Disentangling Associations Between Frequency of Specific Social Networking Site Platform Use, Normative Discrepancies, and Alcohol Use Among Adolescents and Underage Young Adults

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Abstract

Although there is a robust literature examining normative discrepancies for drinking, less is known related to normative discrepancies related to alcohol-posting behavior on social networking sites (SNS). Given that SNS are posited to be an important risk factor for adolescent and young adult alcohol use, the aims of the present study were to: (1) document descriptive and injunctive normative discrepancies for number of alcohol-related posts on SNS, (2) examine associations between frequency of using SNS platforms (Facebook, Instagram, Snapchat) and descriptive and injunctive normative discrepancies, and (3) to examine whether descriptive and injunctive normative discrepancies are associated with willingness to use alcohol and drinking among adolescents and young adults. Data were drawn from the baseline assessment of a larger longitudinal experimental study (*N*= 306, age 15-20). Overall, participants perceived that their peers are more approving of and post about alcohol use more often than they do themselves, thus indicating significant descriptive and injunctive normative discrepancies. More frequent use of Facebook was associated with having greater descriptive normative discrepancies, whereas frequency of both Facebook and Instagram use were associated with greater injunctive normative discrepancies. Results further indicated that controlling for frequency of SNS use, descriptive normative discrepancies, but not injunctive, were associated with greater willingness to drink and drinks per week. Results provide evidence that in particular, descriptive normative discrepancies for SNS use may be important to target when planning intervention programs to reduce the impact of SNS use on adolescent and young adult alcohol use.

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Adolescent and young adult alcohol use remains a significant public health concern with approximately 19% of individuals aged 12 to 20 years reporting using alcohol and 11.4% engaging in heavy episodic drinking (defined as having five drinks for men or four drinks for women in the span of two hours; SAMHSA, 2019) in the past 30 days. Although there have not been significant increases in alcohol consumption over the past decade (Grucza et al., 2018; NIDA, 2019), adolescent and young adult alcohol use increases the risk for acute and long-term negative consequences (Bolland et al., 2016; Eaton et al., 2012). One risk factor associated with adolescent and young adult alcohol use is social networking site (SNS) use. The vast majority of adolescents and young adults are active on SNS, with research indicating that among adolescents age 13-17, 72% use

Instagram, 69% use Snapchat, and 51% use Facebook (Lenhart et al., 2015), whereas among individuals aged 18-24 years old, 68% use Facebook, 71% use Instagram, and 78% use Snapchat (Smith & Anderson, 2018). On average, individuals reported spending 136 minutes per day on SNS (Clement, 2020), which is a marked increase from 90 minutes of average daily use in 2012 (Clement, 2020).

Given how frequently adolescents and young adults use SNS, in conjunction with research indicating many SNS profiles contain alcohol-related content, most of which portray alcohol use in a positive light (Cavazos-Rehg et al., 2015; McCreanor et al., 2013; Moreno et al., 2012, 2016, 2019), SNS are influential risk-conducive environments for adolescent and young adult alcohol use. Both experimental and longitudinal studies demonstrate that viewing and sharing SNS alcohol-related content is associated with risky drinking cognitions and alcohol use (Boyle et al., 2016; Geusens & Beullens, 2018; Hoffman et al., 2017; Litt & Stock, 2011; Litt et al., 2018; Moreno et al., 2015; Nesi et al., 2017). Additionally, posting alcohol-related content on SNS may be a reflection of actual alcohol use and perceived drinking norms (D'Angelo et al., 2014; Geusens & Buellens, 2017; Westgate et al., 2014).

Although SNS are considered risk factors for alcohol use among adolescents and young adults, specific features of SNS platforms differ and thus may have differential associations with drinking. For example, Facebook's features include posting photos and status updates, and creating events and groups, whereas on Instagram users share photos, which can be liked or commented on by their followers indefinitely, so long as the user does not manually delete content. In contrast, Snapchat automatically deletes messages sent in one-on-one chats after both users have opened the chat and deletes unopened chats after 30 days. Individuals can save chat messages manually, although this is not the default option. Snapchat users can also post short videos and pictures to their stories that automatically disappear 24 hours after being posted. The unique features and interactive capabilities across platforms, coupled with findings that SNS users may post and/or be exposed to alcohol-related content differently across platforms (Boyle et al., 2017), suggest that research is needed to understand their independent associations with adolescent and young adult alcohol use.

Alcohol use during adolescence and young adulthood typically occurs in the context of peers (e.g., Barnes et al., 2006; Bersamin et al., 2016; Lipperman-Kreda, et al., 2018) and as such peer influences are central to several theoretical models used to explain substance use (Bhochhibhoya & Branscum 2020; Fishbein & Yzer, 2003; Gerrard et al., 2008). Specific to adolescents and young adults, the prototype willingness model (PWM; Gerrard et al., 2008) aims to explain decisions to engage in health risk behaviors and conceptualizes descriptive and injunctive normative perceptions as key antecedents to behavior, including drinking. Within the PWM, descriptive norms refer to the perception of other's quantity and frequency of alcohol consumption, whereas injunctive norms refer to the perceived approval of drinking (Borsari & Carey, 2003; Cialdini et al., 1990). Perceived descriptive and injunctive drinking norms are significantly related to willingness to use alcohol (i.e., openness to drinking if the opportunity were presented), as well as alcohol use among adolescents and young adults (Borsari & Carey, 2001; Gerrard et al., 2008; Lewis & Neighbors, 2006; Litt & Lewis, 2016; Neighbors et al., 2016; Simons-Morton et al., 2018).

Although perceived descriptive and injunctive norms are posited to influence behavior among adolescents and young adults, they are often discrepant from actual

drinking norms with perceived drinking norms (both descriptive and injunctive) being overestimated when compared with actual drinking and attitudes (Borsari & Carey, 2001, 2003; Lewis & Neighbors, 2006; Simons-Morton et al., 2018). These normative discrepancies have important clinical implications as it has been well documented that interventions focusing on reducing these normative discrepancies are efficacious in reducing alcohol use (Cronce et al., 2017; Lewis & Neighbors, 2007; Neighbors et al., 2016; NIAAA, 2015) and as such are a prominent focus of many adolescent and young adult interventions (for reviews see Carey et al., 2007; Cronce & Larimer, 2011; Miller et al., 2013).

Personalized normative feedback (PNF) interventions highlight two different types of normative discrepancies, namely: (1) other people drink less than the participant drinks, and (2) other people drink less than the participant thinks others drink. Research comparing these two types of discrepancies indicates that the first type (discrepancy between one's own behavior and behavior of others) may be the most impactful to include in PNF interventions, as it capitalizes on important self-other social comparisons (Neighbors et al., 2016). Thus, it is possible that similar self-other discrepancies exist when looking at perceptions of alcohol-related content on SNS.

Given that exposure to alcohol-related content may vary by platform (Boyle et al., 2017), it is possible that the use of different platforms may lead to variations in normative misperceptions, which may then be associated with willingness to use alcohol and actual alcohol use. Although there is a robust literature examining perceived drinking norms (Borsari & Carey, 2001; Lewis & Neighbors, 2006; Neighbors et al., 2016; Simons-Morton et al., 2018) and a small literature examining how perceived drinking norms impact posting on SNS

(D'Angelo et al., 2014; Geusens & Buellens, 2017; Westgate et al., 2014), it is not clear whether specific normative discrepancies related to the posting of alcohol-related content on SNS exist, whether the frequency of use across different SNS platforms is associated with discrepancies, and how these discrepancies related to alcohol content on SNS may be associated with alcohol-related willingness and behaviors. Thus, the present study had three primary aims: 1) to determine whether there are descriptive normative discrepancies (i.e., discrepancies between descriptive normative perceptions and actual behavior) and injunctive normative discrepancies (i.e., discrepancies between injunctive normative perceptions and attitudes) related to alcohol-related SNS posts; 2) to examine associations between frequency of using different SNS platforms and descriptive and injunctive normative discrepancies; and 3) to examine whether injunctive and descriptive normative discrepancies are associated with willingness to use alcohol and actual consumption among a sample of adolescents and young adults.

Materials and Methods

Sampling and Participants

Data were collected from March 2017 to April 2018 as baseline data from a larger longitudinal experimental study that aimed to understand relationships between alcohol displays on SNS and subsequent alcohol cognitions, use, and negative consequences.

Recruitment efforts were conducted in the Seattle-metro area through various methods and included a direct link to the online screening survey. Participants who accessed the online screening survey were required to provide consent (and parental consent if aged 15-17) in order to proceed to the online screening survey. Parents and teens were informed during the consent process that to

protect the teen's privacy, parents would not have access to the teen's responses and that eligibility was not indicative of a teen's alcohol use or non-use. Of parents asked to provide consent for their teens, consent was granted for 93%. Eligibility criteria included: 1) be 15 to 20 years old; 2) live in the Seattle-metro area; 3) drank at least once within the past 6 months (for those age 18-20); 4) have an active Facebook, Snapchat, or Instagram account; and 5) be willing to attend two in-person sessions at the research offices. Eligible participants attended an in-person session where they completed a baseline assessment from which the current data were drawn, prior to a randomized experimental manipulation which involved viewing researcher-fabricated SNS profiles. All study procedures were approved by the local IRB. The sample was diverse with 55.9% reporting being Caucasian/white, 27.5% Asian, 10.1% multiracial, 3.3% black, and 3.2% other; 9.2% identified as Hispanic/Latino.

Measures

All measures are either reliable and valid measures commonly used in the alcohol field or were adapted from reliable and valid measures.

Demographics. Participants were asked to provide several key demographics including their age and birth sex.

Frequency of SNS use. To capture the frequency with which participants use different SNS platforms, participants reported how many days in the past week (ranging from 0-7) they used Facebook, Instagram, and Snapchat.

Descriptive normative discrepancies. To assess descriptive normative discrepancies, items were adapted from the Drinking Norms Rating Form (Baer et al.,

1991). Participants were asked to "Consider a typical week during the past month. How many posts about your own alcohol use, on average, did you share on each day of a typical week on social networking sites?" as a measure of actual alcohol-related SNS posts. Typical alcohol-related SNS posts per week was the sum of the number of posts for each day of the week. To measure descriptive normative perceptions, participants were asked to "Consider a typical week during the past month. How many posts about their own alcohol use, on average, does a typical male/female your age share on each day of a typical week on social networking sites?", with perceived posts for each day being summed. A *descriptive normative discrepancy score* was calculated by subtracting the average number of alcohol-related SNS posts from the perceived descriptive normative perceptions for number of alcohol-related SNS posts. Greater positive discrepancy values indicate that participants perceived that others post more about alcohol on SNS than they do personally.

Injunctive normative discrepancies. To assess injunctive normative discrepancies, items were from the Drinking Norms Rating Form (Baer et al., 1991). Participants were asked to "Consider a typical week during the past month. How many posts about alcohol use, on average, do you find acceptable to share on each day of a typical week on social networking sites?". The number of acceptable posts per day were summed. To assess perceived injunctive normative perceptions, participants were asked to "Consider a typical week during the last month. How many posts about alcohol use, on average, does the typical male/female your age find acceptable to share on each day of a typical week on social networking sites?" The number of perceived acceptable posts per day were summed. To create an *injunctive*

normative discrepancy score, the attitudes score was subtracted from the injunctive normative perception score. Greater positive discrepancy values indicate that participants perceived that others are more approving of posting about alcohol on SNS than they are personally.

Willingness. Participants were presented with a scenario that involved drinking at a party and rated their willingness to engage in five actions (adapted from Gerrard et al., 2008; Litt & Lewis, 2015). Sample items include "choose a non-alcoholic drink" and "stay and have one more drink" (Cronbach's alpha = .85). Response options ranged from 0 (not at all willing) to 4 (completely willing), and mean scores were calculated for analyses.

Drinks per week. The Daily Drinking Questionnaire (DDQ; Collins et al., 1985) was used to assess number of typical drinks per week with an item that asked "Consider a typical week during the last month. How much alcohol, on average (measured in number of standard drinks; 5 oz. of wine, 12 oz. of beer, 10 oz. of wine cooler, or 1 oz. of 100 proof liquor) do you drink each day of a typical week?". Typical weekly drinking was the sum of the number of drinks for each day of the week.

Drinks per occasion. A single item from the Daily Drinking Questionnaire (Collins et al., 1985) was utilized which asked, "During the past month, when you have consumed alcohol, how many drinks on average did you typically consumed on a given occasion?". Participants responded on a scale from 0 to 25 or more drinks.

Data Analytic Strategy

To document normative discrepancies for alcohol-related posting on SNS, which were measured as count variables, paired-samples t-tests with bootstrapping for count variables (Plonsky et al., 2015) were used to test for the magnitude and significance of these differences. Linear regression models with normal distributions were used for models with normative discrepancies and willingness to drink as outcomes. Preliminary analyses revealed non-normal distributions for drinks per week and typical drinks per occasion, thus negative binomial regression was used. Biological sex and age were included in all analyses as covariates based on their previous associations with drinking outcomes (Neighbors et al., 2007; SAMHSA, 2019).

Results

Descriptives and correlations.
Participants spent an average of 5.05 days per week on Facebook ($SD = 2.54$), 5.75 days per week on Instagram ($SD = 2.15$), and 6.45 days per week on Snapchat ($SD = 1.55$). The average willingness to drink was 1.27 ($SD = 1.25$) and participants reported on average consuming 6.96 ($SD = 8.60$) drinks per week and 3.27 ($SD = 2.38$) drinks per occasion. Correlations indicated multiple significant associations, varying in magnitude, between variables of interest. Descriptive normative discrepancies were positively and significantly correlated with injunctive normative discrepancies, frequency of Facebook and Instagram use, willingness to drink, drinks per week, and drinks per occasion. Injunctive normative discrepancies were positively and significantly associated with Facebook and Instagram use frequency (Table 1).

Magnitude of discrepancies. Results of paired-samples t-tests with bootstrapping for count variables indicated a significant descriptive normative discrepancy ($t = 10.77$, $p < 0.001$; 95%CI: 3.33, 4.83) such that participants perceived that others posted

Table 1

Means, Standard Deviations, and Correlations

Variable	Mean (SD)	Range	1	2	3	4	5	6	7	8	9
1. Age	18.39 (1.32)	15-20	–								
2. Descriptive Normative Discrepancy	.60 (4.90)	-21 to 25	0.12*	–							
3. Injunctive Normative Discrepancy	2.48 (4.66)	-6 to 30	0.07	0.53*	–						
4. Frequency of Facebook Use	5.05 (2.54)	0 to 7	0.32**	0.17*	0.13*	–					
5. Frequency of Instagram Use	5.75 (2.15)	0 to 7	0.11	0.13*	0.14*	0.09	–				
6. Frequency of Snapchat Use	6.45 (1.55)	0 to 7	0.08	0.01	0.04	0.04	0.39**	–			
7. Willingness to Drink	1.27 (1.25)	0 to 4	0.12*	0.13*	0.01	0.17*	0.12*	0.09	–		
8. Drinks Per Week	6.96 (8.60)	0 to 52	0.28**	0.12*	0.01	0.07	0.17*	0.09	0.44**	–	
9. Drinks per Occasion	3.27 (2.38)	0 to 25	0.09	0.11*	0.04	0.02	0.23**	0.17*	0.25*	0.63**	–

*p < .05. **p < .01, N = 306

significantly more alcohol-related posts per week ($M = .35$, $SD = 6.56$) than the participant posted ($M = 1.41$, $SD = 3.99$). Similarly, results indicated a significant injunctive normative discrepancy ($t = 2.94$; $p < 0.05$; 95%CI: 0.60, 3.24) such that participants believed others approved more of posting alcohol-related content ($M = 5.17$, $SD = 5.06$) than the participant approved of ($M = 3.08$, $SD = 5.91$).

Associations between frequency of SNS use by platform and descriptive normative discrepancies. Using linear regression, age, birth sex, and frequency of Instagram and Snapchat use were not associated with descriptive normative discrepancies. More frequent use of Facebook was positively associated with having greater descriptive normative discrepancies such that for every each additional day using Facebook,

descriptive normative perceptions increased by 0.4. The model explained 6% of the variance in willingness to drink ($R^2 = .06$, $F(5, 239) = 3.14$, $p < 0.05$). (Table 2).

Associations between frequency of SNS use by platform and injunctive normative discrepancies. Using linear regression, while age, birth sex, and frequency of Snapchat use were not associated with injunctive normative discrepancies, more frequent use of both Facebook and Instagram were associated with greater injunctive normative discrepancies such that for every additional day per week using Facebook and Instagram, descriptive normative discrepancies increased by 0.96 and 1.24, respectively. The model explained 6% of the variance in willingness to drink ($R^2 = .06$, $F(5, 239) = 2.81$, $p < 0.05$) (Table 2).

Table 2

Associations Between SNS Platform Use and Normative Discrepancies (Linear Regression)

Predictor	B	SE B	Beta	t-value	p-value
Criterion Variable: Descriptive Normative Discrepancy					
Male sex	-0.55	0.93	-0.04	-0.60	0.55
Age	-0.05	0.41	-0.01	-1.21	0.91
Frequency of Facebook Use	0.40	0.19	0.16	1.99	**0.04**
Frequency of Instagram Use	0.39	0.24	0.11	1.61	0.11
Frequency of Snapchat Use	0.16	0.32	0.03	0.50	0.63
$R^2 = .06$, $F(5, 239) = 3.14$, $p < .05$					
Criterion Variable: Injunctive Normative Discrepancy					
Male sex	0.18	1.83	0.01	0.10	0.92
Age	-1.17	0.83	-0.10	-1.42	0.16
Frequency of Facebook Use	0.96	0.39	0.17	2.50	**0.01**
Frequency of Instagram Use	1.24	0.48	0.18	2.60	**0.01**
Frequency of Snapchat Use	0.11	0.64	0.12	1.79	0.07
$R^2 = .06$, $F(5, 239) = 2.81$, $p < .05$					

Note. For all regression models, $n = 306$. Sex coded 0 = female, 1 = male.

Associations between normative discrepancies and willingness to drink. Linear regression results indicated that age, frequency of Facebook, Instagram, and Snapchat use, and injunctive normative discrepancies were not significantly associated with willingness to drink. However, being male and having greater descriptive normative discrepancies were associated with greater willingness to drink such that being male was associated with a 0.52 increase in willingness to drink compared to women and for every one unit increase in descriptive normative discrepancies, willingness to drink increased by 0.03 units. The model explained 5% of the variance in willingness to drink ($R^2 = .05$, $F(5, 239) = 2.54$, $p < 0.05$) (Table 3).

Associations between normative discrepancies and drinks per week. Using negative binomial regression, more frequent Instagram use was significantly associated with consuming more drinks per week such that for every one unit increase (days per week) in using Instagram, drinks per week increased by 0.09 drinks. Other significant associations were found such that being older (age), male, and having greater descriptive normative discrepancies were associated with consuming more drinks per week such that for each year in age increase, drinks per week increased by 0.37 and for males, their drinks per week increased by 0.51 drinks compared to females. Further, for every one unit increase in descriptive normative discrepancies, drinks per week increased by 0.5 drinks. Neither frequency of using Facebook or Snapchat or injunctive normative discrepancies were associated with drinks per week. The overall model was significant with the likelihood ratio for the full model being X^2 (7) = 41.51, $p < 0.001$. The predictors in the model explained 16% of the variance (Pseudo $R^2 = 0.16$) (Table 3).

Associations between normative discrepancies and drinks per occasion. Results of a negative binomial regression indicated that neither age, frequency of Facebook use, frequency of Snapchat use, or injunctive normative discrepancies were associated with typical drinks per occasion. Being male was associated with drinking 0.29 more drinks per occasion relative to females and for each additional day using Instagram, drinks per occasion increased by 0.09 drinks. For each unit increase in descriptive normative discrepancies, drinks per occasion increased by 0.2 drinks. The model was significant with the likelihood ratio for the full model being X^2 (7) = 34.60, $p < 0.001$. The predictors in the model explained 13% of the variance (Pseudo $R^2 = 0.13$) (Table 3).

Discussion

The present findings indicate that descriptive and injunctive normative discrepancies exist associated with alcohol-related posts on SNS. Overall, adolescents and young adults perceived their same age, same sex peers as posting about alcohol use more often than they do personally and being more approving of making more alcohol-related posts than they approve of personally. These SNS-specific findings align with the larger social norms literature indicating that normative discrepancies frequently occur related to peer alcohol use (Borsari & Carey, 2001; Neighbors et al., 2016; Simons-Morton et al., 2018).

Findings indicated that more frequent use of Facebook was associated with larger descriptive normative discrepancies whereas more frequent use of both Facebook and Instagram were associated with greater injunctive normative discrepancies. Notably, frequency of Snapchat use was not associated with either type of normative discrepancy.

Table 3

Associations Between Normative Discrepancies and Drinking Outcomes (Willingness to Drink, Drinks per week)

Predictor	B	SE B	Beta	t-value	p-value		
Criterion Variable: Willingness to Drink (Linear Regression)							
Male sex	0.52	0.17	0.20	3.19	**<.001**		
Age	0.07	0.07	0.07	0.94	0.35		
Frequency of Facebook Use	0.04	0.04	0.09	1.23	0.22		
Frequency of Instagram Use	0.08	0.04	0.13	1.79	0.07		
Frequency of Snapchat Use	0.02	0.06	0.02	0.31	0.78		
Descriptive Normative Discrepancy	0.03	0.01	0.14	2.19	**0.03**		
Injunctive Normative Discrepancy	0.01	0.01	0.03	0.44	0.66		
$R^2 = .05$, $F(5, 239) = 2.54$, $p < .05$							

Predictor	B	SE B	z-value	p-value	Ratio	(95% CI)
Criterion Variable: Drinks per Week (Negative Binomial Regression)						
Male sex	0.51	0.17	3.12	**<.001**	1.66	1.21, 2.31
Age	0.37	0.07	5.31	**<.001**	1.44	1.26, 1.67
Frequency of Facebook Use	0.04	0.03	1.88	0.06	1.04	0.98, 1.08
Frequency of Instagram Use	0.09	0.05	2.12	**0.03**	1.09	1.00, 1.21
Frequency of Snapchat Use	0.08	0.06	1.31	0.19	1.08	0.96, 1.21
Descriptive Normative Discrepancy	0.05	0.01	1.99	**0.04**	1.06	1.02, 1.09
Injunctive Normative Discrepancy	0.01	0.02	0.39	0.70	0.99	0.95, 1.03
$X^2 (7) = 41.51$, $p < .001$; Pseudo $R^2 = 0.16$						

Predictor	B	SE B	z-value	p-value	Ratio	(95% CI)
Criterion Variable: Drinks Per Occasion (Negative Binomial Regression)						
Male sex	0.29	0.09	3.32	**<.001**	1.34	1.13, 1.61
Age	0.06	0.04	1.38	0.17	1.06	0.98, 1.15
Frequency of Facebook Use	0.01	0.17	0.19	0.85	1.01	0.97, 1.04
Frequency of Instagram Use	0.09	0.03	3.30	**<.001**	1.09	1.04, 1.15
Frequency of Snapchat Use	0.06	0.04	1.54	0.12	1.06	0.98, 1.14
Descriptive Normative Discrepancy	0.02	0.01	1.98	**0.04**	1.02	1.01, 1.03
Injunctive Normative Discrepancy	0.01	0.01	1.50	0.13	1.01	0.96, 1.04
$X^2 (7) = 34.60$, $p < .001$; Pseudo $R^2 = 0.13$						

Note. $n = 306$, Ratio = negative binomial incidence rate ratios. Sex coded female = 0, male = 1

Alcohol-related posts may be seen more often and for longer amounts of time on Facebook and Instagram compared to Snapchat due to not being automatically deleted and thus may have a larger influence on normative discrepancies. Further, with participants on average reporting using Snapchat nearly every day of the week ($M = 6.5$ days), it is possible that frequency of Snapchat use does not differentiate between levels of risk. Understanding these platform-specific differences has the potential to inform what platforms should be targeted in alcohol prevention programs as our results indicate that Snapchat use, although frequently containing alcohol-related content (Boyle et al., 2017), may not differentiate between levels of risk.

Descriptive normative discrepancies for alcohol-related SNS content were positively associated with willingness to drink, drinks per week, and typical drinks per occasion, even when controlling for time spent on SNS platforms. This suggests that alcohol-related SNS descriptive normative discrepancies are still robustly associated with drinking outcomes, even when controlling for associations between frequency of SNS use and drinking behavior. Therefore, it is not just that individuals who spend more time on SNS drink more, but rather that descriptive normative discrepancies associated with posting alcohol-related content on SNS are associated with willingness to use alcohol and with actual alcohol consumption. Given the complexity and multitude of other social influences on alcohol use (Lewis et al., 2009), it is not a surprise that while significant, the tested models do not account for large proportions of variance (between 5-16%) in alcohol outcomes, as SNS use is just one factor in the social influence puzzle of adolescent and young adult alcohol use.

Implications for Health Behavior Theory

According to the PWM (Gerrard et al., 2008; Litt & Lewis, 2016), descriptive and injunctive norms are important predictors of adolescent and young adult willingness to drink and actual alcohol use. This study suggests that this model is also relevant when examining alcohol-related behaviors specific to SNS. Viewing alcohol-related content on SNS is associated with willingness to drink and alcohol consumption (Litt et al., 2011; Litt et al., 2018), but this is the first study to date to indicate that there are significant normative perceptions specific to alcohol-related postings on SNS that are associated with willingness and consumption. Thus, the present study has the potential to expand the applications of the PWM to behaviors that take place in online contexts such as SNS.

Clinical Implications

Given that PNF, and specifically intervention content that highlights normative discrepancies between one's own behavior and the behavior of others has been indicated as one of the most promising intervention strategies for adolescent and young adult alcohol use (Carey et al., 2007; Cronce & Larimer, 2011; Neighbors et al., 2016), this study provides preliminary evidence that this same discrepancy, in particular for descriptive norms, may be useful in preventive interventions involving SNS. Thus, PNF that highlights discrepancies between one's own alcohol-related SNS behavior and the perceived alcohol-related SNS behavior of others may be an effective strategy to ultimately reduce alcohol use. This is a potentially promising strategy as it may not be feasible for researchers to target reducing the volume of alcohol displays that adolescents and young adults view on SNS as that may involve larger policy changes specific to allowable content on SNS. However, it may be feasible for researchers to refine interventions to target the impact SNS alcohol-related displays have on descriptive normative discrepancies, willingness to drink, and alcohol consumption. Integrating SNS influences into alcohol intervention content may increase the impact of interventions and produce stronger and more durable effects on cognitions and drinking behavior in comparison to interventions that focus only on offline content,

therefore neglecting an important source of social influence.

Limitations and Future Directions

This study is not without limitations. First, the data collected were self-reported. Participants may under- or over-report both their posting behaviors and alcohol consumption. However, self-reporting for alcohol consumption has been found to be sufficiently reliable and valid (e.g., Simons et al., 2015), whereas research related to validity of self-report measures for SNS use is still somewhat nascent and exhibits mixed findings (Junco, 2013; Scharkow, 2016). As such, future research should aim to determine the validity of the SNS-specific measures used. In addition, the measures of frequency of SNS use in this data were limited, and as such future research should examine potentially important differences based on intensity and duration of SNS usage (i.e., how much time spent on SNS per day), as well as other potentially important factors such as whether the type of posts (i.e., video, text, photos) or source of posts (i.e., close friends, celebrities) impact normative discrepancies. Second, the cross-sectional nature of the study obviates analysis of temporal relationships. Other research designs, including longitudinal, event-level studies, and text and/or machine learning analysis of actual SNS profiles have the potential to lead to a more nuanced understanding of SNS alcohol posting normative discrepancies and related behaviors. Future research should utilize these designs in order to provide stronger evidence supporting causal associations. Finally, the sample in the present study was comprised of participants under the legal drinking age. Therefore, we cannot determine whether the results found in this study would be generalizable to samples of legal young adult drinkers who may have greater exposure to alcohol-related content on SNS and access to alcohol. Future research should examine associations between alcohol consumption and SNS normative discrepancies with a broader age range.

Conclusion

The findings of the present study are the first to identify associations between frequency of SNS use on different platforms, SNS descriptive and injunctive normative discrepancies, and alcohol outcomes among adolescents and young adults. Results from this formative work provide initial evidence supporting additional research examining the inclusion of SNS-specific content into alcohol preventive interventions. Given the prevalence of SNS use among adolescents and young adults and the potential impact of SNS on normative discrepancies and alcohol use, it is vital to continue investigating different factors that may lead to the development of effective prevention strategies.

Discussion Questions

1. Our findings indicate a need to consider normative discrepancies related to posting about alcohol on social networking sites when designing preventive interventions. What are the best ways for researchers to build on this preliminary evidence base in order to ultimately integrate this type of intervention content into existing programming?

2. We suggest that the frequency of use of specific social networking site platforms may be associated with greater descriptive and injunctive normative discrepancies related to posting alcohol content. If future research supports these findings, what challenges might this provide for health care providers, practitioners, and researchers as they attempt to include social networking sites in preventive measures?

Acknowledgments

References

Baer, J. S., Stacy, A., & Larimer, M. (1991). Biases in the perception of drinking norms among college students. *Journal of Studies on Alcohol, 52*(6), 580-586. https://doi.org/10.15288/jsa.1991.52.580

Barnes, G. M., Hoffman, J. H., Welte, J. W., Farrell, M. P., & Dintcheff, B. A. (2006). Effects of parental monitoring and peer deviance on substance use and delinquency. *Journal of Marriage and Family, 68*(4), 1084-1104. https://doi.org/10.1111/j.1741-3737.2006.00315.x

Bersamin, M., Lipperman-Kreda, S., Mair, C., Grube, J., & Gruenewald, P. (2016). Identifying strategies to limit youth drinking in the home. *Journal of Studies on Alcohol and Drugs*, *77*(6), 943–949. https://doi.org/10.15288/jsad.2016.77.943

Bhochhibhoya, A., & Branscum, P. (2020). Beyond one size fits all: Predicting binge and social drinking behavior. *American Journal of Health Studies, 35*(1), 57-72.

Bolland, K. A., Bolland, J. M., Tomek, S., Devereaux, R. S., Mrug, S., & Wimberly, J. C. (2016). Trajectories of adolescent alcohol use by gender and early initiation status. *Youth & Society, 48*(1), 3-32. https://doi.org/10.1177/0044118X13475639

Borsari, B., & Carey, K. B. (2001). Peer influence on college drinking: A review of the research. *Journal of Substance Abuse, 13*(4), 391-424.

https://doi.org/10.1016/S0899-3289(01)00098-0

Borsari, B., & Carey, K. B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol, 64*(3), 331–341. https://doi.org/10.15288/jsa.2003.64.331

Boyle, S. C., Earle, A. M., LaBrie, J. W., & Ballou, K. (2017). Facebook dethroned: Revealing the more likely social media destinations for college students' depictions of underage drinking. *Addictive Behaviors*, *65*, 63–67. https://doi.org/10.1016/j.addbeh.2016.10.004

Boyle, S. C., LaBrie, J. W., Froidevaux, N. M., & Witkovic, Y. D. (2016). Different digital paths to the keg? How exposure to peers' alcohol-related social media content influences drinking among male and female first-year college students. *Addictive Behaviors, 57*, 21-29. https://doi.org/10.1016/j.addbeh.2016.01.011

Carey, K. B., Scott-Sheldon, L. A. J., Carey, M. P., & DeMartini, K. S. (2007). Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addictive Behaviors, 32*(11), 2469-2494. https://doi.org/10.1016/j.addbeh.2007.05.004

Cavazos-Rehg, P. A., Krauss, M. J., Sowles, S. J., & Bierut, L. J. (2015). "Hey everyone, I'm drunk." An evaluation of drinking-related Twitter chatter. *Journal of Studies on Alcohol and Drugs, 76*(4), 635-643. https://doi.org/10.15288/jsad.2015.76.635

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58*(6), 1015-1026.

https://doi.org/10.1037/0022-3514.58.6.1015

Clement, J. (2020, May 18). Social media – Statistics & facts. *Statista.* https://www.statista.com/topics/1164/social-networks/

Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*(2), 189-200. https://doi.org/10.1037/0022-006X.53.2.189

Cronce, J. M., & Larimer, M. E. (2011). Individual-focused approaches to the prevention of college student drinking. *Alcohol Research & Health, 34*(2), 210-221.

Cronce, J. M., Toomey, T. L., Lenk, K., Nelson, T. F., Kilmer, J. R., & Larimer, M. E. (2017). NIAAA's College alcohol intervention matrix: CollegeAIM. *Alcohol Research: Current Reviews*, *39*(1), e1-e5.

D'Angelo, J., Zhang, C., Eickhoff, J., & Moreno, M. (2014). Facebook influence among incoming college freshmen: Sticky cues and alcohol. *Bulletin of Science, Technology & Society*, *34*(1-2), 13–20. https://doi.org/10.1177/0270467614538002

Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Flint, K. H., Hawkins, J., Harris, W. A., Lowry, R., McManus, T., Chyen, D., Whittle, L., Lim, C., & Wechsler, H. (2012). Youth Risk Behavior Surveillance - United States, 2011. *Surveillance Summaries 61*(SS04), 1-162.

Fishbein, M., & Yzer, M. C. (2003). Using theory to design effective health behavior interventions. *Communication Theory, 13*(2), 164-183.

https://doi.org/10.1111/j.1468-2885.2003.tb00287.x

Gerrard, M., Gibbons, F. X., Houlihan, A. E., Stock, M. L., & Pomery, E. A. (2008). A dual-process approach to health risk decision making: The prototype willingness model. *Developmental Review, 28*(1), 29-61. https://doi.org/10.1016/j.dr.2007.10.001

Geusens, F., & Beullens, K. (2017). Strategic self-presentation or authentic communication? Predicting adolescents' alcohol references on social media. *Journal of Studies on Alcohol and Drugs*, *78*(1), 124–133. https://doi.org/10.15288/jsad.2017.78.124

Geusens, F., & Beullens, K. (2018). The association between social networking sites and alcohol abuse among Belgian adolescents: The role of attitudes and social norms. *Journal of Media Psychology, 30*, 207-216. https://doi.org/10.1027/1864-1105/a000196

Grucza, R. A., Sher, K. J., Kerr, W. C., Krauss, M. J., Lui, C. K., McDowell, Y. E., Hartz, S., Virdi, G., & Bierut, L. J. (2018). Trends in adult alcohol use and binge drinking in the early 21st-century United States: A meta-analysis of 6 national survey series. *Alcoholism, Clinical and Experimental Research*, *42*(10), 1939–1950. https://doi.org/10.1111/acer.13859

Hoffman, E. W., Austin, E. W., Pinkleton, B. E., & Austin, B. W. (2017). An exploration of the associations of alcohol-related social media use and message interpretation outcomes to problem drinking among college students. *Health Communication*, *32*(7), 864–871. https://doi.org/10.1080/10410236.2016.1195677

Junco, R. (2013). Comparing actual and self-reported measures of Facebook use. *Computers in Human Behavior, 29*(3), 626-631.

https://doi.org/10.1016/j.chb.2012.11.007

Lenhart, A., Smith, A., Anderson, M., Duggan, M., Perrin, A. (2015). Teens, technology and friendships. Pew Research Center. http://www.pewinternet.org/2015/08/06/teens-technology-and-friendships/

Lewis, M. A., & Neighbors, C. (2006). Who is the typical college student? Implications for personalized normative feedback inter-ventions. *Addictive Behaviors*, *31*(11), 2120–2126. https://doi.org/10.1016/j.addbeh.2006.01.011

Lewis, M. A., & Neighbors, C. (2007). Optimizing personalized normative feedback: The use of gender-specific referents. *Journal of Studies on Alcohol and Drugs*, *68*(2), 228–237. https://doi.org/10.15288/jsad.2007.68.228

Lewis, M. A., Neighbors, C., Lindgren, K. P., Buckingham, K. G., & Hoang, M. (2009). Theories of social influence on adolescent and young adult alcohol use. In *Social Drinking: Uses, Abuses and Psychological Factors* (pp. 101-140). Nova Science Publishers, Inc.

Lipperman-Kreda, S., Finan, L. J., & Grube, J. W. (2018). Social and situational characteristics associated with adolescents' drinking at party and non-party events. *Addictive Behaviors*, *83*, 148–153. https://doi.org/10.1016/j.addbeh.2017.12.001

Litt, D. M., & Lewis, M. A. (2015). Examining the role of abstainer prototype favorability as a mediator of the abstainer-norms–drinking-behavior relationship. *Psychology of Addictive Behaviors, 29*(2), 467-472. https://doi.org/10.1037/adb0000042

Litt, D. M., & Lewis, M. A. (2016). Examining a social reaction model in the prediction of adolescent alcohol use. *Addictive Behaviors, 60*,

160-164. https://doi.org/10.1016/j.addbeh.2016.04.009

Litt, D. M., & Stock, M. L. (2011). Adolescent alcohol-related risk cognitions: The roles of social norms and social networking sites. *Psychology of Addictive Behaviors, 25*(4), 708-713. https://doi.org/10.1037/a0024226

Litt, D. M., Lewis, M. A., Spiro, E. S., Aulck, L., Waldron, K. A., Swanson, A., Head-Corliss, M. K., & Swanson, A. (2018). #drunktwitter: Examining the relations between alcohol-related Twitter content and alcohol willingness and use among underage young adults. *Drug and Alcohol Dependence, 193,* 75-82. https://doi.org/10.1016/j.drugalcdep.2018.08.021

McCreanor, T., Lyons, A., Griffin, C., Goodwin, I., Moewaka Barnes, H., & Hutton, F. (2013). Youth drinking cultures, social networking and alcohol marketing: Implications for public health. *Critical Public Health, 23*(1), 110-120. https://doi.org/10.1080/09581596.2012.748883

Miller, M. B., Leffingwell, T., Claborn, K., Meier, E., Walters, S., & Neighbors, C. (2013). Personalized feedback interventions for college alcohol misuse: An update of Walters & Neighbors (2005). *Psychology of addictive behaviors, 27*(4), 909-920. https://doi.org/10.1037/a0031174

Moreno, M. A., Arseniev-Koehler, A., Litt, D. M., & Christakis, D. (2016). Evaluating college students' displayed alcohol references on Facebook and Twitter. *The Journal of Adolescent Health, 58*(5), 527–532. https://doi.org/10.1016/j.jadohealth.2016.01.005

Moreno, M. A., Christakis, D. A., Egan, K. G., Brockman, L. N., & Becker, T. (2012). Associations between displayed alcohol

references on Facebook and problem drinking among college students. *Archives of Pediatrics and Adolescent Medicine, 166*(2), 157-163. https://doi.org/10.1001/archpediatrics.2011.180

Moreno, M. A., Cox, E. D., Young, H. N., & Haaland, W. (2015). Underage college students' alcohol displays on Facebook and real-time alcohol behaviors. *The Journal of Adolescent Health, 56*(6), 646–651. https://doi.org/10.1016/j.jadohealth.2015.02.020

Moreno, M. A., Mercer, L., Young, H. N., Cox, E. D., & Kerr, B. (2019). Testing young adults' reactions to Facebook cues and their associations with alcohol use. *Substance Use & Misuse*, *54*(9), 1450–1460. https://doi.org/10.1080/10826084.2019.1585458

Neighbors, C., Lee, C. M., Lewis, M. A., Fossos-Wong, N., & Larimer, M. E. (2007). Are social norms the best predictor of outcomes among heavy-drinking college students? *Journal of Studies on Alcohol and Drugs, 68*(4), 556-565. https://doi.org/10.15288/jsad.2007.68.556

Neighbors, C., Lewis, M. A., LaBrie, J., DiBello, A. M., Young, C. M., Rinker, D. V., Litt, D., Rodriguez, L. M., Knee, C. R., Hamor, E., Jerabeck, J. M., & Larimer, M. E. (2016). A multisite randomized trial of normative feedback for heavy drinking: Social comparison versus social comparison plus correction of normative mis-perceptions. *Journal of Consulting and Clinical Psychology, 84*(3), 238–247. https://doi.org/10.1037/ccp0000067

Nesi, J., Rothenberg, W. A., Hussong, A. M., & Jackson, K. M. (2017). Friends' alcohol-related social networking site activity predicts escalations in adolescent drinking: Mediation

by peer norms. *The Journal of Adolescent Health, 60*(6), 641–647. https://doi.org/10.1016/j.jadohealth.2017.01.009

National Institute on Alcohol Abuse and Alcoholism (NIAAA) (2015). *College AIM Alcohol Intervention Matrix.* http://www.collegedrinkingprevention.gov/collegeaim/

National Institute on Drug Abuse (NIDA) (2019). Monitoring the Future Survey: High School and Youth Trends (DrugFacts). National Institutes of Health; U.S. Department of Health and Human Services.

Plonsky, L., Egbert, J., & Laflair, G. T. (2015). Bootstrapping in applied linguistics: Assessing its potential using shared data. *Applied Linguistics, 36*(5), 591-610. https://doi.org/10.1093/applin/amu001

Scharkow, M. (2016). The accuracy of self-reported Internet use—A validation study using client log data. *Communication Methods and Measures, 10*(1), 13-27.

Simons, J. S., Wills, T. A., Emery, N. N., & Marks, R. M. (2015). Quantifying alcohol consumption: Self-report, transdermal assessment, and prediction of dependence symptoms. *Addictive Behaviors, 50*, 205-212. https://doi.org/10.1016/j.addbeh.2015.06.042

Simons-Morton, B., Haynie, D., Bible, J., & Liu, D. (2018). Prospective associations of actual and perceived descriptive norms with drinking among emerging adults. *Substance Use & Misuse, 53*(11), 1771-1781. https://doi.org/10.1080/10826084.2018.1432651

Smith, A., & Anderson, M. (2018). Social media use in 2018. Pew Research Center.

https://www.pewresearch.org/internet/2018/03/01/social-media-use-in-2018/

Substance Abuse and Mental Health Services Administration (SAMHSA). (2019). *Key substance use and mental health indicators in the United States: Results from the 2018 National Survey on Drug Use and Health*. (HHS Publication No. PEP-19-5068, NSDUH Series H-54). Rockville, MD: Center for Behavioral Health

Statistics and Quality, Substance Abuse and Mental Health Services Administration. https://www.samhsa.gov/data/

Westgate, E. C., Neighbors, C., Heppner, H., Jahn, S., & Lindgren, K. P. (2014). "I will take a shot for every 'like' I get on this status": Posting alcohol-related Facebook content is linked to drinking outcomes. *Journal of Studies on Alcohol and Drugs*, *75*(3), 390–398.