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The Reciprocal Associations between Sharing Alcohol References on Social Networking Sites and Binge Drinking: A Longitudinal Study among Late Adolescents

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Abstract

Accumulating evidence indicates that social media use and the consumption of alcohol are related. The present longitudinal study (N=1006) adds to this line of research by examining the reciprocity of sharing alcohol references on social media and binge drinking among late adolescents (age 16-20 at baseline). The results indicate that binge drinking and alcohol-related self-presentation affect each other simultaneously over time. However, no support was found for the proposition that the perceived feedback of peers can strengthen this relationship, nor did we find a direct association between the perceived feedback of peers and alcohol-related self-presentation one year later. Overall, the results suggest that binge drinking and alcohol-related self-presentation on social media should be studied as tied behaviors, affecting each other simultaneously over time.

Key words: alcohol, social media, adolescents, reciprocal media effects, self-generated media effects, binge drinking

The Reciprocal Associations between Sharing Alcohol References on Social Networking Sites and Binge Drinking: A Longitudinal Study among Late Adolescents

1 Introduction

Although alcohol consumption is one of the world's leading factors for morbidity, disability, and mortality (World Health Organization, [WHO], 2014), it is a well-accepted practice in many countries throughout the world. In Belgium, alcohol consumption is legal from the age of 16. One third of Belgian adolescents (age 16-18) regularly drink alcohol, and nearly 70% of them have already engaged in binge drinking (Melis, Rosiers, De Paepe, & Geirnaert, 2016), defined as consuming four or more standard drinks (containing 10 grams or 12.7 ml of pure alcohol, e.g., 25 cl of light (5%) beer, 10 cl of (12%) wine) for girls and five or more standard drinks for boys in a timespan of two hours (NIAAA, 2004; VAD, 2016). The high prevalence of alcohol use and misuse among adolescents is worrisome as it leads to a series of negative health outcomes later in life (WHO, 2014). Consequently, it is of utmost importance to gain a thorough understanding of the factors contributing to adolescents' alcohol consumption.

Recently, several scholars have expressed concern over the potential impact social networking sites (SNS) might have on adolescents' alcohol consumption. Content analyses show that young people frequently share alcohol references on social media (e.g., Beullens & Schepers, 2013). Building on socio-cognitive models and expectancy value models of behavior, a growing body of research suggests that adolescents' exposure to alcohol references on SNS might affect adolescents' alcohol consumption through, for instance, a change in descriptive and injunctive norms (e.g., Litt & Stock, 2011; Teunissen et al., 2012).

In addition, several cross-sectional studies have reported associations between the *sharing* of alcohol related content and alcohol consumption (e.g., Geusens & Beullens, 2016a, 2016b,

2017; Moreno, Cox, Young, & Haaland, 2015; Ridout, Campbell, & Ellis, 2012): The more alcohol references individuals share, the more likely they are to engage in problem drinking.

The current study extends this line of research on the association between SNS use and alcohol consumption in three important ways. First, the study focuses on the examination of one specific type of effects, namely self-generated media effects (Valkenburg & Peter, 2013a). In addition to being influenced by exposure to certain media content, self-generated media effects hypothesis posits that individuals can also affect *themselves* when they share media content, both directly and indirectly through the feedback from others (Valkenburg & Peter, 2013a). The current study is among the first to examine this hypothesis and to assess whether this association is reinforced by perceived feedback from peers. Second, the study substantially extends prior research by examining this association between the sharing of alcohol-related content and drinking behavior longitudinally. Although a limited number of studies have shown that SNS use and alcohol consumption are related, the directionality of this association has remained unclear. Therefore, the present study aims to examine the reciprocal association of social media use and binge drinking behavior, using a cross-lagged path model.

Finally, the present study extends this line of research by its focus on late adolescents. So far, most studies have examined the association between sharing alcohol references and drinking behavior among samples of college/university students (D'Angelo, Kerr, & Moreno, 2014; Glassman, 2012; Moreno, Christakis, Egan, Brockman, & Becker, 2012; Moreno et al., 2015; Moreno, Kacvinsky, Pumper, Wachowski, & Whitehill, 2013; Ridout et al., 2012; van Hoof, Bekkers, & Van Vuuren, 2014). However, one third of late adolescents report to not only regularly consume alcohol, but to engage in binge drinking at least once a month (Melis et al., 2016). Understanding how SNS use is related to this risky drinking behavior is important, as research has shown that adolescents, along with children and elderly people, are especially vulnerable to alcohol-related harm (WHO, 2014).

2 Understanding the Relation between Sharing Alcohol References and Binge

Drinking

Drinking stories and photographs are highly valued among young people, and are frequently shared on social networking sites (SNS) before, during, and after drinking events (Brown & Gregg, 2012; Hebden, Lyons, Goodwin, & McCreanor, 2015; Niland, Lyons, Goodwin, & Hutton, 2014). Content analyses indicate that pictures and status updates referring to alcohol are present on the majority of SNS profiles of young people (Beullens & Schepers, 2013; Moreno et al., 2010; van Hoof et al., 2014). Most of these pictures portray people holding or drinking alcoholic beverages, and status updates refer most often explicitly to alcohol and alcohol consumption (e.g., 'I love champagne') (Beullens & Schepers, 2013, p. 499). Additionally, these alcohol references portray alcohol predominantly in a positive way, associated with dancing, partying and being together with friends (Beullens & Schepers, 2013; Moreno et al., 2010).

There are two main reasons why young people share alcohol references on SNS. On the one hand, individuals share alcohol references as a means to memorialize and relive enjoyable moments with friends. As such, alcohol-related references reflect offline drinking behavior (Hebden et al., 2015; Niland et al., 2014). On the other hand, research has also indicated that some adolescents post alcohol references on SNS in a conscious attempt to express a wild or offensive image, often with the aim of impressing their peers and enhancing social acceptance (Moreno, Briner, Williams, Walker, & Christakis, 2009; Peluchette & Karl, 2009). This desire for social acceptance has been identified by other researchers as an important motivation for online (alcohol-related) self-presentation and identity performances (Farquhar, 2012; Geusens & Beullens, 2017; Hebden et al., 2015; Moreno et al., 2009). In their desire for social acceptance, people tend to align themselves with the group that they want to belong to, and construct their online identities with a conscious orientation toward this group (Farquhar, 2012;

Zhao, Grasmuck, & Martin, 2008). In line with these findings, Geusens and Beullens (2017) indicated that adolescents share alcohol references in consonance with their offline drinking behavior, but only when their friends are sharing alcohol references on SNS as well.

2.1 Self-Generated Media Effects and Self-Perception Theory

Self-generated media effects hypothesis states that by creating and sharing social media content, individuals can unconsciously affect their own cognitions, beliefs, attitudes, and behaviors, both directly and indirectly (Valkenburg & Peter, 2013a). First, direct self-generated media effects hypothesis theorizes that the creation process or the created content can affect the creator him- or herself. This hypothesis can be explained by self-perception theory (Bem, 1972), which posits that an individual may infer their own attitudes and beliefs from their own overt behavior, if that behavior appears to be free from coercion. Observing oneself engage in certain behavior or communicating certain opinions can cause an involuntary internalization of the self-presentation and a change in self-perception, which is quickly and easily followed by behavioral changes to act consistently with this self-perception (Bem, 1972). Consequently, if an individual shares alcohol references on social media to align themselves with their peer group, they can subconsciously infer that they are someone who enjoys drinking and partying, and thus gradually increase their heavy drinking behavior in the future.

A few studies have shown that sharing alcohol references on SNS predicts increased heavy drinking behavior over time (D'Angelo et al., 2014; Moreno et al., 2015, 2013). For example, D'Angelo et al. (2014) found that sharing alcohol references on Facebook prior to beginning college directly predicted the number of binge drinking episodes one year later, at the end of the first year of college. Likewise, Moreno et al. (2013) found that, for female college students, a high prevalence of references to a street block party on Facebook prior to the party, was positively associated with alcohol use and the number of drinks consumed during the party. Finally, Moreno et al. (2015) reported that displaying alcohol references on Facebook,

especially photographs, was related to real-time drinking behavior and problem drinking. In line with these findings and building on the self-generated media effects hypothesis, we hypothesize that sharing alcohol references on SNS predicts binge drinking behavior one year later (H1).

2.2 Transactional Models and Mutually Reinforcing Processes

Additionally, in contrast to the idea that posting alcohol related content may predict subsequent behavior; it has also been argued that shared alcohol references may reflect prior heavy drinking behavior (Geusens & Beullens, 2016b, 2017; Glassman, 2012; Hebden et al., 2015; Moreno et al., 2012; Niland et al., 2014; Ridout et al., 2012; van Hoof et al., 2014). Social media are often used to share happy memories of social activities (e.g. parties, going to a bar) (Hebden et al., 2015; Niland et al., 2014). In real-life these activities often involve alcohol use. Consequently, the relationship between sharing alcohol references on SNS and heavy drinking behavior may be reciprocal, whereby social media use and alcohol consumption affect each other over time. This leads us to expect that binge drinking behavior also predicts the frequency of sharing alcohol references on SNS one year later (H2).

The proposition that media use and media outcomes affect each other in a reciprocal, mutually reinforcing process, has lead several authors to call for the use of transactional models in media effects research (e.g., Slater, 2007; Valkenburg & Peter, 2013a). These models propose that media outcomes and media use should not be studied separately, because media effects can only be ‘meaningfully conceived of when the influence of the outcome on media use is taken into account’ (Valkenburg & Peter, 2013a, p. 205). Yet, transactional models have not yet been applied to the relation between social media use and heavy drinking behavior. However, they have been implemented in a few studies in other media effects fields (e.g., Slater, Henry, Swaim, & Anderson, 2003; Vandenberg, van Oosten, & Peter, 2015). In line with these studies, we argue that alcohol references on SNS can both be a reflection of offline

alcohol use (H2) (e.g., Geusens & Beullens, 2017; Glassman, 2012; van Hoof et al., 2014), as well as predict subsequent alcohol use (H1) (D'Angelo et al., 2014; Moreno et al., 2015, 2013). Therefore, a cross-lagged panel model will be used to simultaneously examine the effects of binge drinking behavior and sharing alcohol references on SNS on each other.

2.3 Perceived Feedback from Peers

Adolescents are especially sensitive to the opinions of peers (Steinberg, 2008) and when individuals share content on SNS, their peers are likely to react and give their opinion through comments and likes. Indirect self-generated media effects hypothesis argues that media users can be indirectly affected through their perception of this feedback as well (Valkenburg & Peter, 2013a). Positive reinforcement of an expressed opinion or behavior signals to users that this behavior is appropriate and socially desirable, and can encourage more congruent behavior in the future. The proposition that the perceived approval of peers is influential in deciding whether or not to engage in certain behavior has been incorporated in several theories (Ajzen, 1991; Gibbons & Gerrard, 1995; Perkins & Berkowitz, 1986). For example, social norms theory (Berkowitz, 2004; Perkins & Berkowitz, 1986) argues that the perceived approval of peers, also defined as normative beliefs, strongly influences engagement in risk behavior. Thereby it is argued that overestimations of acceptance of problem behavior will increase engagement in problem behavior, while underestimations of acceptance of healthy behaviors will discourage individuals from choosing healthy behavioral options.

Though, to our knowledge, the role of perceived feedback from peers has not yet been examined in the relation between online alcohol-related self-presentation and drinking behavior, Beullens and Schepers (2013) indicated that friends' feedback on alcohol references on SNS was predominantly positive. Additionally, Wolfer (2014) indicated that most individuals ignore the media content they disagree with, rather than expressing their disapproval. Therefore, it is expected that individuals overestimate their friends' approval of

the alcohol references they are sharing, and, accordingly, of the heavy drinking behavior they are engaging in. Thus, in line with indirect self-generated media effects hypothesis (Valkenburg & Peter, 2013a) and social norms theory (Berkowitz, 2004; Perkins & Berkowitz, 1986), we hypothesize that perceived positive feedback of peers enhances the strength of the relation between sharing alcohol references and binge drinking (H3). Likewise, perceived negative feedback is expected to lead to sharing alcohol references less frequently in the future (H4).

2.4 Demographic Factors in Risky Drinking Behavior

To test the hypotheses a longitudinal panel survey (1-year interval) was conducted among a sample of late adolescents (aged 16-20 at baseline). At baseline, all respondents were still in high school, a period in life with little variety of key demographic areas, such as living conditions, school attendance, and marital status (Arnett, 2000). However, one year later, many respondents had finished high school and moved on to the next phase in their lives: emerging adulthood (Arnett, 2000, 2013). It has been argued that identity exploration starts in adolescence and intensifies during emerging adulthood (Arnett, 2000, 2013). The goal of these identity explorations is to obtain a broad range of life experiences, and it is often linked to risk behavior, such as excessive alcohol consumption (Arnett, 2000, 2005).

Gender and sensation seeking were added as control variables in the study, as these constructs have previously been related to social media use and alcohol consumption (de Visser & McDonnell, 2012; Hittner & Swickert, 2006; Melis et al., 2016; Rose et al., 2012; Wang, Jackson, Zhang, & Su, 2012). Specifically, boys and individuals' scoring high on sensation seeking have been found to engage more frequently in risky drinking behavior (de Visser & McDonnell, 2012; Hittner & Swickert, 2006; Melis et al., 2016; Rosiers et al., 2014).

3 Method

3.1 Sample

This study is part of the FLAMES research project (Geusens & Beullens, 2016b, 2017) and was approved by the ethical review board of the authors' institution (IRB clearance number G-2014 10 046). At T1 (baseline measurement, February through April (Spring) 2015), a sample of 50 schools was selected from the official list of all secondary schools in Flanders, Belgium. The schools were stratified by different education networks (public and private). School recruitment letters containing the details of the study procedures were sent out to the school principals. These emails were followed by a personal call to make arrangements on which class groups of the 5th, 6th and 7th year of secondary education would participate in the research. In the selected class groups, all pupils were invited to participate in a study on leisure activities, such as media use and going out behavior. They were asked to complete a paper-and-pencil questionnaire during school time with a teacher and research assistant present. The research assistant explained the procedures, assured the confidentiality of the data, and distributed and collected the surveys. In total, 3558 adolescents completed the questionnaire, of whom 3515 were between the ages of 16 and 20.

One year later (T2, follow-up measurement), respondents were contacted again through the email addresses and post addresses they provided at the end of the survey at T1. They were sent a personalized link to the web survey, and were asked to fill out the new survey. Of the 2832 adolescents who provided us with at least one way of contacting them, 1016 respondents completed the questionnaire at T2. Ten of them were younger than 16 or older than 20 at baseline, and were thus deleted from the sample so it would only contain late adolescents at T1 ($n=1006$). Though gender was equally distributed in the total sample at baseline (50.7% males), girls were slightly overrepresented in the follow-up measurement (60.3% females). On average, the adolescents in our sample were 17 years old at T1 ($M=16.99$, $SD=.82$) and 18

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years old at T2 ($M=18.19$, $SD=.87$). The majority of our sample had started a college education (56%), while a minority was still in high school (38%), was working or looking for work (5%), or was doing something else (1%, e.g., a stay-at-home parent).

Table 1

Analysis of Nonresponse

	Total Sample	Responders	Non-responders
Sharing alcohol references			
N	3485	1001	2484
Mean	.41	.28	.46
SD	.73	.50	.79
Binge drinking			
N	3408	986	2422
Mean	1.82	1.45	1.97
SD	1.78	1.56	1.85
Perceived feedback on alcohol references			
N	3246	931	2315
Mean	3.78	3.76	3.79
SD	1.10	.98	1.14
Sensation seeking			
N	3504	1005	2499
Mean	3.20	3.02	3.27
SD	.83	.82	.83
Gender			
N	3509	1005	2504
Mean	.50	.60	.46
SD	.50	.49	.50
Age			
N	3515	1006	2509
Mean	17.16	16.99	17.22
SD	.93	.82	.97

To assess whether attrition may have biased our final sample, we conducted a multivariate analysis of variance (MANOVA) using Pillai's trace to examine the differences between those who participated in both waves and those who participated in only one wave. The analysis indicated that non-respondents differed significantly from respondents when examining

baseline measurements, $V=.05$, $F(6, 3124)=27.72$, $p<.001$, $\eta_p^2=.05$ (see Table 1). Follow-up univariate analyses showed that those who participated in the second wave of the study were more likely to be younger ($M_{\text{difference}}=.23$, $SE=.03$; $F(1,3129)=40.28$, $p<.001$), more likely to be female ($M_{\text{difference}}=-.15$, $SE=.02$; $F(1,3129)=56.00$, $p<.001$), and scored lower on sensation seeking ($M_{\text{difference}}=.24$, $SE=.03$; $F(1,3129)=53.20$, $p<.001$). T2 respondents also shared less alcohol references on SNS at baseline ($M_{\text{difference}}=.19$, $SE=.03$; $F(1,1329)=44.55$, $p<.001$) and engaged less frequently in binge drinking ($M_{\text{difference}}=.54$, $SE=.07$; $F(1,1329)=60.84$, $p<.001$). There was no difference in the perceived feedback of friends on shared alcohol references ($M_{\text{difference}}=.04$, $SE=.04$; $F(1,3129)=.79$, $p=.37$).

3.2 Measures

Sharing alcohol references on SNS was measured at T1 and T2 using a scale similar to Beullens and Vandebosch (2016). Respondents were asked ‘How often do you privately share the following things on any social medium?’ and ‘How often do you publicly share the following things on any social medium?’, followed by four items for each questions: (a) photos or video clips referring to alcohol use, (b) textual updates referring to alcohol use, (c) photos or video clips in which you or your friends are drunk, and (d) textual updates while you are drunk. ‘Private sharing’ was defined as ‘references shared with a limited amount of people, e.g., through communication via direct messaging, private groups or group chats’. Responses ranged from (0) ‘never’, to (6) ‘several times a day’. Exploratory factor analysis indicated that all 8 items loaded onto one factor with good internal reliability, both at T1 (Principal components, eigenvalue=4.53, explained variance=56.67, $\alpha=.88$) and at T2 (eigenvalue=5.10, explained variance=63.71, $\alpha=.91$). Additionally, confirmatory factor analysis (CFA) was conducted in AMOS for all latent variables simultaneously (see 4.1 Measurement model for details).

Binge drinking was measured at T1 and T2 by asking respondents ‘During the last 12 months, how often did you have 5 or more (males) or 4 or more (females) drinks containing any kind of alcohol within a two-hour period?’ (NIAAA, 2004). Answers ranged from (0) ‘0 to 2 days in the past year’ to (8) ‘every day’.

Perceived feedback from peers was measured at T1 by asking respondents how their friends react if they shared the following things on SNS: (a) photos or video clips referring to alcohol use, (b) textual updates referring to alcohol use, (c) photos or video clips in which they or their friends are drunk, and (d) textual updates while they are drunk. Response categories ranged from (1) ‘very negatively’ to (7) ‘very positively’. All items loaded onto one factor (principal components, eigenvalue=3.20, explained variance=79.90) with good internal reliability ($\alpha=.91$)

Control variables were measured at T1, and were gender (male (0) and female (1)) and sensation seeking. Sensation seeking was measured using the 8-item brief sensation seeking scale, with response categories from (1) ‘strongly disagree’ to (5) ‘strongly agree’ (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). Factor analysis indicated that two items had to be dropped (see section 4.1 for more details) (principal components, eigenvalue_{full scale}=3.23, eigenvalue_{items dropped}=2.86, explained variance_{full scale}=40.35, explained variance_{items dropped}=47.61, $\alpha_{full scale}=.78$, $\alpha_{items dropped}=.78$).

3.3 Analyses

SPSS 24 was used to calculate descriptive statistics and correlation analyses, and AMOS 24 was used for testing the measurement model and cross-lagged path model. Following Hayes (2009), all analyses were bootstrapped, resampling the sample data in 5000 samples to compare the effect sizes of those samples to estimate the actual effect size. Missing values were deleted pairwise with N=998 in the analyses. The hypotheses were tested while controlling for gender and sensation seeking, and model fit was decided upon inspection of the comparative fit index

(CFI, >.90), goodness of fit index (GFI, >.95), adjusted goodness of fit index (AGFI, >.80) and root mean square error of approximation (RMSEA, <.08) (Hu & Bentler, 1999). The moderator was constructed following the three-step procedure for interaction outlined by Cortina, Chen and Dunlap (2001) to carry out Ping's (1995) interaction approach.

4 Results

4.1 Measurement model

All variables, except gender and binge drinking, were specified as latent variables. Sharing alcohol references on SNS were identified as second order latent variables both at T1 and T2, the indicators of which were publicly and privately sharing alcohol references on SNS. CFA indicated that the measurement model could be improved ($\chi^2=4897.99$, $df=412$, $\chi^2/df=11.89$, $p<.001$, $GFI=.76$, $AGFI=.71$, $CFI=.78$, $RMSEA=.11$). Following the guidelines by Harrington (2009) and Kenny (2011), we respecified the model. First, we dropped the sensation seeking items 'I get restless when I spend too much time alone' and 'I would like to explore strange places', which had factor loadings of below .40. Next, we used the modification indices to identify which error loadings should be covaried. Due to the wording of our sharing alcohol references measure, we had to covary the error loadings of publicly and privately sharing visual alcohol references ($r_{T1}=.51$, $r_{T2}=.54$, $p<.001$), textual alcohol references ($r_{T1}=.45$, $r_{T2}=.41$, $p<.001$), visual intoxication references ($r_{T1}=.49$, $r_{T2}=.49$, $p<.001$) and textual intoxication references ($r_{T1}=.55$, $r_{T2}=.32$, $p<.001$). The error loadings of the reaction of friends towards visual and textual alcohol references ($r=.73$, $p<.001$) and towards visual alcohol and intoxication references ($r=.34$, $p<.001$) had to be covaried as well. Finally, in the sensation seeking variable, we covaried the error loadings of the items measuring thrill and adventure seeking ($r=.39$, $p<.001$). These changes resulted in an acceptable model fit ($\chi^2=1856.12$, $df=278$, $\chi^2/df=6.68$, $p<.001$, $GFI=.88$, $AGFI=.85$, $CFI=.92$, $RMSEA=.08$).

4.2 Descriptive measures

Table 2

Descriptive Statistics and Correlation Analyses

	1.	2.	3.	4.	5.	6.	7.
1. Sharing alcohol references on SNS T1	-						
2. Sharing alcohol references on SNS T2	.36***	-					
3. Binge drinking T1	.35***	.30***	-				
4. Binge drinking T2	.31***	.40***	.52***	-			
5. Perceived feedback from peers	.29***	.23***	.14***	.16***	-		
6. Gender	-.06	-.08*	-.06	-.14***	-.10**	-	
7. Sensation Seeking	.23***	.26***	.33***	.30***	.14***	-.03	-
M	.28	.36	1.44	1.05	3.76	/	3.02
SD	.49	.59	1.56	1.36	.98	/	.83

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

Table 2 displays the descriptive statistics and correlation analyses of the main constructs in the model. About 40% of our sample indicated that they had not engaged in binge drinking during the last 12 months at T1. One year later, this percentage increased to roughly half our sample (48.1%). One third of our sample engaged in binge drinking maximum once a month (T1=31.4%, T2=36.2%), while engagement in binge drinking behavior more than once a month was less prevalent (T1=27.9%, T2=15.8%). Similarly, roughly half of our sample indicated never to share alcohol references on SNS (T1=58.3%, T2=50.7%), while the other half of our sample indicated to share alcohol references no more than a few times a month (T1=40.2%, T2=46.9%). A minority indicated to share alcohol references at least once per week (T1=1.5%, T2=2.4%). On average, the adolescents in our sample perceived their friends

to be rather negative towards sharing alcohol references, with only 20% of our sample rating their friends' reactions at least somewhat positive.

4.3 Testing self-generated media effects

$\chi^2=2170.96$, $df=367$, $\chi^2/df=5.92$, $p<.001$, $GFI=.88$, $AGFI=.84$, $CFI=.91$, $RMSEA=.07$,
 $AIC=2366.96$

Control variables: Gender, sensation seeking

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

Figure 1. Standardized bootstrapped (5000 samples) cross-lagged panel model examining our main hypotheses

We tested all hypotheses simultaneously in one model, while controlling for gender and sensation seeking (see Figure 1). This model fitted acceptably ($\chi^2=2170.96$, $df=367$, $\chi^2/df=5.92$,

$p < .001$, $GFI = .88$, $AGFI = .84$, $CFI = .91$, $RMSEA = .07$, $AIC = 2366.96$) and confirmed the first two hypotheses. Sharing alcohol references at T1 predicted binge drinking at T2 ($\beta = .12$, $p < .05$): The more frequently adolescents shared alcohol references on SNS, the more often they engaged in binge drinking one year later (H1). Concurrently, binge drinking at T1 also predicted sharing alcohol references at T2 ($\beta = .08$, $p < .05$): The more days adolescents had engaged in binge drinking, the more frequently they shared alcohol references on SNS one year later (H2).

The perceived feedback of peers did not predict binge drinking behavior one year later ($\beta = .02$, $p = .60$), nor did it predict sharing alcohol references one year later ($\beta = .02$, $p = .58$). Additionally, peers' perceived feedback did not strengthen the relation between sharing alcohol references and binge drinking one year later ($\beta = .04$, $p = .29$). Thus, hypotheses 3 and 4 were not confirmed. Girls engaged less in binge drinking behavior at T2 ($\beta = -.10$, $p < .001$) but not at T1 ($\beta = -.06$, $p = .06$), and shared alcohol references as frequently as boys both at T1 ($\beta = -.07$, $p = .08$) and T2 ($\beta = -.05$, $p = .13$). Adolescents with high levels of sensation seeking engaged more often in binge drinking behavior both at T1 ($\beta = .44$, $p < .001$) and T2 ($\beta = .18$, $p < .001$), and shared alcohol references more often both at T1 ($\beta = .40$, $p < .001$) and T2 ($\beta = .17$, $p < .001$).

5 Discussion

Accumulating evidence indicates that various forms of SNS use are associated with alcohol-related perceptions, attitudes and behaviors (e.g., Beullens & Vandebosch, 2016; D'Angelo et al., 2014; Geusens & Beullens, 2016b; Litt, Stock, & Gibbons, 2015; Moreno et al., 2015). The current study substantially extended this line of research by examining the longitudinal and reciprocal associations between adolescents' sharing of alcohol-related content on social media and binge drinking. The results of our study indicated that late adolescents' alcohol references on SNS were directly predicted by their binge drinking behavior during the preceding year. At the same time, our results showed that these alcohol references also

predicted binge drinking behavior one year later. These findings seem to suggest that late adolescents' alcohol references on SNS simultaneously result from and affect their binge drinking behavior.

One explanation for these findings lies in the direct self-generated media effects hypothesis (Valkenburg & Peter, 2013a), which builds on the self-perception theory (Bem, 1972) to posit that individuals can internalize their online self-presentation. On the one hand, the present study confirms cross-sectional and qualitative studies' speculations that alcohol references on SNS may be an indication of alcohol consumption (Geusens & Beullens, 2016b, 2017; Glassman, 2012; Hebden et al., 2015; Niland et al., 2014; Ridout et al., 2012; van Hoof et al., 2014). Young people use their social media profiles to explore and express their identity (Farquhar, 2012), and for some individuals, alcohol and partying is part of who they are or want to be (Casey & Dollinger, 2007; Foster, Neighbors, & Young, 2014; Lindgren, Foster, Westgate, & Neighbors, 2013). However, on the other hand and in line with the self-generated media-effects hypothesis, by presenting oneself as someone who enjoys alcohol, adolescents seem to unconsciously persuade themselves that this is indeed the kind of person they are, thereby strengthening their engagement with this behavior over time.

Slater (2007) proposed that media selectivity and media effects can form a mutually reinforcing process, which moves forward in time, creating a spiral of cumulative effects. Though we cannot test this proposition with only two time points, the results of the current study seem to indicate that binge drinking and sharing alcohol references on SNS may affect each other over time. Adding a third time point, one year after T2 will provide more information on whether this relation is really mutually reinforcing in nature, whereby individuals engage in continued or increased alcohol-related social media use, and maintained or increased binge drinking behavior.

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Additionally, the proposition that binge drinking behavior and alcohol-related self-presentation on SNS can reinforce each other over time, raises the question whether this can lead to extreme behavior. Slater (2007) argued that a reinforcing spiral of media selection and media effects rarely leads to extreme attitudes or behavior, but can result in the maintenance of attitudes and behaviors, despite competing social, psychological and environmental influences, such as prevention campaigns. However, he did identify three groups at risk for more intense spirals of reinforcement: Individuals who are poorly integrated or socialized, individuals whose peers share the same attitudes, behaviors and media use, and individuals who inhabit a larger social environment where the attitudes and behavior have substantial support (Slater, 2007). In line with these assumptions, Valkenburg and Peter's (2013a) indirect self-generated media-effects hypothesis (Valkenburg & Peter, 2013a) proposes that the association between sharing content on SNS and a behavioral or attitudinal outcome is reinforced when the perceived feedback from peers is positive.

Following these propositions, it was expected that perceived disapproval of alcohol references on SNS would reduce the strength of the association between alcohol-related self-presentation and binge drinking, as well as result in less online alcohol-related self-presentation one year later. These hypotheses were not supported by the results. Though the findings of our study show that online alcohol-related self-presentation and adolescents' engagement in binge drinking are closely tied behaviors, the role of social acceptance and desirability is less clear. While sharing alcohol references on SNS predicted binge drinking behavior directly, it did so regardless of the feedback from others. Perceived support for sharing alcohol references on SNS did not predict binge drinking one year later, nor did it strengthen the association between sharing alcohol references and binge drinking.

This could be explained by the fact that our respondents overwhelmingly reported that they perceived their friends to be indifferent toward the alcohol references they share on SNS. It

has been argued that most people ignore SNS content they disagree with, rather than verbalizing their disapproval (Wolfer, 2014). Additionally, though the reactions that individuals do receive appear to be predominantly positive, it should be noted that peers' feedback is limited (Beullens & Schepers, 2013; Moreno et al., 2010). Content analyses indicate that, in general, alcohol-related posts receive only a few reactions (Beullens & Schepers, 2013; Moreno et al., 2010), while the average respondent in our sample indicated to have more than 300 Facebook friends. This could be one explanation for the insignificant role of perceived feedback in the relation between sharing alcohol references and heavy drinking behavior. Further research is required to confirm these findings.

5.1 Limitations

In spite of the fact that the study adds significantly to the literature in this field of research, it also suffers from some shortcomings. First, the study relied on self-reports, which can result in the over- or under-reporting of some behaviors (Billiet & Carton, 2010). It is possible that respondents had difficulty remembering how often they engaged in binge drinking behavior during the past year, or how often they shared alcohol references on social media. Likewise, they could have exaggerated to appear cool, or minimized to give more socially acceptable answers. Though it is difficult to determine with certainty to which extent these self-reports reflect actual behavior, previous research has indicated that self-reports of risk behavior and alcohol use are usually reliable when confidentiality of the data is assured (Simons, Wills, Emery, & Marks, 2015).

Second, our respondents were recruited in Belgium, a country which is known for its tolerant alcohol policy. At baseline, all adolescents were at least 16 years old, which is the legal minimum age to drink wine and beer in Belgium. This minimum age is considerably lower than for instance in the United States, where individuals have to be at least 21 to consume alcohol. Consequently, the social acceptance of adolescent alcohol use, as well as the alcohol

consumption itself and alcohol-related self-presentation differ between Belgium and the USA (e.g., Beullens & Schepers, 2013; Melis et al., 2016; Moreno et al., 2010; Steketee, Jonkman, Berten, & Vettenburg, 2013). Though Belgium appears to correspond to alcohol norms and behaviors in other European countries (Steketee et al., 2013), the results of the present study cannot be generalized to other populations without first conducting cross-cultural research.

Third, only one third of the initial respondents participated in the second wave of the study. Respondents were contacted up to six times, through email and regular mail. An analysis of the non-response indicated that boys were less likely to participate in the second wave. Additionally, adolescents who dropped out of the study were slightly older, shared more alcohol references and engaged more often in binge drinking than the adolescents who participated in both waves. Nonresponse may thus have been systematic, and the sample in the present study may differ from the larger population (Billiet, 2010). It is therefore recommended that future studies examine these relations in other samples to test if the results hold.

In addition, we recommend that future studies add a wider range of constructs related to both social media use and alcohol consumption to their models. It has been argued that media use and responsiveness to media can be partially dependent upon social context and individual difference variables, such as dispositional and developmental constituents (Valkenburg & Peter, 2013b). Including these constructs will provide a deeper insight in the exact nature of the association between sharing alcohol-related references and binge drinking, the pathways through which this association occurs, and the conditions under which it is strongest.

Finally, we did not differ between respondents who were still in high school at T2, and adolescents who had started college or work life at this point. Graduating high school represents the end of adolescence and the start of emerging adulthood, and it has been argued that this period in life is associated with increased risk behavior and alcohol consumption (Arnett, 2000, 2005, 2013). However, when nested model comparison was used to compare

the strength of the tested relations (H1-4) between those who were still in high school and those who had already started college, we found no significant differences. Therefore, we opted to examine the models in the entire sample.

5.2 Conclusion

The present study has identified that binge drinking behavior and alcohol-related self-presentation on SNS should be studied as tied behaviors, affecting each other simultaneously over time. It appears that adolescents share alcohol references on SNS to communicate about their binge drinking behavior, while simultaneously internalizing this alcohol-related communication. The feedback from peers on alcohol-related self-presentation on SNS did not moderate these relations, nor did it directly affect binge drinking behavior or the sharing of alcohol references on SNS.

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