




Fear of missing out and binge-drinking among adolescents

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Abstract

Introduction. No previous studies have examined the cross-sectional association between fear of missing out (FOMO) and binge-drinking among adolescents. The aim of the present study was: (i) to estimate the magnitude of this association; (ii) to assess the impact of potential confounders (i.e. sensation-seeking, symptoms of depression and self-regulation); and (iii) determine if it is uniform across all levels of these characteristics. **Methods.** Cross-sectional study of adolescents from 33 middle schools in Norway, stratified according to geographic location, urban and rural locations, and standard of living. Participants were a nation-wide sample of N = 2646 adolescents (mean age 16.2 years, 43% boys). Self-report data were collected on binge-drinking, FOMO, sensation-seeking, symptoms of depression and self-regulation. **Results.** Overall, 21% reported binge-drinking \leq once per month in the past 12 months, while 9% reported binge-drinking more than once per month. Multinomial logistic regression showed that the crude effect, where greater FOMO was associated with greater risk of binge-drinking, was substantial (relative-risk ratio = 1.50 [1.35, 1.66], $P < 0.001$), but somewhat attenuated after including all potential confounders (relative-risk ratio = 1.28 [1.14, 1.43], $P < 0.001$). Effect modification analyses showed that the effect of FOMO on binge-drinking \leq once per month was stronger for adolescents with low symptom levels of depression and weaker for adolescents at high levels of depression. **Discussion and Conclusion.** Norwegian adolescents with higher FOMO have greater risk of binge-drinking. [Brunborg GS, Skogen JC, Burdzovic Andreas J. Fear of missing out and binge-drinking among adolescents. *Drug Alcohol Rev* 2021]

Key words: alcohol, adolescence, youth, fear of missing out, FOMO.

Introduction

Adolescent drinking has declined in several Western countries in the past two decades [1,2]. However, alcohol consumption, particularly the consumption of large amounts of alcohol on the same occasion, is associated with a range of detrimental consequences and health problems for young people [3–5]. Up-to-date knowledge of risk factors for adolescent binge-drinking is important for developing effective prevention strategies. Fear of missing out (FOMO), defined as ‘...a pervasive apprehension that others might be having rewarding experiences from which one is absent’ [6] could be one such risk factor. FOMO as a phenomenon has gained increased research interest in the last decade, especially due to its close association with social media use [7]. However, research concerning the potential relationship between FOMO and binge-

drinking among adolescents is sparse. In the present study, we attempt to fill this gap in the literature by determining the strength of the relationship using a large nationwide sample of Norwegian adolescents.

FOMO includes both an affective component (fear, anxiety, apprehension, uneasiness) and a cognitive component that involves comparing one’s own experiences to those of others, and to experiences one could have had [7]. FOMO can be thought of as a state or a trait. The FOMO state is the occasional experience of anxiety or apprehension, for instance, when friends are out at a party that one is not attending [8]. Conceived as a trait, it appears that some people are generally more prone to such experiences, and that FOMO is similar to a personality trait with a continuum that ranges from low to high. The FOMO phenomenon can be framed within Self Determination Theory [9], where psychological health is determined by the

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satisfaction of three basic needs: competence (ability to act on one's environment), autonomy (feeling that one has choice) and relatedness (need to belong and be connected to others). FOMO can arise from deficits in satisfying these needs, either temporarily, which can give rise to state FOMO, or more chronic, which can give rise to high trait FOMO [6]. Indeed, there is empirical evidence suggesting that poorer psychological needs satisfaction is associated with higher trait FOMO [6].

Research has shown that high FOMO individuals spend more time on social media such as Facebook and Instagram [6,10], but little attention has been paid to FOMO in relation to away-from-keyboard social activities, such as going to parties. There are at least three reasons why high FOMO can be linked to greater risk of binge-drinking. First, drinking alcohol, especially in social settings, may be motivated by satisfying the basic needs that determine FOMO [11]. For instance, consuming alcohol in a social setting could be motivated by a desire to achieve a temporary heightened sense of competence, autonomy and relatedness. Second, those high in FOMO tend to spend more time on social media where they can be exposed to more events involving alcohol, and to alcohol-related commercials and alcohol-influencers [6,12–15]. Third, individuals high in trait FOMO may simply more readily take part in drinking events because they have greater fear of missing out on the fun and excitement experienced by peers who drink compared to adolescents with lower FOMO [7,16].

We have identified four publications that have reported on the relation between trait FOMO and binge drinking. Riordan *et al.* [12] reported results from two studies involving mostly female university students, one cross-sectional study with 182 participants, and a 2-week prospective daily diary study with 262 participants. In both studies, FOMO was not associated with greater drinking frequency or greater average weekly number of drinks, but in the second study, higher FOMO was prospectively associated with a greater number of alcohol drinks per session. Also, in both studies, higher FOMO was associated with more negative alcohol-related consequences, such as regret, hangovers and memory loss. The reported associations from the study were crude estimates and lacked adjustment for potential confounding factors.

In a survey of 101 university students, Webb [17] found that FOMO was not associated with alcohol-related consequences after adjusting for extroversion, neuroticism and membership in a Greek letter organisation. Also, in a cross-sectional study of 252 university students, Zunic [18] found that FOMO was not related retrospectively to reported alcohol drinking under the age of 21.

Riordan *et al.* [19] studied the relationship between FOMO and alcohol use and alcohol-related harm during orientation week at university. They found that higher levels of FOMO were associated with a higher likelihood of reporting any alcohol consumption, after controlling for gender, age and whether the participant was entering or leaving the premises. However, FOMO was not associated with number of drinks, time spent drinking or breath alcohol concentration. In a retrospective study also reported in the same publication [19], higher FOMO was associated with more drinking during orientation week and more alcohol-related harm, after controlling for gender, age and pre-university alcohol consumption.

We have not come across studies that have investigated the relation between FOMO and alcohol use among adolescents, but previous studies involving university students suggest that there might be such a relationship. Other factors can explain why an association between FOMO and drinking is observed, rendering the association spurious. For instance, high FOMO appears to be related to low general mood, less life satisfaction, more negative affect, insomnia and poor mental health [6,7,20,21]. Such poor mental health and well-being is in turn related to adolescent drinking [13,22,23]. It is therefore plausible that poor mental health is an important confounding factor for the relationship between FOMO and alcohol consumption patterns. Another potential confounder is sensation-seeking. Adolescents with high levels of sensation-seeking are prone to boredom and need novel stimulation, and research has shown that high sensation-seeking is associated with high FOMO [24]. High sensation-seeking is also associated with greater risk of binge-drinking [13,25]. A third potential confounding factor is self-regulation, which can be considered the opposite of impulsivity. Research suggests that high FOMO is related to both difficulties in emotional regulation [26] and lower conscientiousness [27], which are closely linked to poor self-regulation. As poor self-regulation is also related to greater risk of binge-drinking [25,28], it might be the case that the FOMO-binge-drinking link is confounded by low self-regulation. If we observe a positive association between FOMO and alcohol use after accounting for confounders, it is more likely that the association is not just spurious. It could also be the case that FOMO operates differently on alcohol consumption for adolescents at different levels of sensation-seeking, depression and self-regulation. In addition, there may be gender and age differences.

Against this backdrop, the aim of the present study was to: (i) estimate the cross-sectional association between FOMO, conceived as a trait, and binge-drinking among adolescents; and if there is such an association; (ii) to determine if the estimated association is changed by accounting for sensation-seeking,

symptoms of depression and self-regulation as confounders; and (iii) to explore the potential moderating effects of gender, age, sensation-seeking, symptoms of depression and self-regulation.

Method

Data source and sampling

The data were from the MyLife longitudinal study, where a nationwide and geographically and socio-economically heterogeneous sample has been assessed at three time-points 1 year apart. The sampling strategy started with the selection of one county from each of Norway's five geographical regions. Within each county, municipalities and city districts were drawn, stratified by degree of urbanisation and socio-economic indicators. One middle school with students in eighth, ninth and 10th grade from each municipality/city district was included in the study. The study design, ethical approval, recruitment and consent procedures are described in detail elsewhere [29].

Forty-two schools met inclusion criteria, however nine declined to participate, leaving 33 schools with a total enrolment of 6951 students. During school hours, all students were instructed to deliver and return information packages with consent forms to/from their parents. A total of 4195 forms were returned, 3512 with parental consent.

Data collection was completed at three-time points, during autumn in 2017, 2018 and 2019. All those with parental consent were invited to take part at each assessment. The present study used data from the third wave of data collection because FOMO was introduced to the questionnaire at this time-point. The T3 data collection was completed during the autumn of 2019, with a response rate of 75%. The participants who were still in school (10th graders) completed an online questionnaire during a regular school hour under teachers' supervision (response rate: 81%). The rest of the participants (the two oldest age cohorts) completed an online questionnaire at a time and place of their own choosing (response rate: 71%). The analytical sample comprised 2651 (43% male) adolescents who were on average 16.19 years old (SD = 0.84).

Measures

Binge-drinking was measured by asking the participants to indicate how often they had consumed five or more standard drinks during the same occasion in the last 12 months. Response options ranged from 'Not at all' (coded 0) to 'Every day or almost every day' (coded

5). We created a three-level variable where 1 = no binge-drinking, 2 = binge-drinking \leq once per month, and 3 = binge-drinking more than once per month.

FOMO was measured with the 10-item Fear of Missing Out scale [6]. This instrument measures FOMO conceived as a trait. Example items are 'I fear others have more rewarding experiences than me' and 'It bothers me when I miss an opportunity to meet up with friends'. Responses were made using a 5-point scale ranging from 'Not at all true of me' to 'Extremely true of me', and the average score was used in the analysis. Cronbach's alpha for the scale was 0.89.

Sensation-seeking was assessed with the 4-item Brief Sensation Seeking Scale [30,31]. Individual items (e.g. 'I like to do frightening things') were coded with the 5-point Likert type responses ranging from 1 ('Completely disagree') to 5 ('Completely agree'). Scores on individual items were averaged to compute overall scale scores. Cronbach's alpha for the scale was 0.80.

Symptoms of depression. DSM-IV depressive symptomatology during the past 2 weeks was measured by the 9-item Patient Health Questionnaire (modified for use with adolescents) on a 4-point scale where 0 = 'not at all' and 3 = 'nearly every day' [32,33]. Cronbach's alpha for the scale was 0.90, and the sum of item scores was used in the analyses. Additional scale properties have been examined in detail previously [34].

Self-regulation was measured by a set of 4 items adopted from a larger 31-item Self-Regulation Questionnaire [35], which included items such as 'I make a plan for the important things that I do'. Responses were made on a 4-point scale ranging from 'Rarely or never' (coded 1) to 'Almost always or always' (coded 4), and the mean of item scores comprised the self-regulation index. Cronbach's alpha for the scale was 0.77.

Analysis

The analyses were conducted using Stata 16 [36]. Five observations were dropped because their responses were deemed dishonest by use of a screener item (use of a non-existing drug).

First, the three binge-drinking groups (no binge-drinking, binge-drinking \leq once per month, more than once per month) were compared on all predictor variables one-by-one. For this purpose, we used logistic and linear regression followed by pairwise comparisons.

Multinomial logistic regression was used to estimate the relation between FOMO and the three levels of binge-drinking. No binge-drinking was used as base category to be compared with the two binge-drinking

Table 1. Sample characteristics for the study sample and comparisons between binge-drinking sub-groups

Variable	Range	Mean (SD)/%			
		Total sample (<i>N</i> = 2646)	No binge-drinking (<i>N</i> = 1828)	Binge-drinking ≤ once per month (<i>N</i> = 540)	Binge-drinking more than once per month (<i>N</i> = 243)
Fear of missing out	1–5	2.51 (0.82)	2.41 (0.82)	2.75 (0.75) ^a	2.79 (0.83) ^a
Gender (male)	0–1	42.9%	42.9% ^a	40.9% ^a	44.9% ^a
Age	14.7–18.6	16.19 (0.84)	16.05 (0.80)	16.45 (0.83)	16.72 (0.83)
Sensation-seeking	1–5	3.08 (0.98)	2.92 (0.97)	3.42 (0.86) ^a	3.53 (0.94) ^a
Symptoms of depression	0–27	7.76 (5.79)	7.06 (5.47)	9.28 (6.06) ^a	9.70 (6.40) ^a
Self-regulation	1–4	2.75 (0.65)	2.81 (0.65)	2.66 (0.65) ^a	2.56 (0.64) ^a

Note: Group estimates that do not share ^a are significantly different at the *P* < 0.05 level.

categories. To subsequently compare the two binge-drinking categories, binge-drinking ≤ once per month was used as a base category. Gender, sensation-seeking, symptoms of depression and self-regulation were included as covariates. All predictor variables except for gender were standardised (converted to z-scores) by subtracting the mean and dividing by the standard deviation. We reported estimated relative-risk ratios. The largest number of missing values for a variable was 2.8%. Nevertheless, as sensitivity analysis, the multinomial logistic regression modelling was repeated with missing values handled by multiple imputations, with the predictive mean matching module in Stata [37]. Ten datasets with imputed values were created based on all study variables.

Effect modification was assessed by adding the interaction terms of gender, age, sensation-seeking, symptoms of depression and self-regulation, one-by-one to the adjusted multinomial regression model. Because this exploratory analysis involved multiple testing, we set the cut-off point for statistical significance at *P* < 0.01. All models accounted for school nesting by use of cluster-robust standard errors. Predicted

probabilities, on which Figures 1 and 2 were based, were obtained using the ‘margins’ command in Stata.

Results

In total, 21% reported binge-drinking ≤ once per month in the past 12 months, while 9% reported binge-drinking more than once per month. The remaining 70% reported no binge-drinking.

Descriptive statistics and pairwise comparisons between the binge-drinking sub-groups are presented in Table 1. Compared to non-binge-drinkers, both binge-drinking groups had higher scores on FOMO, sensation-seeking and symptoms of depression, and lower scores on self-regulation, but the two binge-drinking groups did not differ significantly from each other. There were differences between all three groups in terms of age, where more binge-drinking was associated with older age. There were no notable differences in gender distribution between the three groups.

Correlations between FOMO and all covariates are presented in Table 2. FOMO was positively correlated with age, sensation-seeking and symptoms of depression, but negligibly correlated with self-regulation. Girls scored higher on FOMO than boys.

Results from the multinomial logistic regression models are presented in Table 3. Both before and after adjusting for the potential confounding factors, there was a statistically significant association where higher FOMO was associated with a greater probability of binge-drinking, both ≤ once per month, and more than once per month. The estimates were, however, somewhat attenuated in the adjusted compared to the crude model. The results were substantively unchanged when we estimated the same models with

Table 2. Correlations between fear of missing out and covariates

No. Variable	1	2	3	4	5
1 FOMO					
2 Gender (male)	−0.25*				
3 Age	0.15*	0.03			
4 Sensation-seeking	0.20*	0.11*	−0.02		
5 Symptoms of depression	0.41*	−0.32*	0.12*	0.15*	
6 Self-regulation	0.02	−0.04	0.03	−0.14*	−0.16*

*Statistical significance at the *P* < 0.05 level. FOMO, fear of missing out.

Table 3. Multinomial logistic regression: Binge-drinking regressed on fear of missing out (FOMO) and potential confounders

	Binge-drinking \leq once per month vs. no binge-drinking		Binge-drinking more than once per month vs. no binge-drinking		Binge-drinking more than once per month vs. binge-drinking \leq once per month	
	RRR (95% CI)	<i>P</i>	RRR (95% CI)	<i>P</i>	RRR (95% CI)	<i>P</i>
<i>Crude model</i>						
Fear of missing out	1.50 (1.35, 1.66)	<0.001	1.58 (1.36, 1.84)	<0.001	1.05 (0.92, 1.20)	0.429
Gender (male)	1.13 (0.90, 1.43)	0.289	1.44 (1.03, 2.01)	0.032	1.27 (0.89, 1.81)	0.187
Age	1.60 (1.47, 1.75)	<0.001	2.25 (1.76, 2.87)	<0.001	1.40 (1.13, 1.75)	0.003
<i>Adjusted model</i>						
Fear of missing out	1.28 (1.14, 1.43)	<0.001	1.35 (1.15, 1.57)	<0.001	1.05 (0.90, 1.23)	0.526
Gender (male)	1.03 (0.79, 1.36)	0.808	1.29(0.92, 1.81)	0.138	1.25 (0.90, 1.73)	0.186
Age	1.72 (1.57, 1.88)	<0.001	2.44 (1.93, 3.11)	<0.001	1.43 (1.15, 1.78)	0.001
Sensation-seeking	1.69 (1.49, 1.91)	<0.001	1.94 (1.62, 2.32)	<0.001	1.15 (0.94, 1.40)	0.168
Symptoms of depression	1.19 (1.06, 1.34)	0.004	1.22 (1.06, 1.41)	0.007	1.03 (0.89, 1.19)	0.721
Self-regulation	0.82 (0.72, 0.94)	0.004	0.70 (0.62, 0.80)	<0.001	0.85 (0.74, 0.99)	0.033

Note: All predictor variables apart from gender are standardised (z-scores). All models accounted for school nesting by use of cluster-robust standard errors. CI, confidence interval; RRR, relative-risk ratio.

multiple imputations for missing values, see Table S1 (Supporting Information).

Predicted probabilities for both binge-drinking categories for different levels of FOMO, based on the adjusted model, are presented in Figure 1. The estimated probability of binge-drinking \leq once per month was 17% for low FOMO (1 SD below the mean) and 23% for high FOMO (1 SD above the mean). The estimated probability of binge-drinking more than once per month was 8% for low FOMO (1 SD below the mean) and 11% for high FOMO (1 SD above the mean).

As for the covariates, age, sensation-seeking and symptoms of depression were positively associated with

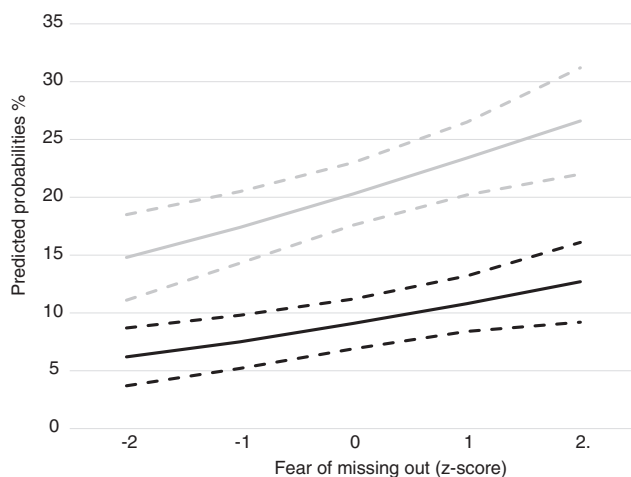


Figure 1. Predicted probabilities (%) of binge-drinking \leq once per month (grey line) and more than once per month (black line) by fear of missing out for Norwegian adolescents (dotted lines are 95% confidence intervals).

greater likelihood of binge-drinking, while higher self-regulation was associated with lower likelihood. Only two variables could distinguish binge-drinking \leq once per month from binge-drinking more than once per month: older age and lower self-regulation were associated with greater likelihood of binge-drinking more than once per month.

Tests of effect modification, where interaction terms for FOMO by each of the included covariates were added to the multinomial model one-by-one, showed that only one interaction term was statistically significant. Specifically, the FOMO \times symptoms of depression term for binge-drinking \leq once per month versus no binge-drinking was relative-risk ratio 0.87 (95% confidence interval 0.80, 0.95, $P = 0.002$). The interaction is displayed in Figure 2. For adolescents at low symptom levels (1 SD below the mean), the association between FOMO and binge-drinking was stronger than for adolescents at high symptom levels (1 SD above the mean). However, adolescents at high depression symptom levels had generally greater probability of binge-drinking than adolescents at low depression symptom levels.

Discussion

To our knowledge, the present study is the first to examine the cross-sectional association between FOMO and binge-drinking among adolescents. The results showed that even after adjusting for potential confounding factors, greater FOMO was associated with greater probability of binge-drinking. This is in

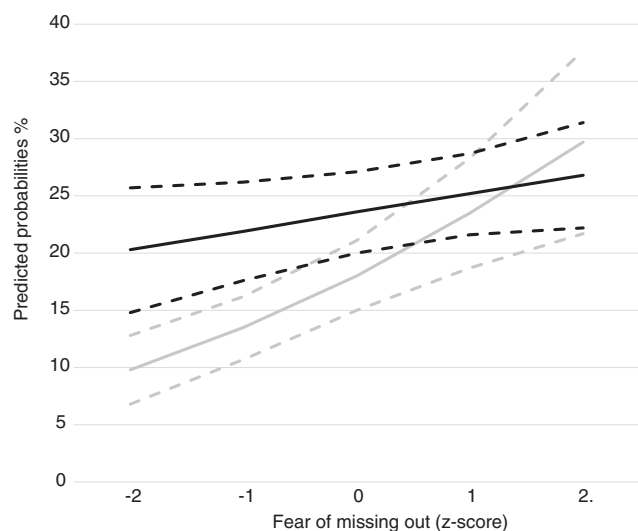


Figure 2. Predicted probabilities (%) of binge-drinking \leq once per month by fear of missing out for adolescent at high (black line) and low (grey line) symptom levels of depression. Dashed lines are 95% confidence intervals.

line with the majority of studies on university students [12,19], despite some exceptions where no such relationship was observed [17,18].

Several potential mechanisms may explain why FOMO can be a risk factor for adolescent binge-drinking. Because adolescents with high FOMO tend to spend more time on social media, they may find more opportunities to drink alcohol, and they may be more exposed to alcohol-advertising and alcohol-influencers, especially in countries like Norway where regular alcohol advertising is banned [14,15]. With knowledge that others are present at social events where alcohol is consumed, adolescents with high FOMO may more readily attend to and compare their own experiences to those of others and combine this with emotions such as apprehension and uneasiness [7]. Adolescents with lower FOMO, on the other hand, may be more oblivious as to whether others are having more rewarding experiences than themselves, or simply not be concerned that they are.

In the present study, we also explored potential effect modification by gender, age, sensation-seeking, symptoms of depression and self-regulation. We found that the association between FOMO and binge-drinking was stronger for adolescents at low symptom levels of depression, and that FOMO may not be as important a risk factor for adolescents at high symptom levels of depression. This was evident only for less frequent binge-drinking (i.e. \leq once per month), hence, the effect modification may be more important for initiation or experimentation rather than more regular binge-drinking. The effect modification analyses were exploratory in nature. It could be the case that FOMO is a mediator for the association between poor mental

health and alcohol use, which is more in line with Przybylski *et al.*'s theory [6]. Future prospective studies should aim to determine if FOMO is a mediator or moderator in the causal chain between poor needs satisfaction and alcohol use.

A potentially important implication of our findings is that prevention strategies could benefit from targeting their efforts at adolescents who are high in FOMO because they are at greater risk of binge-drinking. In combination with structural interventions such as taxation and reduced availability, targeted interventions might reduce both the occurrence and negative consequences of adolescent binge-drinking [38]. Another potential target for intervention would involve strategies aiming to channel FOMO in ways that increases the likelihood of engaging in positive health-related behaviours, while negating behaviours more likely to have negative health consequences. Our results also showed that adolescents high in sensation-seeking, greater symptoms of depression and low self-regulation were at greater risk of binge-drinking, which is in line with results from previous studies [13,22,23,28]. Prevention initiatives may also benefit from targeting prevention efforts at adolescents with these characteristics.

Strengths and limitations

To our knowledge, we are the first to report a cross-sectional association between FOMO and binge-drinking for adolescents. The study also accounted for potential confounding factors. The sample was sizeable, which enables statistically more precise estimates, and the gender distribution was only slightly skewed towards more girls than boys, which is a strength, as previous studies have relied on far less gender-balanced samples.

The cross-sectional design does not allow us to draw firm conclusions about directionality, and future longitudinal studies should address this issue. The measures were based on self-report, which is a limitation as it often leads to socially desirable responses and biased recall. Measurement error may also have biased the estimates toward zero. A considerable share of potential participants was not invited to take part in the study because parental consent forms were not returned. We were unable to obtain information on students whose parents' consent forms were not returned and students with consent who did not participate, and we are unsure of how such non-participation might have affected the results. A further limitation is that we did not examine if FOMO was associated with non-binge drinking, or with the typical amount per

session. Previous studies suggest that high FOMO is associated with greater tendency to drink, but unrelated to the amount per session [19]. Continued detailed examinations are important to understand the association between FOMO and various aspects of alcohol use during adolescence. Finally, there may be other potential confounders of the FOMO and binge-drinking relationship that have been omitted, therefore, we cannot rule out residual confounding. For instance, Webb [17] made adjustment for level of extroversion, which was not available in our data. It could be the case that less extroverted adolescents do not find social events that involve alcohol as rewarding as more extroverted adolescents. However, FOMO appears to be weakly correlated with extroversion (as well as with the other four big-five personality traits: openness, neuroticism, conscientiousness and agreeableness) [8], therefore, it might not confound the relationship between FOMO and adolescent binge-drinking. A related potential confounder is sociability. It could be the case that highly sociable adolescents experience more FOMO and are more likely to drink alcohol.

Conclusion

We estimated the cross-sectional association between FOMO and binge-drinking among Norwegian adolescents. The results showed that adolescent with high FOMO have greater risk of binge-drinking. This association was robust to adjustment for potential confounding factors, and was particularly strong for adolescents without elevated depressive symptomatology. An important implication is that parents, teachers and prevention experts can benefit from targeting adolescents with high FOMO to reduce adolescent binge-drinking and related negative consequences.

Conflict of Interest

The authors have no conflicts of interest.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Table S1. Multinomial logistic regression: Binge-drinking regressed on fear of missing out and potential confounders with multiple imputations for missing values.