Emerging Adults’ Exposure to and Postings About Substance Use on Social Media: An Observational Study

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Abstract
In a community sample of emerging adults (N = 232), this study (a) assessed participants’ exposure to and postings about alcohol, cigarettes, e-cigarettes, and marijuana across social media platforms, (b) investigated how exposure to and posting about text versus visual substance-related content differentially relate to one’s own use, and (c) tested if exposure to versus posting about substances differentially relate to use. Data were collected via cross-sectional, daily, and observational methods. Participants were frequently exposed to substances on social media. Postings were less common, with Snapchat a notable outlet. Visual posts were somewhat more prominently linked to one’s own use than text posts. Posting about substances tended to be more strongly associated with own use than exposure, but this did not necessarily replicate with observed assessments. Social media platforms are key for emerging adults to encounter and post about substance use content, with implications for emerging adults’ own substance use.

Keywords
social media, alcohol, cigarettes, e-cigarettes, marijuana

Introduction
Emerging adults are heavy consumers of social media, with Snapchat, Instagram, and TikTok particularly popular (Auxier & Anderson, 2021). Numerous studies confirm that emerging adults post about and are exposed to content about substance use on social media, and that postings and exposure are linked to their own use of substances (Curtis et al., 2018; Groth et al., 2017). Indeed, exposure to social media substance content is more strongly linked with use than exposure to substance content depicted in traditional media formats, such as television (Depue et al., 2015; Geusens & Beullens, 2021a). Despite our growing knowledge, several limitations and unanswered research questions remain.

First, many studies are limited to self-report assessments of postings, which may not accurately reflect emerging adults’ substance use postings (Geusens & Beullens, 2021b, 2021c). Second, studies that use observational methods are often restricted to a single platform (e.g., Facebook) and focused on content uploaded to participants’ main profile pages. Features such as stories are increasingly popular on platforms such as Instagram and Snapchat. Third, most previous studies have focused on a single substance, usually alcohol. With recent shifts in the prevalence of e-cigarette use (Schulenberg et al., 2020) and rapid changes in the legality of marijuana use in the United States (Hartman, 2021), consideration of other substances is needed. Additionally, although numerous studies have observationally coded the presence of alcohol content on social media (e.g., Moreno et al., 2021), observations of other substances are rarer. Fourth, many studies of emerging adults have drawn from college student convenience samples. Both substance use (Schulenberg et al., 2020) and posting about substances (George et al., 2021) differ by student status. Research using community samples is needed for a more complete investigation about substance-related content on social media.

The current research investigated the following aims. First, we examined the extent to which a community sample of emerging adults is exposed to and posts about substances across platforms, by collecting retrospective self-reports and daily reports. We included observations of Instagram,
Emerging adulthood and Substance Use

Emerging adulthood is a time of exploration and possibility (Arnett, 2000). These elements may enhance the likelihood of substance use (Arnett, 2005), with accessibility increasing and use peaking during this period (Sussman & Arnett, 2014). For some emerging adults, substance use represents a component of identity exploration (Arnett, 2005), in which they can explore the extent to which substances contribute to their sense of self. This exploration may manifest on social media platforms, such as by joining a working environment with older individuals who engage in more substance use, or finding themselves socially isolated from those who do not engage in use. For example, the identity shift perspective (Gonzales & Hancock, 2008) suggests that posting about substances on social media can result in internalizing this self-presentation, which may consequently increase substance use over time (D’Angelo & Moreno, 2019).

Emerging adulthood is also a period of numerous social transitions, with young people navigating new social contexts including college or the workforce (Arnett, 2000). As social reasons are often voiced as a major motive for substance consumption, such as alcohol use (Kuntsche et al., 2005), substance use may play a role in substance use. The college environment might be particularly potent, as college cultures often promote substance use (especially alcohol use) as normative and central to the college experience; those who do not engage in use may find themselves socially isolated (Tan, 2012). Non-student emerging adults may likewise find themselves in social contexts with evolving substance norms, such as by joining a working environment with older individuals who engage in use. With these new social contexts, the norms surrounding substance use may be unclear (Moreno et al., 2014). Emerging adults can utilize social media to gain an understanding of how substances are valued, viewed, and used among new peers. Substances are often portrayed favorably on social media (Beullens & Schepers, 2013; Erevik et al., 2018; Rutherford et al., 2022) and receive more likes compared to non-substance use posts, signaling social approval (Kurten et al., 2022). It is therefore critical to understand how emerging adults are exposed to others’ social media substance postings, as this exposure may play a key role in emerging adults’ own substance use.

On the one hand, the exposure to others’ substance content may influence the perception that substance use is approved, which in turn is associated with increased substance use (Nesi et al., 2017). This path is in line with social cognitive theory, which suggests that one’s own behavior is shaped by the observation of others’ behavior (Bandura, 2001). Indeed, exposure to unknown peers’ alcohol portrayals on Facebook increases willingness to use (Litt & Stock, 2011), and exposure is associated with greater overestimation of the extent to which peers are drinking, which in turn is linked with greater drinking behavior (Brunelle & Hopley, 2017). Moreover, many substance-related posts depict social gatherings (Hendriks et al., 2018a), which may signal to emerging adults navigating new social contexts that substance use is connected to social acceptance, consequently increasing use. On the other hand, uses and gratifications theory posits that media consumers are active in selecting the content with which they interact (Quan-Haase & Young, 2014), indicating that emerging adults who already engage in substance use may select social media content depicting substances. Similarly, emerging adults who engage in higher substance use may also have more acquaintances and friends who engage in substance use (Windle & Windle, 2018); as social media is commonly used to connect with peers (Reich et al., 2012), emerging adults may consequently be exposed to this content online.

Aim 1: Social Media Substance Use Content by Platform

Most previous studies examining substance use content on social media, including observational studies, have focused on Facebook (e.g., Moreno et al., 2014), although a growing number have examined Instagram (e.g., Geusens & Beullens, 2021b, 2021c). There is evidence that how substances are depicted online varies by platform, with alcohol depicted more favorably on Instagram and more negatively on Snapchat (Boyle et al., 2017). Moreover, strength of associations with use may vary, with the association between exposure to alcohol content and drinking strongest for Snapchat, then Instagram, and finally Facebook (Boyle et al., 2016). As Snapchat and Instagram are especially popular among emerging adults (Auxier & Anderson, 2021), exposure to and posting about alcohol and other substances on these platforms may simply reflect their higher use frequency. Alternatively, emerging adults may be attracted to the ephemeral features that both platforms have through the story feature, particularly to display more problematic substance use (Vanherle et al., 2022a). With stories, users upload content that is erased after a short period of time, up to 24 hours. Some evidence suggests that college students report the greatest exposure to alcohol content on Instagram stories (Vanherle et al., 2022b); however, other evidence indicates Facebook references are more common than Snapchat or Instagram references (Vranken et al., 2020).

We examined the extent to which emerging adults are exposed to and post about substances (alcohol, cigarettes, e-cigarettes, marijuana) on several major platforms. We asked the following question, with no formal hypotheses posited due to inconsistencies in past research:

Research Question 1: How does exposure to and postings about substance use vary by social media platform?
Aim 2: Text versus Visual Posts with Associations with Use

The modality of a social media post (i.e., text vs. visual) may differentially relate to substance outcomes (Strowger & Braitman, 2022). Although text and visual exposure and postings tend to be highly correlated (Miller et al., 2014; Vanherle et al., 2022a), social media users may post more visual portrayals of alcohol content than text content on Facebook (Beullens & Schepers, 2013; Hendriks et al., 2018b; Miller et al., 2014; Van Hoof et al., 2014). In turn, exposure to visual portrayals of substance use may be more strongly associated with smoking and alcohol consumption than exposure to communication about substances (Huang et al., 2014; Miller et al., 2014). Other evidence suggests that exposure to alcohol text content may be more critical for alcohol use, whereas exposure to tobacco visual content may be more critical for tobacco use (van Hoof et al., 2014). Another study found that text and visual content vary based on exposure and posting: exposure to text content (and not photo content) was associated with alcohol consumption, whereas posting visual content was more strongly associated with alcohol consumption than posting text content (Vanherle et al., 2022b). We posit the following research question; again, no formal hypotheses were formulated due to these inconsistent past research findings:

Research Question 2: Does exposure to and postings about text versus visual substance use content differentially relate to one’s own substance use?

Aim 3: Exposure to Versus Posting About Substances and Associations with Use

Although exposure to substance-related content on social media is more common than posting about substances (Brunelle & Hopley, 2017; Geusens & Beullens, 2018; Hébert et al., 2017), studies typically demonstrate that posting about use is more strongly linked with substance use outcomes (Erevik et al., 2017; Geusens & Beullens, 2018; 2019; Richner et al., 2021). We test these associations using several sources of data, with the following hypothesis:

Hypothesis 1: Posting about substances on social media is more strongly linked with use than exposure to substance-related content on social media.

Method

Participants

Participants were recruited from a sample enrolled in an ongoing longitudinal study examining adolescent and emerging adult development. At Wave 1 (2015), 2,104 adolescents were recruited from public schools and were representative of the North Carolina state public school population in terms of gender, race/ethnicity, and socioeconomic status. The current sample was recruited from adolescents who participated at the most recent wave (2020) and who were 18 years or older (n = 610) at the time of recruitment, due to the sensitive nature of the study and to increase variability in reported substance use. A power analysis using G*Power indicated that a sample size of 193 was needed to detect a bivariate association of .201 with 80% power and a p-value of .05. Siblings of participants in the ongoing longitudinal study were also welcomed to participate (n = 6). Two hundred and forty-two participants began the baseline survey, with 232 completing at least 50% of the survey and retained for analyses. Participants were between the ages of 18 and 24 and were, on average, 18.91 years old (SD = 0.97). The sample was 61% female and 60% White, 19% Black/African American, 11% Hispanic, and 10% Multiracial/Other. Information on how the sample differed from past waves is in the supplement.

Procedure

Study recruitment occurred from June to November 2021. Participants were emailed and text messaged a link providing information about the study and a consent form. Participants who opted in were directed to the baseline survey. At the completion of the baseline survey, participants who reported having Instagram, finsta (defined as an Instagram account that was private except for to a select few), Twitter, and/or Snapchat accounts were sent “follow” requests to each account from the study team. Table 1 shows that a large majority of participants’ accounts were successfully followed. The first daily survey and observation of social media story content (for Instagram, finsta, and Snapchat) started the following day and continued for seven days. Participants received reminders the morning of the first day if any follow requests were not yet accepted. The day after the seventh day, an additional observation of posts made to “main” pages for Instagram, finsta, and Twitter was conducted. All accounts were unfollowed the next day and all non-participant identifiable information (e.g., usernames) were redacted in study records. Participants received up to $50 for completing the study, with compensation pro-rated depending on extent of study completion.

Measures

Baseline Survey (Day 0)

Demographics. Participants reported their age, race/ethnicity, gender identity, and student status (73% college or professional; 3% high school; 24% not a student).

Social Media Use. Participants reported if they had an account for Instagram, Snapchat, Twitter, TikTok, Facebook, YouTube, and Reddit. For the purposes of the observational component of the study, participants who indicated using Instagram, Snapchat, and Twitter were asked to provide their
Table 1. Frequencies of Observations of Substance Use Postings on Social Media.

<table>
<thead>
<tr>
<th></th>
<th>Accounts followed</th>
<th>Prop sub posts</th>
<th>Alcohol</th>
<th>Cigarette</th>
<th>E-cigarette</th>
<th>Marijuana</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twitter past year</td>
<td>85/109 (78%)</td>
<td>7/1047 (0.7%)</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Instagram past year</td>
<td>187/202 (93%)</td>
<td>41/1168 (4%)</td>
<td>34</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Finsta past year</td>
<td>34/38 (89%)</td>
<td>32/444 (7%)</td>
<td>19</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Snapchat daily</td>
<td>155/185 (84%)</td>
<td>17/195 (8%)</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Instagram daily</td>
<td>186/202 (92%)</td>
<td>15/244 (6%)</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Finsta daily</td>
<td>33/38 (87%)</td>
<td>1/24 (4%)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note. Accounts Followed represents the proportion of accounts followed relative to total number of participants who reported having an account for a given platform. For example, 109 participants reported having a Twitter account at baseline and 85 of these accounts were successfully followed (for a 78% success rate). Because we did not assess finsta account ownership and instead gave the option for participants to provide this account information, it is unclear how many participants had a finsta account but opted out of sharing this information. Two fewer participants are reported for Instagram and Snapchat compared to Table 2 because two participants did not submit their baseline survey and therefore follow requests were not sent. Prop Sub Posts represents proportion of observed posts relative to total observed posts that included a substance use reference. For daily posts, most participants were successfully followed for all 7 days of the study period (see supplement).

account handles for each platform. Those who indicated using Instagram were also asked to report their account handle if they had a finsta account. Because it is possible to access some platforms without having an account, participants were told to include platforms that they did not have an account for but still accessed fairly regularly. For platforms in which participants indicated they held accounts/used, they were directed to open-ended items assessing estimated number of minutes spent on each platform (see Supplement).

Substance Use. Participants reported if they ever used alcohol (more than a few sips), marijuana/hashish, cigarettes, and e-cigarettes. Those who answered affirmatively answered follow-up questions assessing past year use (1 = Never; 10 = Multiple times a day). Those who reported never use on any substance were recoded as ‘1’ for past year use. Lifetime prevalence rates were: 60% alcohol, 13% cigarette, 31% e-cigarette, and 44% marijuana.

Self-Reported Exposure to Social Media Substance Postings. To assess exposure, participants were instructed to think of posts other than advertisements. For each substance (alcohol, cigarettes, e-cigarettes, marijuana), participants were asked how often they saw the substance depicted in a) text postings (defined as status updates, tweets, or comments) and b) visual postings (defined as photos or videos; 1 = Never, 6 = Every Day). For each substance that participants reported affirmatively for either text or visual postings (or both), they were asked to report how often they posted about that substance on each of the assessed platforms: Instagram, Snapchat, Twitter, TikTok, Facebook, YouTube, Reddit (1 = Never, 6 = Every Day). These questions did not distinguish between text and visual postings.

Peers’ Substance Use. Participants were asked how many of their (a) friends and (b) peers (defined as people their age who they are not friends with) use each alcohol, cigarettes, e-cigarettes, and marijuana. Response options ranged from 1 (None) to 5 (All). Items were combined within-substance to form composites of general perceptions of peer use per substance. This variable was included as a covariate for Aim 3.

Daily Surveys (Days 1–7). Five-minute daily surveys were texted or emailed (participants indicated their preference at baseline) nightly at 9:00 p.m. Participants were instructed to complete the survey before bed, but no later than 4:00 a.m. Out of the 232 participants who completed at least 50% of the baseline survey, 229 reached the end of the survey and received links to the daily surveys as well as follow requests for relevant reported accounts. Twenty participants (9%) did not complete any daily surveys. The 209 who completed one or more surveys answered 74% of survey prompts.

Substance Use. Participants reported if they consumed each alcohol, cigarettes, e-cigarettes, and marijuana the previous day.

Self-Reported Exposure to Social Media Substance Postings. Participants indicated how often they saw each alcohol, cigarettes, e-cigarettes, and marijuana depicted in (a) text and (b) visual postings on social media (1 = Not at all, 4 = In most posts), with an option to indicate that they did not use social media that day; these responses were coded as missing. Participants then indicated which platforms (Instagram,
Snapchat, Twitter, TikTok, Facebook, YouTube, Reddit) they used that day. For each platform used, participants reported how frequently they saw a given substance depicted in postings on that platform (1 = Not at all, 4 = In most posts). These items did not distinguish text and visual postings.

**Daily Observation (Days 1–7).** Out of 229 participants who were invited to participate in the daily component of the study, 200 had at least one account successfully followed. Of the remaining 29, 17 did not report having an account on any platforms of interest and 12 did not allow any account access. Additionally, 196 had at least one account successfully followed for access to story content during the 1-week daily period. Participants’ Snapchat, Instagram, and finsta stories were checked at the same time every day during the daily period. Research assistants captured new content through screenshots and screen recordings and uploaded content to a secure folder. Daily survey completion and success in following accounts was generally not associated with key variables (see Supplement).

**Past Year Retrospective Recordings (Day 8).** Research assistants captured any content uploaded to participants’ “main” Instagram, finsta, and Twitter pages over the past year. To avoid research assistant fatigue, only the most recent 25 posts and up to 50 comments were captured. The 25-post cutoff was met for 7% of Instagram accounts, 38% of finsta accounts, and 39% of Twitter accounts. We were particularly interested in Instagram and Snapchat due to their popularity among the targeted sample, and also included Twitter to study a platform that is more heavily text-based (whereas Instagram and Snapchat are more heavily visually-based). We opted not to follow postings made on other popular platforms (Facebook, TikTok, YouTube) because pilot focus group discussions indicated that postings on these platforms are rare; therefore, we focused our efforts on platforms where posting are more common (particularly with story features on Instagram and Snapchat).

**Coding.** Two trained research assistants examined screenshots and screen recordings for the presence of substance-related content. Research assistants overlapped on 25% of participants to evaluate reliability ($\kappa = .70$). A codebook was developed to guide the identification of substances, based on past research (Jensen & Hussong, 2021; Moreno et al., 2014). To be counted as depicting substance use, a portrayal had to be (a) unambiguous (e.g., an empty cup at a party would not be counted, but an empty cup at a party with the caption suggesting alcohol consumption would), and (b) not situated in a broader sociopolitical context (e.g., posts in which participants criticized inequalities in drug incarceration rates were not counted).

**Analytic Plan**

For Aim 1, frequencies were computed. For Aim 2, bivariate correlations were computed, and tests of dependent $r_s$ assessed whether visual versus text content was more strongly associated with one’s own substance use. For Aim 3, linear regression models were used to examine associations between exposure to and postings about substances and one’s own substance use. Regression models were run in Mplus version 8.7 (Muthén & Muthén, 1998-2017), with robust standard error estimation and full information maximum likelihood used to account for missingness. Covariates for Aim 3 models included age, gender, perceived SES, race/ethnicity, estimated daily time spent on social media (summed across platforms), and perceptions of peer substance use (substance-matched; e.g., perceptions of peer alcohol use was included in alcohol models). Models were run separately by substance.

In the first set of models for Aim 3, baseline self-reported exposure and posting for a given substance were included in the same model. In the second set of models, baseline self-reported exposure for a given substance and observed postings about substances over the past year were included in the same model. Though models were run separately by substance, it should be noted that unlike self-reported postings, observed postings of substances did not specify substance. In addition to the aforementioned covariates, average amount of time since posting and number of posts observed were controlled. The third set of models examined associations aggregated from the daily level, with self-reported exposure and observed postings about substances over the week-long daily period included in the same model. Cigarette use was not examined due to very few participants reporting cigarette use over the daily period. In addition to the aforementioned covariates, number of posts observed was controlled. In the first and second set of models, the outcome variables were past year alcohol, cigarette, e-cigarette, and marijuana use. In the third set of models, the outcome variables were proportion of (completed) study days in which alcohol, e-cigarette, and marijuana use was reported. Several sensitivity analyses were run to test the robustness of results (see Supplement).

**Results**

**Aim 1: Social Media Substance Use Content by Platform**

Table 1 demonstrates the frequency of observed coded postings about substances. Alcohol was the most posted about substance, but overall, posting about substances was rare. Thus, observed postings were collapsed across substances and platforms for the additional aims. Out of the 200 participants who provided access to at least one account, forty-one (21%) were observed to reference substances at least once in their past year Twitter, Instagram, and/or finsta posts. Out of the 196 participants who provided access to at least one account for story observation, 20 participants (10%) posted about substances at least once during the daily observation. Of those 20, only seven also posted on their main profiles over the last year. In all, 54 (27%) of the 200 participants who provided some account access were observed to post at least once about
substances. Because of the low posting and substance use rate during the daily period, all variables were aggregated across the 7-day period and examined at the weekly level for analyses.4 For analyses, one variable represents past year substance use postings as collected through the Twitter, Instagram, and finsta "main" profile posts, and one variable represents past week substance use postings as collected through the Instagram, finsta, and Snapchat stories (see Supplement for correlations between variables collected observationally).

Table 2 shows the self-reported extent to which participants were exposed to and posted about substance use by platform. In the baseline survey, emerging adults reported that alcohol was the substance they were most exposed to, regardless of platform. Instagram, Snapchat, and TikTok were the most popular platforms for exposure to alcohol content. Moreover, most users reported some degree of exposure to e-cigarette and marijuana content on Instagram, Snapchat, and TikTok. In terms of posting, roughly one-quarter of users reported posting about alcohol on Snapchat, and 15% reported posting about marijuana on Snapchat; otherwise, posting was reported by less than approximately 10% of users regardless of substance or platform.5

For exposure, aggregated daily reports generally mirrored the pattern of results from the baseline survey. Alcohol was the most exposed-to substance, with Snapchat, TikTok, and Instagram the most popular platforms for alcohol exposure. Unlike the baseline survey, in which these three platforms were comparable for e-cigarette and marijuana exposure, Snapchat emerged as a frontrunner for aggregated daily exposure for both substances.

**Aim 2: Text Versus Visual Posts With Associations With Use**

Frequencies of baseline self-reported exposure to and posting of text and visual social media substance postings and correlations with past year use are in Table 3. Across substances and regardless of text or visual format, 219 participants (94%) reported exposure to substance posts at baseline, and 91 participants (39%) reported posting about substances. Associations for text versus visual exposure with past year substance use did not differ for alcohol, e-cigarette, or marijuana use (ps > .660), but visual exposure to cigarette content was more strongly associated than text exposure with past year cigarette use (p < .001). For postings, exposure to visual postings about alcohol was more strongly associated with past year alcohol use than was exposure to text postings (p = .004), and exposure to visual postings about e-cigarettes was more strongly associated with past year e-cigarette use than was exposure to text postings (p = .031); associations for cigarette and marijuana use were not significant (ps > .052).

Frequencies of self-reported exposure to text and visual social media substance postings as reported during the daily period (aggregated) are in Table 4. As only 6 participants

| Table 2. Frequencies of Self-Reported Exposure to and Posting About Substances. |
|---------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                                | Instagram     | Snapchat      | Twitter        | TikTok         | Facebook       | YouTube        | Reddit         |
| Exposure                       |                |                |                |                |                |                |                |
| Alc                            | 80%           | 81%           | 62%           | 81%           | 53%           | 56%           | 46%           |
| Cig                            | 33%           | 34%           | 26%           | 37%           | 26%           | 28%           | 12%           |
| E-cig                          | 63%           | 67%           | 39%           | 64%           | 33%           | 42%           | 24%           |
| Marij                          | 66%           | 76%           | 60%           | 64%           | 35%           | 39%           | 34%           |
| Posting                        |                |                |                |                |                |                |                |
| Alc                            | 11%           | 25%           | 7%            | 6%            | 3%            | 1%            | 0%            |
| Cig                            | 1%            | 2%            | 0%            | 1%            | 1%            | 1%            | 0%            |
| E-cig                          | 4%            | 8%            | 3%            | 4%            | 1%            | 1%            | 2%            |
| Marij                          | 8%            | 15%           | 10%           | 5%            | 2%            | 1%            | 4%            |
| Exposure                       |                |                |                |                |                |                |                |
| Alc                            | 45%           | 51%           | 38%           | 48%           | 33%           | 29%           | 27%           |
| Cig                            | 11%           | 12%           | 15%           | 13%           | 13%           | 9%            | 15%           |
| E-cig                          | 20%           | 37%           | 14%           | 27%           | 18%           | 11%           | 8%            |
| Marij                          | 33%           | 46%           | 31%           | 34%           | 22%           | 20%           | 23%           |

Note. Daily n’s by platform represent that number of participants who reported at least some extent of platform use during the daily period. For baseline values, percentages indicate the percentage of participants who indicated ever exposure to/ posting about each substance by platform. For example, 80% of Instagram users reported ever being exposed to alcohol content on Instagram. For daily values, percentages represent any type of exposure, aggregated over 1 week. For example, for Instagram alcohol exposure, 45% of participants who used Instagram at least once during the daily period reported exposure to alcohol content on Instagram.
reported cigarette use during the daily period, cigarette use was omitted from these analyses (29% of participants reported some degree of combined text and visual exposure). Visual exposure was more strongly associated with past week alcohol use ($p = .029$) and past week e-cigarette use ($p = .025$); the difference was not significant for marijuana ($p = .210$).

**Aim 3: Exposure to Versus Posting About Substances and Associations With Use**

Text and visual content were highly correlated for both exposure and postings and were combined due to multicollinearity issues. As seen in Table 5, baseline self-reported postings about alcohol, e-cigarettes, and marijuana were robustly associated with past year alcohol, e-cigarette, and marijuana use, respectively. Baseline self-reported exposure to cigarette and e-cigarette content were weakly associated with past year cigarette and e-cigarette use; associations with alcohol and marijuana were not robust. When baseline self-reported postings were swapped with observed past year postings, postings was only robustly associated with past year alcohol use; associations with exposure were robust only for e-cigarettes and marijuana, and to some extent, cigarettes. In the daily models, observed story postings were not associated with aggregated daily alcohol, e-cigarette, and marijuana use; aggregated exposure was robustly associated for e-cigarettes, and to some extent, alcohol. Overall, support for Hypothesis 1 is mixed, with associations varying by substance.

### Table 3. Baseline Descriptives and Correlations with Self-Reported Substance Exposure and Postings.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Percent, %</th>
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<td><strong>Alcohol</strong></td>
<td></td>
<td></td>
<td></td>
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<td>1. Text exposure</td>
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<tr>
<td>2. Visual exposure</td>
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<td>3. Text postings</td>
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<td>.27**</td>
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<td>5. Past year use</td>
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<td>.19**</td>
<td>.29**</td>
<td>.46**</td>
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<td></td>
<td></td>
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<td>6. Combined exposure</td>
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<td></td>
<td></td>
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<tr>
<td>7. Combined posting</td>
<td>.20**</td>
<td>.22**</td>
<td>.87**</td>
<td>.87**</td>
<td>.43**</td>
<td>.23**</td>
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<tr>
<td><strong>Cigarette</strong></td>
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<td>1. Text exposure</td>
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<tr>
<td>2. Visual exposure</td>
<td>.58**</td>
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<td>3. Text postings</td>
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<td>.16*</td>
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<td>.20**</td>
<td>.73**</td>
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<td>5. Past year use</td>
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<td>.07</td>
<td>.12</td>
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<tr>
<td>6. Combined exposure</td>
<td>.88**</td>
<td>.90**</td>
<td>.22**</td>
<td>.26**</td>
<td>.29**</td>
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<td></td>
</tr>
<tr>
<td>7. Combined posting</td>
<td>.27**</td>
<td>.18**</td>
<td>.96**</td>
<td>.90**</td>
<td>.10</td>
<td>.25**</td>
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</tr>
<tr>
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<tr>
<td>2. Visual exposure</td>
<td>.73**</td>
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<tr>
<td>3. Text postings</td>
<td>.18**</td>
<td>.23**</td>
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<td></td>
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<tr>
<td>4. Visual postings</td>
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<td>.59**</td>
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<tr>
<td>5. Past year use</td>
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<td>.34**</td>
<td>.42**</td>
<td>.53**</td>
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<td></td>
<td></td>
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<td>7. Combined posting</td>
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<td>.89**</td>
<td>.89**</td>
<td>.53**</td>
<td>.26**</td>
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<td><strong>Marijuana</strong></td>
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<td>1. Text exposure</td>
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<td></td>
</tr>
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<td>2. Visual exposure</td>
<td>.76**</td>
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<td></td>
</tr>
<tr>
<td>3. Text postings</td>
<td>.20**</td>
<td>.23**</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4. Visual postings</td>
<td>.27**</td>
<td>.31**</td>
<td>.62**</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Past year use</td>
<td>.29**</td>
<td>.28**</td>
<td>.36**</td>
<td>.46**</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6. Combined exposure</td>
<td>.94**</td>
<td>.94**</td>
<td>.23**</td>
<td>.31**</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Combined posting</td>
<td>.26**</td>
<td>.30**</td>
<td>.91**</td>
<td>.89**</td>
<td>.45**</td>
<td>.30**</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** $n = 232$ for exposure; $n = 231$ for posting. The combined exposure and posting variables are a composite of text and visual exposure and posting, respectively. Percentages represent percentage of participants who reported ever exposure to/postings about substances. For example, 85% of participants reported ever being exposed to alcohol text-based social media postings. Pattern of results generally did not change when transforming skewed variables (see supplement).

**p < .01, *p < .05.**

### Table 3. Baseline Descriptives and Correlations with Self-Reported Substance Exposure and Postings.
Marijuana exposure and by mode of data collection. Meaningful deviations from sensitivity analyses are reported in Table 5.

**Discussion**

For many, emerging adulthood is a time of heightened substance use (Arnett, 2005). A majority (56%) of our sample reported past year alcohol consumption; notable minorities engaged in past year marijuana use (38%) and e-cigarette use (26%), and 10% engaged in past year cigarette use. These rates of use, particularly for marijuana and e-cigarette use, are fairly comparable to nationally representative surveys assessing substance use among young adults (in which 42% report past year marijuana use, 22% report past year nicotine vaping, and 21% report past year cigarette use; 82% report past year alcohol use, and our lower rates are likely due to the young age of our sample; Schulenberg et al., 2020). Digital contexts such as social media provide a virtual environment for emerging adults to be exposed to and post about substance use. It was of interest to examine a) the extent to which this occurs on various social media platforms, b) how the type of post (visual vs. text) may differentially relate to substance use, and c) how exposure to and posting about substances may relate to substance use.

### Table 4. Daily (Aggregated) Descriptives and Correlations with Self-Reported Substance Exposure.

<table>
<thead>
<tr>
<th>Substance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Percent, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Text exposure</td>
<td>—</td>
<td>—</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>2. Visual exposure</td>
<td>.67**</td>
<td>—</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>3. Past week use</td>
<td>.16*</td>
<td>.28**</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>4. Combined exposure</td>
<td>.90**</td>
<td>.93**</td>
<td>.25**</td>
<td>67</td>
</tr>
<tr>
<td>E-cigarette</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Text exposure</td>
<td>—</td>
<td>—</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2. Visual exposure</td>
<td>.77**</td>
<td>—</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>3. Past week use</td>
<td>.25**</td>
<td>.35**</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4. Combined exposure</td>
<td>.93**</td>
<td>.96**</td>
<td>.32**</td>
<td>39</td>
</tr>
<tr>
<td>Marijuana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Text exposure</td>
<td>—</td>
<td>—</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>2. Visual exposure</td>
<td>.75**</td>
<td>—</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>3. Past week use</td>
<td>.19**</td>
<td>.25**</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>4. Combined exposure</td>
<td>.94**</td>
<td>.93**</td>
<td>.22**</td>
<td>55</td>
</tr>
</tbody>
</table>

Note. n = 209. The combined exposure variable is a composite of text and visual exposure. Percent represents percentage of participants who reported at least some degree of exposure/past week use. For example, 51% of participants reported some degree of exposure to text alcohol content during the daily period. The substantive pattern of results remained the same when transforming skewed variables (see Supplement).

### Table 5. Results from Multiple Regression with Exposure and Posting Associated with Substance Use.

<table>
<thead>
<tr>
<th>Substance</th>
<th>b [95% CI]</th>
<th>SE</th>
<th>β</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline self-report postings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>—0.04 [-0.20, 0.12]</td>
<td>.08</td>
<td>.34</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Posting</td>
<td>1.06 [0.77, 1.36]</td>
<td>.15</td>
<td>&lt;.05</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cigarette</td>
<td>0.26 [0.04, 0.48]</td>
<td>.11</td>
<td>.23</td>
<td>.021</td>
</tr>
<tr>
<td>Posting</td>
<td>0.06 [-0.69, 0.80]</td>
<td>.38</td>
<td>.02</td>
<td>.880</td>
</tr>
<tr>
<td>E-cigarette</td>
<td>0.34 [0.07, 0.61]</td>
<td>.14</td>
<td>.20</td>
<td>.013</td>
</tr>
<tr>
<td>Marijuana</td>
<td>2.05 [1.47, 2.64]</td>
<td>.30</td>
<td>.46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Past year observed postings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>—0.01 [-0.19, 0.17]</td>
<td>.09</td>
<td>.01</td>
<td>.902</td>
</tr>
<tr>
<td>Posting</td>
<td>0.52 [0.31, 0.72]</td>
<td>.11</td>
<td>.25</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cigarette</td>
<td>0.26 [0.03, 0.48]</td>
<td>.12</td>
<td>.23</td>
<td>.026</td>
</tr>
<tr>
<td>Posting</td>
<td>—0.01 [-0.11, 0.10]</td>
<td>.05</td>
<td>.01</td>
<td>.875</td>
</tr>
<tr>
<td>E-cigarette</td>
<td>0.48 [0.19, 0.78]</td>
<td>.15</td>
<td>.28</td>
<td>.001</td>
</tr>
<tr>
<td>Marijuana</td>
<td>0.04 [-0.40, 0.33]</td>
<td>.19</td>
<td>.01</td>
<td>.837</td>
</tr>
<tr>
<td><strong>Daily observed postings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>0.08 [0.02, 0.15]</td>
<td>.04</td>
<td>.17</td>
<td>.015</td>
</tr>
<tr>
<td>Posting</td>
<td>0.01 [-0.04, 0.06]</td>
<td>.03</td>
<td>.04</td>
<td>.660</td>
</tr>
<tr>
<td>E-cigarette</td>
<td>0.21 [0.02, 0.39]</td>
<td>.09</td>
<td>.25</td>
<td>.026</td>
</tr>
<tr>
<td>Marijuana</td>
<td>—0.02 [-0.10, 0.06]</td>
<td>.04</td>
<td>.05</td>
<td>.576</td>
</tr>
</tbody>
</table>

*Significant with covariates removed, b = 0.28, p = .003, β = .18.
*Significant with covariates removed, b = 0.20, p = .036, β = .14.
*Not significant when excluding participants with no accounts followed, b = 0.07, p = .207, β = .09.
*Significant when posting is proportion to total posts, b = 3.62, p = .011, β = .12.
*Marginal when excluding participants with limited EMA data or no stories followed, b = 0.07, p = .061, β = .15.
*Significant with covariates removed, b = 0.12, p = .025, β = .21, and when excluding participants with limited EMA data or no stories followed, b = 0.13, p = .030, β = .22.
Aim 1: Social Media Substance Use Content by Platform

Nearly all participants reported exposure to postings about substance use to some degree at baseline. Alcohol was the most common exposed-to substance, although e-cigarette and marijuana exposure were also quite high. Observed rates were similar to previous studies on alcohol (Geusens & Beullens, 2018; 2021d; Erevik et al., 2018) and extend these studies by finding high rates of exposure for e-cigarettes and marijuana, with cigarette exposure also reported by most. The daily assessments, which are arguably more accurate due to reductions in recall inaccuracy (Van Roekel et al., 2019), reflect this high exposure (cf. Hendriks et al., 2021; Vanherle et al., 2022b). Most participants reported some degree of alcohol and marijuana exposure at least once during the daily period, and a notable minority reported e-cigarette and cigarette exposure. Collectively, emerging adults are frequently exposed to substance use content on social media, often at least once a week and most frequently for alcohol and marijuana.

Importantly, there was variation of exposure by platform, with Instagram, Snapchat, and TikTok being the most popular platforms for exposure for all substances. This pattern mirrors the platforms that were most popular among the sample and could simply reflect that emerging adults who frequently use a given platform are more likely to encounter substance use content. Although rates of exposure across these three platforms were generally comparable within each substance at baseline, this was slightly different with the daily data, with Snapchat descriptively more popular for e-cigarette and marijuana exposure than Instagram or TikTok.

These small differences for Snapchat could reflect the affordances of the platform, in that Snapchat may be perceived as more private with less risk of unwanted others (e.g., parents, employers) viewing substance use content, especially given its ephemeral nature (Boyle et al., 2017). Marijuana may be particularly important in choosing which platform to broadcast use, given that it is arguably the most illicit of the four substances studied. In the state from which participants were recruited, recreational marijuana remains illegal (Hartman, 2021), and therefore Snapchat may be an appealing choice to lessen the risk of unwanted others seeing substance content that may be viewed especially unfavorably. In a similar vein, perceptions of e-cigarette use have become increasingly negative in recent years (Rapp et al., 2021), and Snapchat may operate similarly as a “safe” haven for posting (and consequent exposure). The importance of Snapchat is reflected in emerging adults’ self-reports of posting behavior: Snapchat emerged as the most prominent platform for posting about alcohol and marijuana, and rates of posting for all other platforms were reported by 10% or fewer of platform users, regardless of substance. These results suggest the importance of studying Snapchat when examining social media substance-related postings, with our observational component illustrating the feasibility of studying this platform. Although there are technical, practical, and ethical issues that arise in observing this content (e.g., the ability to examine private content such as direct communication), most participants, when promised confidentiality, willingly disclosed data.

Posting about substances was rare. Alcohol was posted about most frequently, followed by marijuana. Posting about cigarettes was virtually non-existent. Past research is inconsistent on the frequency of emerging adults posting about alcohol; whereas some studies suggest most post (e.g., Beullens & Schepers, 2013; Geusens & Beullens, 2019; Geusens et al., 2020; van Hoof et al., 2014), others report rates more similar to our observed rates (e.g., Moreno et al., 2012), including when examining substances other than alcohol (George et al., 2021; Hébert et al., 2017). The higher rates observed in some studies could be due to age. Whereas our rates of past year e-cigarette, marijuana, and (to some extent) cigarette use are fairly similar to nationally representative samples (Schulenberg et al., 2020), our rates of alcohol use were lower. Ninety-four percent of participants were below the legal U.S. drinking age of 21, which may explain why our observed rates of posting were lower than other studies that examine alcohol postings. Online substance postings increase with age (Hendriks et al., 2017), particularly once emerging adults reach age of legal consumption (Moreno et al., 2021).

Aim 2: Text Versus Visual Posts with Associations with Use

Overall, the extent to which emerging adults reported exposure to and posting about text versus visual content was comparable for all substances, both at baseline and during the daily period. Despite these similarities, there were some notable discrepancies in associations with use. At baseline, visual exposure to cigarette content was more strongly associated with past year cigarette use; visual postings about alcohol and e-cigarettes were more strongly associated with past year alcohol and e-cigarette use, respectively. At the daily level, aggregated visual alcohol and e-cigarette exposure were more strongly associated with past week alcohol and e-cigarette use, respectively. These results suggest that visual content may be especially important in associations with use, in line with past studies (Huang et al., 2014; Miller et al., 2014).

One explanation is rooted in the actual frequency of exposure to different types of content. Although participants reported fairly similar rates of exposure to and posting about substance content, it is possible that these reports suffered from inaccuracy. Participants may have struggled to accurately distinguish text from visual content, particularly as many platforms blend these features together (e.g., imposing text on a photo or video). Indeed, although the observed frequencies were generally comparable, slightly more participants reported visual exposure to alcohol content during the daily period than text content (62% vs. 51% of
participants), which is more in line with past research finding

greater frequency of visual substance content (Beullens &
Schepers, 2013; Hendriks, van den Putte, & Gebhardt, 2018;
Miller et al., 2014; Van Hoof et al., 2014). Given that par-
ticipants especially favored visually oriented platforms (In-
stagram, Snapchat, TikTok), they may simply be exposed to
and post about content that is more visually oriented, thereby
strengthening associations with use.

Alternatively, there may be something notable about visual
content that strengthens associations with use. Often, social
media substance content depicts social gatherings (Hendriks
et al., 2018b). From an exposure standpoint, a photo showing a
group of friends drinking alcohol may enhance norm per-
ception in a greater way than a text post describing a social
event in which drinking occurred. Compared to text content,
visual content may be more engaging (Strowger & Braitman,
2022) and provide more key contextual information. Most
substance use posts are in a positive context (Beullens &
Schepers, 2013; Erevik et al., 2018; Rutherford et al., 2022),
and users may see a social event in which others are enjoying
themselves and each other as they consume alcohol, which in
turn may increase perceived approval of and subsequent use
(Nesi et al., 2017). These visual portrayals may be especially
important for emerging adults as they navigate new social
contexts and determine how certain behaviors are perceived.
Similarly, from a posting standpoint, visual posts may remind
posters about these social events and the positive nature of the
depicted social event. As suggested by the identity shift
perspective, emerging adults may internalize this self-
presentation, which may be linked with increased substance
use over time (cf. D’Angelo & Moreno, 2019; Geusens &
Beullens, 2019). Importantly, this is highly speculative and
future longitudinal research is needed to confirm.

**Aim 3: Exposure to Versus Posting About Substances
and Associations With Use**

We hypothesized that posting about substances would more
strongly be associated with use than exposure to substance use
content. Overall, there was mixed support for this hypothesis,
with associations varying depending on mode of data col-
lection and substance. In the self-reported models, posting
about alcohol, e-cigarettes, and marijuana was associated with
past year alcohol, e-cigarette, and marijuana use, respectively.
Exposure to alcohol and marijuana content were not related to
past year use, and exposure to e-cigarette content was only
weakly related to past year e-cigarette use. The stronger as-
ociations with postings (vs. exposure) is in line with previous
research (Geusens & Beullens, 2018; Erevik et al., 2017;
Richner et al., 2021). One explanation could be rooted in the
inclusion of peers’ use of substances as a covariate. Since
emerging adults’ substance use often mirrors that of their peers
(Windle & Windle, 2018), and because social media is often
used to connect with peers (Reich et al., 2012), exposure to
social media alcohol and marijuana content may simply reflect
the offline behavior of peers, resulting in associations with
exposure disappearing when this behavior is accounted for.
The association may remain for e-cigarettes because of
changing perceptions about and use of e-cigarettes (Rapp
et al., 2021; Schulenberg et al., 2020): if emerging adults
are more uncertain of the acceptability of e-cigarette use,
particularly as they navigate new social contexts (e.g.,
Moreno et al., 2014), they may be more susceptible to online portrayals
of use. However, longitudinal research is needed to test this
conjecture. Finally, it is important to note that exposure to, but
not posting about, cigarettes was associated with past year
cigarette use. Posting about cigarettes was extremely rare, and
a closer look at the data indicated that only half of those who
posted also reported smoking in the past year. Because we did
not necessarily assess substances in an approved context, it
could be that some of those who are posting are portraying
cigarettes in a negative way, attenuating associations with use.

The weak effect with exposure continued in models
swapping self-reported postings with observed past year
postings about substances. Notably, observed substance-
related postings was only robustly associated with past year
alcohol use. Past research indicates that self-reports are more
strongly associated with alcohol consumption than observed
postings (Geusens & Beullens, 2021b). Alternatively, the lack
of association could be because most captured posts depicted
alcohol, suggesting a substance-specific association. Posts
about marijuana, e-cigarettes, and cigarettes may have simply
been too few to capture the association with posting, partic-
ularly as our observation was limited to posts that were
through non-exclusive channels. As noted above, emerging
adults may turn to more private digital contexts, such as
private snaps or direct messaging, to communicate about more
illicit and disapproved substances (Vanherle et al., 2022a).

In the aggregated daily models, associations with exposure
to social media substance postings were again weak and non-
robust. Surprisingly, observed posting was not associated with
past week use when examining the daily data. As only 10% of
participants were observed to post about substances during the
daily period, it is possible that this rate was too low to observe
critical associations with use. Future research targeting
samples with a higher likelihood of substance use and posting
about use could help elucidate these associations, such as by
recruiting older emerging adults (Hendriks et al., 2017) or
those who already report engaging in substance use (Vanherle
et al., 2022a). Additionally, many report posting about sub-
stances without conscious awareness or realizing that sub-
stances are in a post (Hendriks et al., 2017). It is possible that
we coded instances in which someone else was using sub-
stances in a post, as there were many instances in which we
could not determine with confidence if the substance reference
was specific to the participant. This may have attenuated our
ability to detect associations. It is also possible that some
emerging adults posted about substances despite little to no
substance consumption. Research on adolescents suggests that
a notable minority post alcohol references despite reporting never having consumed alcohol, with speculation that some may post in an attempt to fit in with others (Geusens and Beullens, 2019). A deeper dive into our data suggests that of the 20 emerging adults who posted substance content on their stories, five (25%) reported no past year substance consumption of the assessed substances. Given that emerging adulthood is a time of changing social contexts, including the entry into college, where substance use is perceived as normative and valued (Tan, 2012), some emerging adults may feel pressure to post substance use references to fit into this perceived culture.

Overall, these results suggest that posting may be more critical for outcomes than exposure, although findings were inconsistent with observational measures. Due to issues with accuracy in self-reports (Geusens & Beullens, 2021b, 2021c), observational methods may be crucial to obtain a more accurate assessment of posting behavior, to ensure that associations are not inflated. Moreover, findings suggest the importance of obtaining substance specific measures. Given the past focus on alcohol consumption, measures on other substances, especially marijuana and e-cigarettes, are necessary. However, the use of these measures (particularly if observations are used) should be paired with realistic expectations of the degree to which posting about these substances occurs in a desired sample (e.g., by focusing on samples in which substance use is confirmed to occur).

**Limitations and Conclusions**

Several limitations must be noted. First, due to the low rate of daily substance use postings and substance use, day-level analyses were generally not feasible and measures were aggregated across the week. Second, our observations of substance use postings were likely an underestimate, as participants may have restricted our ability to view some content (e.g., using close friend stories on Instagram). Third, all measures of exposure were self-report. It was not feasible to view the content on participants’ social media feeds with a human coding approach, and the Terms of Service for most of the studied platforms prevent automated data scraping techniques that may have allowed for the collection of such data. Future research should examine other strategies to collect these data, particularly as self-reports and objective- assessments of exposure to substance use content may only be moderately correlated (LaBrie et al., 2021). Fourth, we did not include self-reports of posting behavior in the daily assessments to reduce survey burden. Collecting these self-reports could provide additional information on the extent to which posting behavior is fully observed. Fifth, we adapted a fairly simplistic approach to assess differences between visual and text exposure and postings regarding associations with substance use, due to multicollinearity issues. Future research can employ observational methods to more carefully distinguish visual and text postings, which may aid with participants’ potential conflation of reporting on both modalities. As a result, associations with use can be examined in conjunction with key covariates (e.g., peer substance use).

Despite these limitations, our study advances the literature in several ways. We thoroughly examined several major social media platforms used by emerging adults, especially by including self-reports of the infrequently investigated platform TikTok and by observing content on Snapchat. Our findings point to the importance of examining these platforms in future research, especially Snapchat. We extend most past studies, which primarily examine alcohol, by including cigarettes, e-cigarettes, and marijuana, finding that although alcohol is the most exposed to and posted about substance, the other substances (especially marijuana and e-cigarettes) are prevalent. We add to the somewhat contradictory literature examining differential associations between visual and text content with use, finding that visual content may be particularly important to consider. Finally, we contribute to the few studies that have examined exposure to and posting about substances simultaneously, with results suggesting that, in some cases, posting may be particularly potent in associations with use. These findings suggest several important considerations for future research examining substance use in the critical transition period of emerging adulthood.

**Declaration of Conflicting Interests**

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**Open Practices**

Raw data are not available due to the sensitive nature of the study. Analytic code, study materials, and aggregated data with key demographic identifiers removed can be found on Open Science Framework (https://osf.io/ env2b). This study was not preregistered.

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**Supplemental Material**

Supplemental material for this article is available online.

**Notes**

1. The estimated effect size was determined from meta-analytic evidence in which the association between exposure to social media substance content is moderate ($r = .36$; Curtis et al., 2018),
References


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