

Cluster-randomized trial of a German leisure-based alcohol peer education measure

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Summary

Because of scarce research, the effectiveness of substance abuse prevention in leisure settings remains unclear. In this study, we evaluated the effectiveness of a peer-led educational prevention measure with adolescent groups in unstructured leisure settings, which is a component of the complex German nationwide ‘Na Toll!’ campaign. Using a cluster-randomized two-group post-test-only design, we tested whether the measure influenced component-specific goals, namely risk and protective factors of alcohol use such as risk perception, group communication and resistance self-efficacy. The sample consisted of 738 adolescents aged 12–20 years who were recruited at recreational locations and completed an online questionnaire 1 week after the peer education or recruitment event. Sixty-three percent of the sample participated in the 3-month follow-up assessment. Data analysis revealed post-test effects on risk perception, perceived norm of alcohol communication in the peer group and resistance self-efficacy. Follow-up effects were not observed, with the exception of a significant effect on risk perception. In conclusion, the peer-led education measure in leisure settings might have supported the adolescents in this study to perceive alcohol-related risks, to feel accepted to talk about alcohol problems with their friends and to be more assertive in resisting alcohol use in the short term.

Key words: alcohol prevention, peer education, leisure setting, effectiveness

INTRODUCTION

Alcohol use is a pleasurable behavior but has been associated with health risks. Among German adolescents, the overall alcohol consumption and episodes of binge drinking have decreased during the recent years (Bundeszentrale für gesundheitliche Aufklärung (BZgA), 2012). However, in 2010, still 35% of 16- to 17-year-olds reported engaging in binge drinking during the last month and every tenth adolescent drank alcohol in amounts that have been shown to predispose adults to health risks (Bundeszentrale für gesundheitliche Aufklärung (BZgA), 2012). About 40% of adolescent binge drinkers reported

one or multiple alcohol-related health or social problems (Kraus *et al.*, 2012b). An estimated 25% of young Germans will develop alcohol abuse and 11% will develop alcohol dependence until age 34 (Wittchen *et al.*, 2008). Hence, the short-term and long-term alcohol-related risks for deleterious consequences in adolescence demand adequate preventive interventions.

‘Na Toll!’ [Oh, great!] is a nationwide alcohol abuse prevention campaign of the German Federal Center for Health Education (BZgA), which targets 12- to 16-year-olds (Strüber *et al.*, 2009). It can be considered a complex intervention (Bödeker, 2012) because it consists of multiple

components such as traditional mass media (booklets, flyers and postcards), online (informative and interactive modules) and personal communication interventions (peer education and participative events). Within the complex intervention concept, the goal of the peer education measure is to provide awareness regarding alcohol-related risks by stimulating personal reflection of own alcohol use, and informative interaction about alcohol-related risks in a friendship group (Bundeszentrale für gesundheitliche Aufklärung (BZgA), 2010). Accordingly, young adults talk to groups of adolescents at the beach, at music or sport festivals, or on the street. They are trained to educate by initiating discussions about alcohol use practices and alcohol-related risks. The attitude conveyed is to be responsible in dealing with alcohol-related matters. At the end of the peer talk, participants are requested to fill out a fact sheet to reflect their own alcohol use and to give feedback on the peer talk. A process evaluation study has been conducted with favorable results (Knittel *et al.*, 2011). In this effectiveness study, we aimed to determine whether the specific goals of the peer education measure are being attained.

Rationale of the peer education measure

The peer education measure is implemented in unstructured leisure settings and public places to reach the target group in situations with heightened probability of use and heavy drinking of alcohol (Crawford and Novak, 2002). A peer approach was chosen because alcohol is most often consumed, especially heavily, with friends (Kraus *et al.*, 2012a). Peer alcohol use and perceived peer norms are significant in predicting own alcohol use (Cruz *et al.*, 2012; Kelly *et al.*, 2012). Thus, a peer-led, social norm-oriented approach with peer and friendship groups in leisure settings seems to be a reasonable prevention setting (Flannery *et al.*, 1999; Gage *et al.*, 2005; Tebes *et al.*, 2007; Stumpp *et al.*, 2009). Young adults are chosen as mediators to facilitate access to and increase acceptance and credibility among peers (Turner and Shepherd, 1999). An educational approach is applied as basic research continues to show the significance of cognitions in alcohol use, a.o. positive expectations and risk perception (Aas *et al.*, 1998; Kuntsche *et al.*, 2004; Leigh and Stacy, 2004; Bundeszentrale für gesundheitliche Aufklärung (BZgA), 2012). However, educational measures have been judged to be ineffective with regard to preventing alcohol consumption and related negative consequences (Babor *et al.*, 2010). Nonetheless, peer education approaches may differ from conventional educational efforts. Peers were found to be better communicators of preventive messages (Mellanby *et al.*, 2000) and are expected

to model and normalize protective behaviors (Turner and Shepherd, 1999), thereby effectively facilitating discussions about alcohol-related topics, strengthening protective norms in the group and enhancing self-efficacy in resisting alcohol use in peer situations.

Effectiveness research on peer education in substance abuse prevention

Similar peer education projects have been implemented internationally, but almost all have not been tested on effectiveness yet (Calafat *et al.*, 2009). To our knowledge, only one study reported findings of effectiveness based on a controlled post-test-only design (Planken and Boer, 2010). Dutch adolescents who were peer educated at campsites during summer holidays and interviewed 2 weeks later held a more realistic view of their alcohol intake, more often classified their friends' drinking as binge drinking, and intended to drink less alcohol in the future. Unexpectedly, adolescents reported less self-efficacy to reduce alcohol use after peer education. Alcohol use did not differ between the adolescents in the study group and those in the control groups (CGs) who were recruited at the same campsites before the intervention phase started (Planken and Boer, 2010). Findings have to be interpreted cautiously because of between-group differences in age and sex, which were not controlled for in the statistical analysis. Effectiveness beyond 2 weeks after the intervention was not tested. In addition, the generalizability of the results is limited, as it is not clear whether the study sample is representative of the entire adolescent population registered in the campsites during that summer.

In general, rigorous tests of effectiveness of preventive interventions in recreational settings have not been performed thus far (Calafat *et al.*, 2009; Akbar *et al.*, 2011; Burkhart, 2011), which might be due to associated methodological challenges such as selective sampling and/or pretest data collection. Randomization is a tool to reduce the related implications regarding validity of results. If units of analysis are randomly chosen from the target population and randomly assigned to study conditions, samples can be assumed to be representative of the target group and comparable at baseline (Bortz and Döring, 2006). In this study, we used a cluster-randomized design; that is, prevention operation locations were randomly chosen from a pool of planned operation locations and assigned to the treatment or control condition.

Hypotheses (individual level)

To sum up, peer and friendship groups in leisure settings seem to be a reasonable alcohol prevention setting. With the exception of one study, studies on the effectiveness

of alcohol prevention through peer education directed to peer/friendship groups outside the school setting have not been undertaken. Cognitive rather than behavioral effects have been reported by educational approaches in general. Based on this background information, this study aimed to evaluate the effectiveness of a peer education measure targeting peer/friendship groups in unstructured leisure settings. We hypothesized that youth who are peer educated perceive increased risk from drinking during adolescence, including fewer positive outcome expectancies, report to have discussed alcohol problems with their friends more often, and perceive their peer group norm to be more open to communicate about alcohol problems and thus feel more confident to be able to resist alcohol use in social contexts. Effects on alcohol consumption were not expected through this one component of the complex prevention campaign.

METHODS

The study used a two-group post-test-only experimental design (Figure 1). Group assignment was performed by cluster randomization of ‘Na Toll!’ operation sites to either an intervention group (IG), who were to receive the peer intervention, or a CG. The CG participants did not receive any intervention and were only asked to provide their e-mail addresses for follow-up purposes.

Procedure

For the summer of 2010, a total of 63 ‘Na Toll!’ operations were planned. The operations were grouped according to location (city, beach, music festival, sports event and others). By flip of coin, ‘Na Toll!’-staff randomly assigned 22 operations to the intervention condition and five operations to the control condition. Intervention operations were oversampled because of the following reasons: (i) Fewer contacts per operation were expected because of the limited time available. Implementing a peer discussion takes longer than asking for study

participation. (ii) Denial of study participation was anticipated. In contrast to the control participants, who were asked for study participation on site, the intervention participants were invited to the study via e-mail after the event.

Twenty peer educators (19–23 years old, *n* = 13 female) were recruited through ads on an Internet jobsite, posters at universities and personal contact of former peer educators. The peer educators received a 3-day training and written materials on the effects of alcohol use and communication techniques. Recruiters of the CG participants were former peer educators who attended a half-day workshop for instruction purposes. They were asked to approach adolescent groups whom they would have approached as a peer educator, but to remain non-intervening and to motivate the groups for study participation only.

During the IG assignments, the peer educators approached dyads or groups of adolescents and used a 10-question multiple-choice quiz about alcohol use as a teaser for further alcohol-related discussions. The educators and adolescents together analyzed the quiz responses and discussed the topics of alcohol use that were of interest to the group. Finally, the participants were asked to answer a short standardized questionnaire (‘fact sheet’) to give feedback on the peer talk and were asked to report their e-mail address for further follow-up. The whole intervention was projected to last ~10–15 min. ‘Na Toll!’ staff also had a variety of incentives such as stickers and brochures to give away to participants. Study operations were mainly located at beaches, at festival sites and in city shopping areas. During the recruitment of CG participants, the recruiters approached adolescents and asked them to provide their e-mail addresses for study participation. The CG participants did not complete the fact sheet, as it is considered an essential component of the intervention. The participants in both groups were asked to answer the online T1 assessment 3 days after the intervention and the online T2 assessment 3 months after the

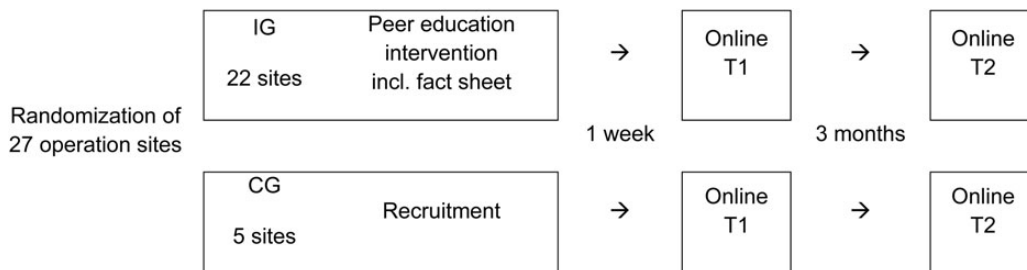


Fig. 1: Study design.

intervention. Consent was given by the individuals at the beginning of the online assessment.

Measures—primary outcomes on individual level

The primary outcomes were measured through online assessment at T1 and T2.

Risk perception

Awareness of risks of alcohol use was assessed with three single items and a scale. Respondents rated the statement ‘For adolescents, alcohol use is always associated with health risks’ on a 4-point Likert scale (‘agree not at all’ to ‘agree completely’). Youth-specific risk was perceived if respondents answered for the item ‘In comparison to adults, youth have . . .’ the option ‘a higher health risk’. Perceived risks associated with frequent (every weekend) binge drinking was assessed with one item taken from the European School Survey Project on Alcohol and Other Drugs (ESPAD) (Kraus *et al.*, 2012b). Responses were recorded on a 4-point Likert scale (‘no risk’ to ‘high risk’). The belief to be able to accelerate sobering up was measured via four items. The participants rated the following for the item ‘To accelerate sobering up, you can . . .’ on a 4-point Likert scale (‘agree not at all’ to ‘agree completely’): ‘eat something’, ‘throw up’, ‘move a lot’ and ‘do nothing’. The internal consistency of these four items was Cronbach $\alpha = 0.65$.

Alcohol-related outcome expectancies

Expectancies were assessed with 17 items from the Comprehensive Alcohol Expectancy Questionnaire (Demmel and Hagen, 2003), which are being used in ESPAD (e.g. ‘When I drink alcohol . . . I behave more casually’). The items belonged to the areas of social assertiveness, tension reduction, cognitive impairment and aggressiveness, and responses were recorded on a 5-point Likert scale (‘not at all’ to ‘definitely’). Scores were calculated for every subscale, and internal consistency was acceptable to high (Cronbach $\alpha = 0.76$ – 0.84) for all the scales except for tension reduction (Cronbach $\alpha = 0.59$). Thus, the tension reduction scale was excluded from further analyses.

Resistance self-efficacy

Self-efficacy in resisting alcohol in the context of close friends and in the broader social context was assessed with eight items taken from the Drinking Refusal Self-Efficacy Questionnaire (Oei *et al.*, 2005), such as ‘How sure are you that you would resist drinking alcohol . . . when your friends are drinking?’ Responses were recorded on a 5-point Likert scale (‘not at all’ to

‘very sure’). The internal consistency of the scale was high (Cronbach $\alpha = 0.91$).

Communication about alcohol-related risks

The perceived social norm with regard to communication about alcohol risks was assessed with a single item. Participants were asked whether it was ‘in’, ‘okay’, or ‘out’ in their friendship group ‘to talk about alcohol problems with friends’. The answering format was dichotomized. Actual communication about alcohol-related risks was assessed based on how much the following single item applies to their experience: ‘During the last 4 weeks, in my friendship group, we talked about negative sides of alcohol use (e.g. blackouts, vomiting, fighting, hangovers)’. Responses were recorded on a 4-point Likert scale (‘applies not at all’ to ‘applies absolutely’) and dichotomized for analysis.

Measures for preliminary analyses and covariates Sociodemographic characteristics

Age and sex were assessed based on fact sheet data and online questionnaires. Educational background was assessed at the T1 online measurement and dichotomized into higher educational track (school leading to university or at university) and lower educational track (all other schools).

Alcohol use (fact sheet)

Frequency of alcohol use and binge drinking was assessed with one item each (i.e. ‘How often do you drink alcohol/drink five or more alcoholic drinks per drinking occasion?’). Responses were recorded on a 5-point Likert scale (‘never’ to ‘four times or more a week’). No use/low use was assigned if adolescents reported to have never used alcohol or to use alcohol up to four times per month without binge drinking. Regular and intensive use was defined as any use pattern beyond no or low use (monthly use and monthly binge drinking, weekly use and monthly binge drinking or weekly use and weekly binge drinking). Cross-validation with age, sex and lifetime drunkenness supported this classification (Knittel *et al.*, 2011).

Alcohol use (online assessment)

Frequency of alcohol use and binge drinking was assessed with one item each (i.e. ‘How often did you drink alcohol in the last 12 months? How often did you drink five or more alcoholic drinks per drinking occasion in the last 4 weeks?’). Responses were recorded on a 7-point (‘never’ to ‘daily’) and 5-point Likert scale (‘never’ to ‘four times or more a week’). No use/low use was assigned according to the same definition as with the fact sheet data.

Power analysis

For sample size calculations, power analysis revealed that a small effect ($f = 0.08$) could be detected when using linear multiple regression analyses including four predictors and a total sample size of $n = 237$ (power = 0.95, $\alpha = 0.05$; Faul *et al.*, 2009). The cluster sampling design effect assuming an average cluster size of $m = 25$ and $k = 27$ clusters ($N = 675$) and an intra-class correlation (ICC) of 0.01 would result in an effective sample size of $ESS = 544$ and in case of $ICC = 0.07$ in an effective sample size of $ESS = 251$. Hence, assuming an ICC of 0.07, an analysis with data of an intended real sample size of 675 provides sufficient power to detect a small effect.

Analytical strategy

To analyze the intervention effects on outcomes at T1, regression analyses (linear or logistic) with group as the main predictor were performed. To test intervention effects on outcomes at T2, regression analyses were repeated including outcome variables at T1 as additional predictors. Age and educational status were used as covariates in all the analyses.

All the analyses were weighted according to the age, sex and alcohol use characteristics of the full sample of the summer campaign of 2010 ($n = 15\,693$). The utilized weights were computed using the logistic regression approach and ranged from 3.7 to 103.3 (Johnson, 2008). As randomization was realized on the level of assignments, robust standard errors were used in all the analyses to adjust for the clustered structure of the data.

RESULTS

Sample

A total of 18 962 young people (15 693 adolescents aged 12–20 years old) filled out a fact sheet after being contacted by a campaign peer during one of the 63 operations in June to October 2010 (Knittel *et al.*, 2011). We refer to these 15 963 as the ‘full sample’ compared with the ‘online sample’ which resulted from the study sampling design and was intended to be sampled for the effectiveness trial.

For the online sample, the peer educators recruited 1359 participants during the 22 IG operations which then completed the fact sheet and provided a valid e-mail address (Figure 2). Of these 1359 participants, 386 (28.4%) completed the T1 online questionnaire. At the five CG recruitment operations a total of 1185 adolescents agreed to participate in the study and provided a valid e-mail address to be contacted for online follow-up assessment. Of these 1185 young people 407 (34.3%)

successfully completed the T1 online assessment. For analysis, 27 participants (IG: $n = 7$; CG: $n = 20$) were excluded from analysis because they were younger than 12 years and older than 20 years and 13 (IG: $n = 6$; CG: $n = 7$) were excluded because they did not provide any valid information on their educational background. In addition, five IG-clusters were dropped for analysis due to a cluster size of <10 . This resulted in an analytical sample of $n = 739$ participants at T1 aged 12–20 years, of whom 358 belonged to the IG and 380 to the CG (retention sample at T2: IG, $n = 233$ [65.1%]; CG, $n = 233$ [61.3%]). The online sample had a mean (SD) age of 15.6 (1.69) years, including more girls than boys (71.7 vs. 28.3%), and 60.7% of the participants were on a higher educational track.

Representativeness of online sample

The fact sheet data of a total of 335 IG online participants were compared with data from the full sample of 12- to 20-year-olds ($n = 15\,693$). This analysis showed that the online sample differed from the full sample in a systematic way. A disproportionately high number of female adolescents participated in the online study (72% [$n = 221$] vs. 55.6% of the full sample [$n = 8533$], $\chi^2(1) = 35.7$; $p < 0.0001$). Percentages of no or low use were higher in the online than in the full sample (51.1% [$n = 168$] vs. 42.1% [$n = 6605$], $\chi^2(1) = 5.9$; $p = 0.015$). No difference with regard to age was found between the online sample (mean [SD], 15.1 [1.6] years) and the full sample (15.1 [1.9]; $T(1691) = -0.08$; $p = 0.935$). To determine the selectivity of sampling and increase the generalizability of the results, all intervention effect analyses were weighted according to the age, sex and alcohol use characteristics of the full sample.

Baseline equivalence of treatment groups

A pre-intervention assessment was not feasible in this study. To generate pretest equivalence of IG and CG, we used cluster randomization of the operations to the conditions. Empirically, we compared IG and CG in terms of T1 variables that were not modifiable by the intervention but were shown to be related to alcohol use, namely age, sex and educational track (Kraus *et al.*, 2012b). More adolescents from the CG were on a higher educational track than the adolescents from the IG (IG: 55.6%; CG: 65.5%; $\chi^2(1) = 7.6$; $p = 0.008$). The participants from the IG were significantly younger than the participants from the CG (mean [SD]: 15.4 [1.6] years vs. 15.9 [1.7] years; $T(1736) = 4.3$, $p < 0.001$). The groups did not differ with regard to sex. Accordingly, age and educational status were included as control variables in all the further analyses.

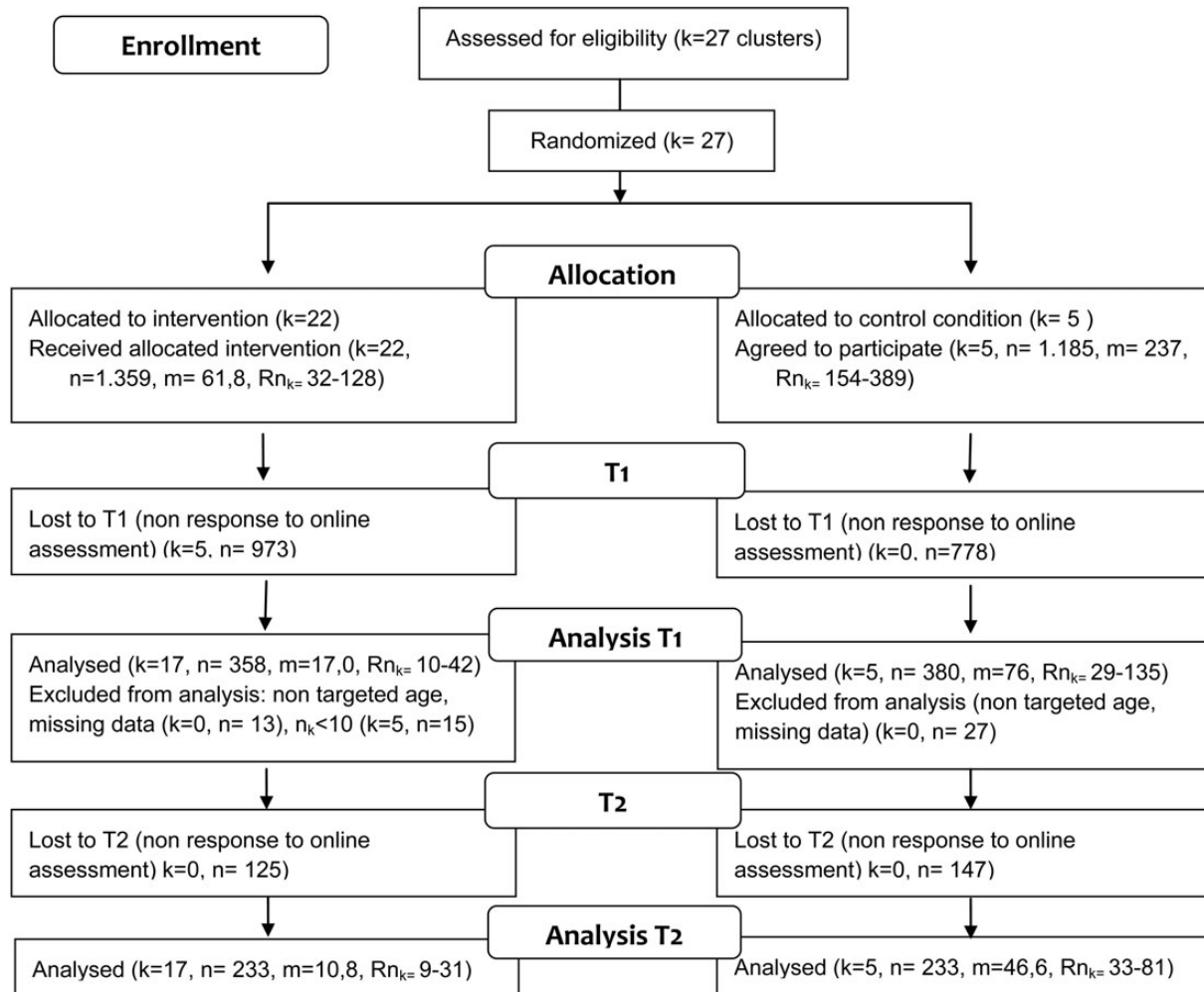


Fig. 2: Flow-chart of clusters and participants (k = cluster, n = individuals, n_k = individuals in cluster, m = mean of n in k , R = range).

Attrition

Drop out between T1 and T2 occurred to the same extent in the IG and CG (IG: 35.5%, CG: 38.7%, $\chi^2(1) = 0.81$, $p = 0.367$). There were no differences in attrition depending on age and sex. The adolescents on a higher educational track dropped out less than those on a lower educational track (31.1% [$n = 141$] vs. 47.1% [$n = 141$], $\chi^2(1) = 19.9$, $p < 0.001$). With regard to substance use attitudes, dropping out was related to a lower perception of youth-specific risks (dropouts: 3.31 [0.72]; retention: 3.43 [0.66]; $T(1, 738) = -2.2$; $p = 0.043$), a lower perception of risk from regular binge drinking (dropouts: 3.32 [0.38]; retention: 3.41 [0.32]; $T(1, 736) = -3.6$; $p < 0.001$), less resistance self-efficacy (dropouts: 3.43 [1.08]; retention: 3.73 [0.93]; $T(1, 731) = -3.9$; $p < 0.001$) and heavier alcohol use (dropouts: 45.2% [$n = 122$]; retention: 35.5% [$n = 164$]; $\chi^2(1) = 6.72$; $p = 0.010$). However, no significant differences in dropouts across the IG and CG were found.

Primary outcomes

Approximately 1 week after the peer education intervention had been implemented, IG adolescents reported significantly higher alcohol-related risk perceptions than the CG adolescents (Table 1). This held true for youth-specific risk in general and in comparison with adult risk and perceived risk of regular binge drinking. IG adolescents knew to a higher extent that there is no way of accelerating the process of sobering up. Treatment group significantly predicted these four outcomes in the regression analyses ($p = .001$ or $p \leq 0.001$). No differences in outcome expectancies were observed between IG and CG. Participants expected alcohol use to have socially enhancing, cognitively impairing and aggressive consequences to the same degree regardless of whether they had received the peer education or not.

Looking at peer group behavior, the peer-educated adolescents did not report having talked about negative consequences of alcohol use more frequently lately. However, they more often perceived talking about alcohol-related problems with friends to be 'in' than CG members ($p < 0.05$). In addition, adolescents felt more assertive in resisting alcohol use in closer friendship and wider peer group situations if they participated in the peer education measure than if they completed the online assessment only ($p < 0.05$).

Three months after the first assessment, the analysis tested differences in outcomes controlled for T1 assessment scores or status. The IG adolescents were more aware of heightened alcohol-related risk for young people in comparison with adults ($p < 0.001$). No other effects were observed. As expected, alcohol use patterns were not affected by the peer education measure at T1 and T2.

DISCUSSION

This study is the first to investigate the effectiveness of a peer-led alcohol education measure in leisure settings using a randomized design. The measure is part of a multi-component, complex intervention, the nationwide 'Na Toll!' campaign, which aims to prevent alcohol misuse behavior among young German adolescents. Each 'Na Toll!' component has different intermediate goals to reach the overall aim of the campaign to promote responsible alcohol use (Strüber *et al.*, 2009). Our study results show that the following specific goals of the peer education component were accomplished: change in risk perception, perceived communication norms and resistance self-efficacy. Before discussing the results in detail, the methodological strengths and limitations of the study are considered.

Using a cluster-randomized post-test-only design with a 3-month follow-up period, this study extends the limited research on the effectiveness of the prevention approach in leisure settings in general and on peer-led education measures in particular (Calafat *et al.*, 2009; Akbar *et al.*, 2011). Peer education is a frequent prevention approach in Germany and Europe (Calafat *et al.*, 2009). However, if at all, only process evaluation data have been published and effectiveness studies are not available (with one exception). The lack of sound evaluations may be due to specific methodological challenges that can result in reduced internal and external validities of evaluation results, such as how to implement a pretest assessment, how to achieve a representative sample or how to follow up study participants. Although we used randomization to counter these threats of validity, study results have to be interpreted with caution. Randomization unit was at cluster level (operation locations), but response rates within the clusters in the online assessment were low so that sample selectivity cannot be ruled out (Rhodes *et al.*, 2003). However, the response rate corresponds with that of an online research using similar recruitment strategies; a response rate between 20 and 40% was observed for a strategy with pre-contact and incentive (Cook *et al.*, 2000). Unlike other studies in leisure settings (Akbar *et al.*, 2011), we had the opportunity to estimate the representativeness of our online sample. Therefore, we determined selectivity and were able to weigh our analyses accordingly. It should be noted that due to our use of the fact sheet assessment that was established by the 'Na Toll!' campaign, we had to use a gender unspecific binge drinking item of five or more drinks at a drinking occasion, which may limit the comparability of our results to other studies. An additional limitation was that the baseline equivalence of IG and CG in alcohol-related variables had to be assumed after randomized assignment to conditions but could not be

Table 1: Intervention effects weighted according to the fact sheet sample (age, sex and alcohol use)

Outcomes	T1: Tests of group differences						T2: Tests of group differences, controlled for T1					
	<i>n</i>	ICC	IG Mean (SD)/ % (<i>n</i>)	CG Mean (SD)/ % (<i>n</i>)	Coef. (95% CI) ^a / OR (95% CI)	<i>p</i> -value	<i>n</i>	ICC	IG Mean (SD)/ % (<i>n</i>)	CG Mean (SD)/ % (<i>n</i>)	Coef. (95% CI) ^b / OR (95% CI)	<i>p</i> -value
Alcohol risk perception												
For adolescents, alcohol use is always a health risk	732	0.067	3.52 (0.61)	3.25 (0.73)	0.33 (0.15–0.51).	0.001	462	0.004	3.43 (0.68)	3.35 (0.68)	−0.01 (−0.15–0.14)	0.906
Higher risk in adolescence than in adulthood	735	0.084	94.4 (338)	73.2 (276)	6.3 (3.1–12.9)	<0.001	460	0.076	94.8 (219)	72.1 (168)	14.4 (7.3–28.6)	<0.001
Physical and other risks of regular binge drinking	732	0.056	3.43 (0.34)	3.32 (0.35)	0.13 (0.06–0.20)	0.001	462	0.050	3.49 (0.30)	3.42 (0.32)	0.01 (−0.07–0.09)	0.836
No acceleration of sobering up	731	0.172	2.94 (0.75)	2.33 (0.70)	0.66 (0.52–0.82)	<0.001	460	0.097	2.82 (0.78)	2.35 (0.76)	0.16 (−0.05–0.38)	0.131
Outcome expectancies: sociability	724	0.020	2.90 (0.61)	2.97 (0.60)	−.09 (−.20–0.02)	0.088	456	0.033	2.93 (0.59)	2.99 (0.59)	0.03 (−0.06–0.12)	0.525
Outcome expectancies: cognitive constraints	724	0.001	2.47 (0.65)	2.44 (0.67)	<0.01 (−0.09–0.09)	0.933	457	0.000	2.49 (0.60)	2.44 (0.66)	<0.01 (−0.10–0.12)	0.893
Outcome expectancies: aggression	717	0.020	1.84 (0.79)	1.89 (0.83)	−0.09 (−0.23–0.04)	0.133	454	0.031	1.81 (0.75)	1.85 (0.83)	−0.03 (−0.18–0.13)	0.717
Peer group												
Discussion about negative effects in the last 4 weeks	725	0.018	50.8 (177)	48.4 (182)	1.1 (0.6–1.8)	0.781	457	0.035	46.7 (107)	44.3 (101)	1.0 (0.6–1.8)	0.946
Perceived norm: ‘In to talk about alcohol problems’	729	0.001	30.8 (109)	25.6 (96)	1.4 (1.1–1.9)	0.013	463	0.007	27.8 (64)	24.7 (57)	1.0 (0.6–1.5)	0.934
Resistance self-efficacy	733	0.000	3.68 (0.96)	3.57 (1.02)	0.12 (0.01–0.22)	0.028	468	0.000	3.68 (0.91)	3.75 (0.90)	−0.08 (−0.23–0.06)	0.278
Alcohol use in the last 4 weeks												
Low use (abstinent, maximum once a month, no bingeing)	732	0.094	65.6 (233)	56.5 (213)	1.0 (0.6–1.8)	0.905	461	0.048	64.5 (150)	60.3 (140)	0.8 (0.5–1.3)	0.376

Coef., regression coefficient; CI, confidence interval; ICC, intra-class correlation.

^aRegression coefficient and 95% CI for the predictor treatment group (IG vs. CG) adjusted for age and education.

^bRegression coefficient and 95% CI of the predictor treatment group (IG vs. CG) adjusted for age and education, and controlled for T1 scores of the dependent variable.

tested. IG and CG differed in sociodemographic characteristics. However, unlike the only evaluation of a substance abuse peer education measure in recreational settings (Planken and Boer, 2010), we tried to enhance baseline equivalence through statistical control of sex and educational status. Given the few evaluation studies available, our study may be considered as a valuable contribution to prevention evaluation research in the leisure setting and as a step closer to a sound estimation of effectiveness.

The 'Na Toll!' peer education measure specifically aims at educating about risks and stimulating personal reflection of own alcohol use and alcohol-related communication in friendship groups (Bundeszentrale für gesundheitliche Aufklärung (BZgA), 2010). Given the above-mentioned limitations, our study results indicate that the measure has initial effects on the participants' perception of alcohol-related risks, perceived alcohol communication norms in their friendship group and resistance self-efficacy in alcohol-use situations. After the intervention, the adolescents became more aware of a higher risk of alcohol use and excessive use during adolescence in general. Thus, the general message of the peer education measure was successfully conveyed. This is of preventive relevance because adolescents who are more aware of the potential cost of risky consumption have a lower probability of substance abuse (Petraitis *et al.*, 1995). Risk perception might directly affect own use behavior or can buffer the strong influence of peer consumption on own alcohol use (Henry *et al.*, 2005).

Personal outcome expectancy of alcohol use with regard to sociability, cognitive impairment and aggressiveness is another important risk factor of alcohol use (Aas *et al.*, 1998; Oei and Jardim, 2007) but was not changed through peer education. Thus, certain specific personal expectancies were not challenged by the measure. Maybe especially positive expectancies should be more explicitly addressed by the peer educators to generate effects. This speculation is supported by the fact that an intervention effect could be observed with regard to myths about acceleration of sobering up, which was a part of the quiz component. The participants were more aware of the fact that sobering up cannot be accelerated. Overestimating the rate of elimination of alcohol is associated with risky behaviors like drunk driving (Aston and Liguori, 2013). Thus, this effect is relevant for preventing accidents and injuries, which are the most prominent alcohol-related problems among German adolescents (Kraus *et al.*, 2012b).

With regard to alcohol-related communication in their friendship group, no difference was found between IG and CG in the level of actual communication about mental blackouts, hangovers, vomiting or fighting. Every second adolescent in both study conditions reported that their friendship group engaged in talking about 'negative'

effects of drinking, which seems to improve group cohesion and help to establish group norms (Stumpp *et al.*, 2009). However, compared with controls, peer-educated adolescents more frequently perceived that it was acceptable to talk about alcohol problems with their friends. In addition, peer-educated adolescents felt more capable of resisting alcohol in drinking situations with friends or in the wider peer group. Resistance self-efficacy is another major protective factor of alcohol use (Oei and Jardim, 2007). Integrating these results, the peer education measure does not seem to have changed actual communication but the personal perception of the friendship group in accepting to talk about alcohol problems and to say 'no' to alcohol use.

To sum up, the goals of the 'Na Toll!' campaign with regard to its peer education measure were achieved in part for the short term. Notably, these short-term effects go beyond 'happy sheets' evaluations, which take place in the presence of peer educators immediately after the intervention and are subject to social desirability bias. This study confirms the results of the aforementioned evaluation of a similar peer-led measure in recreational settings that demonstrated short-term effects on alcohol-related cognitions (Planken and Boer, 2010). However, effects mostly could not be maintained by the 3-month follow-up assessment. The 15-min peer talk seems to have failed to buffer other influences on risk perception and resistance self-efficacy that have their origin from family, peers and media (Evans *et al.*, 1978). Too many other social factors might have operated to counter the initial changes (Jang *et al.*, 2012). Considering these various influences, the complex 'Na Toll!' intervention might be well advised to add even more components to the campaign in order to intensify peer elements or to address other settings of significant influence like the family or the community. More intensive peer elements might include repeated, personalized education efforts after the initial peer talk (e.g. 'booster sessions' through social media). Within the given peer education concept, peer group behavior might be worth emphasizing besides individual risk perception. A qualitative study by Stumpp *et al.* (2009) pointed to the fact that adolescents establish an alcohol policy within their friendship group to experience a 'loss of control under control'. Peer-led prevention programs could help adolescents to become aware of the group alcohol code to minimize risky habits of alcohol use and to maximize protective group strategies.

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