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Subjective norms as a mediator between exposure to online alcohol and marijuana content and offline use among adolescents

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Abstract

Introduction: While adolescent substance use (SU) may be viewed as normative, SU can quickly escalate leading to consequences. Social media use may increase SU risk. Despite using social media to connect with others, adolescents also view depictions of glamorised SU by both peers and influential figures. Exposure to online alcohol and marijuana content may impact subjective norms (i.e., injunctive and descriptive) ultimately leading to increased offline SU. Data from a multi-wave project was collected to assess whether subjective norms-mediated associations between exposure to alcohol and marijuana content by peers and influential figures on Instagram and Snapchat and offline SU.

Methods: At Wave 1, participants were 264 adolescents (M_{age} = 14.91, 51% female, 86% White, 85% Hispanic/Latino/a/x).

Results: Injunctive norms significantly mediated associations between exposure to alcohol content posted by peers and influential figures on Instagram and Snapchat and offline alcohol use. Injunctive norms significantly mediated associations between exposure to marijuana content posted by peers and influential figures on Instagram, and peers on Snapchat and offline marijuana use. Descriptive norms significantly mediated associations between exposure to alcohol content posted by peers on Instagram, as well as peers and influential figures on Snapchat and offline alcohol use.

Discussion and Conclusion: Increased exposure to online SU content was more consistently associated with injunctive norms rather than descriptive norms. Future research should examine which social media features (e.g., the like button) contribute to increased subjective norms. Overall, findings suggest that social media may strongly convey approval of SU behaviours rather than actual use.

KEYWORDS
adolescent, peer influence, social media, substance use

Key Points

- With adolescents spending over eight h a day using screen media, social media may be a risk factor for adolescent alcohol and marijuana use.

- Subjective norms may mediate the association between exposure to alcohol and marijuana content and offline use given the glamorised nature of online substance use content.
- Findings suggest that increased exposure to online alcohol and marijuana content was more consistently associated with norms, or perceptions of approval, than descriptive norms, or perceptions of use.
- Social media may be more strongly conveying approval of substance use behaviours compared to actual use.

1 | INTRODUCTION

Initiation and experimentation with substance use (SU) typically occur during adolescence [1]. Results from *Monitoring the Future* [2] suggest that alcohol is the most widely used substance, with 17% of 8th graders, 29% of 10th graders and 47% of 12th graders reporting annual use. Among illicit drugs, marijuana has the highest prevalence rate, with 7% of 8th graders, 17% of 10th graders and 31% of 12th graders reporting annual use [2]. While adolescent SU is somewhat normative, experimentation can escalate into use that has negative consequences [1]. Thus, identifying risk factors of SU can inform prevention programming to reduce onset.

One possible risk factor for adolescent SU is social media use. In the United States, adolescent smart phone use is almost universal [3]. In fact, screen time among adolescents has increased by 17% since 2019 [4], with adolescents now spending an average of eight and a half hours per day on screen media [4]. Prior work indicates that adolescents often share more information about themselves on social media than they do in person [5], and that social media has been used to display risk behaviours (e.g., SU [6]). While adolescence poses the greatest risk for both SU initiation and increased time spent on social media, longitudinal evidence linking adolescent SU and social media is sparse. Moreover, most research assessing risk behaviours and social media has focused on college students/young adults and Facebook, despite the fact that Instagram and Snapchat are more popular among adolescents [3]. Accordingly, examining adolescent exposure to alcohol and marijuana use on Instagram and Snapchat is timely and may provide insight into online risk behaviours that impact offline use among today's adolescents.

Among college students, exposure to alcohol-related content on social media was associated with alcohol consumption [7]. Further, research has found that alcohol-related content is more frequently observed on Instagram and Snapchat compared to Facebook [7]. College students often 'airbrush' or display positive consequences of alcohol use (e.g., increased socialisation) and reframe negative aspects (e.g., blackouts, hangovers) in a positive way [8].

Prior work demonstrates that adolescents believe that online alcohol references are displays of real behaviour and efforts to look cool [9]. Emerging longitudinal work indicates that exposure to alcohol-related content on social media was associated with alcohol initiation among adolescents [10]. However, the majority of studies with adolescents have not examined specific social media platforms and have focused primarily on alcohol content. With increased legislation to legalise marijuana, depictions of marijuana on social media may be more prevalent, directed towards youth and displayed with an absence of negative consequences. Together, these likely shift adolescent perceptions of approval and use. This study enhances the current literature by separately examining two popular social media platforms among adolescents (i.e., Instagram, Snapchat) and assessing exposure to both alcohol and marijuana content.

Behavioural theories are often used to characterise the ways in which individuals' behaviours, including the decision to use substances, are shaped. The Theory of Planned Behaviour [11] suggests that peer behaviour can impact subjective norms (i.e., injunctive and descriptive), which are then associated with SU engagement. On social media, favourable perceptions of peer use (i.e., injunctive and descriptive norms) may increase due to exposure to the glamorisation of SU without displays of negative consequences [8]. Specifically, injunctive norms refer to perceptions of acceptability (i.e., whether society approves/disapproves of the behaviour [12]). Perceived injunctive norms have been linked with drinking behaviours (e.g., frequency, quantity [13]), as well as marijuana use among adolescents [14]. Descriptive norms refer to perceptions of what people actually do (i.e., rates of frequency/engagement in a particular behaviour [12]). Descriptive norms are strong predictors of intentions to use alcohol, and alcohol use [15, 16], as well as marijuana use [17]. Recent work demonstrates that more proximal reference groups, like close friends, have a stronger influence on risk behaviour, like SU compared to peers overall [18]. Thus, it is important to examine how social media content can impact perceptions of close friend behaviours, rather than more distal reference groups.

While adolescents utilise social media to connect and interact with peers, social media also offers socialisation contexts that go beyond direct relationships [19]. However, by only examining exposure to peer SU content, researchers are not fully capturing all media influences. On social media, influential figures (e.g., celebrities, musicians, athletes) have nearly 400 million followers and frequently post glorified content depicting SU [20]. While adolescents do not often know influential figures offline, social media has created the 'illusion of intimacy' often used in advertising [21] by providing constant access into their daily lives. Further, Social Influence Theory [22] suggests that individuals may conform to the attitudes and behaviours of influential figures because they aspire to be like them. Moreover, observing influential figures receiving millions of likes on images depicting risk behaviour may influence perceptions of such behaviour, as well as increase the likelihood of engagement in that behaviour in the hopes of achieving a similar status. As such, characterising the impact of exposure to SU content on social media by influential figures, as well as peers on adolescent SU, is critical. This work could highlight ways social media content may impact perceptions and offline SU. In addition, identifying possible mechanisms linking online SU exposure to offline SU could inform prevention and intervention targets, especially regarding social media policies and online interventions.

The current study examined whether injunctive and descriptive norms mediate the association between exposure to SU content on social media and offline SU among adolescents. The study extends prior research by examining multiple substances (i.e., alcohol, marijuana), popular social media platforms among adolescents (i.e., Instagram, Snapchat), multiple socialisation contexts (i.e., peers, influential figures) and mechanisms of action (i.e., subjective norms). While advancing our current knowledge requires examination of each construct individually, we recognise that this yields several mediation models. However, the current study is based on a priori hypotheses that have been informed by theory and prior research. Thus, we believe that examining each construct separately provides novel information that can inform future research, as well as prevention and intervention programming for adolescent SU. We hypothesised differential effects when considering Instagram and Snapchat. While Instagram promotes connections with both peers and influential figures, adolescents may be more likely to connect with peers on Snapchat given the platform. Thus, we hypothesised that peers and influential figures would impact both offline alcohol and marijuana use via Instagram, whereas only peers would impact offline alcohol and marijuana use via Snapchat. Further, we hypothesised that both injunctive and descriptive norms would mediate associations between social media content and offline SU.

2 | METHODS

2.1 | Participants

Participants were adolescents who completed waves one (W1; $n = 264$; $M_{age} = 14.91$, SD = 0.67, 51% female, 86% White and 85% Hispanic/Latino/a/x) and two (W2; approximately 15 months apart; $n = 222$) of a longitudinal study assessing risk factors for SU initiation, which took place in the United States. In the region where the study took place, adolescent alcohol use is illegal until the age of 21 and marijuana use has not been legalised for recreational purposes. Adolescent participants had to meet the following enrolment criteria: (i) be a freshman or sophomore at a local public high school; (ii) have no diagnosis of a learning disorder, intellectual disability or physical disability that would make it difficult to complete questionnaires; (iii) have no diagnosis of a neurological disease or severe mental health problem; (iv) be able to speak/understand English; and meet at least one of the following criteria: (v) exceed the cut-off score on the SU risk profile screen [23]; (vi) endorse that a peer or family member has tried a substance; or (vii) endorse intentions to use cigarettes and/or e-cigarettes within 5 years. Less than 3% of participants screened were ineligible for the study, therefore this sample is likely representative of high school students in the region. There were no significant differences across age, sex, race or ethnicity among those who completed both waves and those who completed only W1.

2.2 | Procedure

Research staff provided study information and project materials at local high schools through recruitment events. Adolescents interested in participating provided staff with their caregivers' contact information. Caregivers and adolescents were then contacted to complete an eligibility phone screen. Adolescent participants eligible for W1 were scheduled for an in-person appointment at a university research laboratory, while W2 appointments were partially completed in-person until COVID-19 safety restrictions required remote appointments. Staff obtained informed consent from caregivers and adolescents 18 years or older, and assent from minor adolescents. Questionnaires were completed through REDCap. Adolescents received a $40 gift card for participating

during each wave. The Institutional Review Board approved study procedures (IRB-17-0344 #106086).

2.3 | Measures

2.3.1 | Exposure to alcohol- and marijuana-related content on Instagram and Snapchat (W1)

Exposure to alcohol- and marijuana-related content on Instagram and Snapchat posted by either peers or influential figures was assessed with eight separate items (adapted from Boyle et al. [7]). Items included, 'how often do you see text or pictures posted by peers (people that you know personally) related to alcohol, drinking, being drunk, or hungover when you check Instagram' and 'how often do you see text or pictures posted by celebrities, musicians, athletes, or other influential figures (people that you do not know personally) related to marijuana, or being high when you check Snapchat?' All items were rated on a five-point Likert scale (0 = 'Never' to 4 = 'Always').

2.3.2 | Subjective norms (W1)

Four separate items [24] were used to assess injunctive and descriptive norms. Adolescents were asked how often their three closest friends approve or disapprove of drinking alcoholic beverages and using marijuana. Both items were rated on a seven-point Likert scale (1 = 'Strongly Disapprove' to 7 = 'Strongly Approve'). Then, adolescents were asked how often their three closest friends drink alcohol beverages and use marijuana. Both items were rated on a seven-point Likert scale (1 = 'Never' to 7 = 'Daily').

2.3.3 | Alcohol and marijuana use (W2)

Adolescents were asked to report how many days since the last assessment (i.e., W1) they used either alcohol or marijuana. Items were adapted from the Population Assessment of Tobacco and Health [25].

2.3.4 | Covariates (W1)

Biological sex, age and ethnicity were included as covariates, as SU can vary across these variables [26]. Dichotomous variables reflecting lifetime alcohol and marijuana use (yes/no) from W1 were also included as covariates.

2.4 | Data analytic plan

Pearson correlation coefficients were estimated to examine associations between variables. Sixteen structural equation models in Mplus 8.1 [27] were estimated to examine whether injunctive and descriptive norms mediate the association between exposure to alcohol and marijuana Instagram and Snapchat content by peers and influential figures and offline alcohol and marijuana use. Covariates were included when estimating each endogenous path within all models. We note that adolescents were asked to report on online SU exposure and subjective norms within the same assessment, as perceptions of social media content likely occur immediately [28]. Accordingly, the models included online SU exposure from W1, subjective norms from W1 and offline SU at W2. Percentile bootstrapping was used to estimate indirect effects as it is robust to violations of non-normality and provides asymmetric confidence intervals (CI) [27].

3 | RESULTS

At W1, 58.0% of adolescents endorsed having a sip of alcohol, 32.2% endorsed having a drink of alcohol and 17.8% endorsed using marijuana in their lifetime. Additionally, 89.8% of participants reported having Instagram and 79.9% reported having Snapchat. Descriptive statistics and correlations for study variables related to alcohol (Table 1) and marijuana (Table 2) were examined.

3.1 | Alcohol and injunctive norms models

Across models (see Figure 1, Panels A through D), the direct effect of exposure to alcohol-related content by peers and influential figures on Instagram and Snapchat on offline alcohol use was not significant. From a statistical perspective, the direct effect between the independent variable and the outcome is not necessary to establish mediation [29]. Yet, increased exposure to alcohol-related content by both peers ($p < 0.001$) and influential figures ($p < 0.001$) on Instagram and peers ($p < 0.001$) and influential figures ($p < 0.01$) on Snapchat significantly predicted increased injunctive norms. Injunctive norms predicted greater offline alcohol use across models ($p < 0.05$). There was evidence of a significant indirect effect via injunctive norms across all four models (see CIs reported in Figure 1).

TABLE 1 Means, standard deviations and Pearson correlation coefficients of study variables related to alcohol.

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Biological sex	0.49	0.50										
2. Age	14.91	0.67	0.03									
3. Ethnicity	0.84	0.36	**−0.12**	0.08								
4. Lifetime alcohol use (W1)	0.32	0.47	−0.03	0.18	**0.16**							
5. Peer alcohol content (I; W1)	1.07	1.12	−0.08	0.10	0.03	**0.25**						
6. Influential figure alcohol content (I; W1)	1.23	1.12	−0.06	0.06	−0.01	**0.14**	**0.55**					
7. Peer alcohol content (S; W1)	1.06	1.23	**−0.17**	**0.18**	**0.13**	**0.20**	**0.67**	**0.48**				
8. Influential figure alcohol content (S; W1)	0.84	1.12	**−0.15**	0.07	0.04	0.11	**0.42**	**0.54**	**0.62**			
9. Injunctive norms—alcohol (W1)	3.30	1.76	−0.10	**0.17**	**0.17**	**0.40**	**0.38**	**0.34**	**0.37**	**0.24**		
10. Descriptive norms—alcohol (W1)	1.77	1.14	0.00	**0.23**	0.03	**0.27**	**0.32**	**0.22**	**0.33**	**0.19**	**0.52**	
11. Alcohol use (W2)	4.50	19.72	−0.07	0.12	0.09	**0.17**	0.13	0.13	**0.23**	**0.22**	**0.29**	**0.22**

Note: Biological sex (0, females; 1, males); Platform (I, Instagram; S, Snapchat); Wave (W1, Wave 1; W2, Wave 2); bold values = significant correlations ($p < 0.05$).

TABLE 2 Means, standard deviations and Pearson correlation coefficients of study variables related to marijuana.

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Biological sex	0.49	0.50										
2. Age	14.91	0.67	0.03									
3. Ethnicity	0.84	0.36	**−0.12**	0.08								
4. Lifetime marijuana use (W1)	0.18	0.38	0.10	**0.15**	0.06							
5. Peer marijuana content (I; W1)	1.26	1.27	−0.10	0.11	−0.00	**0.36**						
6. Influential figure marijuana content (I; W1)	1.13	1.19	−0.01	0.05	0.01	**0.30**	**0.62**					
7. Peer marijuana content (S; W1)	1.26	1.33	**−0.15**	**0.12**	0.11	**0.35**	**0.68**	**0.48**				
8. Influential figure marijuana content (S; W1)	0.80	1.13	**−0.15**	0.06	0.05	**0.18**	**0.49**	**0.64**	**0.59**			
9. Injunctive norms—marijuana (W1)	3.09	2.07	−0.05	0.04	0.05	**0.45**	**0.48**	**0.36**	**0.43**	**0.26**		
10. Descriptive norms—marijuana (W1)	2.03	1.84	0.02	0.08	0.06	**0.49**	**0.38**	**0.26**	**0.34**	**0.21**	**0.62**	
11. Marijuana use (W2)	11.22	51.74	0.06	0.12	0.07	**0.42**	0.04	0.05	0.07	0.03	**0.26**	**0.27**

Note: Biological sex (0, females; 1, males); Platform (I, Instagram; S, Snapchat); Wave (W1, Wave 1; W2, Wave 2); bold values = significant correlations ($p < 0.05$).

3.2 | Marijuana and injunctive norms models

Across all four models (see Figure 2, Panels A through D), the direct effect of exposure to marijuana-related content by peers and influential figures on Instagram and Snapchat on offline marijuana use was not significant. Yet, increased exposure to marijuana-related content by both peers ($p < 0.001$) and influential figures ($p < 0.001$) on Instagram and peers ($p < 0.001$) and influential figures ($p < 0.01$) on Snapchat significantly predicted increased injunctive norms. Injunctive norms predicted greater offline marijuana use when examining marijuana-related content on Instagram ($p < 0.05$), but this association failed to reach significance in the Snapchat models ($p = 0.07$). Nevertheless, there was evidence of a significant indirect effect for all models (see CIs reported in Figure 2) except when examining exposure to marijuana content by influential figures on Snapchat (Figure 2, Panel D).

3.3 | Alcohol and descriptive norms models

Across all four models (see Figure 3, Panels A through D), the direct effect of exposure to alcohol-related content by peers and influential figures on Instagram and

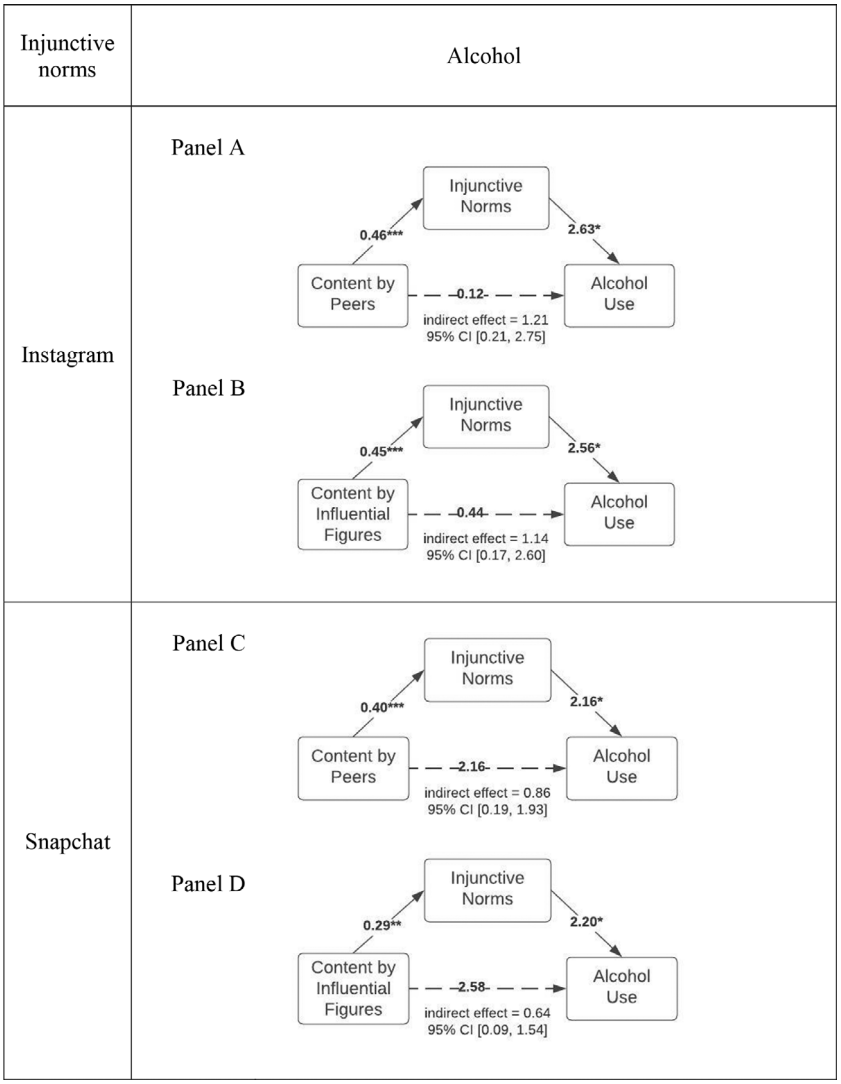

FIGURE 1 Adolescent's report of exposure to alcohol-related content by peers and influential figures on Instagram (top panel) and Snapchat (bottom panel) on offline alcohol use by injunctive norms. Significant paths ($p < 0.05$) are presented with a solid line; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Covariates are not depicted. Percentile bootstrapped confidence intervals are displayed below each path model. All models were just-identified; thus, model fit indices are not provided.

Snapchat on offline alcohol use was not significant. Yet, increased exposure to alcohol-related content by both peers ($p < 0.001$) and influential figures ($p < 0.01$) on Instagram and peers ($p < 0.001$) and influential figures ($p < 0.05$) on Snapchat significantly predicted increased descriptive norms. The association between descriptive norms and alcohol use did not reach significance when examining alcohol-related content by peers ($p = 0.09$) or influential figures ($p = 0.10$) on Instagram, or peer ($p = 0.10$) and influential figures ($p = 0.07$) on Snapchat. Nevertheless, there was evidence of a significant indirect effect for all models (see CIs reported in Figure 3) except when examining exposure to alcohol-related content by influential figures on Instagram (Figure 3, Panel B).

3.4 | Marijuana and descriptive norms models

Across all four models (see Figure 4, Panels A through D), the direct effect of exposure to marijuana use was not significant. Yet, increased exposure to marijuana-related content by peers ($p < 0.001$) but not influential figures ($p = 0.06$) on Instagram and by peers ($p < 0.01$) but not influential figures ($p = 0.08$) on Snapchat significantly predicted increased descriptive norms. Descriptive norms did not predict greater offline marijuana use. Further, CIs for all four models contained zero, suggesting no evidence of an indirect effect (see CIs reported in Figure 4).

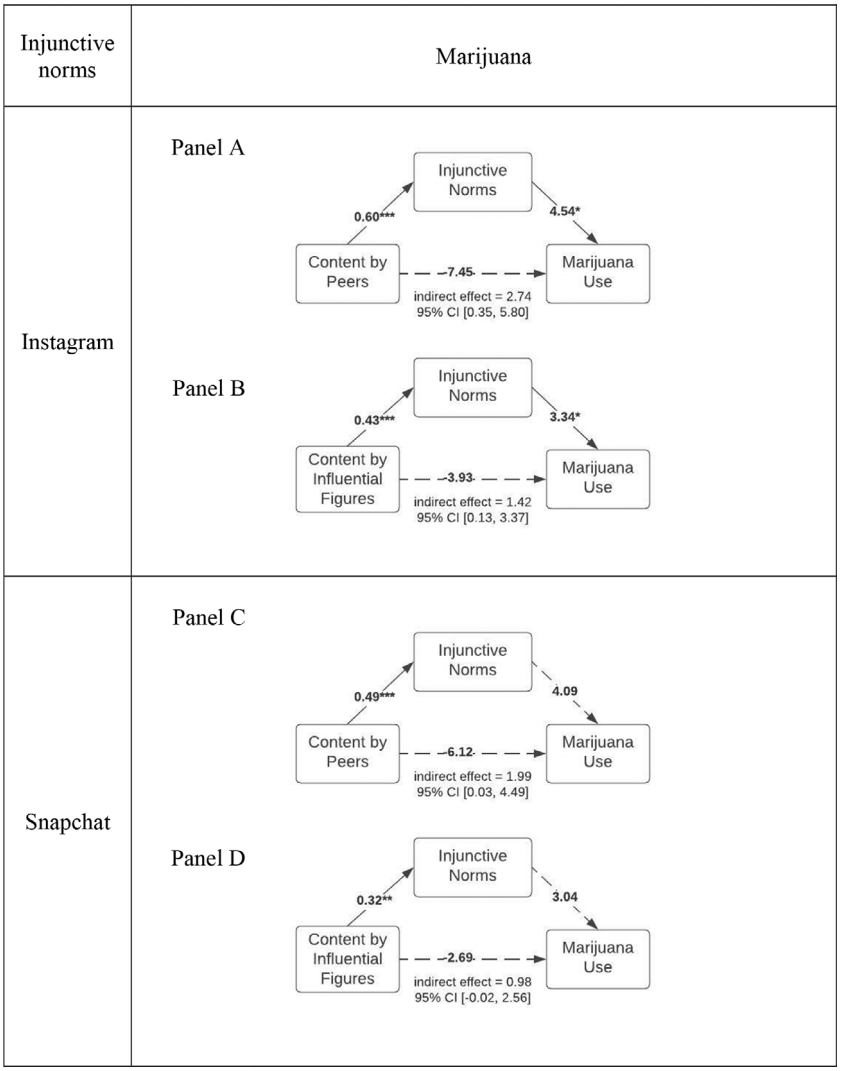

FIGURE 2 Adolescent's report of exposure to marijuana-related content by peers and influential figures on Instagram (top panel) and Snapchat (bottom panel) on offline marijuana use by injunctive norms. Significant paths ($p < 0.05$) are presented with a solid line; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Covariates are not depicted. Percentile bootstrapped confidence intervals are displayed below each path model. All models were just-identified; thus, model fit indices are not provided. CI, confidence interval.

4 | DISCUSSION

There is a crucial need to identify novel factors influencing adolescent SU. Adolescents are now spending more time online than they are in school [4] and prior work suggests that social media engagement may be a SU risk factor. However, research examining the impact of social media on offline SU use has often focused on Facebook, a platform with declining popularity among adolescents, and content by peers, which does not capture all socialisation contexts that adolescents are exposed to online. Thus, the current study sought to address gaps in the literature by examining whether injunctive and descriptive norms mediated associations between exposure to SU content by peers and influential figures on Instagram and Snapchat and offline alcohol and marijuana use among adolescents.

Injunctive norms significantly mediated associations between exposure to alcohol-related content by peers and influential figures on Instagram and Snapchat and offline alcohol use. Injunctive norms significantly mediated associations between exposure to marijuana-related content by peers and influential figures on Instagram, and peers on Snapchat and offline marijuana use. Aspects of social media may contribute to perceived injunctive norms. A process known as Media Cultivation Theory [30] suggests that SU displays on social media in the absence of negative consequences may imply that use is without risks. Further, social media platforms promote quantifiable reinforcement or feedback (e.g., likes, comments [31]) that suggest approval of the behaviour. Additionally, adolescence is a developmental period characterised by high sensitivity to social

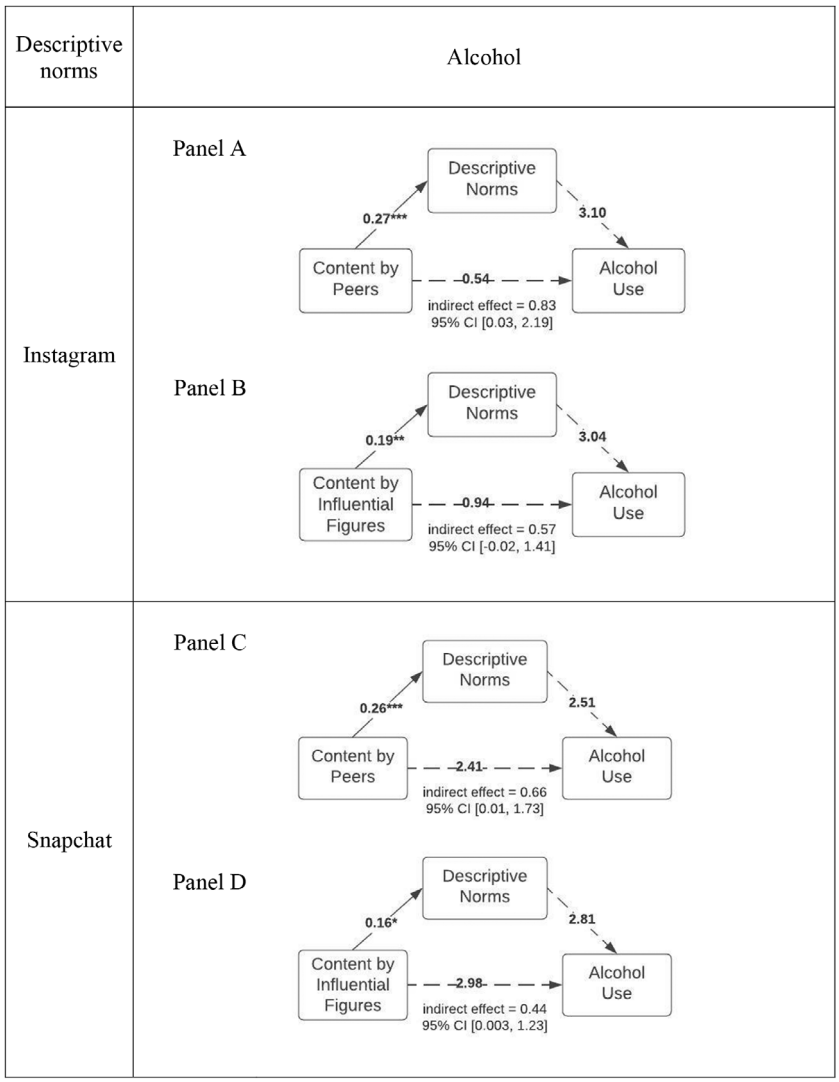

FIGURE 3 Adolescent's report of exposure to alcohol-related content by peers and influential figures on Instagram (top panel) and Snapchat (bottom panel) on offline alcohol use by descriptive norms. Significant paths ($p < 0.05$) are presented with a solid line; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Covariates are not depicted. Percentile bootstrapped confidence intervals are displayed below each path model. All models were just-identified; thus, model fit indices are not provided. CI, confidence interval.

cues, such as likes or views, that reflect popularity or reward [32, 33].

While injunctive norms mediated almost all associations, it did not mediate the association between exposure to marijuana-related content by influential figures on Snapchat and offline marijuana use. Snapchat, which is a messaging app, differs from Instagram, as it allows users to send content that can disappear. Further, users cannot see communications between others and content does not leave a digital footprint. Accordingly, quantifiable reinforcement or feedback may not be readily apparent on Snapchat. However, injunctive norms did mediate the association between exposure to marijuana content by peers on Snapchat and offline marijuana use. Marijuana use has typically been viewed as a more 'norms-violating' behaviour compared to alcohol use [34]. Adolescents are more likely to engage in marijuana use when unsupervised [35]. Thus, adolescents may be more likely to display marijuana-related content on Snapchat, compared to influential figures, because it disappears and is less likely to be monitored. Moreover, prior work examining mentions of SU in the Billboard Hot 100 list from 2014 to 2020 found that among songs referring to substances, musicians were most likely to mention alcohol (87% of songs) compared to marijuana (30%; [36]). Influential figures that are most likely to depict marijuana-related content may be more likely to use Instagram compared to Snapchat given that older youth are more likely to use Instagram [37]. Further, state laws related to marijuana vary leading some influential figures to be less likely to post about marijuana.

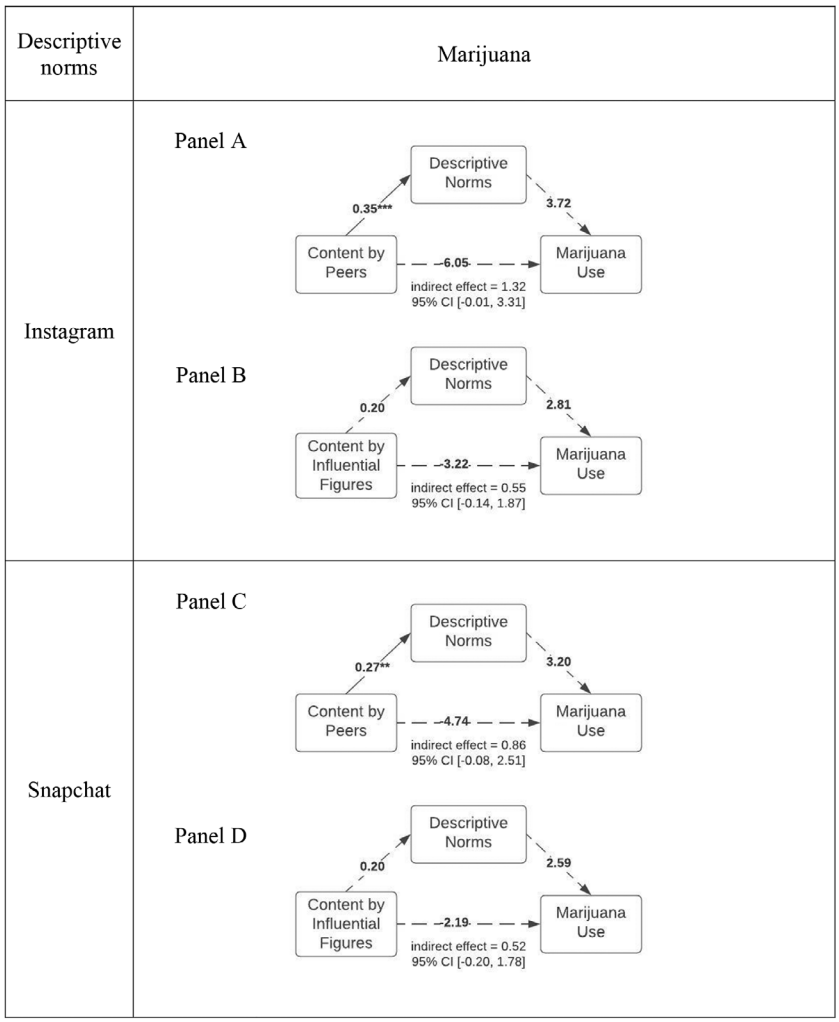

FIGURE 4 Adolescent's report of exposure to marijuana-related content by peers and influential figures on Instagram (top panel) and Snapchat (bottom panel) on offline marijuana use by descriptive norms. Significant paths ($p < 0.05$) are presented with a solid line; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Covariates are not depicted. Percentile bootstrapped confidence intervals are displayed below each path model. All models were just-identified; thus, model fit indices are not provided. CI, confidence interval.

In the third set of models (Figure 3), there was evidence suggesting that descriptive norms significantly mediated associations between exposure to alcohol-related content by peers on Instagram, and peers and influential figures on Snapchat and offline alcohol use. In the fourth set of models (Figure 4), descriptive norms did not mediate any of the associations between exposure to marijuana-related content and offline marijuana use. Overall, injunctive norms significantly mediated more of the associations than descriptive norms. Adolescents may be more likely to engage in SU when they observe individuals receiving increased positive reinforcement for depictions of use [38]. Despite this, descriptive norms did mediate associations between exposure to alcohol-related content by peers on Instagram, and by peers and influential figures on Snapchat and offline alcohol use. In contrast to injunctive norms, descriptive norms may be more relevant on Snapchat where individuals are unable to view quantifiable reinforcement but can see direct messages including pictures. Exposure to content on Snapchat that disappears and displays risk behaviours in the absence of negative consequences may be more likely to impact perceptions of use than approval. Lastly, across all models, exposure to SU content posted by peers was more consistently associated with subjective norms and offline use compared to influential figures. This varies somewhat from Social Influence Theory [22] which suggests that adolescents may be more highly influenced by influential figures compared to peers. However, this is not surprising given that the subjective norms variables assessed perceptions of close friend approval/use. Further, influential figures may use social media in a more strategic way in order to reach a specific audience across platforms.

While this study presents novel findings, it is not without limitations. First, this study was comprised of mostly Hispanic/Latino/a/x adolescents. Most research related to social media has been conducted with White college samples. However, research has highlighted differences in the ways in which White adolescents and those with diverse identities use social media [39]. Adolescents needed to meet a high-risk criterion for study eligibility. Although only a small number of adolescents were excluded based on this criterion, this indicates that adolescents sampled in this region or who identify as Hispanic/Latino/a/x may be at greater risk for SU initiation and limits the generalisability of findings. Another limitation was the timing of assessments, as the current study used two waves of data to estimate mediation models. Given that the amount of time between waves is approximately 15 months, it is unlikely that social media content would impact perceptions of approval or use over a year later. While exposure to social media is likely impacting subjective norms immediately [28], future research should use longitudinal data with additional waves. Lastly, adolescent social media trends during the study have continued to evolve. For example, TikTok is now more popular than Instagram and Snapchat among adolescents [40]. Studies should continue to examine how popular social media platforms can influence offline SU among adolescents.

5 | CONCLUSION

Despite these limitations, this study advances our understanding of how exposure to alcohol and marijuana content by both peers and influential figures on Instagram and Snapchat can influence offline SU among youth. This study highlights the need for future research characterising which social media features contribute to perceptions of approval or use, and ultimately offline SU. Social media may be a naturalistic avenue on which to provide education on prevalence rates and deliver preventive interventions (i.e., normative feedback interventions delivered online).

AUTHOR CONTRIBUTIONS

Each author certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to disclose.

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