objective SM time tracking methods like those used in this study can also provide insight into the times of day when young adults are most likely to be using specific SM platforms. This information, in turn, may better inform the development and dissemination of social media-based health promotion efforts.

Although supporting a shift toward objective SM time tracking methods, findings also carry implications for researchers limited to using self-report measures to assess daily SM time. That is, a greater understanding of the demographic, personality, and social identity

characteristics systematically related to over-reporting SM time may help researchers for whom objective assessment is not possible to reduce or account for such reporting biases. For example, findings suggest that the accuracy of self-report is higher on SM platforms used less heavily (e.g., Facebook, Twitter). Thus, researchers limited to self-report may prefer to investigate time on these platforms. This study's findings also suggest that a researcher specifically interested in time spent on Instagram in relation to mental health, for example, would be wise to query participants about their time on other SM platforms as well rather than ask questions only about Instagram. Although more research is needed, it may be possible to reduce reporting-related noise in relationships of interest in the analysis stage by including participant-level variables such as sex, number of SM platforms used, and time on other SM platforms in models as covariates.

4.2. Limitations and Future Directions

This study is limited in that data came from sample of first-year students from a single university. However, the sample size exceeded those utilized in previous studies (e.g., Johannes et al., 2021; Junco, 2013), and self-reported daily SM platform use patterns mapped onto national survey data from of 18–24-year-olds (Anderson & Jiang, 2018; Auxier & Anderson, 2021), suggesting that findings may generalize to young adults beyond the current sample. An additional limitation was related to the RescueTime software application used in this study not being compatible with iPhones. This resulted in iPhone users being required to complete additional steps to ensure that the time they spent actively using the four SM platforms from their phones during the surveillance period could be combined with the data from their other electronic devices. To avoid such extra burden among a subset of participants, it will be important for future research to develop and utilize cross-device software programs able to track

participants' SM use more seamlessly across all versions of IOS, Android, and Windows-based operating systems. The current study is also limited in that it did not objectively assess participants' time spent on every SM platform currently available (e.g., TikTok, YouTube, etc.), and instead narrowed focus to the four platforms most widely used by students during the year data were collected (i.e., 2018-2019) and of highest interest among health behavior researchers. Although more research is needed, this study's findings suggest that expanding focus to a larger number of popular SM platforms may lead to even greater reporting inaccuracies among those swinging a greater number of platforms, with these inaccuracies potentially obscuring true relationships between time on SM, well-being, and health behavior. Thus, examining self-report inaccuracies on additional SM platforms and evaluating correlates such as age, sex, social identity, perceived in-group peer norms for platform use, and other SM variables (e.g., motivations for use, passive lurking versus active sharing/interacting etc.), represent important directions for future research that may provide researchers investigating SM time additional insight into survey question optimization and statistical techniques to reduce bias in self-report data.

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