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Differential segmentation responses to an alcohol social marketing program

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Abstract

Objective: This study seeks establish whether meaningful subgroups exist within a 14-16 year old adolescent population and if these segments respond differently to the Game On: Know Alcohol (GOKA) intervention, a school-based alcohol social marketing program.

Methodology: This study is part of a larger cluster randomized controlled evaluation of the Game On: Know Alcohol (GOKA) program implemented in 14 schools in 2013/2014. TwoStep cluster analysis was conducted to segment 2114 high school adolescents (14-16 years old) on the basis of 22 demographic, behavioral and psychographic variables. Program effects on knowledge, attitudes, behavioral intentions, social norms, expectancies and refusal self-efficacy of identified segments was subsequently examined.

Results: Three segments were identified: (1) Abstainers (2) Bingers and (3) Moderate Drinkers. Program effects varied significantly across segments. The strongest positive change effects post participation were observed for the *Bingers*, while mixed effects were evident for *Moderate Drinkers* and *Abstainers*.

Conclusions: These findings provide preliminary empirical evidence supporting application of social marketing segmentation in alcohol education programs. Development of targeted programs that meet the unique needs of each of the three identified segments is indicated to extend the social marketing footprint in alcohol education.

1. Introduction

Adolescents are inundated by images depicting the benefits of alcohol consumption, through TV-shows and movies (Gunter, Hansen, & Touri, 2009; Hanewinkel et al., 2012) and social media channels (Hastings & Sheron, 2013). They are also surrounded by drinking behaviors in their socio-cultural environment (Trucco, Colder, Wieczorek, Lengua, & Hawk, 2014), with alcohol drinking dominating large social occasions such as festivals and sporting events (Ellickson, Collins, Hambarsoomians, & McCaffrey, 2005). Frequently, rapid and excessive alcohol consumption, termed 'binge drinking', is accepted and encouraged (Jones, 2014). Binge drinking is the most common pattern of alcohol consumption among youth (Miller, Naimi, Brewer, & Jones, 2007), with stories and artefacts related to binge drinking often celebrated and worn as a badge of honor (Reid, Farrelly, Farrell, Fry, & Worsley, 2013). A key public health challenge is to reduce alcohol consumption and risky drinking among adolescents (Roche et al., 2010). School-based alcohol education programs continue to be one of the most convenient and cost-effective face-to-face environments to reach adolescents (Babor et al., 2010) and play an important role in attempting to shift drinking attitudes and behavior towards moderate or (ideally) no alcohol drinking and in discouraging binge drinking (Botvin & Griffin, 2004; McBride, Farringdon, Midford, Meuleners, & Phillips, 2004).

Researchers are beginning to explore differential effects of alcohol education programs on subgroups within the adolescent population (Foxcroft & Tsertsvadze, 2012; McKay, Sumnall, McBride, & Harvey, 2014; Newton, Teesson, Barrett, Slade, & Conrod, 2012). Some programs yield greater effects in either low-risk or high-risk groups and some with females (Vogl et al. 2009; Weichold et al, 2009) and yet others with males (Dielman, 1994; Faggiano et al., 2008; Vogl et al., 2009). Studies typically employ predominantly socio-demographic

variables (Boslaugh, Kreuter, Nicholson, & Naleid, 2005; Moss, Kirby, & Donodeo, 2009) or one dimensional behavioral variables (McKay et al., 2014) to define subgroups. A key aim in segmentation studies is to look for differences between consumers that affect how they respond (Sharp, 2013). Use of one dimensional variables such as for example socio-demographic variables is unlikely to identify 'true' market segments or subgroups that enable deeper understanding (Dibb & Simkin, 2009). Understanding differences can assist the development of more efficacious and cost-efficient programs targeted at one or more market segment(s) based on consumer differences (Albrecht & Bryant, 1996; Beane & Ennis, 1987). In response, a few recent studies have segmented adolescents using psychographic (e.g. attitudes) and behavioral variables (e.g. alcohol consumption patterns) in addition to socio-demographic characteristics (Babbin, Velicer, Paiva, Brick, & Redding, 2014; Mathijssen, Janssen, van Bon-Martens, & van de Goor, 2012; Tomcikova, Madarasova Geckova, Van Dijk, & Reijneveld, 2011). However, these studies do not investigate whether the identified segments responded differentially to alcohol education or prevention/intervention programs.

A social marketing perspective suggests that members of one 'true' segment will respond uniformly to programs and following this logic, different segments will respond differently to programs (Wilkie, 1994). Without establishing whether segments respond differently to programs, the value of segmentation and subsequent targeting of programs within this context is uncertain. That is, if segments respond uniformly to alcohol programs, there would be no need to tailor programs to suit the unique needs and characteristics of one or more target segments. This research therefore builds on the literature by examining whether adolescent subgroups identified on the basis of demographic, psychographic and behavioral variables respond differentially to a school-based alcohol social marketing program. This study employs a cluster analysis to identify meaningful segments amongst a 14-16 year old adolescent population. Next, it investigates whether the outcome effects of Game On: Know

Alcohol (GOKA), a school-based alcohol education program employing social marketing principles, varied for each of the identified segments.

1.1 Alcohol education programs and market segmentation

The majority of alcohol education programs in school settings follow a one size fits all approach, meaning that they deliver an identical program (universal program) to all participants (Botvin & Griffin, 2007; Foxcroft & Tsertsvadze, 2012). Universal programs are implemented prior to onset of alcohol use by equipping adolescents' with and promoting interpersonal and intrapersonal skills to foster resilience. Some universal programs have reported positive outcomes (Botvin, Griffin, Diaz, & Ifill-Williams, 2001) while others have reported no effect (Sloboda et al., 2009). Critics of universal programs suggest that these programs cover too many subjects (Amaro, Blake, Schwartz, & Flinchbaugh, 2001) and in reality are often implemented when some adolescents are already consuming alcohol, limiting their effectiveness in the most vulnerable groups of adolescents. Further, research indicates that a universal approach may be suboptimal given previous studies have observed significantly different program effects on subgroups (McBride, Farringdon, Midford, Meuleners, & Phillips, 2003; McKay et al., 2014), notwithstanding studies that simply neglect or don't want to report group differences (Foxcroft & Tsertsvadze, 2012). Some programs, for example, produce greater effects in either low-risk or high-risk groups, or with males rather than females (Newton, Vogl, Teesson, & Andrews, 2009).

Viewed through a social marketing lens, group differences suggest application of the principle of market segmentation may offer a means to extend outcome effects. A complete market segmentation process consists of identifying homogenous segments within a larger heterogeneous population, evaluating and selecting one or more target segment(s), and developing a program suited to the unique needs and characteristics of the target segment(s)

(Donovan, Egger, & Francas, 1999). Meaningful segments can be identified on the basis of demographic, psychographic, geographic, and behavioral variables (Kotler, 1980). Geographic variables can range from areas such as cities, states, region to urban, rural and suburban classifications (Kotler & Armstrong, 2001). Demographic segmentation includes quantifiable social characteristics such as age, ethnicity, income and gender. Psychographic segmentation moves beyond geographic and demographic segmentation variables by describing individuals' attitudes, values and their lifestyles. Behavioral segmentation comprises variables such as benefits sought, frequency of behavior and quantity consumed.

The complete market segmentation process described previously has rarely been used in alcohol research (Moss et al., 2009) and school contexts (Mathijssen et al., 2012), and has not been applied in alcohol education programs aimed at middle and high school segments. Further, only a few studies employ multiple segmentation bases, including demographic, psychographic and behavioral variables, in the first phase of the market segmentation process (Babbin et al., 2014; Mathijssen et al., 2012; Tomcikova et al., 2011). However, these programs have not investigated whether differential effects are evident following program participation. Against this background, the purpose of the study is twofold. Initially the presence of segments within 14-16 year old high school segment will be examined on the basis of demographic, psychographic and behavioral variables. Second, the study will investigate whether the identified segments responded differently to the GOKA program.

2. Methods

2.1 The GOKA program

This study is part of a larger cluster randomized controlled design research project that is implementing and evaluating an alcohol social marketing program, GOKA. The GOKA program is being delivered in schools to Year 10 adolescents, typically aged 14-16 years

old. Cohort sizes have ranged from 20-200 adolescents across program schools. Preliminary results indicate that the program significantly improved knowledge and reduced positive attitudes towards binge drinking for program participants when compared to the control group (Rundle-Thiele et al., in press) GOKA is a six module program that uses three custom developed online games (http://gameon.rcs.griffith.edu.au/student-portal/), an existing Australian government online board game (Don't Turn Your Night into a Nightmare) and practical activities to help students understand the effects of alcohol (e.g. wearing Beer Goggle Activity) and binge drinking (e.g. Passing Out Activity, Stork Balance Test) as well as to equip them with strategies to reduce or abstain from drinking (e.g. Pledge). The GOKA program was delivered by university researchers from Social Marketing @ Griffith in one full school-day in 14 Catholic schools located in one Australian state. Based upon the underpinning do-feel-learn hierarchy (Ray, 1973), adolescents were provided with a mixture of online games and practical activities to first do and feel followed by a short message delivered by the research team. GOKA further draws upon the UK National Social Marketing Centre [NSMC] (2009) social marketing principles and was designed on the basis of the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and experiential learning theory (Kolb, 1994). A more detailed explanation of the development of the GOKA program can be found in Rundle-Thiele et al. (2013) and Rundle-Thiele et al. (in press). Ethical clearance was obtained from the Griffith University Human Research Ethics Committee. Active parental and student consent was obtained from all intervention participants. For the control schools, a passive parental consent procedure was followed (Castellanos & Conrod, 2006). Participants did not receive any incentive or compensation.

2.2 Research design & sample

From a population of 92 Catholic education schools from one Australian state, a simple cluster randomized controlled trial design was used. First, schools were randomly allocated

to 20 intervention and 20 control schools. A total of 14 intervention and 10 control schools

agreed to participate in the 2013-2014 delivery and evaluation program, representing a school

level response rate of 70% and 50% respectively. For the segmentation analysis, a total of 20

schools (10 control and 10 intervention) were selected, representing all schools where data

had been collected at the time. From 3102 enrolled adolescents in the 20 schools, 2337

adolescents (75.5%) completed an online survey at baseline. The survey was administered

prior to students' participation in GOKA and immediately following program delivery.

Control schools completed the survey within a two week timeframe. The control group did

not have any contact with the intervention program and may in some cases have received

their schools standard alcohol and drug education classes during this time. However, this was

not recorded. A retention rate of 70.6% for the intervention schools and 69.6% for the control

schools was achieved (Intervention: 810; Control: 768) at pre-and-post program delivery.

2.3 Measures

A total of 12 constructs (22 items) were examined. Four items of the Alcohol Use Disorders

Identification Test (AUDIT) (World Health Organization, 2006) were used to capture

adolescent drinking behaviors. Questions comprised whether respondents had ever had a full

alcoholic drink, frequency and quantity of drinking as well as frequency of binge drinking.

Demographic variables including age and gender were included. Psychographic measures

such as subjective norms, attitudes and behavioral intentions towards binge drinking were

derived from Fishbein and Ajzen (2010) and Norman and Conner (2006). More specifically,

the attitudinal items included five items on a seven-point bi-polar semantic differential scale

with -3 indicating a negative and +3 indicating a positive attitude towards binge drinking.

Three items measured behavioral intentions towards binge drinking on a seven-point unipolar

scale with a range of 1-7, where a lower score indicates a lower likelihood of binge drinking

while a higher score suggests a greater likelihood of engaging in a binge drinking session

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over the next two weeks. The subjective norm items were also measured on a seven-point unipolar scale, where 1 indicates respondents' believed people important to them would disapprove of binge drinking while 7 indicates the perception that important people would support binge drinking. The alcohol knowledge measure included ten items and was calculated following the Rundle-Thiele, Ball, and Gillespie (2008) score point system that was adapted and validated for adolescents in Rundle-Thiele and colleagues (2013). The knowledge questions comprised three True/False questions surrounding common alcohol misperceptions and norms, five questions related to standard drink knowledge and two questions relating to drinking guidelines. Drinking expectancies were measured on a five-point unipolar rating scale (1 = strongly disagree; 5 = strongly agree) using 21 items to identify adolescents thoughts, feelings and beliefs about drinking alcohol. Adolescents' refusal self-efficacy was measured on a six-point unipolar scale (1 = I am very sure I could not resist drinking; 6 = I am very sure I could resist drinking) using 16 items describing the handling of drinking situations, drawn from the adolescent versions of the Drinking Expectancy Questionnaire-Revised and the Drinking Refusal Self-Efficacy Questionnaire-Revised respectively (Connor, George, Gullo, Kelly, & Young, 2011). Both measures (drinking expectancies and adolescent refusal self-efficacy) have frequently been used in the context of social learning theory (Bandura, 1977, 1989), yet they have only recently been validated in the context of high school adolescents (Connor et al., 2011). Binge drinking was defined as consumption of more than 6 Australian standard drinks (1 standard drink = 10g ethanol).

2.4 Analysis

Data from the baseline online survey was used to conduct a TwoStep cluster analysis (Intervention: 1163; Control: 1174) to identify whether unique segments existed in the Year 10 student population. A repeated measure Analysis of Covariance [rANCOVA] was selected

to investigate changes over time and compare differential effects across segments and program against the control condition (Hair et al., 2010; IBM, 2010). More specifically, a A 2 (Time) x 2 (School condition: Intervention vs. Control) x 3 (Segment) repeated measures ANCOVA investigated the changes post GOKA participation to identify whether the three different segments, responded differently to the GOKA program and whether changes at the segment level were a result of program participation (intervention versus control). Independent t-tests and chi-square tests at baseline indicated significant differences for attitudes, intentions, subjective norms, self-efficacy, expectancies and age measures. Differences in the above mentioned variables were included as covariates in the analysis.

2.5 TwoStep cluster analysis

A deductive approach was employed in the current study. Specifically the Theory of Reasoned Action which underpins the initial design of GOKA (see Rundle-Thiele et al. 2013) was used as an evaluative framework for GOKA. This was later extended to include factors known to increase the variance explained in behavioral intention and behavior including Alcohol Expectancies and Self-Efficacy. This study employed TwoStep cluster analysis at baseline to segment Year 10 adolescents. TwoStep Cluster analysis has recently been applied in adolescent populations and an alcohol education context (Dietrich, Rundle-Thiele, Leo, & Connor, 2015). The aim is to more rigorously test for the existence of subgroups in the adolescent population regarding differences in binge drinking behaviors and attitudes. A cluster analysis is most suitable when the data sample is heterogeneous and neither the number nor the members of the potential segments are known (Hair, Black, Babin, & Anderson, 2010). The TwoStep method allows for an automatic selection of the ideal number of cluster solutions by processing continuous and categorical variables while being able to handle a large amount of data (Hair et al., 2010; IBM, 2010).

3. Results

3.1 Demographics

The overall sample (n = 2180) was 54.2% male. The mean age was 14.5 years with 91.7% of

adolescents born in Australia, 2.4% from the United Kingdom and 2.3% from New Zealand.

There was a significant difference between the intervention and control group samples in

terms of gender composition (χ^2 (1, n = 2180) = 8.839, $p < .05$) with males (57.4%) over-

represented in the intervention sample.

INSERT TABLE 1 HERE

There was a significant, but small, difference in the average age of respondents between the

intervention (*M* = 14.7, *SD* = .58) and control (*M* = 14.6, *SD* = .58) groups (t [2019] = 4.040,

$p < .05$). No difference between intervention and control groups were observed for self-

reported academic achievement level of respondents, (χ^2 (4, n = 2177) = .1275, $p = .866$) with

the majority of respondents (50.8%) reporting that they achieve mostly B level grades. Self-

reported frequency of alcohol drinking behavior was not significantly different between the

intervention and control groups, (χ^2 (4, n = 2304) = 2.511, $p = .643$) with 66% reporting

abstaining from drinking completely. Self-reported frequency of binge drinking was not

significantly different between the two groups (χ^2 (4, n = 2304) = 8.169, $p = .086$).

Approximately 58% of adolescents in the sample had never tried drinking alcohol and a

further 22% drank alcohol less than monthly. The majority (81.6%) of the sample had not

previously engaged in binge drinking (> more than 6 standard drinks), suggesting that only

18.4% of the adolescents in the sample reported participating in this pattern of excessive

alcohol consumption. This rate is lower than reported in previous studies investigating high school adolescent binge drinking (Eaton et al., 2012; White & Hayman, 2006).

3.2 Three segment solution

TwoStep cluster analysis produced a sample (n=2114) with a silhouette measure of cohesion and separation of 0.3 (Norusis, 2007). After the identification of segments, verification of face validity and statistical significance was tested (Sherman & Sheth, 1977). A cross-validating method of the identified segments was carried out by dividing the total data sample (n=2114) in half and repeating the identical analysis on each half of the data sample (Punji & Stewart, 1983). The individual adolescent ID code was used to split the data into half. To minimize order effects, the cases were randomly ordered (IBM, 2010).

A three segment solution with 22 segmentation variables was accepted as the final solution (see Table 2 & 3). Next, the variables individual predictor importance score (ranging from 0 least important to 1 most important) was assessed. A total of four variables had the highest predictor score of 1, including two intention items (*How likely is it that you will binge drink over the next two weeks / Do you intend to binge drink over the next two weeks)* and two drinking behavior items (*how often do you have a drink containing alcohol / Have you had a full alcoholic drink before?)*. Further important predictor variables were the third behavioral intention item (0.97), all six social norm items (ranging from 0.69-0.87), and all five attitudinal items (0.41-0.66). The least important predictor variables were knowledge (0.15), time spend doing homework (0.12), fathers drinking behavior (0.05), gender (0.02) and age (0.02).

After validation of the segments, chi-square tests were performed on all categorical items (7) with statistically significant differences between groups noted for all seven categorical

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variables. ANOVA testing was conducted on all continuous items (15) representing age, drinking attitudes, drinking intentions, injunctive and descriptive norms and knowledge. With the exception of age, all measures were statistically different between segment groups.

INSERT TABLE 2 & 3 HERE

Segment 1 (*Abstainers*) was the largest adolescent segment (n=1223; boys: 54%) with only 5% of this segment having ever consumed a full alcoholic drink. All of the adolescents in this segment were not currently engaging in drinking activities. They possessed the lowest-risk attitudes towards binge drinking, reported the lowest intentions to binge drink and they were surrounded by a social environment that does not engage in or support binge drinking. *Abstainers* recorded the highest knowledge score of all three segments at baseline (M: 5.3; SD 1.5). Furthermore, this segment was characterized by spending more time doing homework and having less parental drinking (father) compared to the other segments. Differences for age were not observed between the segments.

Segment 2 (*Bingers*) was the smallest segment (n=363; boys: 69%) with the highest ratio of male adolescents compared to the other two segments. They featured the lowest knowledge score (M: 4.0; SD: 1.6), together with the most positive attitudes towards alcohol drinking and they reported the highest intentions to binge drink. About two-thirds of this segment drank alcohol regularly and every third adolescent binged monthly. Every tenth adolescent in this sample reported binge drinking at least once a week. The high mean score of subjective norms (M: 4.4; SD: 2.0) suggested that *Bingers* are surrounded by a social environment where drinking is the norm.

Segment 3 (*Moderate Drinkers*) had an even gender split and was the second biggest segment (n=528; boys: 49%). Everyone in this group had tried a full alcohol drink in their lifetime and 70% of adolescents reported drinking alcohol on a monthly or less level. This segment's knowledge score (M: 4.7; SD: 1.5) fell between the Bingers and Abstainer's score at baseline, with the majority of adolescents (91%) reporting drinking lower volumes of alcohol (less than 5 standard drinks) than the *Bingers*. Sixty-six percent of adolescents in the *Moderate Drinkers* segment did not engage in binge drinking sessions (> more than 6 standard drinks).

3.3 Prospective change scores of segments

A (2) x 2 x 3 repeated measures ANCOVA investigated the changes post GOKA delivery. Post hoc analyses further examined whether significant differences between the three segments existed. The Shapiro-Wilk, F_{max} and Levene's test statistics were used to test the assumptions of normality and homogeneity of variance.

There was a significant three-way interaction between time, school condition and the three segments for four outcome measures: a) Knowledge, b) Attitudes, c) Behavioral intention and d) Subjective norms (see Table 4).

INSERT TABLE 4 HERE

3.3.1 Knowledge

A significant three-way interaction between time, school condition and segments for Knowledge was obtained $F(2,1094) = 5.833$, p = .003).*Abstainers* possessed the highest knowledge score at baseline (M = 5.4; SD = 1.5), followed by *Moderate Drinkers* (M = 4.7; SD = 1.4), while the *Bingers* had the lowest knowledge score (M = 3.9; SD = 1.4) prior to participation in GOKA. In the intervention condition, the *Moderate Drinkers* and *Abstainers*

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as well as the *Bingers* all possessed significantly higher knowledge scores at follow-up indicating the GOKA program positively impacted all three segments' knowledge. To better understand the three way interaction, we investigated simple effects and discovered that the *Abstainers* knowledge (M = 1.4) increased significantly less (p < .05) than that of the *Moderate Drinkers* (M = 1.9) and *Bingers*(M = 1.7). However, the *Bingers* knowledge remained lowest post program (M = 5.7; SD = 1.8) compared to the *Abstainers* (M = 6.7; SD1.6) and the *Moderate Drinkers* (M = 6.6; 1.6).

There were also significant two-way interactions. The knowledge score of adolescents that participated in the GOKA program increased in the intervention compared to the control condition $F(1, 1094) = 245.425$, p = .000. The *Abstainers* and *Bingers* segments in the control condition (who did not receive the program) possessed a slightly reduced alcohol knowledge score at follow-up while it remained unchanged for the *Moderate Drinkers*. We also found a significant effect for the interaction of time and the three segments $F(2, 1094) = 3.248$, p = .039.

3.3.2 Attitudes towards binge drinking

A significant three-way interaction between time, school condition and segments for Attitudes was observed $F(2,1062) = 6.077$, p = .002). For further detail on the three way interaction, simple effects were investigated which showed that the *Abstainers* attitudes changed significantly less in the desired direction (p < .05) than attitudes of the *Bingers* and *Moderate Drinkers*. Examination of the means showed that *Abstainers* had the most negative attitudes towards binge drinking pre (M = -2.0; SD = 1.0) and following the GOKA program (M = -2.2; SD = 1.1). *Bingers* reported the greatest positive attitude shift, despite their attitudes remaining more positive towards binge drinking (M = -0.4; SD = 1.7) than *Moderate Drinkers* (M = -1.6; SD = 1.3) and *Abstainers* (M = -.2.2; SD = 1.1) segments.

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There were also significant two-way interactions. Attitudes towards binge drinking changed for the better (meaning adolescents thought more negatively of binge drinking) in the intervention compared to the control condition $F(1, 1062) = 35.425$, p = .000. In the control condition attitudes towards binge drinking changed in the undesired direction, (meaning they thought more positively of binge drinking). A significant effect for the interaction of time and segment was not found $F(2, 1062) = 1.560$, p = .211.

3.3.3 Behavioral intentions towards binge drinking

A three way interaction between time, school condition and segment was also observed $F(2, 1078) = 8.142$, p = .000. Simple effects indicated that strongest significant positive change effects (reduced intentions to binge drink) were observed for the *Bingers* segment (p < .05). No significant segment effects were observed between the *Abstainers* and *Moderate Drinkers* and while the *Abstainers* behavioral intentions towards binge drinking changed in the undesired direction at follow-up, the intention of the Moderate Drinkers remained unchanged. However, The *Abstainers* (M = 1.1; SD = 0.3) and the *Moderate Drinkers* (M = 1.3; SD = 0.5) had the lowest intentions to binge drink prior to GOKA while *Bingers* had the highest intentions (M = 3.3; SD = 1.9).

There were also significant two-way interactions. Intentions towards binge drinking changed for the better in the intervention compared to the control condition $F(1, 1078) = 35.540$, p = .000. The segments in the control condition showed significantly higher binge drinking intentions at follow-up. A significant effect for the interaction of time and segment was found $F(2, 1078) = .894$, p = .409.

INSERT FIGURE 1 HERE

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3.3.4 Subjective norms

A significant three-way interaction was found $F(2, 1058) = 4.561$, p = .011. Simple effects indicated that strongest significant positive change effects (reduced social norms) were observed for the *Bingers* segment (p < .05). No significant segment effects were observed between the *Abstainers* and *Moderate Drinkers* and both social norms measures remained unchanged. Results suggest that GOKA changed subjective norms for *Bingers* segment for the better, but no changes were observed for *Abstainers* and *Moderate Drinkers*. However, it is important to note that the *Bingers* segment also reported highest social norms for binge drinking behaviors amongst their social environment at pre (M = 3.8; S = 1.3) and post (M = 3.1; SD = 1.7) program delivery stages while *Moderate Drinkers* (M = 1.6; S = 1.0) and *Abstainers* (M = 1.3; S = 0.9) suggest a social environment where binge drinking is not the norm.

A significant interaction between time and intervention vs. control condition was observed $F(1, 1058) = 25.832$, p = .000. Subjective norms towards binge drinking changed significantly in the negative direction in the control condition while they remained unchanged in the intervention condition. We also found a significant interaction of time and the three segments $F(2, 1058) = 11.743$, p = .000.

3.3.5 Expectancies and self-efficacy

No three-way interaction was obtained $F(2, 1023) = .995$, p = .370. No interaction effects were observed time and school condition $F(1, 1023) = .238$, p = .626. We only observed a two way interaction effect between time and segments $F(2, 1023) = 9.226$, p = .000, yet these results provide very limited insight as it looks at the whole segment including control and intervention cases. At baseline, *Abstainers* featured the lowest expectancies from drinking

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alcohol (M = 65.2; SD = 9.0) followed by much higher expectancies of the *Moderate Drinkers* (M = 73.6; SD = 8.7) and *Bingers* (M = 74.1; SD = 8.8).

3.3.6 Self-efficacy

At baseline, *Abstainers* featured the highest score (higher scores = higher self-efficacy) followed by *Moderate Drinkers* and *Bingers* with the lowest scores. However, no interaction effects were observed for time and intervention vs. control condition $F(1, 1012) = 1.819$, p = .178; time and segment interaction $F(2, 1012) = .194$, p = .823; as well as interaction between time, school condition and segments $F(2, 1012) = .628$, p = .534

4. Discussion

Segments representing *Abstainers, Bingers,* and *Moderate Drinkers* were identified within this adolescent, high school population. The vast majority of *Abstainers* had never consumed a full alcoholic drink. This segment also possessed the lowest-risk attitudes towards binge drinking. In contrast, about two-thirds of *Bingers* drink alcohol regularly and about a third binge monthly. *Bingers* possessed the lowest alcohol-related knowledge score, highest alcohol expectancy score and the most supportive social environment for binge drinking. *Moderate Drinkers* were situated between the *Abstainers* and *Bingers* on most measures. The results have indicated that based on the predictor importance scores, psychographic and behavioral measures were the strongest and most important variables in the segment formation. Demographic factors were less important. These findings may be of interest to prevention science as many studies focus predominantly on socio-demographic characteristics (Hecht, Graham, & Elek, 2006; Sussman, Sun, Rohrbach, & Spruijt-Metz, 2011) while the current study indicates the importance of behavioral and psychographic rather than demographic factors.

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Overall, program effects were found to vary significantly between the identified segments. Positive significant change in knowledge scores, although varying in extent, were observed across all three segments that participated in the GOKA program. Increased knowledge about the harmful effects of alcohol, particularly binge drinking, is an important finding within this age group (14-16 year olds). It is at this age that adolescents begin to experiment with alcohol (AIHW, 2003) following increased exposure to drinking opportunities.

A substantial reduction in intentions to binge drink was observed for the Bingers segment following participation in GOKA indicating that the larger attitude change magnitude observed for this segment had the desired impact on intentions to binge drink consistent with the Theory of Reasoned Action. Behavioral intentions to binge drink slightly increased for the Abstainers and Moderate Drinkers segments. It is important to note that both Abstainers and Moderate Drinkers reported very low intentions to engage in binge drinking and their attitudes towards binge drinking were less favorable when compared to the Bingers segment prior and post participation in GOKA. Taken together, the results indicate that larger shifts in attitudes may be required to change behavioral intentions in different adolescent segment groups. Even prior to participation in GOKA and despite a marginal increase at follow-up, Abstainers and Moderate Drinkers remained strongly opposed to engaging in binge drinking. Results indicate that GOKA has the strongest, most positive impact on the most at risk segment (Bingers). A significant overall increase of binge drinking intentions in the control school condition across all three segments was observed at follow-up indicating that both the maintenance of behavioral intentions and a decrease in behavioral intentions is an important step in the right direction.

The results also suggest that GOKA had the desired effect on affective attitude toward binge drinking across all segments. Despite no differential segment effects, the results are important

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in that adolescents' perceived binge drinking to be less pleasurable and enjoyable after participating in GOKA given binge drinking is often perceived as a pleasurable activity (Fry, 2011). Furthermore, GOKA also had the desired effect on instrumental attitudes toward binge drinking across all segments, indicating that participants thought of binge drinking as more harmful following program participation. These results are significant given attitudes have been shown to influence behavioral intentions and consequent performance of behavior (Armitage & Conner, 2001; Sheppard, Hartwick, & Warsaw, 1988).

No significant change effects were observed for drinking expectancies and self-efficacy measures. This result may be underpinned by multiple factors. Some program effects may take a longer period to become apparent, requiring longer follow-up reporting. The hierarchy of effects model (Ray, 1973), for example, suggest that changes in awareness and knowledge precede other changes culminating in behavior modification. Further, it is not surprising that a one-off program will possess limitations in affecting change across outcome measures (Donovan, 2011), particularly given the unrelenting competition from the alcohol industry (Hastings & Angus, 2011; Hastings & Sheron, 2013; Morgenstern et al., 2014). Further, it is possible that the program did not have the desired effect on reducing drinking expectancies. However, this result has to be taken within the consideration that *Abstainers* and *Moderate Drinkers* had very low intentions to binge drink. Finally, while both measures have been frequently used in the context of social learning theory (Bandura, 1977, 1989), they have only recently been trialled in the context of high school adolescents (Connor et al., 2011).

We use a segmentation process in order to improve our strategic approach to resource allocation and to design more effective program solutions. Catering for individual difference in school settings is too challenging and segmentation may provide an avenue to design even better targeted programs. A practical consideration stems from how to best deliver segmented

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interventions to the three identified segments. As it would be impractical to separate students into different groups, technology may help to overcome the challenge on how three different interventions can be delivered to the segments within a single Year 10 cohort. More specifically, adolescents would be required to take the baseline survey prior to intervention delivery, which would then indicate the adolescent's segment association. Next, adolescents would receive different online components depending on their segment association. This way, no individual is neglected and adolescents are largely unaware they are receiving unique tailored program elements (avoids stigmatization). A restricted access webpage would allow log-in based access that recognizes the adolescents' baseline segment and then provides tailored program resources.

5. Limitations

The results of this study should be interpreted in light of some limitations. The multi-site study used participants from private schools in one state of Australia drawn from a single religious denomination (Catholic). This focus potentially restricts application to other or non-secular schools. The results represent immediate follow-up data and collection and evaluation of longer follow-up behavioral (drinking) data is desirable. Data collection remains a major barrier to a more sophisticated analysis with high attrition rates observed at follow-up. Difficulties in code matching as well as surveys being timed-out (flat computer batteries, user fatigue) were factors that impacted attrition rates. Given the potentially sensitive information collected (adolescents' attitudes, intentions, expectancies and behaviors surrounding alcohol consumption), social desirability bias and recall bias may have impacted the results. To manage this bias, confidentiality and anonymity were stressed. Furthermore, despite efforts to ensure an equal ratio of intervention to control schools, two control schools missed their follow-up survey. Also, changes in the outcome variables are not always strong predictors of behavioral change. Finally, a number of other measures can be used to potentially influence

the segmentation formation. Four segment bases, demographic, psychographic, behavioral and geographic have previously been identified in the marketing literature (Kotler & Armstrong, 2001) and while the authors trialled adding a geographic measure in from of a Socio-Economic Indexes for Areas [SEIFA] to the segment solution, this measure did not prove to be a strong enough predictor in the cluster formation. Further behavioral measures such as smoking behavior were considered, but in the data sample smoking prevalence rates were only 5.2 percent and therefore once again did not provide sufficient predictor importance.

Simple cluster randomization creates a number of problems. Foremost is the possibility that the randomized schools will have different cultures and draw students from different social backgrounds. A stratified longitudinal cluster randomized controlled trial design is recommended for future trials aiming to evaluate adolescent response to a comprehensive social marketing program. Scientific accuracy can be enhanced (Schulz & Grimes, 2002) by stratifying across factors known to be related to alcohol use, for example socio-economic status (measured by the Australian Bureau of Statistics SEIFA index) and gender prior to randomization.

Analysis reported in the current study has considered outcomes at a group (segment) level to understand whether segments respond differently to a comprehensive social marketing program using a repeated measure ANCOVA. The current study aimed to divide a heterogeneous market comprised of a broad array of individuals into groups with similar needs and wants. Such an approach can be highly instructive for practitioners who need to make decisions on what to communicate, where, when and how. Examination of the relationships between key variables in the study represents an avenue for further research. Techniques such as multi-level modelling, which partition variance, permit data to be

examined at different levels simultaneously represent the next stage of this research. Multilevel modelling will enable assessment of both individual and school level differences within one model. Multilevel assessment will permit assessment of the extent to which differences in program response to GOKA are accounted for by school level factors and to understand whether and to what extent school differences can be observed. **6. Conclusions** Drawing from social marketing theory, this study demonstrates that the market segmentation process can inform alcohol education program development. It is the first study to provide evidence that meaningful segments exist within the adolescent population and that these segments respond differently to universal alcohol programs. Consequently, the findings suggest that selecting and subsequently targeting one or more segment(s) through tailored and co-created program design may improve program efficacy and efficiency. Further research is needed to confirm these findings.

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Table 1 - Sample description

	Intervention n (%)	Control n (%)	Total sample n (%)	p
Gender				.003
Male	631 (57.4)	551 (51.0)	1182 (54.2)	
Female	469 (42.6)	529 (49.0)	998 (45.8)	
Age	14.7	14.6	14.5	.011
Grades				.866
Mostly A's	227 (20.7)	217 (20.1)	444 (20.4)	
Mostly B's	563 (51.3)	543 (50.3)	1106 (50.8)	
Mostly C's	283 (25.8)	296 (27.4)	579 (26.6)	
Mostly D's	15 (1.4)	16 (1.5)	31 (1.4)	
Mostly E's	10 (0.9)	7 (0.6)	17 (0.8)	
Frequency of alcohol drinking				.643
Never	749 (65.5)	773 (66.6)	1523 (66.1)	
Monthly or less	269 (23.5)	264 (22.8)	533 (23.1)	
2-4 times a month	92 (8.0)	87 (7.5)	179 (7.8)	
2-3 times a week	17 (1.5)	24 (2.1)	41 (1.8)	
4 or more times a week	17 (1.5)	12 (1.0)	29 (1.3)	
Frequency of binge drinking				.086
Never	910 (79.5)	969 (83.5)	1880 (81.6)	
Less than monthly	141 (12.3)	119 (10.3)	260 (11.3)	
Monthly	70 (6.1)	51 (4.4)	121 (5.2)	
Weekly	10 (0.9)	13 (1.1)	23 (1.0)	
Daily or almost daily	13 (1.1)	8 (0.7)	21 (0.9)	

Table 2 – Three segment solution – Behavior & demographic variables

Drinking Behavior	Total 100% n=2114	Abstainers 58% n=1223	Bingers 17% n=363	Moderate Drinkers 25% n=528	*P*
Proportion who have had a full alcoholic drink?	40%	5%	73%	100%	.000
How often do you have a drink containing alcohol?					.000
Never	67%	100%	31%	15%	
Monthly or less	23%	0%	31%	70%	
2-4 times in a month	7%	0%	25%	13%	
2 or more times a week	3%	0%	13%	2%	
How many standard drinks do you consume on a typical day when you are drinking?					.000
0	77%	100%	45%	46%	
1-4	16%	0%	24%	45%	
5 or more	7%	0%	31%	9%	
How often do you have six or more standard drinks on one occasion?					.000
Never	82%	100%	45%	66%	
Less than monthly	11%	0%	24%	28%	
Monthly	5%	0%	21%	6%	
Weekly or more	2%	0%	10%	0%	
Time spent doing homework					.000
0 hours	8%	4%	21%	7%	
1-4 hours	54%	51%	58%	60%	
5 or more hours	38%	45%	21%	33%	
Age (mean)	14.6	14.6	14.6	14.6	.489
13	2%	2%	4%	1%	
14	38%	40%	36%	37%	
15	57%	55%	56%	59%	
16	3%	3%	4%	3%	
Gender					
Boys	55%	54%	69%	49%	.000
Does your father drink alcohol					.000
Never	9%	10%	8%	4%	
Occasionally	35%	36%	33%	34%	
In social settings	30%	33%	20%	29%	
Every day	22%	17%	33%	30%	
Don't know	4%	4%	6%	3%	

Table 3 – Three segment solution – Psychographic variables

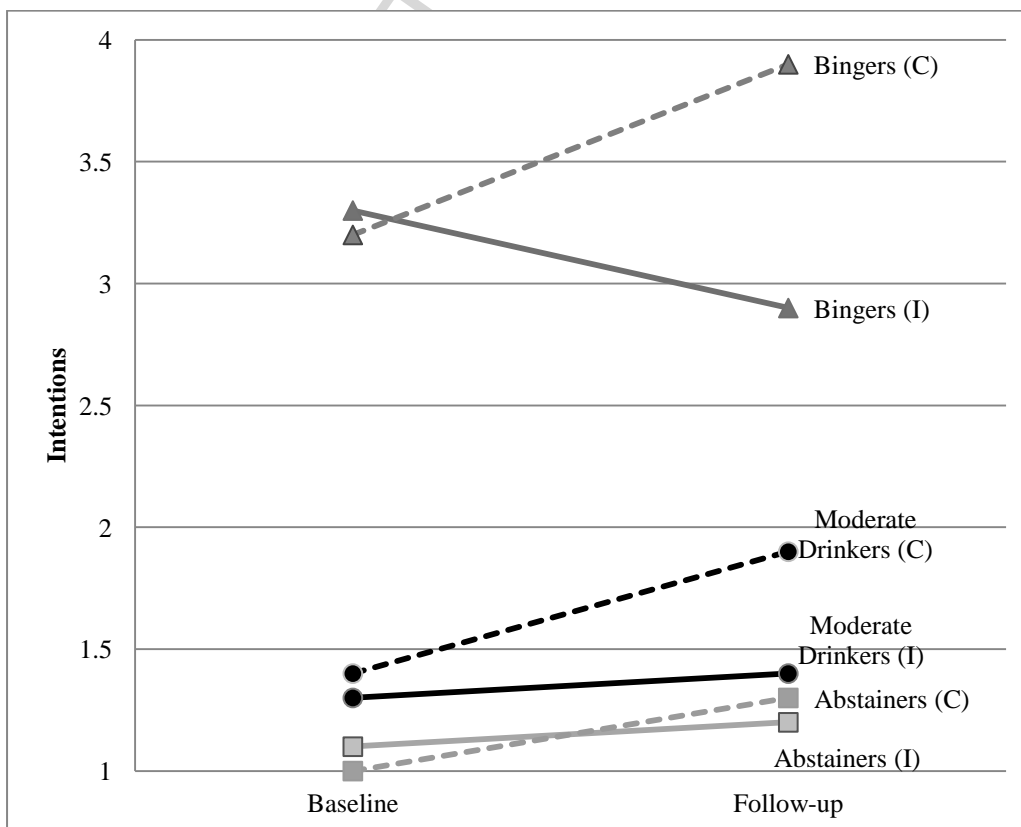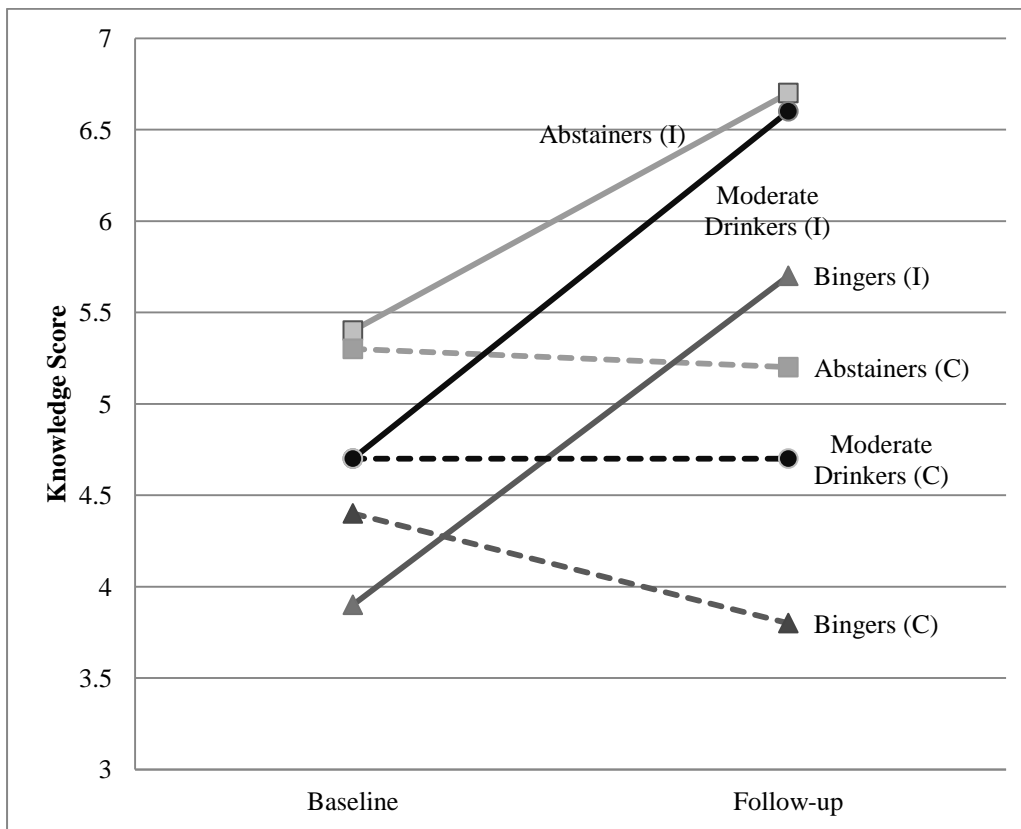|	Total 100% n=2114	Abstainers 58% n=1223	Bingers 17% n=363	Moderate Drinkers 25% n=528	P
Attitudes towards binge drinking[1]					
Bad / Good	-1.8 (1.6)	-2.4 (1.0)	0.3 (2.1)	-1.8 (1.3)	.000
Foolish / Wise	-2.0 (1.4)	-2.5 (0.9)	-0.4 (2.1)	-2.1 (1.0)	.000
Harmful / Beneficial	-2.0 (1.5)	-2.5 (0.9)	-0.3 (2.1)	-2.1 (1.1)	.000
Unpleasant / Pleasant	-1.0 (2.0)	-1.8 (1.6)	1.1 (1.8)	-0.8 (1.7)	.000
Unenjoyable / Enjoyable	-0.3 (2.1)	-1.1 (1.9)	1.7 (1.6)	0.2 (1.9)	.000
Intentions towards binge drinking[2]					
Do you intend to binge drink over the next 2 weeks	1.6 (1.4)	1.1 (0.3)	3.8 (2.1)	1.4 (0.7)	.000
I will binge drink over the next 2 weeks	1.5 (1.3)	1.1 (0.3)	3.5 (2.1)	1.3 (0.6)	.000
How likely is it that you will binge drink over the next 2 weeks	1.6 (1.4)	1.1 (0.3)	3.7 (2.1)	1.4 (0.7)	.000
Social Norms (injunctive)					
Most people who are important me think [I should not/I should] engage in a binge drinking session in the next 2 weeks	1.6 (1.4)	1.1 (0.6)	3.5 (2.1)	1.4 (0.8)	.000
Most people who are important to me want me to engage in a binge drinking session in the next 2 weeks	1.6 (1.4)	1.1 (0.6)	3.6 (2.2)	1.3 (0.8)	.000
Most people whose opinions I value think that it is [inappropriate/ appropriate] for me to binge drink in the next 2 weeks	1.7 (1.4)	1.2 (0.6)	3.7 (2.1)	1.4 (0.7)	.000
Most people whom I respect and admire would [oppose/support] me binge drinking in the next 2 weeks	1.7 (1.4)	1.2 (0.7)	3.8 (2.0)	1.4 (0.8)	.000
Social Norms (deductive)[2]					
Most people who are important me [do not/do] binge drink	2.1 (1.7)	1.5 (1.0)	4.4 (2.0)	2.1 (1.4)	.000
How many of the people whom you respect and admire binge drink?	2.0 (1.6)	1.4 (1.0)	4.1 (2.0)	2.1 (1.4)	.000
Alcohol knowledge score[3]	4.9 (1.6)	5.3 (1.5)	4.0 (1.6)	4.7 (1.5)	.000

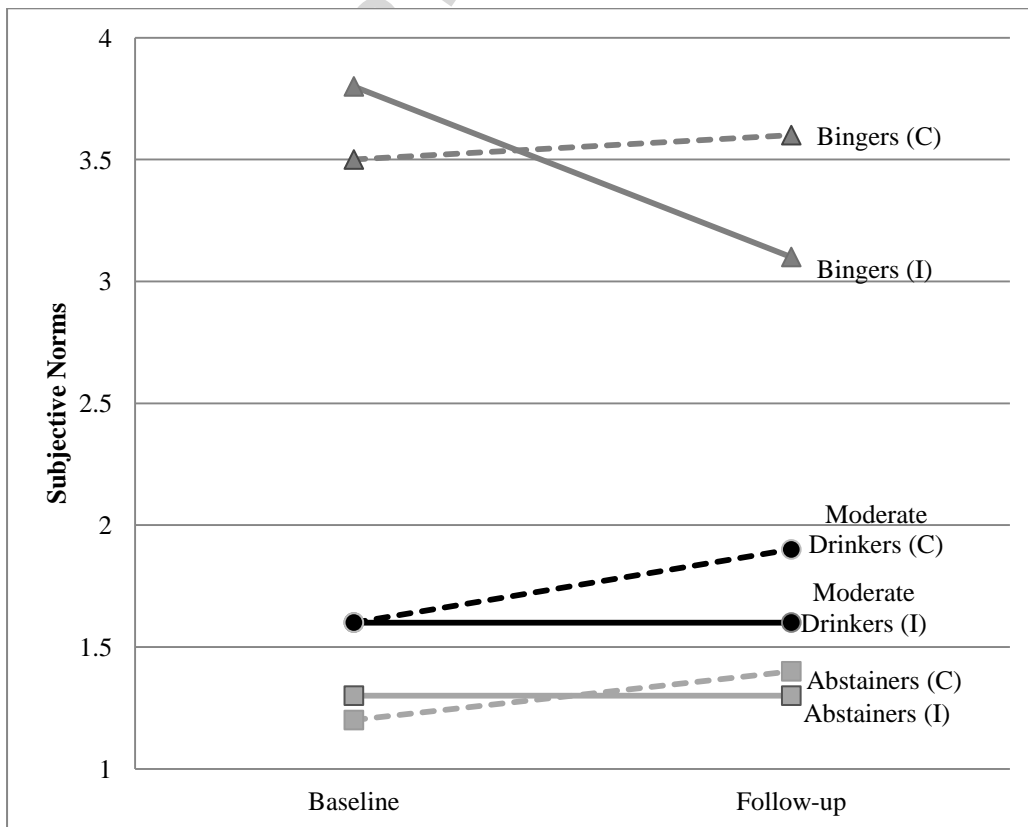[1] Bipolar items (-3 negative to positive 3); [2] Likert-scale 0 to 7; [3] Knowledge score (0 to 10); [ab]
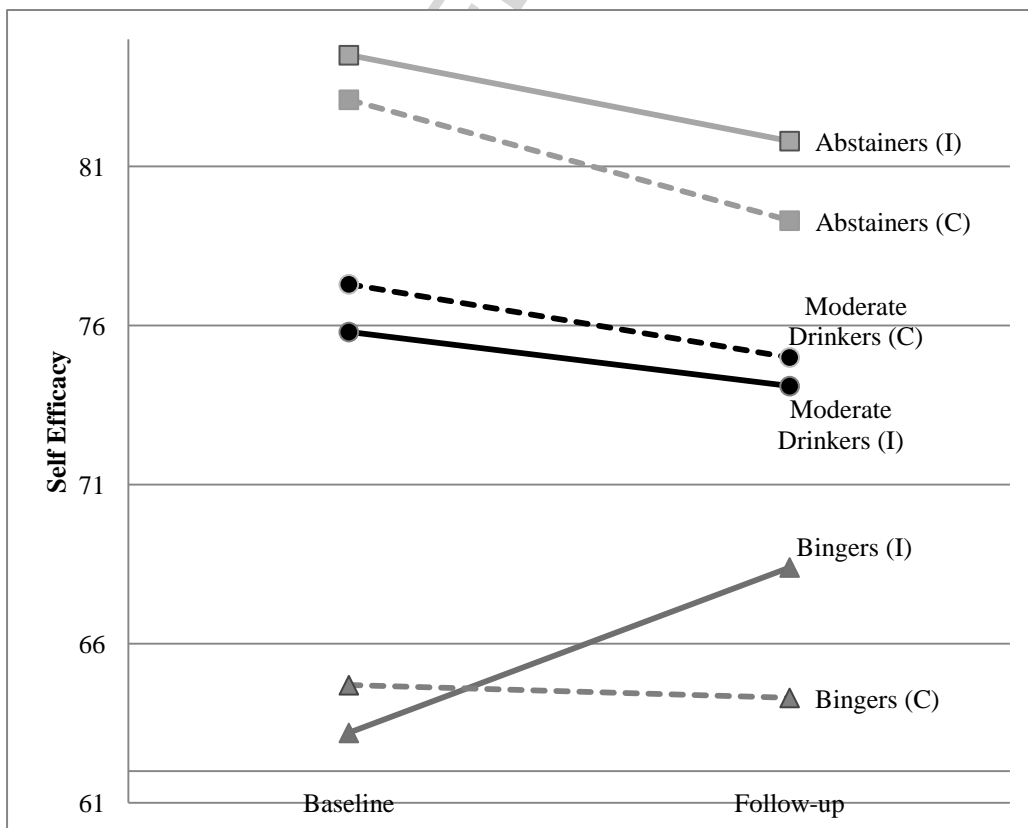
29

Table 4 - Prospective Data Results of the Three Segments

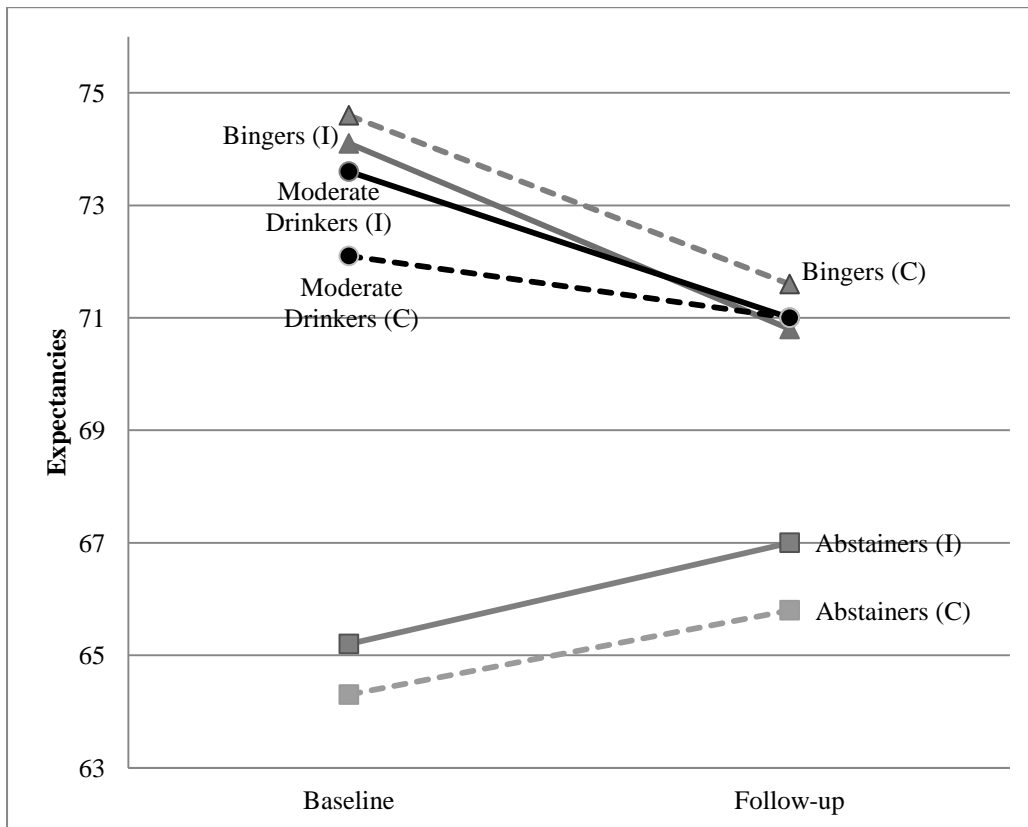|	Abstainers				Bingers				Moderate Drinkers				Time * School (I/C)	Time* Segments	Time* School* Segment
	Intervention (n=382)		Control (n=233)		Intervention (n=103)		Control (n=41)		Intervention (n=179)		Control (n=81)				
	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)	Pre M (SD)	Post M (SD)		F (df)	
Knowledge Score	5.4 (1.5)	6.7 (1.6)	5.3 (1.4)	5.2 (1.5)	3.9 (1.4)	5.7 (1.8)	4.4 (1.4)	3.8 (1.6)	4.7 (1.4)	6.6 (1.6)	4.7 (1.6)	4.6 (1.5)	245.425*** (1,1094)	3.248* (2,1094)	5.833** (2,1094)
Attitudes	-2.0 (1.0)	-2.2 (1.1)	-2.2 (1.0)	-2.1 (1.4)	0.3 (1.4)	-0.4 (1.7)	-0.4 (1.5)	0.4 (1.4)	-1.3 (0.9)	-1.6 (1.3)	-1.3 (1.0)	-1.3 (1.4)	35.425*** (1,1062)	1.560 (2,1062)	6.077** (2,1062)
Behavioral Intentions	1.1 (0.3)	1.2 (0.8)	1.0 (0.2)	1.3 (1.0)	3.3 (1.9)	2.9 (2.0)	3.2 (1.6)	3.9 (1.9)	1.3 (0.5)	1.4 (1.1)	1.4 (0.6)	1.9 (1.2)	35.540*** (1,1078)	0.894 (2,1078)	8.142*** (2,1078)
Subjective Norms	1.3 (0.5)	1.3 (0.9)	1.2 (0.4)	1.4 (1.0)	3.8 (1.3)	3.1 (1.7)	3.5 (1.3)	3.6 (1.7)	1.6 (0.6)	1.6 (1.0)	1.6 (0.6)	1.9 (1.2)	25.832*** (1,1058)	11.743*** (2,1058)	4.561* (2,1058)
Drinking Expectancies	65.2 (9.0)	67.0 (7.2)	64.3 (9.4)	65.8 (7.8)	74.1 (8.8)	70.8 (7.0)	74.6 (6.8)	71.6 (6.7)	73.6 (8.7)	71.0 (8.0)	72.1 (8.4)	71.0 (7.7)	.238 (1,1023)	9.226*** (2,1023)	.995 (2,1023)
Self-Efficacy	84.5 (16.9)	81.8 (22.2)	83.0 (19.2)	79.3 (24.4)	63.2 (22.1)	68.4 (20.5)	64.7 (19.5)	64.3 (21.7)	75.8 (18.0)	74.1 (23.2)	77.3 (17.1)	75.0 (21.7)	1.819 (1,1012)	.194 (2,1012)	.628 (2,1012)

*p < .05; **p < .01; ***p < .001

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Figure 1 – Prospective changes across all measures
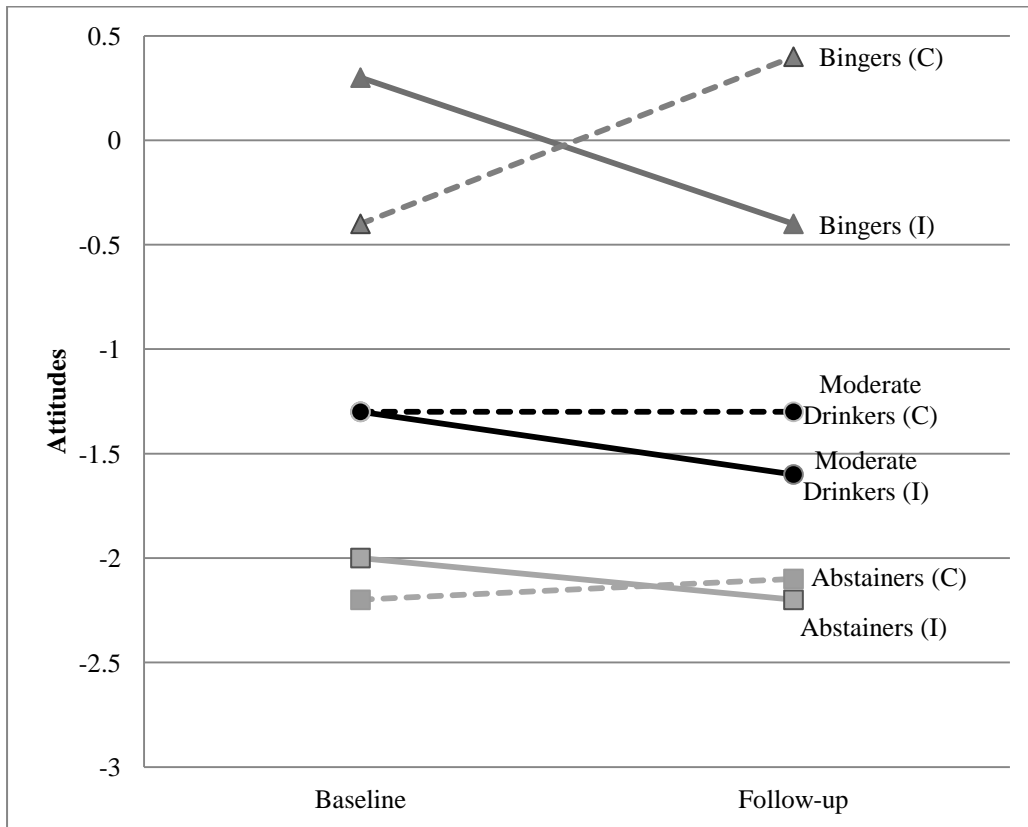
Contributors

Timo Dietrich and Sharyn Rundle-Thiele designed the segmentation study. Timo Dietrich, Sharyn Rundle-Thiele, Lisa Schuster, Jason Connor and Matthew Gullo conducted the statistical analysis. Timo Dietrich led the drafting of the manuscript and all authors contributed to and/or have approved the final manuscript.

Conflict of interest

All Authors have declared no conflict of interest.

Highlights

- This study is part of a cluster RCT trial named Game On: Know Alcohol (GOKA).
- TwoStep cluster analysis was conducted to segment 2114 high school adolescents.
- Three segments were identified: (1) Abstainers (2) Bingers and (3) Moderate Drinkers.
- Program effects varied significantly across segments.
- Findings support application of segmentation in alcohol education programs.