Frequent electronic media communication with friends is associated with higher adolescent substance use

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Introduction

With the increase in electronic media communication (EMC; e.g., texting, instant messaging) among adolescents (Valkenburg and Peter 2010), the contexts important for adolescents' interactions with peers have expanded from the physical (offline) to the virtual (online) world (Brechwald and Prinstein 2011). Adolescents use EMC frequently to communicate and to develop and maintain close relationships with their peers (Lenhart, 2012).

Previous research has shown that EMC is positively associated with adolescent substance use (e.g., Ohannessian 2009; Osaki et al. 2012). However, it remains unclear how these associations should be interpreted. On the one hand, these associations may reflect already established associations between offline interactions and adolescent substance use (e.g., Chassin et al. 2009; Kuntsche et al. 2009a). On the other hand, there may be unique and independent associations of EMC with adolescent substance.

The current study examined the unique effects of EMC with friends on adolescent substance use (tobacco, alcohol, cannabis), over and beyond the effects of face-to-face (FTF) interactions with friends and the classroom norm (i.e., the average level of substance use by classmates).

Hypotheses

1. More EMC is uniquely associated with more adolescent substance use
2. EMC strengthens the associations of FTF interactions with friends as well as average classroom substance use with individual substance use, due to the increased exposure to peers' displays of such behaviors via EMC

Method

Participants

- 5,642 adolescents from 264 classrooms (M_{age} = 14.29; *SD* = 1.26; 49.2% boys)

Measures

- Control variables: Age, sex, weekly computer use, weekly internet use
- EMC (1-5): Talk to your friend(s) on the phone, communicate with them via instant messaging, or send them text messages or e-mails
- FTF day and evening: How many days per week after school (0-5) or how many evenings per week (0-7) usually spent with friends
- Tobacco (1-7), alcohol (1-14), cannabis (1-7) use in last four weeks
- Classroom norm: the average substance use of all participating classmates

Analysis Strategy

- ML design, participants (L1) nested within classrooms (L2)
- Model 1: intercept only, Model 2: including control variables, Model 3: including EMC, Model 4: including FTF, Model 5: including classroom norm, Model 6: including interactions of EMC with FTF and classroom norm

Results

The distributions of the behaviors were positively skewed (most adolescents did not engage in substance use; see Table 1). Further, substance use behaviors were significantly and positively correlated with all predictor variables. More EMC, more FTF interactions, and a higher classroom norm were associated with more individual substance use.

Results of the final multilevel Model 6 (including all fixed and random effects) revealed that use of each substance was significantly and positively associated with EMC (see Table 2). These main effects weakened slightly though remained significant after including FTF interactions and the classroom norm. Additional analyses revealed that the standardized effect of EMC was significantly stronger for alcohol use (β = .15) than for tobacco (β = .05, $t(5180)$ = 3.33) or cannabis use (β = .06, $t(5160)$ = 2.79, all ps < .01).

Table 1
Descriptive Statistics for Predictor and Dependent Variables, Correlational Coefficients with Predictor Variables, and Intraclass Correlations (ICCs) and Design Effect Estimates (DEs) for Classroom Level by Dependent Variables (The Netherlands, 2009)

Variable	*N*	*M*	*SD*	*Skewness* [b]	*Kurtosis* [b]	Correlations *r* with Predictor Variables [a]				Intraclass correlations *ρ* (DE)
						EMC	*FTF day*	*FTF evening*	*Classroom substance use*	*Classroom level*
Predictor Variables										
EMC	2793	3.63	1.37	-.51	-1.06					
FTF day	2784	3.30	1.54	.31	-.85	.20				
FTF evening	2770	2.86	1.71	1.12	.97	.31	.40			
Dependent Variables										
Tobacco	2794	1.57	1.54	2.76	6.23	.17	.22	.38	.33	.149 (2.43)
Alcohol	2752	2.57	2.97	2.27	4.41	.24	.13	.37	.46	.273 (3.57)
Cannabis	2768	1.10	.58	7.34	59.55	.10	.12	.23	.17	.077 (1.73)

[a] All correlation coefficients significant at p < .01, unless otherwise specified. A Bonferroni correction was applied to the correlations between predictor and dependent variables to control for FWER in multiple comparisons ($p < \alpha/12$).
[b] SE_S = .046-.047, SE_K = .093-.094.

There were four significant interactions: FTF day by EMC for tobacco use, FTF evening by EMC for tobacco use and cannabis use, and average classroom use by EMC for alcohol use. First, the association between FTF day and tobacco use was stronger at high levels of EMC (B = .14, SE^B = .03) than at moderate levels of EMC (B = .09, SE^B = .02), while this association was not significant at low levels of EMC (B = -.01, SE^B = .03). Second, the association between FTF evening and tobacco use was stronger at high levels of EMC (B = .28, SE^B = .04) than at moderate (B = .22, SE^B = .03) or low levels of EMC (B = .12, SE^B = .05).Third, the association between classroom and individual alcohol use was stronger at high levels of EMC (B = .77, SE^B = .05) than at moderate (B = .60, SE^B = .04) or low levels of EMC (B = .26, SE^B = .10; see Figure 1). Finally, the association between FTF evening and cannabis use was stronger at high levels of EMC (B = .09, SE^B = .02) than at moderate levels of EMC (B = .05, SE^B = .01). FTF evening was not associated with cannabis use at low levels of EMC (B = -.02, SE^B = .02).

Table 2
Fixed and Random Parameter Estimates for Model 6 by Dependent Variable

	Tobacco use	Alcohol use	Cannabis use
	B (SE)	*B (SE)*	*B (SE)*
Fixed effects			
Intercept (γ_{00})	1.388 (0.146) ***	2.601 (0.398) ***	1.139 (0.055) ***
Sex (γ_{20}) [a]	-0.007 (0.058)	-0.503 (0.104) ***	-0.085 (0.024) ***
EMC (γ_{10})	0.071 (0.027) **	0.304 (0.045) ***	0.037 (0.012) **
FTF after school (γ_{60})	0.091 (0.019) ***	0.048 (0.034)	0.017 (0.008) *
FTF in the evening (γ_{70})	0.225 (0.026) ***	0.343 (0.043) ***	0.052 (0.013) ***
Classroom substance use (γ_{01})	0.490 (0.070) ***	0.596 (0.039) ***	0.300 (0.091) ***
Interaction effects			
EMC x FTF after school (γ_{80})	0.037 (0.013) **	0.010 (0.022)	0.006 (0.004)
EMC x FTF in the evening (γ_{90})	0.041 (0.016) *	0.044 (0.027)	0.027 (0.008) ***
EMC x Classroom substance use (γ_{11})	0.080 (0.044)	0.127 (0.032) ***	0.104 (0.057)
Random effects			
Participant level (σ^2_{r0})	1.766 (0.153) ***	5.443 (0.496) ***	0.273 (0.049) ***
Classroom level (σ^2_{u00})	0.054 (0.047)	0.328 (0.128) **	0.014 (0.009)
Model summary			
ΔDeviance (Δdf) [b]	28.49 (5) ***	39.36 (5) ***	54.51 (5) ***
Explained variance R^2 [c]			
Participant level (R^2_1)	.215	.325	.073
Classroom level (R^2_2)	.729	.803	.387

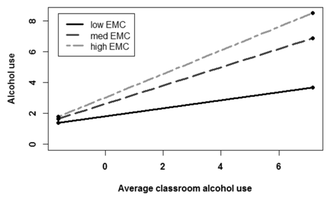
Note. * p < .05; ** p < .01; *** p < .001.
[a] 1 = boys, 2 = girls
[b] The deviance of Model 6 compared to the previous Model 5 is provided.
[c] Proportion of explained variance in Model 5 (excluding random effects).

Conclusion

This study showed that higher levels of EMC were associated with higher levels of adolescent substance use, predominantly for alcohol use. EMC explained unique substance use variance over and beyond FTF interactions and average classroom substance use. Further, EMC strengthened several positive associations of FTF interactions and average classroom substance use with individual substance use.

Various explanations can be provided for these findings. First, adolescents who use EMC frequently also have frequent offline FTF interactions with (the same) peers because EMC is used to communicate with peers about where and when to meet and what to do offline (Kraut et al. 2002; Kuntsche et al. 2009b; Subrahmanyan and Greenfield 2008). As a consequence, their substance use increases, given the well-established fact that adolescents often engage in substance use in the presence of peers (e.g., Branstetter et al. 2011; Chassin et al. 2009). A second explanation may be found in the content of adolescents' EMC, especially for alcohol use. Online displays of engagement in alcohol use (e.g., texting about or posting pictures of partying and drinking) likely leads to conformity in adolescents' own alcohol use to peers' alcohol use (Huang et al. 2014; Loss et al. 2013).

These findings imply that electronic media communication and other online behaviors should not be left unnoticed in order to fully understand and prevent adolescent substance use. Prevention efforts should take into account the potential negative consequences of online displays of substance use and should include information on the potential inaccuracy and one-sidedness of peers' online reports of substance use.



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