Effectiveness of a selective alcohol prevention program targeting personality risk factors: Results of interaction analyses

Jeroen Lammers a,⁎, Ferry Goossens a, Patricia Conrod b, Rutger Engels a,⁎, Reinout W. Wiers c, Marloes Kleinjan a

a Trimbos Institute (Netherlands Institute of Mental Health and Addiction), Utrecht, The Netherlands
b Department of Psychological Medicine and Psychiatry, Section of Addiction, Kings College London, University of London, United Kingdom
c Behavioural Science Institute, Radboud University Nijmegen, The Netherlands

A R T I C L E   I N F O

Article history:
Received 16 September 2016
Received in revised form 2 January 2017
Accepted 25 February 2017
Available online 28 February 2017

Keywords:
Selective prevention
Personality traits
Alcohol use
Binge drinking
Adolescence
Education level

A B S T R A C T

Aim: To explore whether specific groups of adolescents (i.e., scoring high on personality risk traits, having a lower education level, or being male) benefit more from the Preventure intervention with regard to curbing their drinking behaviour.

Design: A clustered randomized controlled trial, with participants randomly assigned to a 2-session coping skills intervention or a control no-intervention condition.

Setting: Fifteen secondary schools throughout The Netherlands; 7 schools in the intervention and 8 schools in the control condition.

Participants: 699 adolescents aged 13–15: 343 allocated to the intervention and 356 to the control condition; with drinking experience and elevated scores in either negative thinking, anxiety sensitivity, impulsivity or sensation seeking.

Measurements: Differential effectiveness of the Preventure program was examined for the personality traits group, education level and gender on past-month binge drinking (main outcome), binge frequency, alcohol use, alcohol frequency and problem drinking, at 12 months post-intervention.

Intervention and comparator: Preventure is a selective school-based alcohol prevention programme targeting personality risk factors. The comparator was a no-intervention control.

Findings: Intervention effects were moderated by the personality traits group and by education level. More specifically, significant intervention effects were found on reducing alcohol use within the anxiety sensitivity group (OR = 2.14, CI = 1.40, 3.29) and reducing binge drinking (OR = 1.76, CI = 1.38, 2.24) and binge drinking frequency (β = 0.24, p = 0.04) within the sensation seeking group at 12 months post-intervention. Also, lower educated young adolescents reduced binge drinking (OR = 1.47, CI = 1.14, 1.88), binge drinking frequency (β = 0.25, p = 0.04), alcohol use (OR = 1.32, CI = 1.06, 1.65) and alcohol use frequency (β = 0.47, p = 0.01), but not those in the higher education group. Post hoc latent-growth analyses revealed significant effects on the development of binge drinking (β = −0.19, p = 0.02) and binge drinking frequency (β = −0.10, p = 0.03) within the SS personality trait.

Conclusions: The alcohol selective prevention program Preventure appears to have an effect on the prevalence of binge drinking and alcohol use among specific groups in young adolescents in the Netherlands, particularly the SS personality trait and lower educated adolescents.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

Preventure is a selective prevention programme with a personality-targeted approach. It targets young adolescents with two risk factors for heavy alcohol consumption: early-onset alcohol use (Grant & Dawson, 1997; Hawkins et al., 1997) and personality risk for alcohol abuse (e.g. (Rutledge & Sher, 2001)). Preventure has proven to be effective in Canadian, British and Australian studies when offered to high-school students (Conrod, Stewart, Comea, & Maclean, 2006; Conrod, Castellanos, & Mackie, 2008; Conrod, Castellanos-Ryan, & Mackie, 2011). In a recent
study on the effectiveness of Preventure in The Netherlands, no pro-
gram effects were found when looking at the incidence of alcohol use
at the follow-up points separately (Lammers et al., 2015). By modelling
the development of alcohol use over time using latent growth modell-
ing, positive program effects were found. The exposure to the interven-
tion resulted in significantly less growth in binge drinking and binge
drinking frequency over the whole group of young adolescents
(Lammers et al., 2015). In the current post hoc analyses of the Dutch
Preventure study, we explored whether certain theory-based high risk
groups would benefit more from the Preventure intervention than
others.

Specific characteristics of study participants may moderate the rela-
tionship between the Preventure intervention and substance use be-
aviours (Conrod et al., 2008; Conrod et al., 2011; Kreamer, Wilson,
Fairburn, & Agras, 2002). The risk moderation hypothesis suggests
that prevention programs should be more effective in high-risk groups
compared to lower risk groups. On the basis of previously reported
moderators in the literature (Conrod et al., 2008; Kuntsche, Knibbe,
Gmel, & Engels, 2006; Verdurmen, Koning, Vollebergh, van den
Eijnden, & Engels, 2011), we specifically examined participants’ personality
traits, educational level and gender as possible moderators of interven-
tion effects.

Two personality dimensions were previously found to be predictive of
heavy alcohol use and alcohol use disorders, namely (1) an impulsive
sensation seeking dimension, and (2) a behavioural inhibition dimen-
sion (Conrod et al., 2006). These two broad personality dimensions
are either more proximal to alcohol use and misuse or they map onto
specific motivational processes underlying alcohol use or misuse
(Conrod et al., 2006). The impulsive sensation seeking dimension is re-
lated to drinking problems through negative affect coping motives. In
contrast, the inhibition dimension is associated with positive affect re-
lated drinking, which is in turn associated with heavier drinking and
drinking problems (Conrod et al., 2006). Within these two dimensions,
Conrod and colleagues (Comeau, Stewart, & Loba, 2001; Sher,
Bartholow, & Wood, 2000) distinguished four personality profiles at
higher risk of developing alcohol problems: sensation seeking (SS), im-
pulsivity (IMP), anxiety sensitivity (AS) and negative thinking (NT).
Both anxiety sensitive and hopeless individuals showed higher levels
of alcohol use and drinking problems (Sher et al., 2000; Conrod, Pihl,
& Vassileva, 1998; Stewart, Peterson, & Pihl, 1995; Krank et al., 2011).
Sensation seekers were found to drink earlier, at greater frequency,
and they were at risk of heavy alcohol use (binge drinking) (Sher et
al., 2000; Castellanos-Ryan, Rubia, & Conrod, 2011; Krank et al., 2011).
Impulsive individuals showed an increased risk of early alcohol and
drug use (Krank et al., 2011; Shin, Hong, & Jeon, 2012; Walther,
Morgenstern, & Hanewinkel, 2012). Consistent with the Canadian,
British and Australian studies (Conrod et al., 2006; Conrod et al., 2008;
Conrod et al., 2011), we hypothesised that Preventure would be effective
in reducing binge drinking rates among the sensation seekers’ trait,
and reducing drinking rates and problem drinking among the anxiety sensitivity and negative thinking personality traits (Conrod
et al., 2006).

A unique feature of the education system in the Netherlands is that
the population of secondary school pupils is divided into different edu-
cation levels and there are important differences in substance use behav-
iours between adolescents from lower and higher educational backdrops (Sallona et al., 2008; Spijkerman, Van den Eijnden,
& Huiberts, 2008; Verdurmen et al., 2012). For example, a great propor-
tion of pupils from lower education levels report binge drinking; 75%
of pupils aged 13–15 with preparatory vocational training (lower edu-
cational level) engage in binge drinking, compared to 56% of students
with pre-university education (higher educational level) (Verdurmen
et al., 2012). In other Dutch prevention trials, (Verdurmen et al., 2011;
Koning et al., 2009; Verdurmen, Koning, Vollebergh, van den Eijnden,
& Engels, 2014), education level was found to moderate intervention ef-
effects. Because binge drinking is more common among pupils from lower
educated levels, and previous trials indicated that lower educated stu-
dents might benefit more from alcohol prevention programmes
(Koning et al., 2009), we hypothesised that Preventure would be more
effective in reducing binge drinking in the group of lower educated stu-
dents at follow-up compared to students with a higher education level.

Finally, boys and girls have different drinking patterns. For instance,
boys tend to drink more frequently and are more engaged in binge
drinking compared to girls (Verdurmen et al., 2012), at least at the
time this trial was conducted. In general, externalizing risk factors,
such as low self-regulatory capacities, are more common among boys
(Chassin, Pitts, & Prost, 2002; Hill, White, Chung, Hawkins, & Catalano,
2000) and internalizing factors, like low self-esteem, are more present
among girls (Chassin et al., 2002; Colder, Campbell, Ruel, Richardson,
& Flay, 2000). Furthermore, girls are more likely to use substances as a
way to cope with stress, while boys are more likely to use out of en-
hancement motives (Kuntsche et al., 2006). Because the intervention
matches those differences expected for the personality types, we ex-
pected boys and girls to benefit both from the Preventure program.

With the exploration of these certain theory-based high risk groups,
the Preventure programme can possibly be implemented more effective
and more tailored into the Dutch school setting.

2. Method

2.1. Study sample

A total of 100 schools were selected randomly from all public second-
cary schools in The Netherlands (N = 405). Sixty schools fulfilled the inclusion criteria: 1) at least 600 students, 2) <25% of students
from migrant populations, and 3) no special education. Fifteen schools (25%) were willing to participate. A screening survey was carried out
among all students attending grade 8 and grade 9 in the participating schools. The students who reported to have drunk at least one glass of
alcohol, and scored more than one standard deviation above the sample
mean on one of the four personality risk scales were classified as be-
longing to a risk group (Woicik, Stewart, Pihl, & Conrod, 2009). In
total, 4844 students participated in the screening, and 699 students par-
ticipated in the study (see Fig. 1). Analyses revealed no significant dif-
fences in prevalence or demographic characteristics between consenting and non-consenting students. Randomization occurred at
school level to avoid contamination between conditions. Parents and
students provided active informed consent to participate in the inter-
vention part of the study. The study was approved by the Medical
Ethical Commission for Mental Health (METIGG). The design, including
the power analyses, is described in more detail in earlier reports
(Lammers et al., 2011; Lammers et al., 2015). The trial is registered in
The Netherlands Trial Register (NTR1920).

A total of 581 students (83%) completed follow-up measures after 2
months, 552 students (79%) after 6 months and 530 students (76%) at
the 12-month follow-up. The students who only completed the
screening questionnaire (7% of all respondents) were more likely to
have a lower level of education than those who completed at least one of
the three follow-up questionnaires (53% vs. 34%, χ²(1) = 8.20, P < 0.004).

2.2. Intervention

Preventure is a brief intervention using motivational interviewing
strategies and cognitive behavioural skills training, that is tailored to
one of the four personality profiles (Conrod et al., 2011; Conrod et al.,
2013). It focuses on changing coping strategies rather than substance
use specifically. The intervention involved two 90-minute group ses-
sions, carried out at the participants’ schools, during school hours.
Group-sessions were supported by student manuals, in which thoughts
and exercises could be logged. In the first group session, psycho-educu-
tional strategies were used to educate students about the target

J.Lammers et al. / Addictive Behaviors 71 (2017) 82–88 83
personality variable, and the associated problematic coping behaviours, such as risky behaviour, and substance misuse. Students were motivated to explore ways of coping with their personality through a goal-setting exercise. In the second session, participants were encouraged to identify and challenge personality-specific cognitive thoughts that lead to problematic behaviours. Students assigned to the control group received no further intervention.

2.3. Treatment integrity

The intervention was provided by three qualified counsellors and two co-facilitators. The counsellors were observed by a supervisor at their first two group sessions at each school, and were provided with feedback through four peer reviewing meetings during the implementation. Eighty percent (80%) of participants were present for the first intervention session and 71% for the second session. In total, 71% of the students followed both group sessions. Students who did not attend both group sessions (29%) were more likely to have recently been binge drinking (59% vs. 45%) \((\chi^2(1) = 5.12, \rho < 0.024)\) and were more likely to skip one or more of the follow-up measurements \((\chi^2(1) = 25.87, \rho < 0.0001)\) than students who attended both group sessions.

2.4. Outcome measures

2.4.1. Baseline measures

The baseline questionnaire included demographic variables: age, sex, year of level, ethnicity and level of education. For baseline screening, the Substance Use Risk Profile Scale (SURPS; (Woicik et al., 2009)) was used, which distinguishes four personality profiles. Each profile is assessed using five to seven items that can be answered on a 4-point scale. Studies in both adolescent and adult samples in several countries have shown that this scale has good internal reliability, convergent and discriminant validity, and adequate test–retest reliability (Krank et al., 2011; Woicik et al., 2009; Malmberg et al., 2012). All four subscales demonstrated good internal consistency in the current sample (Cronbach’s \(\alpha = 0.84\) for NT, 0.72 for AS, 0.69 for IMP and 0.66 for SS). These reliability estimates converge with those from previous research (e.g. (Malmberg et al., 2012; Jaffee & D’Zurilla, 2009)) and are satisfactory for short scales (Loewenthal, 1996).

2.4.2. Primary outcome measure

The primary outcome was binge drinking at 12 months follow-up measurement, assessed with the question ‘How many times have you had five or more drinks on one occasion, during the past four weeks?’ with the answer categories ‘none’, ‘1’, ‘2’, ‘3–4’, ‘5–6’, ‘7–8’ and ‘9 or more’. Because the binge drinking variable was skewed to the low end, the item was recoded into a binominal variable (0 = ‘none’, 1 = ‘1 or more’).

2.4.3. Secondary outcome measures

Alcohol use was assessed by 1-month prevalence (Engels, Knibbe, & Drop, 1999) at 12 months follow up measurement by asking: ‘In the past four weeks, did you drink any alcoholic beverage(s)?’ Alcohol use was recoded into a binominal variable (0 = ‘none’, 1 = ‘1 or more’).

---

Fig. 1. Flow diagram of recruitment and progress throughout the study.
more”). Binge drinking frequency was assessed with the same question as binge drinking. Frequency of alcohol use was assessed with the question ‘In the past four weeks, how often did you drink one or more alcoholic beverages?’ ranging from 0 to 40 or more times. The binge drinking frequency and alcohol frequency items were log-transformed to approximate a normal distribution. To assess drinking problems, the abbreviated Rutgers Alcohol Problems Index (RAPI) (White & Labouvie, 1989) was used. Participants could indicate on a scale ranging from 0 (never) to 5 (>6 times) how often they experienced each of 18 alcohol-related problems during their life. Item scores were summed. Because the variable was skewed, the item was recoded into a binominal variable (0 = ‘absence’; 1 = ‘presence’). The original RAPI has been well validated for use with both clinical and community adolescent samples (White & Labouvie, 1989; Wiers, 2008).

2.5. Statistical analyses

Descriptive analyses were conducted to examine whether randomization resulted in a balanced distribution of demographic and outcome variables over the two conditions. The randomization resulted in an uneven distribution in terms of age, sex and level of education. Hence, these variables were included as covariates in all subsequent analyses. As the intervention condition showed higher binge drinking at baseline than the control condition, binge drinking was also used as covariate. To correct for the potential non-independence (complexity) as well as clustering of the data, the TYPE = COMPLEX procedure is used. To correct for the potential non-independence (complexity) as well as clustering of the data, the TYPE = COMPLEX procedure was used. Participants could indicate on a scale ranging from 0 (never) to 5 (>6 times) how often they experienced each of 18 alcohol-related problems during their life. Item scores were summed. Because the variable was skewed, the item was recoded into a binominal variable (0 = ‘absence’; 1 = ‘presence’). The original RAPI has been well validated for use with both clinical and community adolescent samples (White & Labouvie, 1989; Wiers, 2008).

3. Results

3.1. Descriptive analyses

Descriptive analyses revealed significant differences between the experimental conditions with regard to sex (χ²(1) = 5.96, p = 0.015), age (t (697) = 2.98, p < 0.003) and level of education (χ²(1) = 24.77, p < 0.001). The intervention condition included more girls, slightly younger students and more students with a low education level. Furthermore, the students in the intervention condition were more likely to engage in binge drinking at baseline (χ²(1) = 10.43, p < 0.001) than the students in the control condition (see Table 1).

3.2. Moderators

Interaction analyses examined if adolescents’ personality traits, level of education or gender moderated the relationship between the intervention condition and substance use. Significant Intervention x Personality Group interactions were found for anxiety sensitivity (AS) and sensation seeking (SS) for binge drinking, binge drinking frequency and alcohol use at 12 months post-intervention (see Table 2). For NT and IMP, the intervention effects were not significant. Intervention x education level analyses indicated significant interaction effects on binge drinking, binge drinking frequency and alcohol frequency. Young adolescents with lower education were less engaged in binge drinking, and used alcohol less frequent than adolescents with higher level of education, after receiving the intervention (see Table 3).

No significant interaction effects were found for the outcome variable problem drinking, and no significant interaction effects were found for boys and girls.

3.3. Intervention effects on growth over time

Analyses were conducted to examine the effect of Preventure on the linear increase in alcohol use among subgroups, by means of a latent-growth curve approach. The intercept and slope were computed for both. Each growth curve had a certain initial level (intercept) and a certain rate of change over time (slope) (Duncan, Duncan, Strycker, Li, & Alpert, 1999). In this latent growth model, the alcohol outcome slope was regressed on the Preventure intervention condition variable, controlled for the other outcome measures and the covariates age, sex and education. The fit of the models was reported by χ² and, because with large sample sizes the χ² is often significant, we also reported the CFI, TLI and the RMSEA.

Table 1

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Measure</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 699</td>
<td>Mean (SD)/%</td>
<td>Mean (SD)/%</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>47%</td>
<td>57%</td>
<td>&lt;0.015</td>
</tr>
<tr>
<td>Age</td>
<td>13.9 (0.98)</td>
<td>14.1 (0.77)</td>
<td>&lt;0.003</td>
</tr>
<tr>
<td>Dutch</td>
<td>87%</td>
<td>87%</td>
<td>n.s.</td>
</tr>
<tr>
<td>Low level of education</td>
<td>43%</td>
<td>26%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total group</td>
<td>60%</td>
<td>59%</td>
<td>n.s.</td>
</tr>
<tr>
<td>NT</td>
<td>55%</td>
<td>59%</td>
<td>n.s.</td>
</tr>
<tr>
<td>AS</td>
<td>52%</td>
<td>49%</td>
<td>n.s.</td>
</tr>
<tr>
<td>IMP</td>
<td>70%</td>
<td>60%</td>
<td>n.s.</td>
</tr>
<tr>
<td>SS</td>
<td>62%</td>
<td>62%</td>
<td>n.s.</td>
</tr>
<tr>
<td>Binge drinking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total group</td>
<td>49%</td>
<td>37%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>NT</td>
<td>47%</td>
<td>36%</td>
<td>n.s.</td>
</tr>
<tr>
<td>AS</td>
<td>46%</td>
<td>35%</td>
<td>n.s.</td>
</tr>
<tr>
<td>IMP</td>
<td>51%</td>
<td>42%</td>
<td>n.s.</td>
</tr>
<tr>
<td>SS</td>
<td>52%</td>
<td>34%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Note. NT = negative thinking; AS = anxiety sensitivity; IMP = impulsivity, SS = sensation seeking.
drinking frequency slope ($\beta = -0.10, p = 0.03$). This indicates that adolescents with the personality trait SS who received the intervention increased their binge drinking behaviour less than those adolescents with the same personality trait in the control condition. The fit between model and data was good for both binge drinking ($\chi^2 = 29.095, p < 0.03$; RMSEA = 0.033 [0.000–0.091], CFI = 0.981, TLI = 0.964) and binge drinking frequency ($\chi^2 = 33.571, p < 0.01$; RMSEA = 0.039 [0.016], CFI = 0.982, TLI = 0.967). No significant effects were found on the intercepts and slopes for the outcome measures alcohol use and drinking problems, nor for the other personality traits IMP, NT and AS.

### 4. Discussion

In a previous study on the effectiveness of Preventure in the Dutch setting, no program effects were found when looking at the incidence of alcohol use at the follow-up points separately (Lammers et al., 2015). By taking the development of alcohol use over time into account, significant program effects were found over the whole group of young adolescents (Lammers et al., 2015). In the current secondary analyses of the Preventure programme, we explored whether certain theory-based subgroups would benefit more from the Preventure intervention than others. The interaction analyses revealed that the Dutch Preventure intervention had beneficial effects for young adolescents with the personality traits anxiety sensitivity and sensation seeking. Adolescents scoring high on SS seemed to benefit most from Preventure when it comes to binge drinking and binge drinking frequency outcomes. Adolescents scoring high on AS benefitted most from Preventure in the Netherlands compared with the regard to the outcome alcohol use at 12 months post-intervention. Post hoc latent growth analyses revealed that the intervention resulted in significantly less growth in binge drinking and binge drinking frequency over 12 months' time within adolescents scoring high on SS. In our study we used both regression analyses and latent growth analyses. Combining these two approaches increased the reliability of the outcome measures and provided a more complete picture of the intervention effects of the Preventure programme. In order to meet the CONSORT statement we used regression analyses as the primary analyses, and the latent growth analyses as post hoc analyses.

The findings of the current study are in line with previous studies of Conrod and colleagues. According to trials among Canadian and British young adolescents (Conrod et al., 2006; Conrod et al., 2008), Preventure was particularly effective in preventing the incidence of binge drinking in those students with an sensation seeking personality, and preventing alcohol use among students with an anxiety sensitivity personality, after four and six months post-intervention. Consistent with the British trial (Conrod et al., 2011), the Preventure programme had an impact in reducing the relationship between SS and the growth in binge drinking.

### Table 2

Interaction effects personality traits on alcohol outcomes at 12-month follow-up (T3) among alcohol users at baseline.

<table>
<thead>
<tr>
<th></th>
<th>Binge drinking</th>
<th>Alcohol use</th>
<th>Problem drinking</th>
<th>Binge drinking frequency</th>
<th>Alcohol frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>p</td>
<td>OR (95% CI)</td>
<td>p</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td><strong>AS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>0.96 (0.69, 1.33)</td>
<td>0.81</td>
<td>0.55 (0.38, 0.79)</td>
<td>0.00</td>
<td>0.89 (0.60, 1.30)</td>
</tr>
<tr>
<td>Age</td>
<td>1.40 (1.07, 1.83)</td>
<td>0.01</td>
<td>1.60 (1.44, 1.72)</td>
<td>0.01</td>
<td>1.53 (1.18, 1.99)</td>
</tr>
<tr>
<td>Edu</td>
<td>0.90 (0.75, 1.09)</td>
<td>0.28</td>
<td>1.04 (0.72, 1.50)</td>
<td>0.74</td>
<td>1.17 (0.97, 1.41)</td>
</tr>
<tr>
<td>Cond</td>
<td>0.95 (0.60, 1.50)</td>
<td>0.81</td>
<td>0.80 (0.44, 1.44)</td>
<td>0.45</td>
<td>1.00 (0.65, 1.54)</td>
</tr>
<tr>
<td><strong>SS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>1.16 (1.03, 1.31)</td>
<td>0.01</td>
<td>1.57 (1.19, 2.02)</td>
<td>0.00</td>
<td>1.17 (0.97, 1.41)</td>
</tr>
<tr>
<td>Age</td>
<td>0.95 (0.85, 1.06)</td>
<td>0.32</td>
<td>1.03 (0.81, 1.30)</td>
<td>0.80</td>
<td>1.17 (0.97, 1.41)</td>
</tr>
<tr>
<td>Edu</td>
<td>0.97 (0.86, 1.09)</td>
<td>0.64</td>
<td>0.88 (0.47, 1.65)</td>
<td>0.69</td>
<td>1.03 (0.65, 1.64)</td>
</tr>
<tr>
<td><strong>IMP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>1.02 (0.76, 1.37)</td>
<td>0.91</td>
<td>0.58 (0.41, 0.83)</td>
<td>0.00</td>
<td>0.91 (0.61, 1.34)</td>
</tr>
<tr>
<td>Age</td>
<td>1.41 (0.91, 2.18)</td>
<td>0.01</td>
<td>1.60 (1.44, 2.23)</td>
<td>0.01</td>
<td>1.54 (1.19, 1.99)</td>
</tr>
<tr>
<td>Edu</td>
<td>0.90 (0.75, 1.09)</td>
<td>0.29</td>
<td>1.03 (0.82, 1.30)</td>
<td>0.80</td>
<td>1.17 (0.98, 1.40)</td>
</tr>
<tr>
<td>Cond</td>
<td>0.87 (0.53, 1.43)</td>
<td>0.59</td>
<td>0.98 (0.51, 1.87)</td>
<td>0.95</td>
<td>0.87 (0.58, 1.29)</td>
</tr>
<tr>
<td><strong>NT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>1.12 (0.77, 1.90)</td>
<td>0.42</td>
<td>1.14 (0.68, 1.94)</td>
<td>0.64</td>
<td>1.02 (0.62, 1.69)</td>
</tr>
<tr>
<td>Age</td>
<td>1.21 (0.77, 1.90)</td>
<td>0.42</td>
<td>1.14 (0.68, 1.94)</td>
<td>0.64</td>
<td>1.02 (0.62, 1.69)</td>
</tr>
</tbody>
</table>

Note. Adjusted for cluster effects. AS = anxiety sensitivity, NT = negative thinking, IMP = impulsivity, SS = sensation seeking. OR = odds ratio, CI = confidence interval, β = standardized logistic regression coefficient, Edu = education, Cond = condition.

### Table 3

Interaction effects education on alcohol use outcomes at 12-month follow-up (T3) among alcohol users at baseline.

<table>
<thead>
<tr>
<th></th>
<th>Binge drinking</th>
<th>Alcohol use</th>
<th>Problem drinking</th>
<th>Binge drinking frequency</th>
<th>Alcohol frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>p</td>
<td>OR (95% CI)</td>
<td>p</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.01 (0.93, 1.09)</td>
<td>0.83</td>
<td>0.58 (0.40, 0.84)</td>
<td>0.00</td>
<td>0.91 (0.61, 1.37)</td>
<td>0.66</td>
</tr>
<tr>
<td>1.44 (1.11, 1.88)</td>
<td>0.01</td>
<td>1.65 (1.21, 2.26)</td>
<td>0.00</td>
<td>1.55 (1.19, 2.03)</td>
<td>0.00</td>
</tr>
<tr>
<td>0.88 (0.70, 1.11)</td>
<td>0.28</td>
<td>0.47 (0.12, 1.88)</td>
<td>0.28</td>
<td>0.83 (0.30, 2.37)</td>
<td>0.74</td>
</tr>
<tr>
<td>0.50 (0.36, 0.76)</td>
<td>0.20</td>
<td>0.89 (0.57, 1.40)</td>
<td>0.43</td>
<td>1.14 (0.81, 1.65)</td>
<td>0.30</td>
</tr>
<tr>
<td>1.47 (1.14, 1.88)</td>
<td>0.04</td>
<td>1.32 (1.06, 1.65)</td>
<td>0.74</td>
<td>1.06 (0.75, 1.51)</td>
<td>0.74</td>
</tr>
<tr>
<td><strong>Cond</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.10 (0.03, 0.35)</td>
<td>0.03</td>
<td>0.14 (0.03, 0.05)</td>
<td>0.88</td>
<td>0.16 (0.06)</td>
<td>0.03</td>
</tr>
<tr>
<td>0.25 (0.07, 0.94)</td>
<td>0.04</td>
<td>0.47 (0.11)</td>
<td>0.01</td>
<td>0.09 (0.06)</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Note. Adjusted for cluster effects. OR = odds ratio, CI = confidence interval, β = standardized logistic regression coefficient, Cond = condition, Edu = education.
after 12 months. No significant effects were found for the personality traits impulsivity (IMP) and negative thinking (NT) at the different follow-up points, nor did the intervention significantly impact the relationship between the personality traits IMP, NT and AS, and the growth in binge drinking, which is in line with the findings of Conrod et al. (Conrod et al., 2006; Conrod et al., 2008; Conrod et al., 2011).

So, consistent with the Canadian and British trials, there was some evidence that intervention effects for AS were stronger in relation to alcohol onset measures, and intervention effects for SS were more consistently revealed for binge drinking outcomes. The personality-specific intervention was effective in reducing the drinking behaviour that is most problematic for each personality type. These findings provide further support for the necessity of personality targeting interventions for preventing alcohol misuse among young adolescents.

No significant effects were revealed on problem drinking for the personality traits. We expected these to be present particularly among the AS and NT personality traits. Conrod and colleagues only found effects in reducing problem drinking at the longer term, after 24 months post-intervention (Conrod et al., 2011; Conrod et al., 2013). This may implicate that curbing the growth of drinking in early onset drinkers may delay the onset of problem drinking over the longer term. Future research is needed to examine outcomes beyond 12 months post-intervention to see whether the intervention is effective for alcohol-related problems at later ages for AS and NT.

Because of the different education levels within the Dutch school system, we tested the differences between students receiving education at a ‘high level’ (e.g. pre-university education) and students receiving education at a ‘lower level’ (e.g. vocational training). Conrod et al. (Conrod et al., 2006; Conrod et al., 2008; Conrod et al., 2011; Conrod et al., 2013) did not distinguish between different levels of education, because of the different school systems in Canada and England. In our study, the significant effects were found mainly among students with lower-level education. It seems that students in this education category benefit more from the intervention than students with higher education, perhaps because they are more engaged in alcohol drinking and binge drinking than students with higher level of education (Verdurmen et al., 2012). These findings are consistent with findings from a previously tested Dutch alcohol parent and student prevention program. In this study moderation effects were found for educational level on heavy weekly alcohol use, indicating that lower educated adolescents profited more from the alcohol intervention than students with a higher education level (Verdurmen et al., 2011; Koning et al., 2009). Our results can be interpreted as indicating that Preventure is most effective among young adolescents at a lower level of education, and is best suited for this type of education. Consistent with previous studies of Conrod and colleagues (Conrod et al., 2006; Conrod et al., 2008; Conrod et al., 2011; Conrod et al., 2013), and as expected, no significant moderation effects were found for gender.

4.1. Limitations

The current study has some limitations. First, our study was confined to students who voluntarily participated in the intervention and for whom parental consent was obtained. Fifty-two percent of the potential participants did not consent or failed to obtain parental consent. For the group of students who were identified as high risk based on the screening, no differences were found on demographic variables or the prevalence of alcohol use between those who participated in the study and those who did not provide consent. However, the group of students who participated can be a selective group, because they can differ on other characteristics which were not measured. The results may therefore not be generalizable to the whole group of students who are screened positive for one of the personality traits. Second, the use of self-reports might have led to measurement errors, due to situational and cognitive influences (Brener, Billy, & Grady, 2003). To overcome situational influences (e.g. social desirability) and to optimize measurement validity, we guaranteed full confidentiality (anonymity) to our participants (e.g. (Koning et al., 2009; Del Boca & Darkes, 2003)). Third, the intervention and control conditions differed at baseline on sex, age, level of education and binge drinking status. The intervention condition included more girls, slightly younger students and more students with a low education level, and the students were more likely to engage in binge drinking. Randomization at school level is probably responsible for this unequal distribution. Therefore, cluster level effects were accounted for in the analyses. A possible solution for future trials might be to randomize within schools, although one should be careful to avoid contamination effects.

Preventure has been evaluated in different countries (Conrod et al., 2006; Lammers et al., 2015; Conrod et al., 2013), and the results on alcohol misuse appear to be fairly robust. Our results show that the personality targeted Preventure is a promising intervention in the Dutch setting, especially for secondary schools with a lower level of education (vocational schools). Preventure is complementary to universal alcohol prevention programmes. Whereas universal alcohol prevention is most effective in increasing knowledge and changing attitudes among young adolescents in general, selective prevention seems to be more effective in changing alcohol misuse behaviour among high risk young adolescents more specifically. Future research could be focused on populations with a higher proportion of high-risk adolescents, such as the setting of special education or youth with mild mentally disabilities.

Role of funding sources

This study was supported by the Dutch Medical Research Council, ZonMW (No. 12052011). The ZonMW council had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Authors’ contributions

JL and FG were responsible for data collection and data analysis. JL and MK were responsible for reporting the study results. PC, the principal investigator of the Preventure trials in the UK and Canada, trained the Dutch therapists and contributed to writing this report. MK, RE and RW were supervisors. All authors read and approved the final manuscript.

Declarations of interest

JL, FG, MK and RE. declare that they have no conflicts of interest. PC is the developer and licensee of Preventure. In 2012 P.C. wrote a chapter for an ERAB (the European Foundation for Alcohol Research) book, ‘Underage Drinking’, for which she received an honorarium, and also received reimbursement of the travelling costs for a meeting in Brussels. In 2008, P.C. received a research grant from ERAB for a project on social networks and drinking behaviour of adolescents. P.C.’s salary was supported by a research fellowship from Action on Addiction when this trial commenced and is currently supported by a Senior Scientist Award (Chechez Bousier-Senio) from the Fondation de Recherche du Quebec-Sante (FQ-S). R.W.’s research is paid primarily by national grant agencies (NWO, National Science Foundation, Netherlands; ZON-MW, Medical Research Council, the Netherlands) and university money. In addition, R.W. had EU funding (FP7 Alice Rap). His research is not sponsored by tobacco companies. R.W. gave a paid talk for Lundbeck pharmaceutical company, was co-applicant in two awarded grants from ERAB and was also involved in the ERAB/AIMRF Underage Drinking Report (2012), ERAB is an independent foundation paid by the alcohol-industry that awards alcohol-related research after an independent scientific evaluation (peer-reviewed), with guarantee of completely independent scientific expression (in accordance with the Dublin principles), http://www.api.or.at/sp/alcoholpolicyis20dokumente/dublinprinciples.pdf.

Acknowledgements

We would like to thank Suzanne Lokman for the recruitment of the schools, Boulke van Vlkhoven and Hettie Rensink for the translation and development of the materials, and Nathalie Castellanos-Ryan for her assistance during the execution of the study. Last but not least, we would like to thank the schools and their students who participated in this study.

References


J. Lammers et al. / Addictive Behaviors 71 (2017) 82–88


