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Disentangling gender and age effects on risky single occasion drinking during adolescence

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Objectives: To determine the association between adolescent risky single occasion drinking (RSOD) and gender, age, and the relative age position of students within their class. **Method:** A cross-sectional national representative sample of 7088 from 8th to 10th graders in Switzerland (mean age 14.6; SD = 0.94) as part of the ESPAD international study was analysed using hierarchical linear modelling. **Results:** Being male, older than the class average and a member of older classes (on average) was associated with a higher RSOD frequency. Additionally, interactions between student and class level were found. The higher the mean class age the greater the difference in RSOD between boys and girls, and the lower the impact on RSOD of the relative age position in a class. **Conclusions:** In early and mid-adolescence, prevention efforts should try to impede the modelling of alcohol use of older classmates, whereas in late adolescence gender-specific motives for RSOD should be taken into account.

Keywords: adolescents, old-for-grade, Switzerland, multilevel, group mean centring

Introduction

Risky single occasion drinking (RSOD), also called 'binge drinking' or 'heavy episodic drinking',[1,2] has increased among adolescents in many European countries.[3] The increased prevalence of RSOD has raised public awareness of this problem and there have been calls for prevention strategies. However, RSO drinkers are not a homogeneous group of adolescents,[4] and a 'one size fits all' intervention approach appears to be rather ineffective in reducing adolescent RSOD.[5,6] It is therefore important to know which groups are prone to RSOD and how this behaviour develops over a life-time and particularly during adolescence. The present study focuses on school classes, an important environment in which to target prevention efforts.

While it is common knowledge that gender and age are strong predictors of RSOD in adolescence and beyond,[2,7,8] the present study investigates the development of the effects of gender and the relative age position of students in their class during their adolescent years by analysing the interaction of these effects with the mean age of the school class in hierarchical linear modelling (HLM).

Evidence consistently shows that the prevalence of RSOD increases steadily during adolescence and peaks in late adolescence or early adulthood.[8–13] Apart from the age effect on RSOD, it is claimed that the relative age position of students in their class has an effect on the level of RSOD. Studies from the US suggest that adolescents who are older than the majority of their classmates (called old-for-grade) are more likely than their classroom peers to use alcohol and other psychoactive substances.[14,15] Byrd *et al.*,[16] for example, revealed that old-

for-grade adolescents are twice as likely to be risky single occasion drinkers. Accordingly, adolescents who are more physically mature than their same-age classmates are more likely to consume alcohol and other psychoactive substances.[17,18] These older or more physically mature students may, in turn, serve as role models for the rest of the class as their alcohol consumption is often interpreted by younger students as a sign of independence and maturity.[17,19]

There are different reasons for being old-for-grade. Some students have their birthday near the beginning of the school term, others are retained by parents or teachers, sometimes owing to developmental problems. Academic failure that leads to repeating a school year is also a reason for being old-for-grade. Byrd *et al.*,[20] however, found that both grade-retained and not retained old-for-grade adolescents show higher rates of problem behaviour than their classmates.

During adolescence, we hypothesize increasing gender differences and decreasing differences in RSOD as regards relative age. This means that, in early adolescence, students who are older or more mature than their classmates have a higher RSOD frequency but boys have the same frequency as girls. In late adolescence, both younger and older students in the class have the same frequency. However, boys have higher RSOD frequency than girls.

Studies demonstrate that early physical maturation, for example, is likely to contribute to higher substance use rates particularly among girls.[18,21] These differences in substance use are observed particularly in early adolescence, whereas they diminish in later adolescence.[17] Furthermore, for different gender and age groups, distinct motivations to engage in RSOD were found. Enhancement motives, including drinking to get drunk or high, are particularly common among male drinkers.[22–25] However, these gender differences do not develop until late adolescence. In her study, Cooper[26] found no gender differences at the ages of 13 and 14, but a stronger increase in enhancement motives among boys in subsequent years. At the ages of 18 and 19, boys indicated a far higher level of enhancement motives than girls.[26] Accordingly, in Switzerland, no gender differences in RSOD frequency were found among 11 and 13 year olds,[27] whereas gender differences in RSOD are highly pronounced in the group of 15–24 year olds.[13] Several longitudinal studies in the US found that girls were prominent in

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groups with an early onset of RSOD, but the frequency of which did not increase during adolescence; boys were prominent in groups with an early onset of RSOD, the frequency of which increased over time.[28–30] Therefore, we expect an interaction of gender and age in predicting RSOD frequency.

We also expect the gap to close for relative age differences with increasing mean age within classes, because interindividual differences are expected to level off with increasing age owing to more normative patterns of RSOD. In the Adolescent Health Risk Study, a 5 year US follow-up study of 13–19 year olds, the increase in RSOD was steepest for the youngest cohorts and levelled off with age.[12] No increase was found in the oldest cohorts (i.e. age from 19 to 24 and from 20 to 25 years). However, since alcohol consumption is legal at an earlier age in Switzerland (the legal drinking age is 16 for beer and wine, and 18 for spirits), we also expect age differences to level off at an earlier mean age than in the US.

Methods

Study design and sample

The database used for the analyses is part of the 'European School Survey Project on Alcohol and Drugs' (ESPAD).[3] This survey has been conducted every 4 years since 1995 in about 30 European countries under the supervision of the Swedish Council for Information on Alcohol and Other Drugs and the Co-operation Group to Combat Drug Abuse and Illicit Trafficking in Drugs (Pompidou Group).

Data were collected by means of a paper–pencil questionnaire which was administered in classes between the end of April and the end of June 2003. The time frame for filling out the questionnaires was one school lesson (~45 min). Students could freely choose to participate and confidentiality was ensured at all stages of the study, e.g. by providing unmarked envelopes for completed questionnaires that could be sealed.

Cluster sampling was used, based on a list of all classes of Swiss schools from 8th to 10th grade compiled by the Swiss Federal Statistical Office, where the classes served as the primary sampling unit. An overall response rate of 83.1% could be achieved (86.3% at class level and 95.9% at student level). Only 4.1% of the students in the participating classes did not take part in the survey because they were absent or refused. The 35 students (0.5%) who did not answer the RSOD question and the 32 students (0.4%) who did not indicate their age were excluded. The analysed data consists of 7088 13–17 year old students. This sample can be considered as representative for all 8th, 9th, and 10th graders in public schools in Switzerland. The total mean age was 14.6 years (SD = 0.94).

Measures

The questionnaire was developed by an interdisciplinary research group from the participating countries.[3] Subsequently, the resulting questionnaire was translated under the supervision of SIPA in the three most frequently spoken languages in Switzerland: German, French, and Italian.

RSOD. The adolescents were asked how frequently they had five or more drinks in a row in the past 30 days with the answers: 'none' (coded as 0), '1' (coded as 1), '2' (coded as 2), '3–5' (coded as 4), '6–9' (coded as 7.5), and '10 or more times' (coded as 11, see e.g. Greenfield[31] as an example to add one drink to the highest category). As the distribution on RSOD was skewed to the left, the logarithm was taken for the analyses in HLM.[32] One drink was added before taking the logarithms [RSODLN = LN(RSOD + 1)], because the log of zero is not defined. Adding one drink puts the minimum useful value of the logarithmic transform back to zero.[33]

Age ranged from 13 to 17 years and was coded from 0 to 4, hence the intercepts corresponded to the values of the youngest age group as a reference. Girls were coded 0 (boys = 1) and thus girls made up the reference group.

Analytical strategy

To estimate the impact of gender, age, and the relative age position of students in their class on RSOD, hierarchical linear models were estimated by means of the software package HLM 5.04.[32] HLM also adjusts for design effects owing to clustering.[34,35] To indicate the relative age of each student in a class, age was group mean centred, i.e. the deviation of each student from the mean class age. At the second level the mean age of each class was introduced.[36,37] Cross-level interactions of gender and relative age with the mean age in each class at the second level were used to test the hypothesized increase in gender differences and the decrease in the relative age effects when adolescents grow older. To assess and compare the fit of the different models, Akaike's Information Criterion (AIC) and Schwarz's Bayesian Information Criterion (BIC) are applied.[36]

The first model includes only variables at the individual level. The formula is:

$$RSOD_{ij} = \beta_{0j} + \beta_{1j}(\text{gender}) + \beta_{2j}(\text{age}_{\text{group mean centred}}) + r_{ij} \text{ with}$$
$$\beta_{0j} = \gamma_{00} + u_{0j}(\text{mean class age}) + u_{0j} \text{ and}$$
$$\beta_{1j} = \gamma_{10} + u_{1j} \text{ and}$$
$$\beta_{2j} = \gamma_{20} + u_{2j}$$

where j indicates the class and i the individual within a class.

The second model estimated the joint effect of individual level variables (i.e. gender and the relative age position in the class) and the class level variable (i.e. the mean age). The formula is:

$$RSOD_{ij} = \beta_{0j} + \beta_{1j}(\text{gender}) + \beta_{2j}(\text{age}_{\text{group mean centred}}) + r_{ij} \text{ with}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{mean class age}) + u_{0j} \text{ and}$$
$$\beta_{ij} = \gamma_{10} + u_{1j} \text{ and}$$
$$\beta_{2j} = \gamma_{20} + u_{2j}$$

where j indicates the class and i the individual within a class.

The third model additionally included all cross-level interactions. The formula is:

$$RSOD_{ij} = \beta_{0j} + \beta_{1j}(\text{gender}) + \beta_{2j}(\text{age}_{\text{group mean centred}}) + r_{ij} \text{ with}$$
$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{mean class age}) + u_{0j} \text{ and}$$
$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{mean class age}) + u_{1j} \text{ and}$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{mean class age}) + u_{2j}$$

Results

A description of RSOD according to gender and age is given in table 1. More than one third of the total sample had already had an occasion in the past 30 days where five or more drinks were consumed in a row. Among boys the prevalence is about one

Table 1 RSOD (at least once in the last 30 days) according to gender and age—in percentage terms

	Total (*N* = 7088)	Boys (*n* = 3486)	Girls (*n* = 3602)
Total sample (*N* = 7088)	35.9	42.1	29.8
Age groups			
13 year olds (*n* = 786)	20.9	20.1	21.6
14 year olds (*n* = 2510)	31.9	36.9	27.1
15 year olds (*n* = 2597)	40.7	49.4	32.4
16 year olds (*n* = 1031)	43.5	51.7	35.2
17 year olds (*n* = 164)	42.7	49.4	36.8

Table 2 Parameter estimates of the three hierarchical linear models estimated

Individual level	Class level	Individual level-only model			Individual and class level model			Cross-level interaction model		
		B	SE	*t*-ratio	B	SE	*t*-ratio	B	SE	*t*-ratio
Intercept (β_{0j})	Intercept (γ_{00})	0.348***	0.013	25.9	0.182***	0.027	6.9	0.258***	0.030	8.6
	Mean age (γ_{01})				0.102***	0.015	6.7	0.054**	0.017	3.1
Gender (β_{1j})	Intercept (γ_{10})	0.173***	0.019	9.2	0.175***	0.019	9.2	0.001	0.039	0.0
	Mean age (γ_{11})							0.108***	0.023	4.8
Relative age (β_{2j})	Intercept (γ_{20})	0.075***	0.013	5.7	0.075***	0.013	5.7	0.177***	0.033	5.3
	Mean age (γ_{21})							−0.061**	0.020	−3.0
Model fit (AIC, BIC)		13816.2, 13864.2			13784.5, 13832.6			13779.0, 13827.1		

**$P < 0.01$
***$P < 0.001$
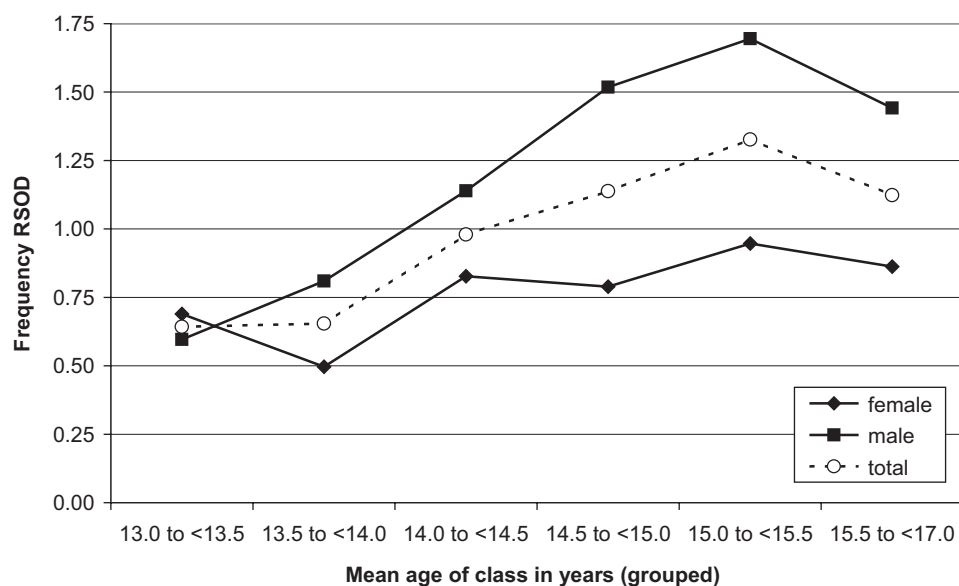
Figure 1 Mean frequency of RSOD in the last 30 days according to the gender and the mean age of the class

and a half times higher than among girls. One out of five 13 year olds had already consumed five or more drinks in a row on at least one occasion. RSOD increased with age until 16 and thereafter remained stable. No marked gender differences could be found at the age of 13, but gender differences increase until the age of 16.

The individual level-only model showed that gender as well as the relative age position in the class are significantly associated with the frequency of RSOD. Boys and adolescents of both genders who are older than the class mean are more likely to report more RSOD occasions. Additionally, for gender (variance component = 0.05091, χ^2 = 610.011, DF = 395, $P < 0.001$) and relative age (variance component = 0.00838, χ^2 = 458.161, DF = 395, $P < 0.05$), a significant slope variation across school classes was found. The fit of the individual level-only model considerably increased compared to the intercept only model (AIC = 14013.6, BIC = 14027.3) (table 2).

In the next step, the mean age of students was included at the class level. This model reveals that RSOD increase with the mean age of students in the class independently of the effects of gender and the relative age position in the class. Based on this model, students who were in a class that was 1 year older experienced on average one risky drinking occasion more in the last 30 days

than students in the younger class. In contrast, students who were 1 year older than the class mean experienced only 0.8 more risky drinking occasions. This model, however, did not include cross-level interactions.

In the final model that includes cross-level interactions, the impact of the mean age of the class on the variation in slopes and intercepts was analysed. While the mean age of the class could explain the variation in both slopes, the coefficient for gender is positive and the coefficient for the relative age position is negative. The higher the average age of a class the higher the association between gender and RSOD, and the lower the association between the relative age position and RSOD. The older adolescents in classes become, the greater the gender differences and the lower the effect of the relative age position.

To illustrate these interactions that can be deduced from the final HLM model, the aggregated mean age of classes was plotted against the aggregated frequency of RSOD, broken down by gender (figure 1) and the quartiles of youngest and oldest students in each class (figure 2). As the mean age of the class rises, the steeper the increase in RSOD among boys than among girls. As the mean age of the class rises, the steeper the increase in RSOD frequency among the younger students in the class than among their older classmates.
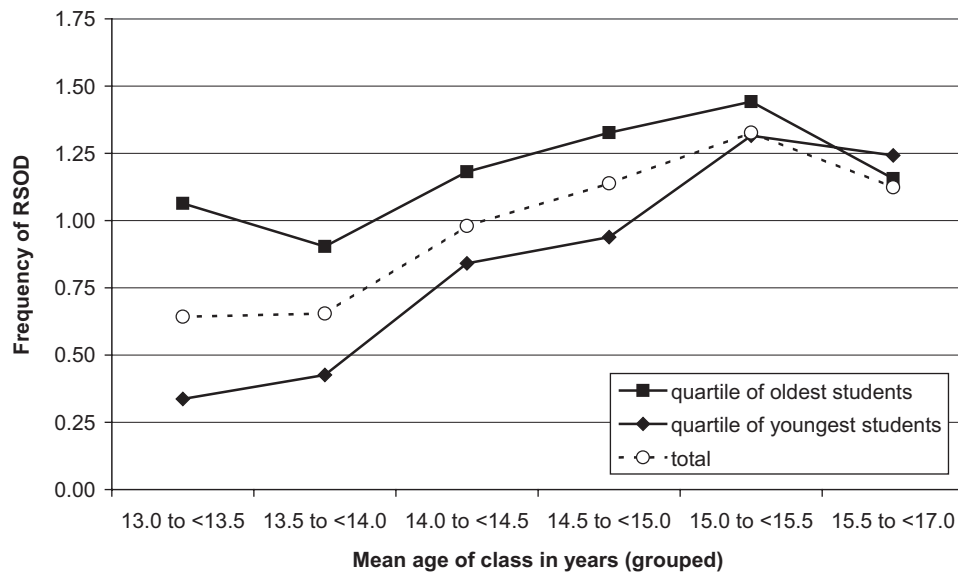
Figure 2 Mean frequency of RSOD in the last 30 days according to the relative age position (younger versus older) and the mean age of the class.

Discussion

The present study was undertaken to determine changes in RSOD during adolescence according to gender, age, and the relative age position of students in their class. The results show that being male, older than the class average and a member of older classes (on average) is associated with a higher RSOD frequency. Additionally, an interaction between gender and the mean age of the class and one between the relative age position in class and the mean age of the class were found. The higher the mean class age the greater the association between gender and RSOD, and the weaker the association between the relative age position and RSOD. Thus, compared with younger students, gender differences among older students were more pronounced while the effect of the relative age position was less pronounced.

According to longitudinal studies in the US,[28–30] the present results confirm that there are no gender differences in RSOD in early adolescence.[27] However, whereas girls only slightly increase their RSOD frequency as they grow older, a stronger increase was found among boys. In late adolescence, RSOD is more frequent among boys.

This means that in early adolescence older or more mature adolescents of both sexes have a higher RSOD frequency than their younger classmates. In late adolescence, younger class members have the same frequency as their older classmates but boys have higher RSOD frequency than girls. Previous studies demonstrated that early physical maturation is likely to contribute to higher substance use rates particularly among girls.[18,21] These differences in substance use are observed particularly in early adolescence, whereas later in adolescence they diminish.[17] Furthermore, for different gender and age groups, previous studies found distinct motivations to engage in RSOD. Enhancement motives, including drinking to get drunk or high, are particularly common among male drinkers.[22–25] However, these gender differences do not develop until late adolescence.[26] Accordingly, in Switzerland, no gender differences in RSOD frequency were found among 11–13 year olds,[27] whereas gender differences in RSOD are highly pronounced in the group of 15–24 year olds.[13]

The results from the second multilevel model reveal that adolescents of the same age have a higher frequency of RSOD if they are in an older class (e.g. 14-year-old girl in a class of mean age 14 years: RSOD = 0.182 + 0.102 = 0.284; 14-year-old girl in a class of mean age 15 years: RSOD = 0.182 + 0.204 −

0.075 = 0.311). It appears that older classmates who are more physically mature and more likely to participate in frequent RSOD serve as role models for the rest of the class, as their alcohol consumption is often interpreted by younger students as a sign of independence and maturity.[17–19]

Additionally, in the final model, an interaction between the mean class age and being old-for-grade was found in the way that being old-for-grade constitutes a risk factor for RSOD[16] but only in early adolescence. As adolescents grow older, the effect of the relative age on RSOD lessens accordingly. In late adolescence, however, it appears that particular drinking habits including RSOD are already established and that RSOD frequency reached a ceiling in late adolescence or early adulthood.[12] In our study, this ceiling occurred at the age of 16 and thus about 3 years earlier than in the US.[12] This might be related to the fact that alcohol consumption is legal at an earlier age in Switzerland than in the US. In figures 1 and 2, even a slight decline from the age of 16 to 17 is visible. However, as the purpose of ESPAD is to achieve a national representation of 15 year olds, the 17 year olds are not very well represented in the sample ($n = 164$). Therefore, further studies are needed to confirm the decline.

This was the first study investigating effects of being old-for-grade on adolescent RSOD by applying group mean centred multilevel techniques. Future studies should additionally try to measure the students' age more precisely. However, for the present study, it was not possible to ask for the students' date of birth for confidentiality reasons. Furthermore, RSOD is likely to be embedded in a broader substance use or risk behaviour syndrome.[38–40] Future studies should therefore investigate if the same relations can be found for the use of tobacco, cannabis, or other substances or risk behaviours. The present work focused on interactions between basic sociodemographic predictors. In future studies, however, it would be interesting to determine whether these effects further interact with other variables such as academic achievement, peer pressure, or social capital.

The reported results have important implications for prevention. They confirm that 'one size fits all' intervention appears to be somewhat ineffective in reducing adolescent RSOD.[4–6] Instead, in early and mid-adolescence, social resistance programmes appear to be appropriate to counter the potential role model effect of old-for-grades. Components of such programmes, like normative education or resistance skills training, are designed to impede the modelling of alcohol use and to reinforce resistance to offers of alcohol by peers. Most of the

students in this age group have yet to consume five drinks or more on one occasion, but they are prone to model RSOD from older students in their class to demonstrate their maturity and independence.[19] Furthermore, in early and mid-adolescence, gender differences in RSOD are not pronounced. Therefore, social resistance programmes appear to be effective for both genders. Prevention programmes should incorporate high-risk screenings, particularly based on older students within a class.

In late adolescence, however, social resistance programmes appear to be less effective. Most adolescents who like to experience drunkenness and risky drinking have already done so and they are less likely to serve as role models for younger classmates. On the other hand, there are increasing gender differences in the frequency of RSOD, which may be related to the gender-specific motivations to engage in RSOD. Boys in particular tend to like the effects of RSOD and to expect positive consequences.[22–25] However, these gender differences are not developed until late adolescence.[26] Prevention efforts in late adolescence should therefore take into account the gender-specific motivations behind RSOD, for example, by offering boys alternatives to indulging in extreme experiences and by promoting strategies to cope with personal problems among girls.

To conclude, prevention programmes that take into account gender and old-for-grade students and that are more sensitive to the specific needs of particular groups tend to target RSOD better and are therefore more likely to be effective.

Key points

- Risky single occasion drinking (RSOD) was regressed on gender, age, and the relative age position of students within their class.
- Being male, older than the class average and a member of older classes was associated with a higher RSOD frequency.
- With increasing age, gender differences in RSOD increase and the impact of the relative age position in a class decrease.
- Prevention should target modelling of alcohol use of older classmates in early adolescence and gender-specific motives for RSOD in late adolescence.

Acknowledgement

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