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Time on social networking sites is associated with impulsive decision-making

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ABSTRACT

Almost five billion individuals worldwide use social networking sites (SNSs) such as Instagram, Facebook, Snapchat, and X (formerly known as Twitter). The social rewards obtained on these sites induce users to spend substantial durations of time on them. However, current research demonstrates mixed findings on whether greater time on SNSs is related to riskier decision-making and impulsive tendencies. To address these findings, we conducted an online study ($n = 225$) to assess how time across four SNSs relates to impulsive decision-making in the delay discounting task. We included each trial as an individual choice in a regression model predicting preference for the immediate reward, for a total of 20,265 choices. Greater average time across all SNSs was related with a higher likelihood of choosing the immediate, but smaller, reward. In other words, people who spent more time on SNSs also made more impulsive decisions. When including individual platforms, greater time on Instagram and X, but not Facebook or Snapchat, was related with a higher likelihood of choosing the immediate reward. These findings help clarify prior literature on the relationship between platform specific SNS use and impulsive decision-making. We discuss limitations, directions for future research, and broader implications for the field.

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Social media; social networking sites; impulsivity; delay discounting; temporal discounting; decision making



1. Introduction

Almost five billion individuals worldwide use online social networking sites (SNSs) such as Instagram, Facebook, Snapchat, and X (formerly known as Twitter^a) (Statista 2023). On average, users spend 147 minutes a day on these sites (Statista 2022a), engaging in a wide variety of activities. These activities include, but are not limited to, creating profiles, building a network by connecting/following others, sharing information (e.g. photos), observing others, and providing/receiving feedback (e.g. 'likes'). Many of these activities provide social rewards to users (Meshi, Tamir, and Heekeren 2015), which act as reinforcers, encouraging individuals to spend more time on these sites. While SNSs provide opportunities to connect and engage with others, research demonstrates negative outcomes associated with large amounts of time on these sites, such as poor mental health (Keles, McCrae, and Grealish 2020; Primack et al. 2017) and worsened academic performance (Al-Menayes 2015; Giunchiglia et al. 2018). In addition to these negative outcomes, researchers have investigated impulsive, risky

decision-making in individuals with greater use of SNSs.

Impulsivity involves a propensity towards hasty, immediate actions without regard for future consequences (Moeller et al. 2001). As a behaviour, impulsivity can be characterized as a preference for more immediate rewards, despite potentially larger risks, an aspect of risky decision-making often referred to as 'impulsive choice' (Stevens et al. 2014). Researchers use decision-making tasks to assess impulsivity, such as the commonly employed delay discounting task (DDT). In the DDT, participants make monetary decisions between smaller, immediate rewards, and larger, delayed rewards. A greater preference for smaller, immediate, rewards is considered an index of impulsive decision-making (for review see Moreira and Barbosa 2019). Myriad studies have linked impulsivity to a variety of psychiatric, personality, and behavioural disorders, including but not limited to, substance use dependency, ADHD, and borderline personality disorder (Moeller et al. 2001).

Recently, researchers have begun to explore the relationship between SNS use (e.g. time spent on these

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platforms) and impulsivity (Zahrai et al. 2022), especially through performance in the DDT. In one study, researchers assessed time spent on SNSs with a single question which asked participants to self-report time spent across all social media platforms. The results demonstrated that individuals who spend more time on SNSs are more impulsive, preferring more immediate rewards at the expense of larger, delayed rewards (Hayashi and Glodowski 2023). In a separate study, researchers specifically investigated time spent on Instagram, also captured by self-report. Here, time spent on Instagram was not significantly related with performance on the DDT (Schulz van Endert and Mohr 2022). Due to this limited extant research on SNSs and impulsivity, we can also look at the smartphone literature for insights into the former relationship, as people use smartphones to access SNSs. For example, greater frequency of specifically smartphone-based SNS use was associated with greater impulsivity, as assessed with the DDT (Wilmer and Chein 2016). In addition, a separate study used the DDT to reveal that greater overall time on smartphones was related with greater impulsivity (Schulz Van Endert and Mohr 2020). Furthermore, these authors divided smartphone screentime by application type, and established that greater social media use was also related with greater impulsivity in the DDT.

With the above in mind, it appears that the more time an individual spends on SNSs, the more impulsive their decision-making. However, this relationship doesn't seem to hold when assessing time on individual platforms (e.g. Instagram). Therefore, we designed the current study with the goal of clarifying these seemingly mixed findings – we set out to investigate both overall time spent on SNSs, as well as time spent on several individual platforms, in relation to impulsive decision-making in the DDT. We hypothesize that participants who spend more overall time across SNSs will demonstrate greater impulsive decision-making in the DDT, indexed as a greater preference for more immediate rewards and a devaluing of larger, delayed rewards. In addition, we explore whether relationships between time using an SNS and impulsivity will differ for each individual platform. To address our aims, we asked participants to self-report their time spent on four popular SNS platforms (Instagram, Facebook, Snapchat, and X) and complete an extended version of the DDT. We then related participants' average time spent across all SNSs with DDT performance. In addition, we also investigated time on each platform individually in relation to DDT performance. Overall, our research aims to disentangle the individual and collective relationships of SNS platforms on impulsive decision-making.

Table 1. Summary of demographic characteristics and descriptive statistics (N = 225).

Variables	M (SD) or N (%)
Age	21.5 (3.4)
Gender	
Male	114 (50.7%)
Female	111 (49.3%)
GPA	3.20 (0.47)
Average Time on SNSs (min)	119.2 (55.8)
Time on Instagram	151.4 (104.6)
Time on Facebook	102.8 (69.8)
Time on Snapchat	131.2 (97.0)
Time on X	91.5 (76.9)

Note: SNSs = social networking sites.

2. Methods

2.1. Participants

Participants were recruited from an online participant pool at a large Midwestern U.S. university and received course credit for their participation. All participants received the same credit for this study, regardless of performance, and had the ability to delegate credit to a course of their choosing. To participate, individuals needed to be at least 18 years of age and use at least one SNS (Instagram, Facebook, Snapchat, or X). The final sample consisted of 225 participants (114 female, 111 male), after excluding 37 participants who failed an attention check (see below), and three participants who reported spending over 24 hours per day on SNSs. On average, participants were 21.4 years old ($SD = 3.4$). Please see Table 1 for the complete demographic characteristics of the sample.

2.2. Procedure

With the use of an online survey (Qualtrics), participants first provided informed consent. They then provided demographic information (age, gender, and GPA), completed our measures assessing time spent using SNSs, and performed our DDT. Two attention-check questions were included within the survey, one after the demographic items and another after the SNS items, to ensure that participants carefully read each question. These were common-sense questions (e.g. the city where the university is located). In addition, five attention check questions were distributed within the DDT (e.g. offered \$300 as the immediate reward and \$200 as the delayed reward). All procedures were approved by Michigan State University's Institutional Review Board (STUDY00001607).

2.3. Measures

2.3.1. Time on SNSs

We assessed participants' average daily time spent on four different SNSs. To do this, participants were

asked to report the amount of time per day spent on each platform (Instagram, Facebook, Snapchat, X) across all devices (e.g. desktop/laptop, mobile phone, tablet, etc.). Responses for each site were presented via two drop-down menus for hours and minutes respectively – response options included ‘don’t have an account,’ and sequentially discrete whole numbers between 1-24 hours and 1-60 minutes. We converted hours to minutes and added this value to participants’ responses to the minutes item. The sum yielded each participant’s time on each SNS. We then computed the average, overall time each participant reported spending across all four SNSs by adding the total minutes for each platform and dividing by the total number of platforms used. Please see Table 1 for the means and standard deviations of these measures.

2.3.2. Delay discounting task

We measured impulsive decision making with the DDT. This task assesses impulsivity, operationalized as a preference for immediate rewards at the expense of more beneficial long-term rewards (Rachlin, Raineri, and Cross 1991). Participants completed a total of 110 trials where they were asked to choose between an immediate and delayed reward. Immediate rewards were consistent in the time delay (immediate/no delay) but varied in the amount of money offered. The amount of immediate money increased sequentially from \$10 to \$190 in \$10 increments, with the last two choices being \$198 and \$199 respectively. Delayed rewards were consistent in the amount of money allocated (\$200) but varied in the time delay to receive the reward. The time delay varied between five time periods: 1 week, 1 month, 6 months, 1 year, or 3 years. The following is an example item on our DDT: ‘Which do you prefer: \$130 today or \$200 in 1 year?’

2.4. Statistical analysis

All analyses were performed in R (R Development Core Team, 2020). To assess the relationships between SNSs and impulsivity, we performed two trial-level multiple logistic regressions. The first regression predicted participants’ choice of the immediate reward in the DDT with trial terms (delay interval, immediate reward amount), average time on SNSs, and demographic information (age, gender, and GPA) as predictors. The second regression was identical to the first with the exception of the inclusion of the four separate SNSs as individual predictors in place of average time on SNSs. Of note, the delay interval was log-transformed, and we used this transformed data for all analyses. Every trial of each participant was included in our

analysis as a separate choice, for a total of 20,265 choices. This trial-level approach enabled us to investigate more nuanced relationships and interactions between variables. Furthermore, this analysis enables a larger sample size and greater power beyond summarizing all choices of each participant to a single data point, resulting in higher confidence in potential findings. Gender was coded as a categorical variable (male = 1, female = 0). Age, GPA, and average time on SNSs were all z-scored, therefore coefficients reflect differences from their respective averages.

3. Results

Descriptive statistics for all demographic characteristics and variables of interest are presented in Table 1. Overall, participants reported spending an average of 119.2 minutes a day ($SD = 55.8$) across the four different SNSs. Time differed by specific site, with participants spending the most time on Instagram ($M = 151.4$ min, $SD = 104.6$) and the least time on X ($M = 91.5$ min, $SD = 76.9$). Of the 225 total participants, the majority (156; 69.3%) reported using all four SNSs assessed in the current study, with 41 participants (18.2%) using three SNSs, 19 participants (8.4%) using two SNSs, and 9 people using one SNS (4.1%).

To address our hypothesis, we first conducted a logistic regression predicting participants’ choice of the immediate reward in the DDT from average time on SNSs (Table 2). For average time across all SNSs, our results demonstrate that the task functioned as expected – the longer the delay interval ($\beta = .190$, $p < .001$) and greater the immediate reward amount ($\beta = 1.233$, $p < .001$), the greater the likelihood of participants choosing the immediate reward. In addition, average time on SNSs was significantly related with preference for the immediate reward ($\beta = .220$, $p < .001$). In other words, participants who spent more time on SNSs were more likely to make impulsive choices. Age and GPA were also significant predictors, with greater

Table 2. Logistic regression predicting choice for the immediate reward ($n = 20,265$).

Independent Variables and Covariates	β	SE	95% CI		p -value
			LL	UL	
(Intercept)	1.518	0.037	1.446	1.589	<.001
Age	0.319	0.037	0.245	0.392	<.001
Gender	-0.033	0.027	-0.085	0.019	0.221
GPA	-0.122	0.027	-0.178	-0.068	<.001
Delay Interval	0.190	0.016	0.158	0.222	<.001
Immediate Reward Amount	1.233	0.031	1.165	1.288	<.001
Average Time on SNSs	0.220	0.028	0.164	0.275	<.001

Note: CI = Confidence Interval, LL = Lower Limit, UL = Upper Limit, SNSs = Social Networking Sites. Gender was coded as Male = 1, Female = 0.

Table 3. Logistic regression predicting choice for the immediate reward from each individual SNS ($n = 20,265$).

Independent Variables and Covariates	β	SE	95% CI		p -value
			LL	UL	
(Intercept)	1.533	0.037	1.461	1.606	<0.001
Age	0.362	0.039	0.285	0.439	<0.001
Gender	-0.010	0.027	-0.064	0.043	0.702
GPA	-0.129	0.027	-0.183	-0.076	<0.001
Delay Interval	0.192	0.016	0.159	0.224	<0.001
Immediate Reward Amount	1.239	0.032	1.177	1.301	<0.001
Time on Instagram	0.219	0.033	0.155	0.283	<0.001
Time on Facebook	-0.033	0.032	-0.095	0.029	0.295
Time on Snapchat	0.053	0.030	-0.007	0.112	0.084
Time on X	0.210	0.028	0.155	0.264	<0.001

Note: CI = Confidence Interval, LL = Lower Limit, UL = Upper Limit, Gender was coded as Male = 1, Female = 0.

age ($\beta = .319$, $p < .001$) and lower GPA ($\beta = -.122$, $p < .001$) indicating a preference for the immediate reward on any individual trial.

To address our research question, we conducted a logistic regression predicting participants' choice of the immediate reward in the DDT from self-reported time on each SNS as separate predictors (Table 3). Greater time on Instagram ($\beta = .219$, $p < .001$) and X ($\beta = .210$, $p < .001$) were significantly related with preference for the immediate reward. Time on Facebook and Snapchat was not significant (p 's $> .05$). In other words, participants who spent more time on specifically Instagram and X were more likely to make impulsive choices.

4. Discussion

The current study investigated the relationship between time on SNSs and impulsive decision-making with the DDT using a trial-level analysis of intertemporal choice. We hypothesized that individuals who spend more average time across SNSs would also demonstrate greater impulsive decision-making on the DDT. We confirmed our hypothesis, as individuals who reported spending more average time across four different SNSs (Instagram, Facebook, Snapchat, X) displayed a greater preference for immediate rewards, and hence greater impulsivity. Our findings align with one previous study on the DDT and time on SNSs, and two studies on the DDT and smartphone time/ smartphone-based SNS use. For example, one study also found greater time on SNSs to be related with greater impulsivity on the DDT (Hayashi and Glodowski 2023). However, whereas Hayashi and Glodowski (2023) demonstrated greater impulsive decision-making in male excessive social media users compared to females, we found no relationships between gender and decision-making on the DDT. Furthermore, our research aligns with

research on smartphone use which demonstrates greater time on both smartphones and smartphone-based SNSs to be related with greater impulsivity in a DDT (Schulz Van Endert and Mohr 2020; Wilmer and Chein 2016). Finally, our findings contribute to, and complement, related avenues of research on problematic social media use. Various studies on problematic social media use, a maladaptive use of SNSs, establish problematic use to be related with greater impulsive choices on DDT (Delaney, Stein, and Gruber 2018) and a variety of other risky, or impulsive, decision-making tasks such as the Iowa Gambling Task and Wheel of Fortune Task (Meshi et al. 2019, 2021). Overall, when time on SNSs are assessed as an average across multiple platforms, our findings contribute to a larger body of literature which established significant, positive, links with impaired decision-making.

We also explored the relationships between time spent on individual SNSs and impulsive decision-making in the DDT. To the best of our knowledge, this study is the first to collect time estimates of multiple, individual, SNSs separately and analyze them with respect to impulsivity. We found differences relationships with impulsivity across different SNSs, with a direct, positive relationship between greater time on Instagram and X and greater impulsive decision-making, but not time on Facebook or Snapchat. Therefore, individuals who spent more time on these two SNSs in particular demonstrated more impulsivity. Of note, our significant findings with Instagram contrast with another study that found no significant relationships between time on Instagram and performance in two versions of the DDT (Schulz van Endert and Mohr 2022). To explain, these researchers used monetary rewards in one DDT and social media-based rewards (e.g. number of likes or followers on Instagram) in another DDT. Time on Instagram was not significantly related with performance in either the monetary or social media DDT (Schulz van Endert and Mohr 2022). Of note, the two DDTs in this study consisted of 27 questions, whereas the current study employed a 110-question version of the DDT. In addition, the other study was conducted with a German sample, while the current study was conducted with American participants. Taken together, these differences may explain the discrepancy between our significant finding and the previous study's non-significant findings. Overall, in an attempt to interpret our findings across the four different platforms we assessed, we speculate that there may be content or functionality differences between these platforms (Instagram/X vs. Facebook/Snapchat) that either induce impulsivity in users, or attract users with greater impulsivity. Future

research looking at platform content and functionality differences, as well as user personality differences, will likely be able to better tease apart these relationships.

The current study has several limitations. First, our data is cross-sectional, which does not permit us to test for causal relationships. It could be that greater time on SNSs leads individuals to develop more impulsive, decision-making tendencies. However, it could also be that individuals who already display impulsive decision-making tendencies seek out and spend more, on SNSs. Future research can address causality through a longitudinal research design. Second, our study relies on self-reported estimates of time spent across four different SNSs. Prior research reports recall biases and inaccuracies in self-reported time spent on SNSs, with individuals often overestimating their screentime (Boyle et al. 2022; Parry et al. 2021). While some research captures both self-reported time and time metrics on smartphone devices (e.g. Schulz Van Endert and Mohr 2020), it is worth noting that even device metrics may not accurately capture all SNS use (e.g. use on internet browsers). Future research can address these limitations by either using a combination of self-report and device metrics or assessing time spent on SNSs at multiple different timepoints. Third, our participants were a convenience sample of all college-aged students which limits the generalizability to other populations. However, as college-aged individuals display high use of most SNS platforms (Statista 2022b), understanding SNSs use in this particular population is important. Regardless, future research can address these relationships in different age groups and other diverse demographics to assess whether these findings may change.

In the present work, we found that greater time spent on SNSs is related to greater impulsive decision-making. Specifically, participants who report more time spent on SNSs also demonstrated higher preferences towards immediate, but smaller, rewards at the expense of delayed, but larger, rewards. In addition, when analyzing each SNS individually, participants who reported greater time on Instagram and X also demonstrated higher preferences towards immediate, but smaller rewards, whereas time on Facebook and Snapchat were not significantly related to participants' impulsive decision-making. These findings emerged after analyzing each individual trial and decision as a separate choice across a total of 20,265 choices, which helps better identify nuances in individual intertemporal preferences. This study demonstrates that testing the relationship between individual SNSs and decision-making may be contingent on the specific platform choice, as only some platforms demonstrate significant

relationships. Therefore, researchers should take caution in choosing theoretically or experimentally relevant SNSs if not analyzing SNSs collectively. In addition, we assessed SNS time across four separate platforms and employed significantly more trials (110 trials) than previous studies of the DDT. Overall, these results align with a pattern in the literature which supports a relationship between the greater use of SNSs, and technology that accesses SNSs, and impulsive decision-making.

Researchers now have baseline support for investigating more nuanced relationships between SNSs and decision-making. For example, our findings could inform potential intervention points for those interested in reducing impulsive decision-making through SNSs by reducing average time spent on them. This could be achieved by having individuals intentionally reduce their overall time on SNSs, or time on specifically Instagram and X. Furthermore, clinicians, policymakers, teachers, and parents interested in SNSs or impulsivity should be aware of these relationships. For example, policymakers now have support for a potentially detrimental relationships between the SNS use of multiple platforms and impulsive decision-making. While the nature of this research prevents any causal claims or speculation as to the directionality of this relationship, it remains apparent that greater use of SNSs is linked with aspects of impulsive, riskier decision-making.

Authors' contribution

DP: data analysis; manuscript writing; KML: manuscript writing; manuscript revision; DF: project supervision; data analysis; manuscript revision; DM: study conceptualisation; project supervision; manuscript revision.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

Data will be made available upon request.

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