



Effectiveness of a drinking-motive-tailored emergency-room intervention among adolescents admitted to hospital due to acute alcohol intoxication – A randomized controlled trial

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ABSTRACT

The aim of this study is to develop and test the effectiveness of a drinking-motive-tailored intervention for adolescents hospitalized due to alcohol intoxication in eight cities in Germany between December 2011 and May 2012 against a similar, non-motive-tailored intervention. In a randomized controlled trial, 254 adolescents received a psychosocial intervention plus motive-tailored (intervention group; IG) or general exercises (control group; CG). Adolescents in the IG received exercises in accordance with their drinking motives as indicated at baseline (e.g. alternative ways of spending leisure time or dealing with stress). Exercises for the CG contained alcohol-related information in general (e.g. legal issues). The data of 81 adolescents (age: $M = 15.6$, $SD = 1.0$; 42.0% female) who participated in both the baseline and the follow-up were compared using ANOVA with repeated measurements and effect sizes (available case analyses). Adolescents reported lower alcohol use at the four-week follow-up independently of the kind of intervention. Significant interaction effects between time and IG were found for girls in terms of drinking frequency ($F = 7.770$, $p < 0.01$) and binge drinking ($F = 7.0005$, $p < 0.05$) but not for boys. For the former, the proportional reductions and corresponding effect sizes of drinking frequency ($d = -1.18$), binge drinking ($d = -1.61$) and drunkenness ($d = -2.87$) were much higher than the .8 threshold for large effects. Conducting psychosocial interventions in a motive-tailored way appears more effective for girls admitted to hospital due to alcohol intoxication than without motive-tailoring. Further research is required to address the specific needs of boys in such interventions. (German Clinical Trials Register, DRKS ID: DRKS00005588).

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Introduction

Alcohol use is the number one risk factor for morbidity and mortality among young people in established market economies (Rehm et al., 2006). Comparing different risk factors for disability-adjusted life-years among 10 to 24-year-olds worldwide, Gore et al. (2011) identified alcohol use as the most important one.

Across Europe, the number of adolescents admitted to hospital due to alcohol intoxication has risen in the last two decades (Slovak Republic: Kuzelova et al., 2009; Croatia: Bitunjac & Saraga, 2009; Netherlands: Bouthoorn et al., 2011). For example, in 2013, 23,267 ten to nineteen-year-olds in Germany were treated in hospital because of alcohol intoxication (Federal Statistical Office, 2015), which represents an increase of

more than 40% compared to the year 2004. This is particularly worrying as alcohol intoxication can lead to hypoglycemia, hypothermia, injuries and coma (Lamminpää, 1995). Furthermore, risky drinking in adolescence is correlated with poor academic performance, unplanned pregnancy, violence and accidents (Gmel et al., 2003).

Adolescents brought to hospital emergency rooms can be considered as a 'window of opportunity' for delivering interventions aimed at counteracting alcohol intoxication. Adolescents and young adults with problematic alcohol use reported reduced alcohol consumption and fewer alcohol-related problems after participating in a motivational interviewing (MI) intervention compared to standard care, which consisted, for example, of general medical practice or the provision of handouts or brief feedback (Spirito et al., 2004; Monti et al., 1999; Monti et al., 2007; Bernstein et al., 2010).

The most widely implemented emergency room intervention in Germany targeting adolescents' acute alcohol intoxication is "HaLT" (Hart am Limit; Villa Schöpflin, 2009). In addition to standard medical care, HaLT consists of a psychosocial intervention on the morning after

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admission usually conducted by a social worker and includes motivational interviewing strategies (Rollnick & Miller, 1995) to enhance adolescents' commitment to cutting down risky alcohol use. In addition, information on the effects of alcohol is given and the previous day's events which led to this severe intoxication are discussed (Stolle et al., 2009; Stürmer & Wolstein, 2011). Adolescents are also invited to participate in a group intervention, where they can discuss their drinking motives within the setting of outdoor activities (Villa Schöpflin, 2009). Adolescents who participated in this group intervention showed better results with regard to episodic heavy drinking than the non-participating group (Wurdak et al., 2014).

Up to now, the HaLT intervention did not account for drinking motives. This is particularly regrettable since the factors proximate to drinking, such as motives, are not only thought to be more easily accessible for prevention efforts than distal factors, but also tend to reflect or include such distal factors as culture, situation or personality (Cox & Klinger, 1988, 1990; Kuntsche et al., 2006a). Drinking motives are the final pathway to alcohol use, the gateway through which more distal influences, such as personality characteristics or cultural differences, are mediated (Kuntsche et al., 2008, 2015).

According to the Motivational Model of Alcohol Use (Cox & Klinger, 1988, 1990), drinking motives can be classified by crossing two dimensions (source: internal or external and kind of reinforcement: positive or negative) to obtain four different categories: enhancement, social, coping and conformity motives (Cooper, 1994; see Table 1 for item examples). High scores in enhancement motives are associated with heavy drinking (Cooper, 1994; Kuntsche et al., 2014; Wurdak et al., 2010) and coping motives are also linked to alcohol-related problems (Cooper, 1994; Kuntsche et al., 2005).

Kuntsche and Gmel, (2004), Kuntsche et al. (2005, 2006b, 2010b) and Kuntsche and Labhart (2013b) therefore describe two different risk groups that basically differ in terms of positive and negative reinforcement (cf. Table 1). Enhancement drinkers tend to enjoy the feeling of drunkenness and their motives often appear in conjunction with personality traits such as extraversion, impulsivity or sensation-seeking (internal positive reinforcement). Additionally, they often drink with their peers and thus score high on social motives (external positive reinforcement). Coping drinkers tend to be introvert and anxious and consume alcohol on their own to forget about their worries and problems (internal negative reinforcement). Furthermore, they tend to drink to be liked or accepted by others or gain access to peer groups and thus score high on conformity motives (external negative reinforcement).

One-size-fits-all interventions do not take into account the particular needs of these two groups. Experts point out that "it might be more effective if enhancement and coping drinkers were targeted by distinct prevention programs that take into account their specific needs and problems" (Kuntsche & Cooper, 2010a, p. 52). For example, coping drinkers in particular are thought to benefit from stress relaxation techniques as they drink to forget about their problems and to reduce their stress levels.

However, to our knowledge, drinking motives have not yet been considered in psychosocial interventions within the setting of emergency rooms. Conrod et al. (2006, 2011) tested personality-targeted interventions in order to reduce alcohol consumption among adolescents, but drinking motives were addressed only indirectly and the intervention appears unsuitable for implementation in an emergency-room

setting since it is a time-consuming process consisting of two 90-minute group sessions.

When developing and testing motive-tailored interventions, it is important to take gender differences into account as boys score higher on enhancement motives, whereas coping drinkers tend to be female (Kuntsche et al., 2006a,b) and as the prevalence of alcohol consumption and binge drinking is higher among boys (Kraus et al., 2011).

The aim of this study is to develop drinking-motive-tailored interventions for alcohol-intoxicated adolescents and to test whether participants receiving a motive-tailored intervention show a greater reduction in alcohol consumption compared to the HaLT psychosocial intervention applied in general (i.e. a non-motive-tailored intervention).

Methods

Study design

In a randomized controlled trial (see Fig. 1, drawn up in accordance with the CONSORT Statement: www.consort-statement.org), adolescents who were admitted to hospital between December 2011 and May 2012 in one of the six largest HaLT centers in Bavaria (Augsburg, Bamberg, Erlangen, Munich, Nuremberg and Schweinfurt) and at two large HaLT centers in two other federal states of Germany (Hanover in Lower Saxony and Leipzig in Saxony) were randomly assigned either to the motive-tailored HaLT intervention group (IG) or to the standard HaLT intervention, here regarded as the control group (CG).

Sample size was determined with the software G*Power 3 (<http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/>). With $\alpha = 5\%$, power = 80% and effect size = 0.35 a sample size of $n = 204$ was calculated. The original sample consisted of 254 adolescents, randomized into those who received motive-tailored HaLT interventions (IG; $n = 120$) and those who were given general (CG; $n = 134$) HaLT interventions. The simple randomization into these two groups was conducted via a RANDOM algorithm on the tablet PC. Thereof, 199 adolescents (78.3%) provided their e-mail-address and were invited to visit the website, complete booster sessions and fill out the follow-up questionnaire. From this sample, we obtained 81 follow-up questionnaires, equating to a response rate of 40.7% (i.e. 31.9% of the original sample). This final analytic sample did not differ from the non-response sample in terms of age ($t = -0.789$, $p = 0.431$) and gender ($\chi^2 = 0.014$, $p = 0.904$). Furthermore, there were no significant differences regarding drinking frequency ($t = 0.017$, $p = 0.986$), frequency of binge drinking ($t = 0.911$, $p = 0.363$) and drunkenness days ($t = 1.960$, $p = 0.05$). Adolescents in the analytic sample differed from the non-response sample in terms of the type of schooling ($\chi^2 = 13.469$, $p < 0.05$; participants with lower educational levels are under-represented in the final sample).

Data collection took place in the hospital just before the intervention started (baseline, t1) and four weeks later via an online questionnaire (follow-up, t2). Adolescents had to give their informed consent to take part in the study. Participants received an online voucher (amazon.de) worth 15 euros for completing the follow-up questionnaire. The study was approved by the ethics committee of the University of Bamberg and registered in the German Clinical Trials Register (DRKS ID: DRKS00005588).

Procedure

To be able to specifically target the intervention, combinations of motives were used to account for the two risk groups with internal positive or negative reinforcement (enhancement or coping motives), which are further specified according to the score for external positive or negative reinforcement (social or coping motives). Consequently, adolescents were classified into six groups: 'pure' enhancement drinkers (low social motives), 'pure' coping drinkers (low conformity motives), drinkers with enhancement and social motives, drinkers with coping

Table 1

Classification of drinking motives according to the kind of reinforcement (positive or negative) and source (internal or external).

	Positive	Negative
Internal	Enhancement motives, e.g. "because it's fun"	Coping motives, e.g. "to forget about your problems"
External	Social motives, e.g. "because it helps you enjoy a party"	Conformity motives, e.g. "so you won't feel left out"

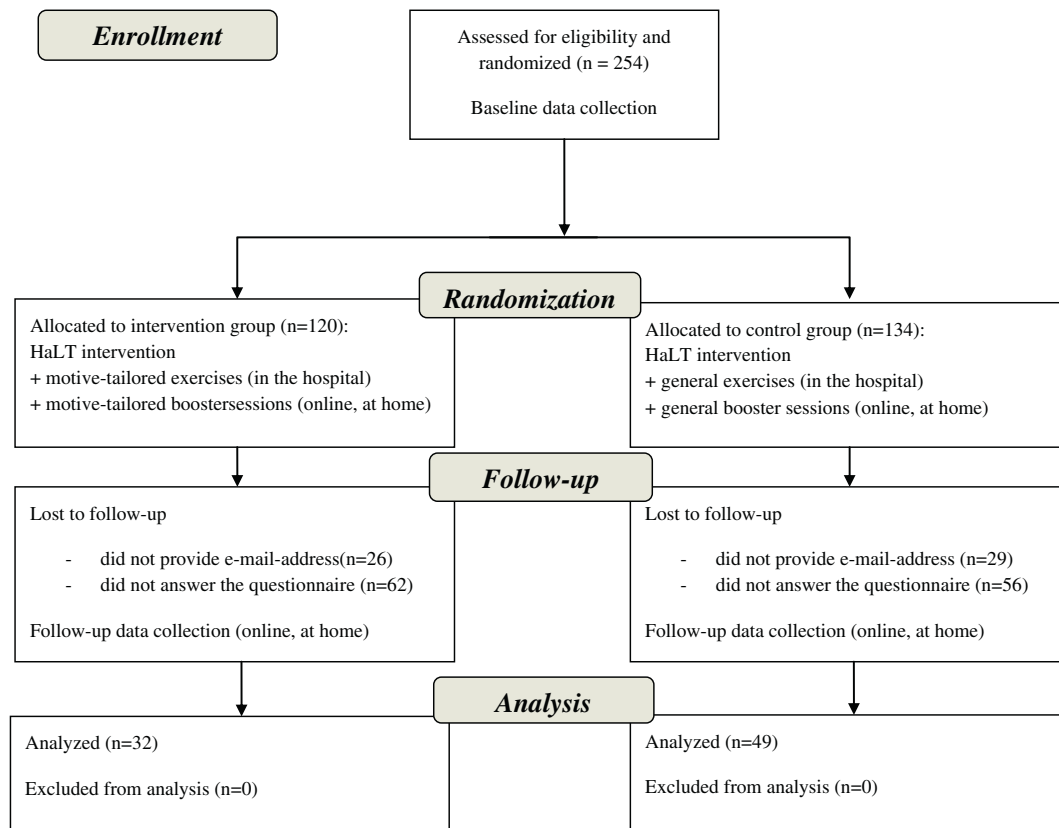


Fig. 1. Study procedure.

and conformity motives, drinkers scoring high on both enhancement and coping motives, and those scoring low on these motives. This classification took place after randomization. Based on the participant's answers in the drinking motive questionnaire revised short form (DMQ-R SF; Kuntsche & Kuntsche, 2009), we developed a classification algorithm for allocating the participants to one of the six groups. The classification algorithm was based on a comparison of the means and z-values of the DMQ-R answers. e.g., to be classified as an enhancement and coping drinker, the mean score on enhancement motives had to be the same as the mean score on coping motives and both z-values needed to be positive (further information on the algorithm can be obtained from the authors on request).

Based on this classification and in addition to the HaLT intervention, adolescents from the IG were offered a set of different motive-tailored exercises designed to provide alternative ways of fulfilling the specific needs of the six motive groups. For example, enhancement and social drinkers received exercises relating to alternative ways of spending their leisure time, sensation-seeking activities and dealing with peer pressure. Coping drinkers were shown ways of dealing with problems and stress and introduced to various relaxation methods. Likewise, as an add-on to the HaLT psychosocial intervention, participants from the CG received exercises with alcohol-related information in general, for example on legal drinking age or the effects of alcohol intoxication and first aid activities.

We developed 27 different exercises, each taking about ten minutes to complete. The exercises were based on evaluated treatment programs or psychological theories on, for instance, interpersonal skills (e.g. Hirsch and Pfingsten, 2007), protective behavioral strategies (LaBrie et al., 2011) and dealing with stress (Lohaus et al., 2007). For example, exercises in stress reduction for coping drinkers refer to the evaluated training program for adolescents developed by Beyer and Lohaus (2005, 2006), which is based on problem-solving competencies (cf. Fig. 2 for an example). All exercises contained educational

information as well as interactive sections. Video clips, audio files, pictures or quotes from celebrities were included to catch the adolescents' attention and to make the exercises more attractive. All adolescents were asked to complete booster sessions at home (motive-tailored in the IG and general in the CG). Both groups completed exercises on tablet PCs (at the hospital) and via the Internet (at home), thus balancing out any potential bias from the use of modern communication devices.

Social workers who conducted the intervention received a training session and a detailed manual including information on the theoretical background, instructions on how to use the tablet PCs and explanations of the data collection procedure and the different exercises. Adolescents completed the baseline questionnaire and one exercise (motive-tailored in the IG, general in the CG) on the tablet PC as part of the HaLT psychosocial intervention on the morning after their admission. Booster sessions were provided on the website and participants were asked to complete these at home. Participants who filled out the follow-up questionnaire visited the website on average three times (median = 3.0) in the four-week period and spent approximately 28 min (median = 25.0) there. Participants from the IG reported that they visited the website more often ($M = 3.65$, $SD = 4.94$) and spent more time ($M = 32.19$, $SD = 32.17$) on the exercises than CG adolescents (frequency: $M = 2.60$, $SD = 1.94$; time: $M = 24.77$, $SD = 17.10$), but these differences were not statistically significant (frequency: $t = 1.31$, $p = 0.193$; time: $t = 1.18$, $p = 0.244$).

Measures

Sociodemographics

Age and gender were included at baseline.

Drinking motives

The 12 items (three per motive category) of the DMQ-R SF (Kuntsche & Kuntsche, 2009) measure the relative frequency of drinking due to

Please arrange the following stress reactions to the table:

aggressiveness

head-ache

heart palpitation

anger

anxiety

hecticness

disturbed concentration

huffiness

grief

black-out

insomnia

tremor

How do you notice, that you are stressed?





<p>Physical stress reactions:</p> 	<p>Stress behavior:</p> 
<p>Stress feelings:</p> 	<p>Stress thoughts:</p> 

Fig. 2. Example of an exercise designed for coping drinkers to reduce stress (excerpt).

enhancement, social, coping and conformity motives (see Table 1 for item examples) within the past 30 days on a five-point scale from 1 = never to 5 = always. Its validity and reliability have been demonstrated in a variety of studies across Europe (Németh et al., 2011; Mazzardis et al., 2010; Kuntsche et al., 2014; Kuntsche et al., 2015). Internal consistencies (Cronbach's Alpha) were .81, .85, .88 and .88 for enhancement, social, coping and conformity motives, respectively.

Alcohol consumption

Questions were adapted from the European School Survey Project on Alcohol and Other Drugs (ESPAD; Hibell et al., 2009; Kraus et al., 2008), requested numerical responses (0–30) and included frequency of alcohol consumption (*During the last 30 days: On how many days have you had any alcoholic beverage to drink, e.g. beer, wine/sparkling wine, mixed drinks, alcopops or spirits?*), frequency of binge drinking (*During the last 30 days: On how many days have you had five or more alcoholic drinks, e.g. beer, wine/sparkling wine, mixed drinks, alcopops or spirits?*) and frequency of drunkenness (*During the last 30 days: On how many occasions (if any) have you been intoxicated from drinking alcoholic beverages so that you e.g. staggered when walking, were not able to speak properly, or could not remember anything the next day?*).

Statistical analyses

Following the recommendation of Armijo-Olivo et al. (2009), we did not conduct intention-to-treat analyses as “interpretation of the ITT analysis is difficult if (...) the proportion of patients who drop out is significant. ITT is inappropriate for efficacy researchers and clinicians since it analyses the effect of treatment prescribed and not the effect of treatment received” (Armijo-Olivo et al., 2009, p. 41). For these reasons we performed an available case analysis.

To test whether the motive-tailored intervention resulted in a greater reduction in alcohol consumption compared to the standard HaLT intervention plus general exercises, we used ANOVAs with repeated measurements. Unfortunately, comparative statistical tests rarely yield significant results when using small samples, which is usually the case when dealing with adolescents admitted to hospital due to acute alcohol intoxication (Monti et al., 1999; Spirito et al., 2004). We therefore also calculated the proportional reduction in alcohol consumption

from baseline to follow-up and the corresponding effect sizes (Cohen's d) according to the formula for different variances but same sample sizes (Bortz & Döring, 2006). Cohen's d values of 0.8, 0.5 and 0.2 represent large, medium and small effects, respectively (Bortz & Döring, 2006). Effect sizes like Cohen's d are regarded as particularly suitable for assessing the practical relevance of interventions (Kessler, 2015). Due to gender differences regarding alcohol consumption and drinking motives (Holmila & Raitasalo, 2004; Kuntsche et al., 2006b,c; Kuntsche and Kuntsche, 2009; Kraus et al., 2011), all analyses were conducted separately for each gender.

Results

Descriptive statistics

The randomization was successful since the IG and the CG from the final sample did not differ in terms of age ($t = -0.328$, $p = 0.744$), gender ($\chi^2 = 0.521$, $p = 0.470$), type of schooling ($\chi^2 = 3.482$, $p = 0.323$), baseline frequency of alcohol consumption ($t = 0.982$, $p = 0.329$), binge drinking ($t = 0.788$, $p = 0.433$) and drunkenness ($t = -0.069$, $p = 0.945$). At baseline, adolescents had consumed alcohol on 2.72 and 3.43 days on average in the last 30 days in the IG and CG, respectively. They reported binge drinking on 1.19 (IG) and 1.49 (CG) days and drunkenness on 1.03 (IG) and 1.02 (CG) days.

Intervention effectiveness

Among girls, the interaction between time (baseline, t1 vs. follow-up, t2) and group (CG vs. IG) was significant for frequency of alcohol consumption and binge drinking (Table 2). There was no significant interaction in relation to the frequency of drunkenness. The proportional reductions and corresponding effect sizes showed no effect, a small effect and a large effect for the frequency of alcohol consumption, drunkenness and binge drinking, respectively, in the CG. In the IG, however, the effect sizes for each of the alcohol consumption measures were even much higher than the .8 threshold for large effects (see Table 2).

Among boys, there was no significant effect for any of the alcohol consumption measures (Table 3). In both the CG and IG, there were small and large effects for the frequency of alcohol consumption and

Table 2
Alcohol consumption among girls – comparison of intervention and control group.

Girls	Group	t1/t2	N	M	SD	Time * group interaction		Proportional change	Cohen's d
						F	p		
Frequency of alcohol consumption	CG	t1	19	2.16	2.141	7.770	0.009	+ 7%	+ 0.06
		t2	19	2.32	3.092				
	IG	t1	15	2.33	1.839				
		t2	15	0.53	1.125				
Frequency of binge drinking	CG	t1	19	0.58	0.507	7.005	0.013	– 64%	– 0.80
		t2	19	0.21	0.419				
	IG	t1	15	1.13	0.990				
		t2	15	0.00	0.000				
Frequency of drunkenness	CG	t1	19	0.79	0.419	1.414	0.243	– 33%	– 0.20
		t2	19	0.53	1.837				
	IG	t1	15	0.93	0.458				
		t2	15	0.00	0.000				

drunkenness, respectively. For the frequency of binge drinking, the effect size was just above the threshold for medium effects in the CG and just below it in the IG.

Discussion

The aim of this study was to develop and test the effectiveness of a drinking-motive-tailored intervention for alcohol-intoxicated adolescents admitted to hospital emergency rooms. The results showed a reduction in most alcohol consumption measures among girls and boys in both the CG and IG. It appears that the experience of a hospitalization due to acute alcohol intoxication together with a psychosocial intervention already prevents risky drinking behaviors four weeks later.

Over and above this general effect, girls who received a motive-tailored psychosocial intervention reported a lower drinking frequency and less binge drinking at follow-up than girls who received a non-motive-tailored psychosocial intervention. The additional effect of the motive-tailored intervention among girls is especially remarkable as both the CG and IG are comparable in terms of socio-demographics, drinking behavior at baseline, the experience of hospital admission due to intoxication and receiving a psychosocial intervention and additional exercises via tablet PCs and the Internet. The only difference is the motive-tailored vs. the general content of the exercises. It appears that tailoring the exercises to the individuals' personal drinking motives and providing specific advice for their needs and problems was more efficient in helping them to abstain from drinking or reduce their drinking frequency and binge drinking in the weeks after the hospital admission.

For boys, in contrast, there was no such difference. They also reduced their alcohol consumption at follow-up but this was independent of whether they received a motive-tailored or non-motive-tailored intervention. One explanation may be that girls, who are generally more

conscientious than boys (Freudenthaler et al., 2008; Schmitt et al., 2009), completed the exercises more conscientiously and therefore benefited more from the specificity of the content. Another reason may be that the alcohol consumption of girls is more affected by internal factors such as motives whereas that of boys is more affected by external factors such as characteristics of the social surroundings when drinking (Koordeman et al., 2011; Thurl & Kuntsche, 2015).

Among the limitations of the study is the high non-response rate. The hospital experience is usually unpleasant since participants feel physically unwell due to the consequences of alcohol intoxication, may be ashamed about the event and probably do not wish to recapitulate the details of this potentially traumatic experience. These may be reasons for not completing the follow-up questionnaire weeks later, thus resulting in a high non-response rate. Fortunately, the analytic sample and the non-response sample were comparable in terms of age, gender and frequency of alcohol consumption and binge drinking. However, we have to consider a possible selection bias of adolescents with a stronger commitment or higher motivation which violates randomization and might limit the generalizability of our results. Another limitation is the rather short follow-up period of four weeks (which we chose so as not to further increase the non-response rate). However, future research should aim to use longer follow-up periods by making further efforts to minimize attrition. Among the study's strengths is the rather high initial sample size taking into account the small percentage of adolescents who are treated in hospital due to alcohol intoxication (e.g. 0.22% of all 10 to 20-year-olds were admitted to hospital due to alcohol intoxication in the federal state of Bavaria in 2009; Wurdak et al., 2013). Another strength is the multi-site character of the study, it having included multiple hospitals from different regions in Germany. It thus appears likely that the reported results apply to a large proportion of adolescents treated for acute intoxication in Germany.

Table 3
Alcohol consumption among boys – comparison of intervention and control group

Boys	Group	t1/t2	N	M	SD	Time * group interaction		Proportional change	Cohen's d
						F	p		
Frequency of alcohol consumption	CG	t1	30	4.23	4.321	0.310	0.581	– 39%	– 0.44
		t2	30	2.60	2.931				
	IG	t1	17	3.06	2.135				
		t2	17	2.24	2.412				
Frequency of binge drinking	CG	t1	30	2.07	2.392	2.150	0.150	– 60%	– 0.57
		t2	30	0.83	1.895				
	IG	t1	17	1.24	0.970				
		t2	17	0.76	1.251				
Frequency of drunkenness	CG	t1	30	1.17	0.950	0.000	0.988	– 79%	– 1.04
		t2	29	0.24	0.830				
	IG	t1	17	1.12	0.485				
		t2	16	0.19	0.403				

Conclusion

Whereas participants generally reduced their alcohol consumption in the four weeks following hospitalization due to acute alcohol intoxication and participation in a psychosocial intervention, among girls, the reduction was more pronounced when the intervention was conducted in accordance with their needs as determined by their drinking motives expressed at baseline compared to the non-motive-tailored intervention. Since this effect was not observed in boys, further research should investigate ways to better tailor this intervention to the needs of boys admitted to hospital due to acute alcohol intoxication.

Conflict of interest statement

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Transparency document

The Transparency document associated with this article can be found in the online version.

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