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AT-RISK ALCOHOL USE IN YOUNG ADULTS -

EFFECTIVENESS AND MECHANISMS OF BRIEF MOTIVATIONAL INTERVENTION AS A PRIMARY AND SECONDARY PREVENTION MEASURE

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Contents

Summary

The alcohol use of adolescents and young adults is one of the world's most important and costliest health problems. Particularly, binge drinking (i.e. drinking an important amount of alcohol in one occasion) among young people increase the risk of detrimental consequences such as blackouts, injuries, at-risk sexual behaviors, involvement in violent acts, academic failure, and suicide attempts. In countries with mandatory conscription mechanisms, such as Switzerland, the army provides a unique opportunity to reach a large portion of this high risk population. We used this sample to evaluate the prevalence of binge drinking among young men, to test the efficacy of brief motivational interventions (BMI) as a primary and secondary preventive measure, and to examine the mechanisms underlying BMI in this age group.

We showed that binge drinking among young French-speaking Swiss men is less of an exception than it is the norm. Of those using alcohol, 75.5% had a binge drinking episode at least monthly, and 69.3% of all consumption reported in a one-week diary was due to binge drinking days.

We used two different inclusion modes to evaluate the success of alcohol BMI. In the first randomized controlled trial, inclusion relied on a random selection of conscripts. BMI efficacy was evaluated in a sample of conscripts who visited the army recruitment centre that is potentially generalizable to the entire population. In the second randomized controlled trial, we included subjects voluntarily participating in BMI. This venue might be more realistic for young adults; it is more akin to the MI spirit, in which it is crucial for individuals to control their own decisions.

Regarding BMI efficacy as a secondary prevention measure (i.e. to help decrease alcohol use among at-risk drinkers, defined here as those having a binge drinking episode at least monthly), it was effective among randomly selected at-risk drinkers, whereas it was not effective among at-risk drinkers who voluntarily showed up. Individuals who showed interest in BMI had more severe patterns of alcohol use, which may have made change more difficult and calls for treatment that is more intensive. BMI demonstrated a 20% reduction in weekly alcohol use among randomly selected participants, indicating potential interest in BMI implementation within similar community settings.

Regarding BMI efficacy as a primary prevention measure (i.e. to help maintain low levels of use among low-risk drinkers), it had significant protective effects among low-risk drinkers voluntarily showing up whereas it was not effective among low-risk drinkers randomly selected. This suggests that BMI might help young individuals keep their drinking at low levels, especially when they are interested in discussing their alcohol use. Therefore, BMI has potentially promising uses in primary prevention efforts. The content of these interventions for low-risk drinkers who do not seek BMI on their own should be further evaluated.

BMI mechanisms were addressed since little is known about exactly which elements of it work, or which of the counselor and subject communication behaviors are most effective in triggering behavior changes. The causal chain hypothesis developed in the motivational interviewing (MI) theory was followed, and it was found that counselor behaviors consistent with the MI approach (MI-consistent, MICO) were significantly more likely to be followed by participant language in favor of change (change talk, CT), while MI-inconsistent (MIIN) behaviors were significantly less likely to do so. Several CT dimensions measured during BMI (particularly Ability, Desire, and Need to change) were predictive of change in alcohol use. Our findings lend strong support for the use of MICO behaviors and the avoidance of MIIN behaviors in eliciting CT, and point out that particular attention should be paid to the utterances in several sub-dimensions of CT and to the strength of expression, since these are good indicators of potential actual behavior change in future.

Abbreviation glossary

AUDIT	Alcohol Use Disorders Identification Test
BMI	Brief Motivational Intervention
CCT	Counter Change Talk
CT	Change Talk
F/N	Follow/Neutral (utterances not linked with alcohol exploration)
MI	Motivational Interviewing
MICO	MI-Consistent behaviors
MIIN	MI-Inconsistent behaviors
MISC	Motivational Interviewing Skill Code

Introduction

Alcohol drinking in young adults

The transition from adolescence to adulthood involves major individual and contextual changes in many life domains, and is often accompanied by increases in heavy drinking, smoking, other substance use and associated consequences. This phase could set the stage for future substance use problems (Gotham, Sher, & Wood, 2003; Schulenberg & Maggs, 2002). Longitudinal cohort studies show that early initiation of alcohol use among young people increases the risk of progression to more frequent and problematic use in later life (Toumbourou & Catalano, 2005; Agrawal et al., 2009). Binge drinking, also called risky single occasion drinking or heavy episodic drinking, is an amount of alcohol consumption that leads to intoxication and contributes to a major disease burden experienced around the world (Rehm et al., 2004). More so than regular heavy drinking, infrequent binge drinking is highly prevalent among adolescents and young (predominantly male) adults in most societies (Gmel, Rehm, & Kuntsche, 2003; Kuntsche, Rehm, & Gmel, 2004). It is estimated that heavy drinking is responsible for 31.5 % of all deaths and 26.6 % of disability-adjusted life years lost in individuals aged 15-29 years (Toumbourou et al., 2007). The detrimental effects of binge drinking among young people have also been attributed in the literature to consequences such as blackouts, injuries, at-risk sexual behaviors, involvement in violent acts, academic failure, and suicide attempts (Hingson, Heeren, Winter, & Wechsler, 2005; Perkins, 2002; Windle, 2003). Binge drinking, particularly through its acute effects on intentional and unintentional injury, constitutes the greatest risk factor for mortality and morbidity among adolescents and young adults in established market economies (Rehm, Taylor, & Room, 2006).

Although the highest prevalence of binge drinking across cultures and societies has commonly been found among adolescents and young adults (Gmel et al., 2003; Kuntsche et al., 2004), it is not clear whether this is a problem of the minority or majority of them. This issue can be addressed by using conventional alcohol use questions, such as frequency and quantity, frequency of binge drinking, and by measuring the proportion of alcohol used in this population that is consumed on binge drinking occasions.

Access to the target population is of concern when assessing issues such as the prevalence of binge drinking among young adults and the proportion of alcohol used during episodes. Survey data exist but are limited, since adolescent and young adults are often under-represented in the samples. The college campus milieu often has been a major research setting in which to examine substance use and its evolution during young adulthood (e.g. O'Malley & Johnston, 2002; Vik, Carrello, Tate, & Field, 2000), but has the disadvantage of being limited to a highly selective group of individuals who are better educated than their counterparts in the general population. Another promising area for assessing alcohol use and related issues among young men lies within the army, especially in those countries with mandatory conscription mechanisms. In Switzerland, virtually all non-institutionalized men are called for conscription at age 19-20; socio-economic status bias is thus minimal in this group. Women are eligible to enlist on a voluntary basis (but seldom do), and are not representative of their counterparts. This is clearly a sample limitation, even if alcohol use, binge drinking, and related problems are more prevalent and problematic among men.

The first part of the present dissertation (Article 1) permitted an inside look at alcohol use behaviors of young men in a sample based on a census virtually free of sample selection bias. Our specific aims were to explore:

a) **whether at-risk alcohol use (here defined as binge drinking) among young adults affects only a few individuals or a large proportion of the corresponding population; and**
b) **whether most of the alcohol used in this population is consumed on those occasions that place drinkers at high risk for detrimental consequences.**

Brief motivational interventions

The impact of alcohol use (particularly binge drinking) on morbidity and mortality calls for preventive actions. Reviews on strategies targeting alcohol consumption show that brief motivational intervention (BMI) is one of the few effective preventive strategies (along with structural measures such as driving while intoxicated regulations and control of prices and taxes) and the most cost-effective strategy among individual-centered approaches (Babor et al., 2010). BMI is an adaptation of Motivational

Interviewing (MI) (Miller & Rollnick, 2002) used in single, short sessions of 20 to 60 minutes each (Rollnick, Heather, & Bell, 1992). BMI focusing on alcohol has been associated with decreases of approximately 20% in alcohol consumption, and is often as effective as treatments that are more intensive (Kaner et al., 2009).

The effectiveness of BMI as a preventive action has been demonstrated mainly in primary care settings, although its applicability seems to be broader and appropriate for early interventions within populations not actively seeking treatment (Tevyaw & Monti, 2004). BMI, as adapted from MI, aims to introduce behavior change perspectives and discussions in a non-judgmental, empathic and collaborative manner in order to elicit motivation to change alcohol use. Adolescents and young adults might be particularly receptive to motivational methods and could be approached within a wide range of settings (Barnett, Monti, & Wood, 2001; Tevyaw & Monti, 2004). BMI has great potential among individuals in this age group (Tevyaw & Monti, 2004) because the interviewing style avoids argumentation and hostile confrontation. BMI respects the personality styles of participants and does not lecture them or present ultimatums. This intervention style may foster an atmosphere of self-directed change that teachers, parents or other authority figures have trouble adopting easily, and suggests that techniques designed to increase "intrinsic" motivation might translate effectively into meaningful behavior change.

The following BMI model was used in the present dissertation. The hypothesis was that an open discussion, with additional reinforcement by a trained counselor centering around alcohol use and its repercussions on different life areas, would heighten awareness of the importance to change this behavior now (or in the future) and hopefully lead to successful behavior change. This BMI was not a structured intervention with a set succession of phases, but rather a “menu” of strategies in the form of topics or areas of conversation that the counselor might address or not, according to individual drinking status and readiness to change (McCambridge & Strang, 2003). The following strategies were included: a) Opening strategy: lifestyle and alcohol use, alcohol use within a typical day/session; b) The good things and the less good things about drinking alcohol (decisional balance); c) Evoking a hypothetical change; d) Exploring importance, ability, and confidence to change; and e) Eliciting commitment to change and identification of an eventual change.

Counselors were unaware of the drinking status of participants at the beginning of the intervention. The rationale of the intervention for low-risk users was to maintain low-risk drinking in a period of life characterized by the initiation or reinforcement of heavy drinking patterns. If it appeared during the Opening strategy that the young man was a low-risk user, the BMI strategies would be adapted to focus on the following: b) The good things and the less good things related to past experiences with alcohol use; c) Evoking the future; d) Exploring importance, ability, and confidence to maintain low-risk drinking; and e) Eliciting commitment to maintain low-risk drinking. It should be noted that there were not two different interventions (one for at-risk users and another for non-at-risk users), but a single model that was tailored by the counselor to accommodate each individual's continuum of drinking status. For example, a young man drinking a large quantity of alcohol once a year might discuss reasons and motivations to decrease alcohol use on this risky occasion, while another presenting similar patterns of use might discuss how and why to make these occasions less infrequent. On the other hand, a young man that already had cut down on his drinking but was still exceeding the recommended limits might discuss how to maintain this current, less risky behavior, while someone else with similar alcohol use might talk about quitting completely.

BMI efficacy with adolescents and young adults

BMI research on young people has shown mixed, though rather promising results (Larimer, Cronce, Lee, & Kilmer, 2004; Tevyaw & Monti, 2004; Grenard, Ames, Pentz, & Sussman, 2006; Toumbourou et al., 2007). Each study included in a review of BMI applied to adolescents and young adults evaluating the efficacy of single face-to-face sessions described some benefit from BMI in terms of reduced alcohol use or related consequences (Grenard et al., 2006). Three of the studies demonstrated reductions in alcohol use, but claimed no additional advantages or gains in the BMI groups versus the controls (Handmaker, Miller, & Manicke, 1999; Murphy et al., 2004; Baer et al., 1992). These mixed findings suggest conducting additional studies designed to put special emphasis on stricter controls; most of the reviewed studies included some minimal form of intervention in addition to assessing control groups.

BMI typically is conducted on subjects screened for heavy drinking. Very few researchers tested BMI as a primary prevention strategy among low-risk drinkers. One study of personalized mail feedback for college drinking prevention did include low-risk drinkers, as well as abstainers, and found positive effects (Larimer et al., 2007), indicating that brief interventions designed to help young individuals keep their drinking at low-risk levels can be successful. In the present study, participation in BMI was offered to all conscripts instead of selecting at-risk drinkers from screening questionnaires. This was done in order to blind the army from potentially identifying at-risk drinkers involved in BMI and to shield them from being penalized in the future, as well as to allow us to determine whether BMI reinforcement of low-risk drinking helps maintain this level of consumption.

Most of the research up to now has been conducted on selected groups of individuals, particularly in the college milieu (where individuals are better educated than their counterparts in the general population) and clinical settings (where serious presenting conditions are more common). Outside the college milieu, a randomized trial including young workers found no impact on drinking levels in subjects who had a 15-minute BMI in addition to computerized feedback (Doumas & Hannah, 2008). In contrast, our study aimed to test the efficacy of BMI in a wider, more heterogeneous population (compared to the college milieu or the workplace). The army mandatory conscription provides a sample with potentially minimal social status bias and issues of differential access to intervention. This environment thus offers a unique opportunity to propose preventive actions to a large portion of the population, at an age where many individuals begin or continue to engage in alcohol-related risky behaviors.

The primary aim of the second part of the present dissertation was to evaluate the success of BMI (compared to no intervention) in reducing alcohol use among at-risk drinkers, and to maintain low-risk drinking among low-risk drinkers in a large representative sample of 20-year-old French-speaking Swiss men. This was done in Article 2 and Article 3, using different inclusion modes, thus assessing different sub-populations.

Random vs. voluntary inclusion

Two different inclusion modes were used to evaluate the success of alcohol BMI. In the first randomized controlled trial, inclusion relied on an *a priori* randomization of conscripts into intervention and control groups. Randomized conscripts were asked to provide informed consent, then filled out an assessment questionnaire and received BMI (intervention group), or filled out the questionnaire only (control group). Using this method permitted the evaluation of BMI efficacy in a sample visiting the army recruitment centre that is potentially generalizable to the larger population. Since this sample is highly representative of all young French-speaking Swiss men, random selection of participants for the present study offers a unique opportunity to evaluate BMI efficacy in a potentially unbiased population.

The primary aim of our first efficacy study (Article 2) was to evaluate the success of BMI (compared to no intervention) in decreasing alcohol use among at-risk drinkers and to maintain low-risk drinking among low-risk drinkers in a random selection of 20-year-old French-speaking Swiss men within a representative community sample of conscripts.

It also seems logical to assess BMI in the context of voluntary subject pools. To date, this has seldom been done. Voluntary BMI might be more realistic for adolescents and young adults. It is not likely to expect that in the “real world” forced or involuntary counseling will produce favorable responses to BMI or to other such attempts to promote change behaviors. Because of its non-pressured nature, inviting younger individuals to a voluntary BMI might help them enter into reflection and change processes, rather than into traditional treatment and prevention approaches that carry negative stereotypes within this age group. Voluntary participation is also more akin to the MI spirit, in which it is crucial for individuals to control their own decisions.

We found some studies investigating BMI using voluntary subjects (Bailey, Baker, Webster, & Lewin, 2004; Brown, Anderson, Schulte, Sintov, & Frissell, 2005; Berghuis, Swift, Roffman, Stephens, & Copeland, 2006; Walker et al., 2006; D'Amico & Edelen, 2007). They were conducted on adolescents or young adults and addressed alcohol and/or cannabis use. Self-selection was a consistently successful inclusion strategy, although these projects varied in methodological quality and showed mixed results.

A large randomized controlled trial of BMI among voluntary young individuals could offer an important piece of evidence for the effectiveness of this intervention within this age group by conducting it in a more naturalistic setting. The aim of this study (Article 3) was thus to evaluate the success of BMI (compared to no intervention) in decreasing alcohol use among at-risk drinkers and to maintain low-risk drinking among low-risk drinkers in young men voluntarily showing up for a BMI.

BMI mechanisms

Although evidence for the efficacy of BMI is accumulating in some specific domains, little is known about exactly which elements of it work and which of the counselor and subject communication behaviors are most effective in triggering behavior changes. The first contribution to the literature on BMI mechanisms has been the identification of six common factors used in effective brief intervention trials, summarized under the acronym FRAMES (Bien, Miller, & Tonigan, 1993). They are as follows: Feedback regarding personal risk or impairment; emphasis on personal Responsibility for change; clear Advice to change; a Menu of alternative change options; therapeutic Empathy as a counseling style, and enhancement of client Self-efficacy or optimism. The authors demonstrated that these six factors were present in effective brief interventions, but did not evaluate their role in stimulating subject change.

Since BMI is an adaptation of MI performed in a shorter form, it is of interest to turn to the recent development of MI process research. Eliciting and shaping client language in favor of change (change talk, CT) during sessions has been implicated as a causal mechanism in MI (Miller & Rollnick, 2002), and a hypothetical causal chain between therapist MI behaviors, subsequent client CT and actual behavior change has been postulated (Moyers & Martin, 2006; Miller & Rose, 2009). Some empirical explorations in this domain tend to support the assumption of a causal mechanism, both in MI and in BMI. In an early study, Miller and colleagues (Miller, Benefield, & Tonigan, 1993) did not observe a beneficial causal path of MI-consistent behaviors for change, but did see a detrimental path of MI-inconsistent behaviors, i.e. a directive-confrontational counseling style created high resistance in

clients, which in turn predicted fewer reductions in drinking one year later. Moyers and colleagues observed this complete chain in two studies (Moyers et al., 2007; Moyers, Martin, Houck, Christopher, & Tonigan, 2009). The first (Moyers et al., 2007) showed that CT was more likely after counselor behaviors consistent with MI (MICO, e.g. asking open questions, reflective listening, affirming client efforts and strengths, etc.), and counter-CT (CCT) was more likely following behaviors inconsistent with MI (MIIN, e.g. confronting, giving advice without client permission, warning, etc.), and demonstrated that CT is a powerful predictor of reduced substance abuse. The second (Moyers et al., 2009) showed that MICO behaviors predicted client CT, and that CT had a direct link to drinking outcome and mediated therapist behavior and client drinking outcome. In the first literature review on mechanisms of change during MI to date, Apodaca and Longabaugh (2009) concluded that, despite the small number of published studies and the presence of mixed effect sizes, there was evidence that clients receiving MI were more likely to engage in CT that is predictive of better outcomes.

To our knowledge however, only one study addressed MI or BMI mechanisms in adolescents or young adults. Baer and colleagues (2008) did address CT during BMI with homeless adolescents and actual change in substance use (i.e. the second part of the causal chain). None of this research looked at the link between counselor MI skills and subsequent reactions in adolescents or young adults (i.e. the first part of the causal chain).

The third aim of this project was thus to address BMI mechanisms during interactions with young adults in a non-clinical setting by conducting psycholinguistic analyses. This constitutes a unique opportunity to broaden knowledge about communication behaviors during BMI and to describe specific interactions between counselors and young adults. Following the hypothesis of a causal chain developed in the MI theory (Moyers & Martin, 2006; Miller & Rose, 2009), our goals were to answer the following questions:

a) **How do young adults and counselors articulate communication behaviors and particularly, do counselor MICO behaviors predict CT and do MIIN predict CCT?**
b) **Are young adult communication behaviors (particularly CT during BMI) predictive of change at 6-months follow-up?**

Interviewee and counselor communication behaviors articulation

In addition to the studies exploring the entire chain described above (Miller et al., 1993; Moyers et al., 2007; Moyers et al., 2009), some studies (in both MI and BMI) investigated each part of the causal chain separately and results were consistent with the hypothesis. Three studies verified the first part of the chain and showed that CT was more likely after MICO behaviors (Catley et al., 2006; Moyers & Martin, 2006; Gaume, Gmel, Faouzi, & Daeppen, 2008).

While there is some evidence that counselors might influence interviewee speech during sessions, less is known about counselor reactions to interviewee behaviors. Francis and colleagues (2005) showed that higher patient resistance probably leads to an increase in confrontation and other negative behaviors among health professionals attempting to promote behavior change. In a previous study (Gaume et al., 2008), we demonstrated that MICO behaviors were more likely after change exploration by the patient, whereas neither MICO nor MIIN but other counselor behaviors were more likely only after patient utterances not linked with the alcohol topic during BMI alcohol interventions. To our knowledge, no other study has addressed how interviewee speech (particularly CT and CCT) might influence counselor behaviors in a feedback loop. This is an important point. For example, if client CCT leads to counselor MIIN behaviors, which in turn reinforce client CCT, this would advocate for more intensive training of counselors so that they might consistently employ MICO, and avoid MIIN techniques.

The primary aim of this study (Article 4) was thus to address BMI processes by analyzing the articulation of young adult and counselor communication interactions during BMI in a large representative non-clinical setting.

CT as a predictor of actual change

Eliciting and shaping client CT during sessions is a central feature of MI (Miller & Rollnick, 2002). Based on self-perception theory (Bem, 1972), MI hypothesizes that when patients hear their own speech toward change during the therapeutic interaction they will find indicators of their attitudes and

intentions regarding change. Hearing an intention to change in their own speech reinforces patient motivation and commitment to change, and helps to modify subsequent behavior. Several studies empirically investigated this link between CT and actual change and they consistently showed that CT predicts better outcomes (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003; Strang & McCambridge, 2004; Gaume, Gmel, & Daeppen, 2008; Baer et al., 2008; Hodgins, Ching, & McEwen, 2009; Bertholet, Faouzi, Gmel, Gaume, & Daeppen, 2010). Among those studies, only one assessed the link between CT and outcomes in adolescents or young adults. Baer and colleagues (2008) observed CT during BMI with homeless adolescents and found that some dimensions of CT did predict actual change in substance use in the expected direction.

In those studies investigating the links from CT to outcome, several ways of characterizing CT were used. Some summarized CT in 2 global constructs (CT and CCT) while others investigated several CT sub-dimensions (e.g. Reasons to change/not to change, Ability/inability to change, Desire to change/ not to change, Need to change/lack of need for change (or a need not to change), Commitment to change/not to change, etc.). Several ways of measuring overall CT or CT sub-dimensions were also proposed. Some studies used CT frequency, while others used CT strength ratings.

In this second mechanism study (Article 5), we explored several ways to categorize and measure CT and its sub-dimensions, and tested them as predictors of change in alcohol use at 6-months follow-up among 20-year-old men who received a single BMI session in a large representative non-clinical setting.

Main results

Article 1 – Binge drinking among French-speaking 20-year-old Swiss men

Among 3536 young men assessed, 7.2% abstained from alcohol, and 75.5% of those drinking had a binge episode (defined as 6 or more drinks on a single occasion in one day) at least monthly. Almost two thirds (63.3%) of the sample had at least one day with 10 or more drinks in the past year, and 10 to 14 drinks was the mode in the sample for maximum number of drinks in the past year. The typical frequency of drinking was 1-3 days per week on weekends. The average quantity on weekends was about 7 drinks. When summing all drinks retrospectively reported in a one-week diary, 69.3% of the total weekly consumption was in the form of binge drinking days, and 96.2% of all the alcohol consumed was by drinkers who had binge drinking days at least once a month. This first article thus shows that binge drinking among young French-speaking Swiss men is less of an exception than it is the norm.

Article 2 – BMI efficacy among young men randomly selected

In the random sample of young men included during army conscription, 199 individuals were randomized to receive a single face-to-face BMI session and 219 others were to receive no intervention. We conducted all analyses separately for bingers and non-bingers, since the hypotheses tested were different between the two groups (primary versus secondary prevention, i.e. decreasing alcohol use among bingers versus maintaining low-risk drinking among non-bingers). Binger and non-binger groups were defined a posteriori using baseline data; bingers were defined as subjects with typical binge drinking once a month or more. These categories were used to classify subjects, since binge drinking typically characterizes at-risk drinking in young men.

BMI significantly reduced alcohol use in binge drinkers. Among them, there was 20% less drinking in the BMI group versus the control group. The BMI group showed an average weekly reduction of 1.5 drinks compared to an average increase of 0.8 drinks weekly in the control group. Among non-bingers, BMI did not contribute to the maintenance of low-risk drinking.

Article 3 – BMI efficacy among young men voluntarily showing up for BMI

From a pool of 6,085 young men invited to receive BMI, 727 (11.9%) voluntarily showed up. 572 were included in the study (after exclusions related to organizational aspects of the conscription process) and randomized into an intervention group (BMI immediately) or into a control group (BMI after the 6-month follow-up assessment, per a waiting list design). As in Article 2, we conducted all analyses separately for bingers and non-bingers since the hypotheses tested were different between the two groups (primary versus secondary prevention intervention).

Among non-bingers, there was a significant protective effect of BMI on weekly alcohol use, i.e. BMI helped low-risk drinkers maintain their patterns of alcohol use. Among binge drinkers, who had particularly severe alcohol use patterns, there were no significant effects of BMI.

Article 4 – Articulation of counselor and young men communication behaviors during BMI

We analyzed the articulation of counselor and young adult communication behaviors during BMI in order to evaluate and understand this process in a large representative non-clinical setting. Consistent with the first part of the hypothetical causal chain developed in MI theory, MICO behaviors were more likely than expected by chance to be followed by change talk exploration. Additional analyses showed that among MICO behaviors, reflective listening may be a particularly powerful technique to elicit CT. Conversely, MIIN behaviors were significantly more likely to lead to CCT or F/N. These transitions are important, since interviewee utterances were more likely to be followed with a similar utterance (i.e. CT to CT, CCT to CCT, and F/N to F/N) and are probably self-reinforcing. The speech of young men may be influential in eliciting (desired) counselor responses, especially since counselor MICO behaviors were more likely to follow client CT. Similarly, the (less desired) MIIN behaviors by counselors were more likely after client CCT.

Article 5 – Link between young men change talk during BMI and alcohol use outcome

The last part of this dissertation aimed at testing which of several CT dimensions measured during BMI were predictive of change in alcohol use. Contrary to the second part of the hypothesized causal chain, overall CT and CCT were not significantly related to change in drinking. However, the frequency of Ability/Desire/Need to change and of Ability/Desire/Need not to change significantly and independently predicted change in the expected direction. Averaged strength of Ability/Desire/Need was also a robust predictor of change (p=0.001). CT dimensions length was not significantly linked to outcome.

Discussion and perspectives

Binge drinking – a normative behavior in French-speaking Swiss young men

Our first study (Article 1) showed that binge drinking among young French-speaking Swiss men is less of an exception than it is the norm. Among the 92.8% of young men who drank alcohol, about three out of four had binge drinking episodes at least monthly. Almost two thirds of the sample had at least 1 day with 10 or more drinks in the past year. And when all drinks retrospectively reported in a one-week diary were summed, more than two thirds of the total weekly consumption was attributed to binge drinking days.

The extent of this behavior might seem a little surprising, because although it is known that in many societies binge drinking is highest among adolescents and young adults (Kuntsche et al., 2004), Switzerland as a whole is viewed as a "wet" country, with mild drinking patterns consisting of frequent and regular, but moderate consumption with meals (Rehm et al., 2004). This "wet country" stereotype does not hold up among young French-speaking Swiss men. Although these findings cannot be extrapolated from this sample to the rest of Switzerland, it is likely that they would at least apply to those of similar age. Previous findings from data collected in several Swiss army recruitment centers showed similar patterns (Daeppen et al., 2005). Additional studies using young adult samples within the German- and Italian-speaking regions would help answer the question of how well the French-speaking sample does generalize to the rest of the population.

There is substantial agreement in survey literature (Hingson et al., 2005; Perkins, 2002; Windle, 2003) that binge drinking is related to a multitude of acute consequences such as intentional and unintentional injuries. Data from the 2000 Global Burden of Disease study demonstrated that injuries attributed to drinking were predominantly associated with binge drinking, and accounted for a major share of total alcohol-related mortality and morbidity (Rehm et al., 2004). The unfavorable binge drinking consumption pattern that is common among adolescents and young adults has become the primary factor in the disease burden of this age group (Rehm et al., 2006). A comparison of drinking patterns by time of day and day of the week from a Swiss diary survey with police statistics of traffic crashes matched to the corresponding time of day and day of the week gave strong support for a

causal link between binge drinking and accidents. These accidents occurred disproportionately on Friday and Saturday nights in Switzerland (Gmel, Heeb, Rezny, Rehm, & Mohler-Kuo, 2005), and the present study establishes that binge drinking occasions among young men also occur mainly on Friday and Saturday. Another recent report by the Council for Accident Prevention showed that fatal crashes on weekends were higher among individuals aged 18-24 years, and were related to alcohol two times more often than were fatalities on other days of the week (Siegrist, Allenbach, Cavegn, & Niemann, 2005). Unfortunately, none of these consequences were measured with the screening instrument used in the present study.

At-risk drinking patterns that seem to be the norm among young men indicate an important need for preventive actions. Reviews of strategies targeting alcohol consumption show that BMI is one of the few effective preventive strategies (along with structural measures such as driving while intoxicated regulations and control of prices and taxes) and is the most cost-effective strategy among individual-centered approaches (Babor et al., 2010).

BMI efficacy

The aim of the second part of the present dissertation was to evaluate the success of BMI (compared to no intervention) in a large representative sample of 20-year-old French-speaking Swiss men. This was done in Article 2 and Article 3, each using different inclusion modes and thus assessing different sub-populations. Because those studies were conducted in an army recruitment centre, ethical concerns made us chose to blind the army from potentially identifying at-risk drinkers involved in BMI and to shield them from being penalized in the future. Participation in BMI was thus offered to all conscripts instead of selecting at-risk drinkers from screening questionnaires as is done in much of the BMI research. Doing this also allowed us to determine whether BMI reinforcement of low-risk drinking might help maintain this level of consumption. Thus, both of our BMI studies had two primary aims: to decrease alcohol use among at-risk drinkers (secondary prevention); and to maintain low-risk consumption among low-risk drinkers (primary prevention). The low-risk and the high-risk groups were defined a posteriori using baseline data. Binge drinking status as measured at baseline was used to classify subjects, since binge drinking typically characterizes heavy drinking in young men (as reported

in Article 1). As stated in the introduction, it should be noted that there were not two different interventions (one for at-risk users and another for non-at-risk users), but one that was tailored by each counselor to accommodate each individual's continuum of drinking status. We further discuss secondary and primary prevention aims separately.

BMI efficacy as a secondary prevention measure

Regarding BMI efficacy as a secondary prevention measure (i.e. to help reduce alcohol use among at-risk drinkers), we found inconsistent results across our two studies. BMI was effective among at-risk drinkers randomly selected, whereas it was not effective among at-risk drinkers who volunteered to receive BMI.

One explanation for the non-significant findings among binge drinkers voluntarily participating could be that self-selection for the intervention resulted in a sample of especially heavy alcohol users. Comparing the 572 individuals who volunteered for BMI and were included in the present study with the 6341 who were not included (but agreed to fill out a short screening questionnaire), data show that the volunteers indeed had heavier drinking patterns, such as more drinks per week and more binge drinking episodes. Furthermore, about 42% of this group had Alcohol Use Disorders Identification Test (AUDIT) scores above 12 points, indicating severe alcohol use patterns with probable dependence (Gache et al., 2005). Among randomly selected individuals, this proportion was about 29% (data not shown in Article 2; Chi-square=14.5, $p<0.001$). It has been argued (Moyer, Finney, Swearingen, & Vergun, 2002) that BMI is less effective on heavy drinkers, with or without dependence, who may need treatment that is more intensive. In the same way, Saitz and colleagues (2009) found that BMI was not significantly associated with fewer drinks per day among subjects with alcohol dependence, whereas it was among those with non-dependent, but unhealthy alcohol use. In most of the brief intervention studies, individuals with severe alcohol use were excluded, thus there is no clear evidence of the success or failure of this type of intervention on this sub-sample of drinkers (Saitz, 2010).

A positive feature of our study in young men volunteering for BMI is that there appears to be a number of young men who are seeking some type of help for their alcohol problem(s). Therefore, interventions

that are more intensive could be developed in order to produce effects that have more potency. Our design consisted of a short intervention lasting about 20 minutes and did not have any booster component. Expanding the scope of the sessions and following through with some type of “refresher” course, such as a booster, might increase intervention effectiveness and seems worthy of further exploration. Additionally, the BMI setting itself may provide a timely opportunity to provide helpful feedback, including recommendations or referral to further treatment.

On the other hand, BMI significantly reduced alcohol use among binge drinkers when the inclusion consisted of randomly selected participants. BMI demonstrated a 20% reduction in weekly alcohol use among binge drinkers, which is particularly relevant considering that in this age group alcohol use in binge drinking form is practically the norm. A majority of these drinkers increase their consumption between the ages of 18 and 25. In our sample, the control group showed a mean increase of 0.8 drinks per week. Our BMI appeared to reverse this trend, as shown by a reduction of 1.5 drinks per week within the BMI group. This finding should serve as an incentive to conduct comprehensive studies of BMI within this age group, in order to replicate our results and perhaps foster a wider implementation of BMI in similar community settings.

BMI efficacy as a primary prevention measure

Interestingly, we also found inconsistent results across our two studies regarding BMI efficacy as a primary prevention measure (i.e. to help maintain low levels of consumption among low-risk drinkers). BMI had significant protective effects among non-bingers voluntarily showing up, whereas it was ineffective among non-bingers randomly selected.

Among the randomly selected participants, most of the non-bingers remained moderate consumers at follow-up (averaging three drinks per week), but did not seem to gain any “protective” effect because of the intervention. The content of BMI for non-bingers not seeking it should be further evaluated.

Our findings show that BMI might be instrumental in helping young men interested in a BMI, even if they are low-risk alcohol users and merely wish to maintain their current level of consumption. Our

study highlights a type of BMI intervention that potentially has promising uses in primary prevention efforts. To our knowledge, this aspect of face-to-face interviewing and intervention has not been well documented. One recent study did evaluate the efficacy of a mailed feedback intervention for college student drinking prevention (Larimer et al., 2007). It showed that this format had some preventive influence on overall drinking rates as well as on abstainers in the feedback condition, who were twice as likely to remain abstinent at follow-up than were the controls. This suggests (but needs further empirical validation) that motivational interventions designed to help young individuals keep their drinking at low-risk levels can be successful, particularly when those young individuals are interested, and willing to discuss their alcohol use.

Strengths and limitations

An important strength of our research lies in its capability to offer feasible interventions to a large number of individuals. Since virtually all males at age 19 have to undergo the conscription procedures in Switzerland, this sample represents the general population of young men in this country, in contrast to most prior studies conducted on select samples such as found in the college milieu or clinical setting. However, our sample includes only young males from the French-speaking sector of Switzerland, and limits the extent to which the results might generalize to women and young adults who are slightly younger or older. The research environment that exists at the army conscription centre also presents some challenges and disadvantages. Because of the busyness and high activity level present within the centre, it may not be the best place to discover and recruit young men who are highly motivated to actively seek alcohol or drug interventions. Access to confidential spaces and time slots for our research often was difficult to obtain, and we were sometimes forced to exclude participants that had already agreed to participate.

BMI mechanisms

The third aim of this project was to address BMI mechanisms during interactions with young adults in a non-clinical setting. Indeed, little is known about which elements of it work or which of the counselor and subject communication behaviors are most effective in triggering behavior changes. We followed the

hypothesis of a causal chain between therapist MI behaviors, subsequent client speech toward change (CT) and actual behavior change, as proposed and developed in MI theory (Moyers & Martin, 2006; Miller & Rose, 2009). Both parts of the chain were analyzed in Article 4 and Article 5. It was found that MICO behaviors were more likely than expected by chance to be followed by CT, and MIIN behaviors were significantly more likely to lead to CCT or F/N, and that several CT dimensions measured during BMI were predictive of change in alcohol use. We further discuss findings for each part of the chain and their potential clinical implications.

Articulation of counselor and young men communication behaviors during BMI

The findings in Article 4 are concordant with several previous studies (Catley et al., 2006; Moyers & Martin, 2006; Gaume et al., 2008; Moyers et al., 2009) and add to the strong emerging evidence that recommends the use of MI behaviors when trying to promote interviewee speech toward change. The finding that reflections are strongly related to CT also is in agreement with previous research (Moyers et al., 2009; Catley et al., 2006). The sequential nature of the present data and that of Moyers and colleagues (2009), suggests that reflective listening might be a powerful skill that is quite useful in eliciting CT. These transitions might be particularly important since interviewee utterances were more likely to be followed with a similar utterance (i.e. CT to CT, CCT to CCT, and F/N to F/N) and are probably self-reinforcing. Because some CT sub-dimensions were found to be predictive of actual behavior change (see Article 5), these results highlight the usefulness of MI skills in enhancing this change.

Looking at interviewee to counselor transitions, MICO behaviors more often followed both CT and CCT change exploration, but did not follow F/N. MIIN behaviors were used more often after CCT, but not after CT. Even though our research design may not permit conclusions regarding causation, these transitions highlight the apparent influence that speech behaviors of young men have on counselor reaction. Viewing CCT as a *non-desired* behavior, the present findings suggest that this attitude might *provoke* counselors into using MIIN behaviors, as previously observed by others (Francis et al., 2005; Gaume et al., 2008). This phenomenon may create a negative feedback loop of MIIN behaviors, perpetuating even more CCT. An important implication of the present study is that counselors should

receive MI training that equips them with skills that can help them avoid using MIIN behaviors when confronted with client *non-desired* behaviors.

CT during BMI as a predictor of actual change

Our results fail to support the MI hypothesis that overall CT during sessions predicts actual change following the intervention, but they do agree with previous findings showing that several sub-dimensions of CT are predictive of this change (Amrhein et al., 2003; Gaume et al., 2008; Baer et al., 2008; Hodgins et al., 2009). When observing CT sub-dimensions, important and robust effects were found for a dimension regrouping Ability, Desire, and Need to change (or not to change). Of interest is the fact that two other BMI studies (Gaume et al., 2008; Baer et al., 2008) also found that some CT sub-dimensions predicted change. In both those papers, as well as in Article 5, Ability talk was predictive of change at follow-up. Concordant with findings by Baer and colleagues (2008), who also evaluated CT among young adults, our findings show that Desire not to change (or liking the current drinking behaviors) is related to outcome. There is emerging evidence that this type of language, when expressed during BMI, might give important signals for future change in alcohol use. Clinicians noticing this speech (in a positive or negative direction) might therefore have either an indication that their client is moving in a good or in a poor direction. Eliciting Ability, Desire, and Need to change and avoiding Ability, Desire, and Need not to change might thus be a therapeutic goal worth pursuing. Experimental designs in future research are needed to confirm these hypotheses.

This portion of the project also revealed interesting insights regarding Commitment language, which is hypothesized as the major predictor of change in the MI literature (Miller & Rollnick, 2002; Miller & Rose, 2009). In the present study, neither the frequency nor the strength of Commitment to change (or not to change) was significantly linked to outcome. Using combined code and strength, we found that Commitment + 1 and Commitment + 3 were related to outcome in the univariate models, but had opposite signs. Having more Commitment + 1 predicted poorer outcome, whereas having more Commitment + 3 predicted better outcome. Commitment + 3 did not reach significance ($p=0.09$) and was excluded from the multivariate stepwise model; still, this indicates that differential levels of

strength might express different meanings. Weak commitment could indicate aloofness or lack of conviction, whereas strong commitment is what would be expected, according to the MI literature.

Finally and importantly, the present findings yield some insight regarding how to categorize and measure CT. Sub-dimensions of CT were used in this study and were of major importance, since several of them were predictive of change, whereas the overall CT measures were not. We also demonstrated that it was not so much the duration or length of CT expression, but rather its frequency and strength of expression that is consequential. A clinical implication of this result is that counselors should be attentive to all utterances within several of the sub-dimensions of CT (e.g. Ability, Desire, and Need). In particular, they should take note of the strength with which they are expressed and use this information as an indication of potential, actual behavior change in future. Present findings should be confirmed with more research in this area.

Strengths and limitations

An important strength of this research is again that the data were gathered from a large representative sample of young men, at a critical age for receiving alcohol counseling and within a modality that encourages positive motivation to alter their alcohol use habits and patterns. A fairly large number of sessions (149) were available for coding and a comprehensive coding system (the Motivational Interviewing Skill Code (MISC) 2.1 implemented in analysis software) was used, resulting in a large dataset conducive to in-depth analyses. We were able to replicate previous studies verifying the causal chain from MICO behaviors to CT and from CT to actual change by using summarized categories, but we could also further focus on and explore sub-dimensions of the behaviors of counselors (Article 4) and young men (Article 5).

There are several limitations in this research. First, it was not possible to code all of the intervention sessions, due to interviewee refusal, technical problems, and equipment unavailability. We were able to demonstrate the lack of differences between coded and non-coded interventions on socio-demographic and alcohol data (countering potential selection bias somewhat), although it could still be present in some underlying, unmeasured context. Second, although this is a very large and

comprehensive sample, it consists entirely of French-speaking Swiss young men. Our results might not generalize to women, or to other young men in this or other cultures. Third, there were very few observed transitions involving MIIN behaviors (Article 4). There were enough to detect significant transition likelihoods, but their under-representation still precludes making definitive conclusions regarding these transitions. Further studies should incorporate sessions led by counselors with no training in MI, or optimally, counselor behaviors could be experimentally manipulated by purposely increasing MIIN behaviors in order to justify stronger conclusions. Fourth, inter-rater reliability was unsatisfactory for several sub-dimensions of CT (Article 5). Although the inter-rater reliability at the utterance level (pooling all sessions together) was substantial, poor reliability for the individual codes restricted some of the analyses and the conclusions that followed.

Future perspectives

The present project has numerous strengths and important findings, as discussed above. It is a good first step toward understanding the prevalence of at-risk alcohol use, the potential efficacy of BMI as a preventive action, and the mechanisms of these interventions, but further research and implementation strategies are needed. Some suggestions are outlined below.

The prevalence of binge drinking was assessed in a sample including only 20-year young males from the French-speaking sector of Switzerland and using a transversal design. To investigate at-risk alcohol use and binge drinking prevalence among young adults, other representative samples should be obtained that would allow better delineation of alcohol use patterns and potential detrimental consequences. Drinking patterns across different age levels should be focused on, in well-designed longitudinal studies that can capture the trajectories of alcohol use and facilitate the creation of more powerful predictors of negative (e.g. alcohol abuse, dependence and related problems) and positive (e.g. “maturing out” of unhealthy alcohol use) outcomes in adulthood. The drinking behaviors and consequences of young women should also be considered.

One preventive approach to reducing at-risk alcohol use and related consequences was tested in the present project. Alternative interventions exist (Babor et al., 2010) and should be further researched.

These include regulation of alcohol prices and availability, training of beverage servers to be more responsible, raising legal drinking ages and lowering the blood alcohol concentration threshold for drunk driving, information campaigns and education programs, and specialized forms of treatment for high-risk groups.

BMI with French-speaking young men selected at army conscription showed the potential for creating positive impacts on public health. Cost-effective studies should be conducted to empirically validate this potential. Not all conscripts could be offered BMI under real-world conditions, thus implementation of this intervention in the army setting may not be feasible. A screening tool might be used to offer BMI to at-risk users only; this would also take into account the present finding that BMI was not effective among low-risk drinkers who did not volunteer for it. Ethical guarantees should be found to blind the army from potentially identifying at-risk drinkers participating in BMI and penalizing them in the future. Other large samples for prevention implementation and research on young adults might be obtained in various community settings, such as public schools, etc.

Voluntary BMI in the present report demonstrated some efficacy as a primary prevention measure. The MI component of the sessions should be expanded and tested to address those with drinking patterns and related consequences that are more severe. The framework of BMI could be used to elicit interest in specific treatments and to provide the motivation for creating them. These are initial hypotheses that would require further development and resources.

BMI mechanisms analysis using the MISC 2.1 coding system resulted in a large comprehensive dataset conducive to in-depth analyses in the present project. However, the coding scheme itself needs further development, because there were a limited number of coded categories and this restricted some of the analyses. For example, most of the interviewee speech utterances were categorized as Follow/Neutral and Other (see Table 1 in Article 5); these codes do not portray central MI hypotheses. Rather, they could be hiding important information by mixing differential underlying content. Additional knowledge might be gained by refining the instrument or using alternative instruments. Psycholinguistic qualitative research seems to be a good approach to discovering more about the core dimensions of the interventions.

Future studies might also go beyond the investigation of the hypothetical MI causal chain. Other mediators of the BMI process that might be present could be tested (e.g. decisional balance, change plan, etc., see e.g. Lee et al., 2010) and incorporated in BMI and MI paradigms. Characteristics of patients (e.g. Barnett et al., 2010; Bertholet, Cheng, Palfai, Samet, & Saitz, 2009) and counselors (e.g. Gaume, Gmel, Faouzi, & Daeppen, 2009) might also influence the therapeutic interaction and outcome. The investigation and empirical testing of these issues and strategies contribute to an expanding health research field, and could have crucial and important implications for clinical practice, counselor training, and better identification of target patients and clients. Increased efficacy and its positive impacts on public health could be the result.

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Articles

Article 1

Gmel G, Gaume J, Faouzi M, Kulling JP, Daeppen JB (2008) Who drinks most of the total alcohol in young men -- risky single occasion drinking as normative behaviour. Alcohol and Alcoholism, 43(6): 692-697.

Article 2

Daeppen JB, Bertholet N, Gaume J, Faouzi M, Gmel G (2011) Efficacy of Brief Motivational Intervention at Army Conscription to Address Alcohol Use and Related Problems: a Randomized Controlled Trial. Drug and Alcohol Dependence, 113(1): 69-75.

Article 3

Gaume J, Gmel G, Faouzi M, Bertholet N, Daeppen JB (in press) Is brief motivational intervention effective to reduce alcohol use and related consequences among young men voluntary to receive it? A randomized controlled trial. Alcoholism: Clinical and Experimental Research.

Article 4

Gaume J, Bertholet N, Faouzi M, Gmel G, Daeppen JB (2010) Counselor motivational interviewing skills and young adult change talk articulation during brief motivational interventions. Journal of Substance Abuse Treatment, 39(3): 272-81.

Article 5

Gaume J, Bertholet N, Faouzi M, Gmel G, Daeppen JB (in preparation for submission) Does change talk during brief motivational interventions with young men predict change in alcohol use?

Article 1

Gmel G, Gaume J, Faouzi M, Kulling JP, Daeppen JB (2008) Who drinks most of the total alcohol in young men -- risky single occasion drinking as normative behaviour. Alcohol and Alcoholism, 43(6): 692-697.

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EPIDEMIOLOGY

Who Drinks Most of the Total Alcohol in Young Men—Risky Single Occasion Drinking as Normative Behaviour

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Abstract — Aims: The objectives of this study were to analyse (a) the distribution of risky single-occasion drinking (RSOD) among 19-year-old men in Switzerland and (b) to show the percentage of all alcohol consumption in the form of RSOD. **Methods:** The study was based on a census of Swiss francophone 19-year-old men consecutively reporting for processing. The study was conducted at Army Recruitment Center. The participants were 4116 recruits consecutively enrolling for mandatory army recruitment procedures between 23 January and 29 August in 2007. The measures were alcohol consumption measured in drinks of ∼10 g of pure alcohol, number of drinking occasions with six or more drinks (RSOD) in the past 12 months and a retrospective 1 week drinking diary. **Results:** 264 recruits were never seen by the research staff, 3536 of the remaining 3852 conscripts completed a questionnaire which showed that 7.2% abstained from alcohol and 75.5% of those drinking had an RSOD day at least monthly. The typical frequency of drinking was 1–3 days per week on weekends. The average quantity on weekends was about seven drinks, 69.3% of the total weekly consumption was in the form of RSOD days, and of all the alcohol consumed, 96.2% was by drinkers who had RSOD days at least once a month. **Conclusion:** Among young men, RSOD constitutes the norm. Prevention consequently must address the total population and not only high-risk drinkers.

INTRODUCTION

Risky single occasion drinking (RSOD), also called binge or heavy episodic drinking, is an amount of alcohol consumption that leads to intoxication and contributes to a major burden of disease all over the world (Rehm *et al*., 2004). Consumption patterns vary greatly within cultures. In 'wet' countries, drinking is typically frequent, regular and in moderate amounts with meals whereas in 'dry' countries the pattern is more explosive, with heavy intake on weekends and much less drinking during the week (Room and Mäkelä, 2000). These differences markedly affect the relative adverse consequences of using alcohol. Greater burdens resulting from acute drinking, such as injuries, are expected in 'dry' countries whereas more chronic consequences**,** such as liver cirrhosis, are expected in 'wet' countries. Switzerland is commonly thought to be a 'wet' country (Rehm *et al*., 2004) and theoretically should be less burdened by RSOD than are 'dry' countries.

Infrequent RSOD drinking, rather than regular heavy drinking, is highly prevalent among adolescents and young adults (predominantly males) in most societies (Gmel *et al*., 2003; Kuntsche *et al*., 2004). The detrimental effects of RSOD among young people have been widely attributed in the literature to consequences such as blackouts, unintended pregnancy, involvement in violent acts, academic failure and suicide attempts (Perkins, 2002; Windle, 2003; Hingson *et al*., 2005). RSOD, particularly through its acute effects on intentional and unintentional injury, constitutes the greatest risk factor for mortality and morbidity among adolescents and young adults in established market economies (Rehm *et al*., 2006).

The impact of RSOD on mortality and morbidity calls for preventive actions. Effective interventions have been described (Babor *et al*., 2003) that often involve structural measures aimed at the total population, such as legal drinking age limits, price increases through taxation or other restrictions on alcohol availability (limits on opening hours, off- and on-premise densities, etc.). These measures are often unpopular, and preferred measures, such as education, media campaigns, or targeting mainly high-risk groups are commonly ineffective (Munro, 2004; Room, 2004). Therefore, it is important to know whether RSOD constitutes a problem of a minority that can be approached through high-risk group strategies or needs preventive strategies on the population level. Although across cultures and societies the highest prevalence of RSOD has commonly been found among adolescents and young adults (Gmel *et al*., 2003; Kuntsche *et al*., 2004), this neither indicates whether it is a problem of a minority among them nor how much of the total alcohol in this age group is actually consumed in risky drinking occasions. Some studies have shown that a small proportion of alcohol consumers account for a high share of total alcohol intake. Greenfield and Rogers (1999) showed that 20% of the population with high rates of consumption account for almost 90% of the total alcohol use in the United States, and in Switzerland, the highest consumption group (constituting 11% of the total population including abstainers) accounted for 50% of the total alcohol consumed (Institut Suisse de Prévention de l'Alcoolisme et autres Toxicomanies (ISPA), 2004). These studies focussed on the general population and usual consumption volume rates. Greenfield and Rogers (1999) additionally showed that young people (particularly men aged 18–29 years) were over-represented among the heaviest drinkers (>6 drinks per day) and accounted for almost half of all adult drinking, although they represented only 27% of the population. Therefore, the study showed that young adults contributed greatly to the total alcohol use in a society. However, we are not aware of any research that determined the proportion of total alcohol consumption that comes from RSOD occasions among young men. In a companion paper, Rogers and Greenfield (1999)

showed that the strongest predictors of hazardous beer consumption were being male and under the age of 30. Hazardous beer consumption accounted for most of the hazardous alcohol consumption, which was defined similarly to RSOD in the present study. The study we present here seems both important and timely because it was based on a census of young men and is virtually free of sample selection bias. It will permit an inside look at the behaviour of young men in a drinking culture other than the USA. The present study aims to explore in a 'wet' society (a) whether at-risk alcohol use (here defined as RSOD) among young adults affects only a few individuals or a large proportion of that population and (b) whether most of the alcohol used within this population is consumed on those occasions that place drinkers at high risk for detrimental consequences. This information is vital, not only for Switzerland's policy makers but also for policy makers in 'dry' societies where RSOD may be even more of a widespread phenomenon among drinkers.

METHODS

Sample

Switzerland has a mandatory 2-day army recruitment process, and virtually all males at age 19 complete the physical, medical and cognitive assessments for service eligibility in the army. About 50% of these men then move on to army service within the next few years. Those with attested severe disablement are excused from following this procedure and according to estimates by the army are <3%. About 21% of the Swiss population is French speaking (Bundesamt für Statistik (BFS), 2007). Women may voluntarily join the army, but in the present study, only eight of them showed up and participated so they were not included in the present calculations.

Sampling took place during 25 consecutive weeks between 23 January and 29 August in 2007, with the exception that the recruitment centre at Lausanne (which is responsible for all men of the francophone *cantons*) was closed for holidays about 6 weeks in all during that time. A total of 4116 men showed up during the roughly 25 weeks; 264 of them were never seen by the research staff, due to early discharge from the army because of mental and physical handicaps that *a priori* precluded any service or even full completion of the assessment process. The remaining 3852 conscripts were approached to fill out a 5-min screener for alcohol, tobacco and illicit drug use. All were informed that participation in the study was voluntary and that any data provided would never be turned over to nor seen by anyone in the army. The present study is part of a larger project providing brief interventions to conscripts; however, only screening data are used herein. Only 289 men refused the screening and another 24 could not finish the questionnaire because they were called out to complete other mandatory army assessments. Three more cases were excluded due to apparent inconsistent or falsified answers (e.g. a non-drinker claiming to have had >100 drinks the week before the interview, or an individual reporting daily intake of >100 drinks). The end sample included analysable data from 3536 young men. The study was approved by the Ethics Committee for Clinical Research at the Lausanne University Medical School.

Questionnaire and measures

The questionnaire contained items that assessed tobacco, drug and alcohol consumption, which was described as usual drinking in the past 12 months as well as drinking in the 7 days prior to the interview (a retrospective daily alcohol diary was used to record this).

Usual consumption

The usual frequency of drinking was assessed with an open-ended question on how many days per week alcohol was consumed. Non-weekly drinkers responded to closed-ended questions and selected categories of '2 to 4 times a month' (coded as 42 days per year), 'once a month or less often' (coded as 9 days per year) and 'never'. We decided to take higher values than the arithmetic mid-points of 6 and 36 due to (a) the well-known skewness of the drinking distribution, which does not favour a normal (or symmetric) distribution around a range of values as a prerequisite for taking arithmetic means, (b) the under-reporting of consumption in surveys compared to sales data and (c) the fact that 0 is not the lower limit among drinkers for the category once a month or less, nor is 48 the highest possible frequency for the once-a-week equivalent of four times a month (which would be 52). We decided to add half the range between the arithmetic mid-point and the highest nominal category [i.e. $6 + (12 - 6)/2 = 9$ and $36 + (48 - 36)/2 = 42$]. The use of mid-points instead would not have substantively altered any of the present findings, since it affects mainly drinkers at very low levels. Usual quantity per drinking day was an open-ended question about number of standard drinks, which typically contain ~10 g of alcohol. Pictures of standard vessels were shown with the following labels identifying container sizes: 100 mL glass of wine; 250 mL glass of beer; 275 mL bottle of alcopops (a premixed drink containing spirits such as Bacardi Breezer); 25 mL glass of spirits and 50 mL tall glass containing spirits and aperitif (e.g. martini). It was implicitly assumed (but not explicitly mentioned in the question) that respondents converted other vessel sizes (e.g. beer cans of 500 mL) to the corresponding number of standard drinks. The same was true for drinks poured into glasses. There is clear evidence (e.g. Kerr *et al*., 2005; Kerr and Greenfield, 2007) that the amount of self-poured beverages, in particular, can be underestimated by the respondents and therefore the real ethanol content may be underestimated, which is also likely for the present study.

The number of drinks per drinking day was multiplied by number of drinking days to obtain the weekly drinking volume. A cut-off of 21 drinks per week (3 per day) was chosen to distinguish low (up to 21 drinks/week or 210 g/week) from risky drinking volume (22+ drinks/week). Standards for brief intervention studies set by the National Institute on Alcohol Abuse and Alcoholism (NIAAA, see US Department of Health and Human Services (USDHHS), 1995) recommend 15 drinks as the cut-off at which interventions should start. Clinical guidelines in Europe (Anderson *et al*., 2005) and other working definitions (World Health Organization (WHO), 2000; Rehm *et al*., 2004) recommend four standard drinks daily (or correspondingly, 280 g a week with 10 g per standard drink) as cut-offs for brief interventions studies among men. We used a more conservative cut-off that is closer to NIAAA recommendations (note that standard drinks in the USA are between 12 and 14 g and therefore 15 drinks

equal between 180 and 210 g a week) because of the relatively young age of men in the present study. RSOD frequency was measured with an open-ended question about usual number of days per month on which 6+ drinks were consumed. Six drinks contain ~60 g of pure alcohol and equal the most common US measure of 5+ drinks of 12 g per drink (Gmel *et al.*, 2003). Our definition of RSOD conformed to the NIAAA and European recommendations (Anderson *et al.*, 2005). Finally, an open-ended item asked about the maximum number of drinks on any day in the last 12 months. The percentage of total alcohol usually consumed was calculated for low-risk drinkers, i.e. those who never had a RSOD day in the past 12 months nor exceeded the usual drinking limit of 13 drinks per week.

Consumption last week

Conscripts were asked retrospectively to itemize in a 1-week diary their daily beverage-specific consumption, using the alcohol definitions listed above. Drinks were summed over beverages for each day and totalled over the 7 days. This allowed a calculation of maximum drinks in 1 day in the last week for each individual, as well as the proportion of the overall sample with days of 6+, 8+, 10+, etc. drinks. It was assumed that a 6+ day is in fact that many drinks on a single occasion, since multiple occasions (i.e. with and without meals) are probably rare in this age group. The total alcohol consumed in the last week was also calculated for those who had at least one RSOD day in that week.

Statistical analysis

It should be noted that the present study did not use a sample in the inferential statistical sense. It is a census of virtually all young men of the same age who live in the French-speaking parts of Switzerland, who enrolled in the recruitment centre during the study period. The response rate of >90%, in our view, indicates that there is very little self-selection bias built in. *P*-values and confidence intervals are not reported because results have no random component. It also should be noted that, due to the total number of >3500 individuals, any appropriate statistical tests that might be presented in the tables would all be significant at an alpha level <0.01.

RESULTS

Table 1. gives an overview of drinking patterns among young men. In the past year, only 7.2% abstained from alcohol. Including those abstainers, less than a fifth (17.2%) were low-risk drinkers, i.e. neither drank over the volume limits of 21 drinks a week nor had RSOD days at least monthly. It can also be seen that heavier, regular consumption without RSOD is virtually non-existent in this sample of young Swiss men, i.e. only 0.1% of the sample had 22+ drinks weekly without any RSO days at least monthly. Three quarters (75.5%) of the sample did have RSOD days at least once a month.

Almost a quarter (23.7%) of the young men in the sample had no alcohol in the week prior to the interview, but of those who did, 39.0% had at least one RSOD day during that time.

Table 2 shows that 63.4% had at least 1 day in the past 12 months with at least 10 drinks, and 23.1% of the sample had such a day during the prior week. Only 10.3% of all drinkers in the past year had <6 drinks or more on each occasion. The modal maximum in the last 12 months was 10–14 drinks but, among drinkers, only 3–5 drinks in the prior week.

Table 1. Volume of drinking (%) by RSOD occasions in the past 12 months and in the last week

Volume		RSOD			
		No RSOD	1 RSOD	2+ RSOD	Total
Usual consumption[a] ($n = 3536$)	No alcohol use	7.2	0.0	0.0	7.2
	<22 drinks/week	17.2	21.8	44.3	83.3
	22+ drinks/week	0.1	0.1	9.4	9.5
	Total	24.5	21.8	53.6	100.0
Last week[b] ($n = 3536$)	No alcohol use	23.7	0.0	0.0	23.7
	<22 drinks/week	37.1	16.5	5.7	59.4
	22+ drinks/week	0.2	2.2	14.5	16.9
	Total	61.0	18.8	20.2	100.0

[a]For usual consumption: no RSOD = less than monthly; 1 RSOD = 1 RSOD per month; 2+ RSOD = 2 RSOD per month or more.
[b]For last week consumption: no RSOD = not in last week; 1 RSOD = once in the last week; 2+ RSOD = at least 2 RSOD in the last week.

Table 2. Percent drinkers by maximum number of drinks in 1 day in the past 12 months and in the last week ($n = 3536$)

	Past 12 months	Last week
0 drinks	7.2	23.7
1–2 drinks	3.3	17.3
3–5 drinks	7.0	20.0
6–9 drinks	19.2	16.1
10–14 drinks	24.9	12.4
15–19 drinks	13.5	4.9
20–29 drinks	16.7	4.4
30+ drinks	8.3	1.4

Table 3 shows that steady drinking on a weekly basis is not common among young francophone Swiss males. As regards the past 12 months measure, only 17.1% drank on average >3 days per week, and only 27.6% had more than 3 drinking days in the last week. The average frequency was ~2 days per week. It should be noted that RSOD drinkers also drank more often than non-RSOD drinkers, supporting the above statement that regular, moderate alcohol use is not practised by most young men in this culture.

Table 4 shows results from the retrospective (last week) drinking diary used to assess consumption on each of the 7 days prior to the interview. Alcohol use was at its greatest on Friday and Saturday, as might be expected in this young sample. On these 2 days, a higher percentage of all were drinking and in much higher amounts than those who drank on other days. For example, only 10.8% of the sample drank on Tuesday, and those drinking consumed an average of 2.7 drinks, corresponding to 0.3 drinks over the entire sample. On Saturday, 64.4% of the total sample drank alcohol, consuming an average of 7.3 drinks, >2.5 times that of the Tuesday drinkers. Nearly half (48.2%) of the Saturday drinkers had an RSOD day, i.e. they exceeded the RSOD threshold of six drinks. Only 2.5% of the total alcohol consumed over the week was on Tuesday, while >70% was on Friday (29.4%) and Saturday (41.2%).

Table 5 displays the quantities of alcohol consumed on heavy drinking (RSOD) days in the last week and by drinkers who

Table 3. Number of drinking days by RSOD in the past 12 months and in the last week for drinkers only (%)

	Usual consumption, past 12 months, drinkers only			Last week, drinkers only		
Drinking days	No RSOD ($n = 612$)	1+ RSOD ($n = 2669$)	Total ($n = 3281$)	No RSOD ($n = 1320$)	1+ RSOD ($n = 1379$)	Total ($n = 2699$)
<1 day/month	35.8	6.4	11.9			
<1 day/week	24.5	9.4	12.3			
1 day/week	22.4	16.6	17.7	33.0	10.7	21.6
2 days/week	10.9	30.8	27.1	35.8	27.8	31.7
3 days/week	2.8	16.6	14.1	16.7	21.4	19.1
4 days/week	1.6	8.1	6.9	6.4	15.4	11.0
5 days/week	0.8	4.8	4.1	3.5	9.6	6.6
6 days/week	0.7	2.6	2.3	2.7	9.2	6.0
Daily	0.5	4.6	3.8	1.9	6.0	4.0

Table 4. Distributions of percent drinkers and average number drinks[a] on each day of the week for the total sample and for drinkers of the corresponding day only

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Percent drinkers (total sample)	20.8	10.8	15.9	21.3	52.2	64.4	29.8
Percent RSO drinkers (total sample)	2.2	1.0	2.3	4.5	21.6	31.0	5.4
Average no. of drinks (total sample)	0.6	0.3	0.5	0.8	3.4	4.7	1.1
Percent of total weekly volume (total sample)	5.0	2.5	4.5	7.4	29.4	41.2	10.0
Percent RSO drinkers (drinkers that day)	10.6	9.4	14.8	21.3	41.5	48.2	18.2
Average no. of drinks (drinkers that day)	2.8	2.7	3.2	4.0	6.5	7.3	3.8

[a]Based on last week consumption.

Table 5. Percent alcohol consumed on 10+, 8+ and 6+ drinks occasions by the total sample and by drinkers with at least 1 RSOD in the last week or at least monthly

		Alcohol consumed as percent of total
Basis: consumption last week derived from diary Total sample alcohol consumption in number of drinks: 40,685	Days with 10+ drinks in the last week	49.2
	Days with 8+ drinks in the last week	58.4
	Days with 6+ drinks (RSOD) in the last week	69.3
	Drinkers with at least 1 RSOD in the last week	82.8
Basis: weekly usual consumption derived from QF Total sample alcohol consumption in number of drinks: 32,148	Drinkers with at least monthly RSOD	96.2

had at least a monthly RSOD. It is important to note the difference between the two proportions; the first measures consumption on heavy drinking days, whereas the second measures usual weekly consumption of those who have at least a monthly RSOD while including those days without any RSOD. It was estimated by means of the retrospective diary that 69.3% of the total alcohol consumed by all young men was consumed on occasions of at least six drinks, with almost half of all intake (49.2%) occurring on 10+ drink occasions.

RSO drinkers consumed 96.2% of the total volume of alcohol, regardless of whether it was on an RSOD day or otherwise, leaving only 3.8% of all alcohol consumption to those who never (or at least less than once a month) had RSOD days.

DISCUSSION

The present study shows that RSOD among young francophone Swiss men is more the norm than an exception, since 75.5% of alcohol consumers consume six or more drinks on a single occasion in 1 day, at least monthly. Almost two-thirds (63.3%) of the sample had at least 1 day with 10 or more drinks in the past year and 10–14 drinks was the mode in the sample regarding maximum number of drinks in the past year. It is important to note that last week consumption only would miss a major proportion of young men drinking very high levels at least once yearly. For example, the mode of the maximum number of drinks in the past week was 'only' 3–5 drinks and 'only' 23% drank as a maximum 10 drinks or more in the past week. This supports the literature recommending that, at least for the assessment of exposure relevant for harms related to acute heavy drinking, longer recall periods such as 12 months are preferable over very short recall periods such as a week. Short reference periods may result in insufficient assessment of exceptional drinking occasions (Dawson, 1998; Dawson and Room, 2000) or overestimation of abstention (Rehm *et al*., 1999).

The extent of this behaviour might seem a little surprising, because although it is known that in many societies RSO drinking is highest among adolescents and young adults (Kuntsche *et al*., 2004), Switzerland as a whole is viewed as a 'wet' country, with mild drinking patterns of frequent and regular, but moderate consumption with meals (Rehm *et al*., 2004). This 'wet country' stereotype does not hold up among young francophone Swiss men. Although these findings cannot be extrapolated from this sample to the rest of Switzerland, it is likely that they would apply to those of similar age. In all *cantons* of Switzerland the legal purchasing age for alcohol is 18 years for spirits and 16 years for beer and wine; therefore, there is no particular advantage regarding the legal drinking age for francophone men. Alcohol consumption by

men in the Italian-speaking region (∼5% of the population) is higher than in the two other linguistic regions (Gmel and Schmid, 1996; Annaheim and Gmel, 2004) and in the German-speaking region (∼72% of the population) alcohol consumption historically is seen as having an extremely 'festive' quality (Cahannes and Müller, 1981) with many heavy drinking occasions. This assumption has also received support from large-scale general population surveys where the amount of alcohol per drinking occasion is usually high in the German-speaking region (Gmel and Schmid, 1996; Annaheim and Gmel, 2004). Surveys using young adult samples within the German- and Italian-speaking regions would help answer the question of how well the Francophone sample generalizes to the rest of the population.

It is fairly well agreed in the survey literature (Perkins, 2002; Windle, 2003; Hingson *et al*., 2005) that RSOD is related to a multitude of acute consequences such as intentional and unintentional injuries. Data from the 2000 Global Burden of Disease study demonstrated that injuries attributed to drinking were predominantly associated with RSOD and accounted for a major share of total alcohol-related mortality and morbidity (Rehm *et al*., 2004). The unfavourable RSOD consumption pattern that is common among adolescents and young adults has become the primary factor in the disease burden of this age group (Rehm *et al*., 2006). A comparison of drinking patterns by time of day and day of the week from a Swiss diary survey to police statistics of traffic crashes matched to the corresponding time of day and day of the week gave strong support for a causal link between RSOD and traffic crashes. These accidents occurred disproportionately on Friday and Saturday nights in Switzerland (Gmel *et al*., 2005), and the present study establishes that RSOD occasions among young men occur mainly on Friday and Saturday. Another recent report by the Council for Accident Prevention showed that fatal traffic crashes on weekends were higher among 18- to 24-year-olds and were alcohol related two times more often than were those on other days of the week (Siegrist *et al*., 2005). Unfortunately, no consequences were measured with the screening instrument used in the present study.

This at-risk drinking pattern that seems to be the norm among young men points out the failures of current preventive efforts. Babor *et al.* (2003) summarized the prevailing prevention status, saying that effective interventions exist, such as price regulations, restrictions of availability either by reduced density of outlets or reduced opening hours for alcohol sales, training of bar staff for responsible beverage serving, raising legal drinking ages and lowering the BAC threshold for drunk driving. However, these interventions that work and are cost effective are usually unpopular because as structural measures they take a general population approach. What is often preferred and promoted, sometimes in collaboration with the alcohol industry (UK Cabinet Office, 2004; Department of Health, 2007), is either the popular interventions, such as information campaigns and education programmes that have not been shown to foster much change, or a focus on high-risk groups, such as treatment for alcohol dependence (see e.g. Babor *et al*., 2003; Room, 2004). Although it may be that heavier drinkers spent less per drink than lighter drinkers, the present study suggests that ∼70% of total alcohol revenues are attributed to RSOD within the age group.

In conclusion and as a response to our research questions, (a) only 7.2% in this age group abstained from alcohol and 75.5% of those drinking had an RSOD day at least monthly, and (b) most of the total alcohol used within the population of young men is consumed on occasions that place drinkers at high risk for detrimental consequences. Therefore, our findings suggest that preventive strategies designed at targeting high-risk groups have to be complemented by structural measures targeting the general population of adolescents and young adults.

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Article 2

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Efficacy of brief motivational intervention in reducing binge drinking in young men: A randomized controlled trial

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ABSTRACT

Background: Brief motivational intervention (BMI) is one of the few effective strategies targeting alcohol consumption, but has not been tested in young men in the community. We evaluated the efficacy of BMI in reducing alcohol use and related problems among binge drinkers and in maintaining low-risk drinking among non-bingers.
Methods: A random sample of a census of men included during army conscription (which is mandatory for 20-year-old males in Switzerland) was randomized to receive a single face-to-face BMI session ($N = 199$) or no intervention ($N = 219$). A six-month follow-up rate was obtained for 88.7% of the subjects.
Results: Among binge drinkers, there was 20% less drinking in the BMI group versus the control group (incidence rate ratio = 0.80, confidence interval 0.66–0.98, $p = 0.03$); the BMI group showed a weekly reduction of 1.5 drinks compared to an increase of 0.8 drinks weekly in the control group. Among subjects who experienced one or more alcohol-related consequences over the last 12 months, there was 19% less drinking in the BMI group compared to the control group (incidence rate ratio = 0.81, confidence interval 0.67–0.97, $p = 0.04$). Among non-bingers, BMI did not contribute to the maintenance of low-risk drinking.
Conclusion: BMI reduced the alcohol use of binge drinkers, particularly among those who experienced certain alcohol-related adverse consequences. No preventive effect of BMI was observed among non-bingers. BMI is a plausible secondary preventive option for young binge drinkers.

1. Introduction

In many countries in the developed world, heavy drinking is a leading cause of morbidity and mortality in young people. In Switzerland, 75.5% of young men binge at least monthly (Gmel et al., 2008), a finding which applies to the three linguistic regions of the country (Daeppen et al., 2005). It is estimated that heavy drinking is responsible for 31.5% of all deaths and 26.6% of disability-adjusted life years lost in people aged 15–29 years (Toumbourou et al., 2007). Moreover, longitudinal cohort studies show that early initiation to alcohol among young people increases the risk of progression to more frequent and problematic use in later life (Agrawal et al., 2009; Toumbourou and Catalano, 2005). However, many adolescents who drink heavily tend to grow out of their heavy drinking behavior patterns as they enter adulthood (Baer et al., 2001). Thus, prevention approaches, including brief motivational intervention (BMI), could open opportunities for encouraging this process early on.

BMI is an adaptation of motivational interviewing (MI) administered as single, short sessions lasting 15–45 min (Baer et al., 2001; Rollnick et al., 1992). BMI was adapted for young people using various substances (McCambridge and Strang, 2003). Reviews of strategies targeting alcohol consumption show that BMI is one of the few effective preventive strategies (along with structural measures such as driving while intoxicated regulations and control of prices and taxes) and is the most cost-effective strategy among individual-centered approaches (Babor et al., 2010). BMI has demonstrated the effectiveness of preventive action mainly in primary care and university settings, although its applicability seems to be broader and appropriate for early interventions across gender and age groups, particularly in populations where individuals are not actively seeking treatment. BMI with adolescents and young adults has shown mixed results. Each study included in a review of BMI applied with adolescents and young adults evaluating the efficacy of single face-to-face sessions described some benefit from BMI in terms of reduced alcohol use or related consequences (Grenard et al., 2006). Three of the studies demonstrated

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reductions in alcohol use, but claimed no additional advantages or gains for BMI (plus personalized feedback) versus control (personalized feedback-only) (Baer et al., 1992; Handmaker et al., 1999; Murphy et al., 2004). These mixed findings suggest conducting additional studies designed to put special emphasis on stricter controls; most of the reviewed studies included some minimal form of intervention in addition to assessing control groups. Moreover, BMI typically is conducted with heavy drinking subjects; very few researchers chose BMI as a primary prevention strategy among low-risk drinkers, although one study did include them and found positive effects in a personalized mailed feedback for college drinking prevention. This study involved low-risk drinkers as well as abstainers (Larimer et al., 2007). Finally, most studies with young people available today were conducted within college campus milieus (e.g. O'Malley and Johnston, 2002; Vik et al., 2000). Outside the college milieu, a randomized trial including young workers found no additional impact on drinking levels in subjects who had a 15-min BMI in addition to computerized feedback, compared to computerized feedback-only in controls (Doumas and Hannah, 2008). In contrast, our study aimed to test the efficacy of BMI in a wider, more heterogeneous population, compared to the college milieu or the workplace, where groups of individuals may have more education than their counterparts do in the general population.

Most BMI studies focus on drinking levels as a main outcome, but there are questions about whether the presence of consequences or the severity of alcohol use affects counseling efficacy. Conflicting data have been published, since the presence of consequences of alcohol use can enhance counseling efficacy (Blow et al., 2009; Walton et al., 2008), or decrease MI efficacy (Moyer et al., 2002; Saitz et al., 2007). Therefore, in secondary analyses, in order to investigate whether the presence of baseline alcohol consequences may impact BMI efficacy, we evaluated the BMI impact on drinking outcomes in individuals reporting one or more alcohol consequences, compared to counterparts without such adverse experiences.

The primary aims of this study were to evaluate the efficacy of BMI in reducing alcohol use among binge drinkers (subjects reporting typical drinking episodes of 60 g pure alcohol at least once a month) 6 months after the intervention, compared to subjects in a control group without intervention, and to maintain low-risk drinking in non-bingers among 20-year-old French-speaking Swiss men within a representative community sample of conscripts.

2. Methods

The study protocol was approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School (Protocol No. 15/07) and registered in the International Standard Randomized Controlled Trial Number Register, number ISRCTN78822107, http://www.controlled-trials.com/ISRCTN78822107.

2.1. Sample

Switzerland has a mandatory two-day army recruitment process for all males at age 20 in which virtually all conscripts complete physical, medical and cognitive assessments to determine suitability for service in the Swiss military. All French-speaking Swiss men report to the Lausanne recruitment centre, and all of them were eligible to participate if they were present during the research period. Investigators did not share any of the obtained information with the army. Participation was optional and subjects received no compensation. Data were collected during the 2-day mandatory recruitment process, which usually precedes active military service by about a year. Conscripts were excluded if they were pre-empted by the army for special assessment needs, or arrived late, or declined to participate. Details regarding the number of subjects excluded and causes of exclusion are reported in Fig. 1. Contrary to most BMI research, non-heavy drinkers were also included; this blinded the army from identifying heavy drinkers participating in BMI, and allowed the evaluation of whether BMI could help low-risk drinkers maintain their level of consumption.

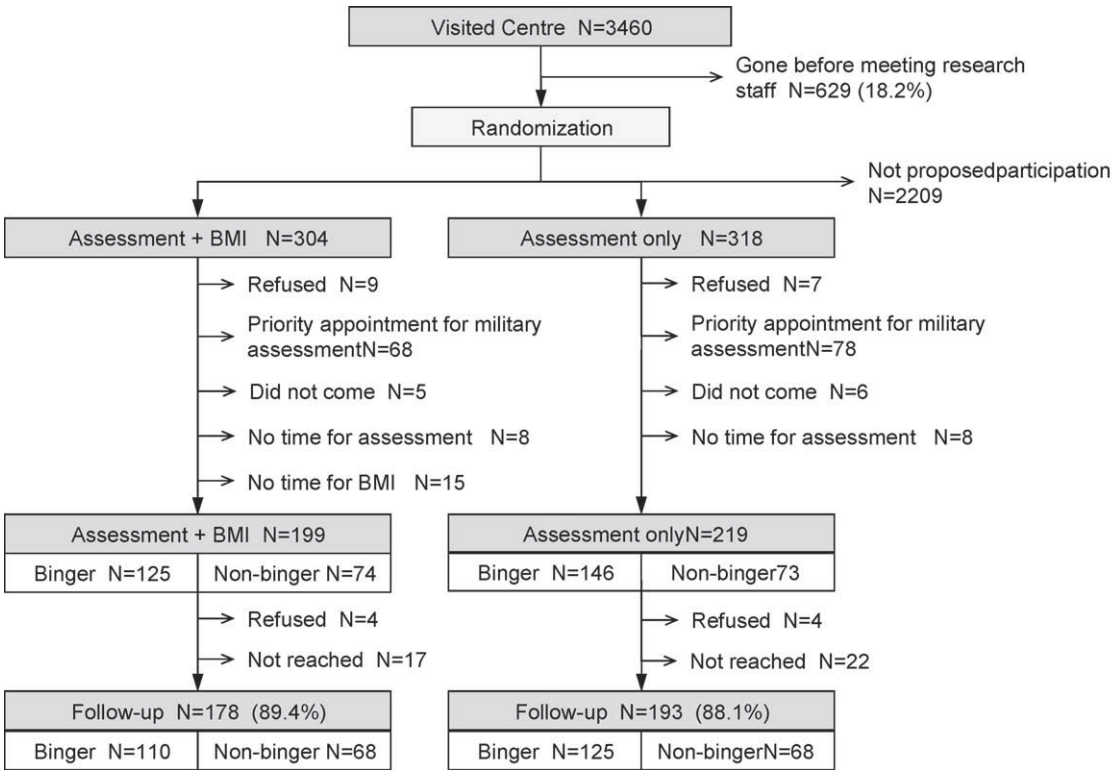

Fig. 1. Trial flow chart. BMI: brief motivational intervention. Bingers were defined as subjects with typical binge drinking once a month or more, which corresponds to consumption of 6 standard drinks on a single occasion (Swiss standard of binge drinking) containing approximately 60 g of pure alcohol (which corresponds to 5 standard drinks of 12 g of ethanol in the US). Among 3460 subjects who visited the centre, 2209 randomly selected subjects were not offered participation since logistic constraints allowed conducting only two BMIs per group of 30 conscripts.

2.2. Intervention

The BMI was conducted immediately following the assessment, in a separate room that ensured confidentiality of verbal communication between counselor and conscript. The proposed BMI intended to reinforce motivation to change behaviors related to alcohol use, or to maintain low-risk drinking in non-bingers. The first aim of this BMI was to introduce a behavior change perspective and discuss it in a non-judgmental, empathic and collaborative manner. The hypothesis was that an open discussion with additional reinforcement by a trained counselor around alcohol use and its repercussions on different life areas could heighten the conscript's awareness of the importance to change this behavior now or in the future. Our BMI model was not a structured intervention with a succession of phases, but rather a menu of strategies in the form of topics, or areas of conversation that the counselor might address, according to individual drinking status and readiness to change (McCambridge and Strang, 2003). Strategies were as follows: (a) opening strategy exploring lifestyle, general alcohol use, alcohol use within a typical day/session, then focusing on the hypothesis of a reduction in alcohol use among bingers or on the status quo among non-bingers; (b) focusing on the pros and cons of alcohol use; (c) evoking hypothetical changes in drinking patterns; (d) exploring importance, ability, and confidence to change; and (e) eliciting commitment to change, and the identification of a hypothetical change. In order to avoid any confrontational dimension, the intervention did not include a personalized feedback. For non-bingers, the rationale was to maintain low-risk drinking during a period of life characterized by the initiation or reinforcement of heavy drinking patterns. If it appeared during the opening strategy that a conscript was a moderate drinker or an abstainer, several of the following strategies shown above were employed: (a) focusing on the pros and cons of experiences with alcohol use; (b) evoking hypothetical changes in drinking patterns; (c) exploring importance, ability, and confidence to maintain low-risk drinking; and (d) eliciting commitment to maintain low-risk drinking. However, it should be noted that rather than having two different kinds of interventions, the basic intervention model was adapted by the counselor to accommodate each individual's status on the drinking continuum. The BMI mean length was 15.8 (±5.5) min.

2.3. Counselor training

Counselors were two masters-level psychologists trained in MI and BMI, and in applying research procedures. A physician (JBD) and a psychologist (CF) experienced in teaching MI and BMI trained counselors in MI over four days, as described elsewhere (Baer et al., 2004). After this initial training, counselors participated in workshops focused on trial information procedures as well as on the delivery of BMI, using actors trained in role-playing young adults who abuse substances. To guarantee uniformity and high quality of BMI delivery throughout the project, counselors received weekly individual supervision in which difficulties and challenges were discussed, along with monthly joint supervision with two senior psychologists. Audiotapes of the interventions were reviewed and feedback was given (CF) on the quality of BMI practice (e.g. MI spirit, reflective listening techniques, and eliciting change talk).

The counselors received 2 h of supervision each week. They were asked to audiotape their interventions, and each week one of these tapes was selected for supervision. Particular attention was paid to the counselor style (empathy, collaboration, evocation, and autonomy support), and the use of motivational interviewing skills, such as the capacity to recognize, elicit, and reinforce change talk, to recognize resistance and work with it, and to elicit and explore behavior change. Moreover, the supervision addressed the importance of eliciting the question of behavior change early in the intervention, where the counselor selectively reflects what the conscript says in order to guide him towards exploring and eventually changing his alcohol use, and trained the counselor to make the necessary efforts to really understand the meaning underlying the words of the conscript. In order to help the counselors hone their developing skills, the supervision lasted throughout the entire duration of the study.

2.4. Study procedures

The design of this study relied on the *a priori* randomization of conscripts to the intervention and the control groups. This randomization could be done in advance since conscripts were assigned a number from the army at the start. Investigators had no way of knowing *a priori* what number anyone was assigned, thus they were blinded to the selection of any particular conscript. Randomization was accomplished by sorting the army numbers for each group of 30 conscripts with a computerized algorithm. The first 15 numbers were assigned to the intervention condition and the last 15 to the control condition. Logistic constraints permitted only two BMI sessions in each group of 30 subjects, so the first two numbers in each condition became the first choice of which conscripts should participate. If either of those designated were excluded for any reason, selection moved to the next number(s) on the randomly sorted list. To guarantee inclusion quality the research staff filled out a list of reasons for keeping or dropping individuals. At this point, subjects were not aware of their assigned condition.

Selected subjects were informed that half of them would fill out a questionnaire and then participate in a 15-min BMI, and half of them would only fill out the questionnaire. They were asked to read the information document and to sign the consent form. Next, they completed the self-administered assessment questionnaire; the research staff provided assistance if needed. Then, subjects were informed of their group allocation, and designated participants in the intervention group received the BMI, while the control group did not.

Follow-up procedures took place 6 months after baseline via computer-assisted telephone interviews. Interviewers were blinded to individual group allocation and were not involved with any aspect of subject participation thus far in the study. The questionnaire contained the same measures as the baseline assessment, described in Section 2.5.

2.5. Measures

Main outcome measures were framed as: (1) the typical number of drinks per week (standard drink containing about 10 g of pure alcohol); and (2) the typical number of binge drinking episodes per month (defined as an occasion with six drinks or more, where six drinks contain approximately 60 g of pure alcohol and equal to the most common measure of five or more drinks of 12 g per drink (Gmel et al., 2003)). Bingers were defined as subjects with typical binge drinking once a month or more.

The assessment (at baseline for all and at follow-up for items subject to change over time) included the age, education and living environment of the subjects. Alcohol use was assessed using the two drinking outcome measures and a list of 12 alcohol-related problems usually experienced by young heavy drinkers (Wechsler et al., 1994). The number of consequences reported was summed to provide scores from zero to 12. The Alcohol Use Disorder Identification Test (AUDIT) was also given, and subjects with scores greater or equal to 8 were identified (Gache et al., 2005). The timeframe for the consequences items and the AUDIT was "in the last 12 months", per the original versions of these instruments. The assessment also included the importance, readiness and confidence to change scales (Bertholet et al., 2009). The frequency of tobacco use item was a standard question ("Do you smoke every day or almost every day?"), and cannabis use frequency was determined using the first item of the Cannabis Use Disorder Identification Test (Adamson and Sellman, 2003).

2.6. Statistical analyses

We conducted all analyses separately for bingers and non-bingers, since the hypotheses tested in the trial yielded group differences, i.e., evaluating the impact of BMI on decreasing alcohol use and showing fewer problems among bingers versus maintaining low-risk drinking among non-bingers. Binger and non-binger groups were defined *a posteriori*. These two categories were used to classify subjects, since binge drinking typically characterizes heavy drinking in young men.

We tested randomization by comparing intervention and control groups on baseline measures (Tables 1 and 3, left side) using Pearson's Chi-squares for categorical variables and the Mann–Whitney *U* non-parametric test for continuous variables with non-normal distributions. We compared group differences from baseline to follow-up (6 months later) with Mann–Whitney *U* tests for continuous variables and two-sample McNemar tests of change (Levin and Serlin, 2000) for categorical variables (Tables 1 and 3, right side).

BMI effectiveness was evaluated with negative binomial regression models for the two main outcomes (drinks per week and binge drinking occasion per month), using each follow-up measure as the dependent variable and adjusting for the baseline measure and any variables for which we found significant differences between groups at baseline. Negative binomial regression models were chosen since our measures were tallied counts and they yielded better fits than other count models, such as Poisson (*countfit* procedure in Stata 10 (StataCorp, 2007)).

Analyses were conducted after taking out the 15 participants assigned to the BMI group who did not receive the intervention (reported in tables) and replicated after incorporating these 15 subjects into intention-to-treat analyses (not reported in tables, but available upon request). All of the regression analyses were repeated in a sensitivity analysis by replacing (missing) values for individuals lost to follow-up with their baseline values in order to account for attrition (also not reported in tables, but available upon request).

In the subgroup of bingers, additional analyses determined whether those who experienced alcohol-related consequences received differential benefit from BMI, compared to counterparts in the control group. Negative binomial regressions were conducted after selecting participants who reported experiencing any of the 12 consequences. Negative binomial regressions were fitted with drinks per week at follow-up as the dependent variable, and condition (where the control group is the reference) as the independent variable. They were adjusted for drinks per week, and importance and confidence to change scales at baseline.

3. Results

Inclusion took place over 19 weeks between September 2007 and August 2008, alternating every other week to accommodate the enrollment of subjects into another study. During this period, 3460 subjects visited the recruitment centre, and of these, 629 (18.2%) were eliminated by the army before encountering any of

Table 1
Characteristics of bingers at baseline and their evolution between baseline and 6-month follow-up, compared to controls.

	Baseline			Baseline to 6-month difference		
	BMI group $N=125$	Control group $N=146$	p value	BMI group $N=110$	Control group $N=125$	p value
Age, mean (SD)	19.9 (1.0)	19.9 (0.9)	0.54 (u)	–	–	–
Education: obligatory school only (vs. higher) n (%)	47 (37.6)	69 (47.3)	0.11 (c)	–	–	–
Professional status						
– Employed, n (%)	29 (23.2)	37 (25.3)	0.90 (c)	–	–	–
– In training, n (%)	92 (73.6)	105 (71.9)		–	–	
– Inactive, n (%)	4 (3.2)	4 (2.7)		–	–	
Living environment: Urban area, n (%)	62 (49.6)	75 (51.4)	0.77 (c)	–	–	–
Drinks per week, mean (SD)	11.3 (11.0)	9.9 (10.9)	0.36 (u)	−1.5 (13.2)	0.8 (10.8)	0.04 (u)
Binge drinking occasion per month, mean (SD)	4.0 (3.7)	3.4 (3.1)	0.30 (u)	−1.5 (3.4)	−0.8 (3.2)	0.04 (u)
Alcohol-related consequence (12 possible), mean (SD)	3.0 (2.0)	3.2 (2.3)	0.69 (u)			
AUDIT score greater or equal to 8, n (%)	89 (71.2)	103 (70.5)	0.91 (c)			
Have person 1 or more with alcohol problems in the family, n (%)	11 (8.8)	15 (10.3)	0.68 (c)	–	–	–
Importance to change (VAS 1–10), mean (SD)	2.6 (1.8)	2.6 (2.4)	0.09 (u)	−0.2 (1.7)	−0.4 (2.4)	0.77 (u)
Readiness to change (VAS 1–10), mean (SD)	3.5 (2.8)	3.5 (3.0)	0.53 (u)	−0.2 (3.6)	0.4 (3.9)	0.41 (u)
Confidence to change (VAS 1–10), mean (SD)	7.2 (2.8)	7.7 (2.9)	0.05 (u)	0.9 (3.2)	0.7 (2.8)	0.55 (u)
Daily tobacco use, n (%)	39 (31.2)	47 (32.2)	0.86 (c)	2 (1.8)	4 (3.2)	0.89 (m)
Cannabis use once a week or more, n (%)	13 (10.4)	17 (11.6)	0.74 (c)	−2 (−1.8)	1 (0.8)	0.40 (m)

Notes: BMI: brief motivational intervention; SD: standard deviation; pct: percentile; AUDIT: alcohol use disorder identification test; VAS: visual analog scale; (u): Mann–Withney U test; (c) Pearson's Chi Square test; (m) two-sample McNemar test of change.

the researchers (Fig. 1). The remaining 2831 were randomized into three groups: 2209 were not invited to participate in the study (logistic constraints permitted only two BMIs per group of 30 subjects), and 622 were assigned to either an intervention or a control group. After removing subjects who declined to participate after randomization, were pre-empted by the army assessment procedure, or arrived too late, the remaining 418 subjects were assigned to: (a) BMI (starting with 214, but dropping 15 who did not get the intervention, leaving $N=199$); or (b) the control group ($N=219$). The six-month follow-up rates were 89.4% for BMI and 88.1% for controls. In order to establish that the alcohol consumption measured at follow-up reflected naturalistic changes in drinking rather than "military drinking", we evaluated whether subjects on active duty in the army at follow-up differed from those who were not yet serving their term. Only 72, or 19.4%, of the 371 follow-up subjects were active in the army at the 6-month follow-up. Further analyses (not reported in tables) indicated similar average drinks per week (7.7 ± 11.1 vs. 7.0 ± 8.0) and monthly binge drinking frequency (1.9 ± 2.7 vs. 1.5 ± 2.1 binge episodes) between subjects who were not yet active in military service versus those who were, respectively.

Results demonstrating BMI efficacy are presented separately for bingers and non-bingers. Fig. 1 lists the breakdown of the 418 subjects into bingers (64.8%) and non-bingers (35.2%). Table 1 first compares the baseline characteristics of bingers receiving BMI with those in the control group, establishing that the randomization resulted in the groups being similar in demography, alcohol use, alcohol-related consequences, proportion with AUDIT scores of 8 or above, family history and attitude towards change in their drinking. Both the importance and the readiness to change scales were globally low (ranging from 2 to 4 on a Likert scale of 1–10), indicating that initially most subjects had little intention of reducing their drinking. Scores were significantly lower on confidence to change in the BMI group. The proportions of regular cigarette and cannabis smokers were similar in the two groups.

The right side of Table 1 depicts the difference between baseline and 6 months follow-up for the BMI and the control groups. As predicted by our hypothesis, there was a significantly larger reduction in the weekly alcohol use and monthly binge drinking episodes in the BMI versus the control group. There were no significant group differences on any of the other measures.

Table 2 presents negative binomial regression models for binge drinkers. The difference between the incidence rate ratio (IRR) and 1.0 (expressed in percent) indicates the change in the outcome count for the intervention group compared to the control group. For weekly alcohol use, the IRR of 0.80 (confidence interval 0.66–0.98) indicates 20% less drinking in the BMI group versus the control group, and is significant. This beneficial effect of BMI on weekly alcohol use is accompanied with an IRR of 0.82 (confidence interval 0.64–1.05) in the number of monthly binge-drinking episodes within the BMI group, though it is not significant. Intention-to-treat analyses (not reported in tables) showed similar results. Replication of regression analyses, with replacement of (missing) values from individuals lost to follow-up with their baseline values in order to account for attrition, showed similar results as well (data not presented).

According to the hypothesis of differential efficacy of BMI in the subgroup of subjects who experienced more alcohol-treated consequences, we explored the efficacy of BMI in subgroups of binge drinkers who (over the previous 12 months) experienced one or more of the 12 alcohol-related consequences evaluated. Results (not reported in tables) indicated that for subjects who experienced one or more alcohol-related consequences over the last 12 months, there was 19% less drinking in the BMI group compared to the control group (incidence rate ratio = 0.81, confidence interval 0.67–0.97, $p=0.04$). Additional exploratory analyses indicated

Table 2
Regression models to test BMI efficacy in bingers ($N=235$).

Outcome	Incidence rate ratio	Standard error	z	p value	>95% Confidence interval
Drinks per week[a]	0.80	0.08	−2.17	0.03	0.66–0.98
Binge drinking occasion per month[b]	0.82	0.10	−1.56	0.12	0.64–1.05

Notes: Negative binomial regression with measure at follow-up as dependent variable, condition as independent variable (control group being the reference).
[a] Adjusted for drinks per week at baseline, importance to change scale, and confidence to change scale.
[b] Adjusted for binge drinking occasion per month at baseline, importance to change scale, and confidence to change scale.

Table 3
Characteristics of non-bingers at baseline and their evolution between baseline and 6-month follow-up, compared to controls.

	Baseline			Baseline to 6-month difference		
	BMI group $N=74$	Control group $N=73$	p value	BMI group $N=68$	Control group $N=68$	p value
Age, mean (SD)	19.8 (0.9)	20.1 (1.3)	0.15 (u)	–	–	–
Education: obligatory school only (vs. further) n (%)	36 (48.6)	34 (46.6)	0.80 (c)	–	–	–
Professional status						
– Employed, n (%)	17 (23.0)	12 (16.4)	0.21 (c)	–	–	–
– In training, n (%)	53 (71.6)	60 (82.2)		–	–	
– Inactive, n (%)	4 (5.4)	1 (1.4)		–	–	
Living environment: urban area, n (%)	40 (54.1)	43 (58.9)	0.55 (c)	–	–	–
Drinks per week, mean (SD)	2.0 (2.4)	1.8 (2.3)	0.56 (u)	1.3 (3.8)	0.7 (2.6)	0.87 (u)
Binge drinking occasion per month, mean (SD)	0.0 (0.0)	0.0 (0.0)	1.00 (u)	0.5 (1.4)	0.3 (0.7)	0.75 (u)
Alcohol-related consequence (12 possible), mean (SD)	1.3 (1.4)	1.2 (1.4)	0.59 (u)			
AUDIT score greater or equal to 8, n (%)	5 (6.8)	7 (9.6)	0.53 (c)			
Have person 1 or more with alcohol problems in the family, n (%)	10 (13.5)	7 (9.6)	0.46 (c)	–	–	–
Importance to change (VAS 1-10), mean (SD)	1.6 (1.7)	2.1 (2.4)	0.31 (u)	−0.2 (2.2)	−0.3 (2.0)	0.25 (u)
Readiness to change (VAS 1–10), mean (SD)	4.0 (3.8)	3.6 (3.7)	0.69 (u)	0.0 (4.6)	0.4 (5.0)	0.50 (u)
Confidence to change (VAS 1–10), mean (SD)	7.7 (3.3)	7.2 (3.8)	0.79 (u)	0.7 (3.4)	1.6 (4.3)	0.36 (u)
Daily tobacco use, n (%)	12 (16.2)	12 (16.4)	0.97 (c)	−1 (−1.5)	−2 (−2.9)	NA (m)
Cannabis use once a week or more, n (%)	3 (4.1)	7 (9.6)	0.18 (c)	0 (0.0)	−2 (−2.9)	NA (m)

Notes: BMI: Brief motivational intervention; SD: standard deviation; pct: percentile; AUDIT: alcohol use disorder identification test; VAS: visual analog scale; (u): Mann–Withney U test; (c) Pearson's Chi Square test; (m) two-sample McNemar test of change. NA: not applicable (denominator cell = 0).

that there was a significant reduction in weekly alcohol use in the BMI group among those who experienced a hangover (incidence rate ratio = 0.80, confidence interval 0.65–0.98, $p = 0.03$), missed a class (incidence rate ratio = 0.47, confidence interval 0.30–0.73, $p = 0.001$), got behind at school (incidence rate ratio = 0.46, confidence interval 0.28–0.77, $p = 0.003$), argued with friends (incidence rate ratio = 0.62, confidence interval 0.40–0.96, $p = 0.03$), engaged in unplanned sex (incidence rate ratio = 0.55, confidence interval 0.37–0.82, $p = 0.003$) or unprotected sex (incidence rate ratio = 0.36, confidence interval 0.20–0.65, $p = 0.001$), than did those in the control group who experienced the same problems at baseline. BMI did not reduce weekly drinking in those who experienced the other six problems at baseline (done something they regret; forgotten where they were or what they did; damaged property; got into trouble with police; got hurt or injured; or required medical treatment after an alcohol overdose), compared to counterparts in the control group.

Table 3 shows that among non-bingers, BMI and control groups were similar at baseline on all variables measured. Low weekly alcohol use, few alcohol-related consequences and AUDIT scores in the low-risk drinking range were recorded for the groups because of their non-binge drinking status. Initially, subjects did not contemplate change in their drinking (as measured by low scores on the importance and readiness to change scales), but they did feel confident in their ability to change, once they decided to. The proportion of non-bingers with regular tobacco and cannabis use was about half that reported by binge drinkers, except for cannabis use within the controls (which was nearly the same for non-bingers as it was for bingers). The relatively small number of cannabis users among non-bingers might explain this. Contrary to our hypothesis of a preventive effect in the BMI group, there were no differences from baseline to six-month follow-up for weekly alcohol use or binge drinking between the two groups.

Non-bingers at baseline generally maintained low-risk drinking patterns at follow-up. Moreover, bivariate analyses reported in Table 3 do not support evidence for a protective effect of BMI. The regression model for non-bingers (not reported in tables) confirmed stable weekly alcohol use in the BMI versus the control group (IRR = 1.35, $p = 0.10$). The replication of these analyses in an intention-to-treat perspective showed no significant differences between groups (IRR = 1.28, $p = 0.17$). Furthermore, no effect on the progression of binge drinking and alcohol-related consequences was observed between groups in either analysis. Considering that abstainers could potentially only increase their alcohol consumption over time, additional analyses focused on that subgroup revealed that 23 subjects (7 in the intervention group and 16 in the control group) were abstainers at baseline (i.e., reporting 0 drinks per week and 0 binge drinking episodes per month) and none of them became bingers at follow-up.

4. Discussion

At army conscription in Switzerland, BMI reduces alcohol use in binge drinkers. This benefit from BMI is heightened in subjects who recently experienced certain alcohol-related adverse consequences. Although BMI demonstrated a 20% reduction in weekly alcohol use among binge drinkers, it is particularly relevant considering that individuals in this age group largely view drinking as a mostly positive experience. A majority of them increase their consumption between the ages of 18 and 25, and most of them have little inclination or motivation to change this pattern. In our sample of French-speaking Swiss men, 64.8% of the conscripts were binge drinkers. This finding should serve as an incentive to conduct larger studies of BMI within this age group, in order to replicate our results and perhaps foster a wider implementation of BMI in similar community settings.

We showed that the presence of consequences of alcohol use enhances BMI efficacy, a finding which may be particularly true for subjects who experienced certain alcohol-related consequences. Similar to results reported by Blow et al. (2009) and in accordance with potential mechanisms of action of BMI (McNally et al., 2005), it is likely that the presence of consequences of alcohol use may help develop discrepancy between the individual's current situation and future and desired goals, hence leading to behavior change.

Results were different for non-bingers who were drinking at moderate, low-risk levels initially. Most of them remained moderate consumers at follow-up (averaging three drinks per week), but did not seem to gain any "protective" effect because of the intervention. Further evaluation of the impact of BMI in non-bingers should be undertaken using larger samples. Moreover, the content of the BMI for non-bingers should be further evaluated. Herein, the intervention was conducted while counselors were unaware of the drinking status of participants. Further research should explore the content of BMI adapted specifically for non-bingers.

This study has some limitations that should be acknowledged. This sample included only 20-year-old men in the French-speaking

sector of Switzerland, which limits the extent to which the results might generalize to women and young adults who are slightly older or younger. However, our findings are likely to apply to young men in other regions of Switzerland (Daeppen et al., 2005) and to young men in other European countries with similar medium to low level of binge drinking among teenagers, i.e., Sweden or France www.espad.org. In addition, subjects were excluded from our project for reasons like unsuitability for service, pre-emption for army assessment procedures, late arrival, etc.; their profiles may have revealed higher levels of substance use. This could limit the generalizability of our conclusions. Moreover, because the protocol called for including 128 participants per group to obtain power of 0.80, the *posteriori* splitting of participants into binger and non-binger designations lowered the statistical power for each of these subgroups.

This study has several strengths. It indicates that young men who initially show little motivation (i.e., low scores on importance and readiness to change) to alter their behavior could have positive outcomes following BMI. This suggests that the various MI techniques in the intervention designed to increase "intrinsic" motivation indeed translate effectively into meaningful behavior change (Monti et al., 1999). One other strength of our study is the generalization of research in this area to a sample of young men more representative of the general population, in contrast to most prior studies conducted on select samples within the college milieu. Moreover, our study contained an assessment-only component without personalized feedback for the control group, while the majority of published studies assessing BMI efficacy in young adults minimally included some feedback mechanism in addition to assessment in the control group (Agostinelli et al., 1995; Baer et al., 1992; Handmaker et al., 1999; Murphy et al., 2004; Walters et al., 2000). These results suggest that BMIs for young adults do not necessary need to include personalized feedback, and it is also possible that the effects would have been greater had feedback been included. Therefore, our findings add to the three studies containing no feedback along with assessment for the control group. These three studies found some impact of BMI on alcohol use (Borsari and Carey, 2000) or on alcohol-related consequences (Baer et al., 2001; Monti et al., 1999), consonant with our own observations.

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Contributors

All authors have approved the final manuscript. Dr Daeppen, Dr Gmel, and J Gaume designed the study and wrote the protocol. Dr Daeppen and Dr Gmel managed the literature searches and summaries of previous related work. Dr Faouzi undertook the statistical analysis, and Dr Daeppen and J. Game wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

Dr Daeppen declares a connection with pharmaceutical industry related to a study without link to the present paper. Dr Gmel has participated in scientific meetings co-sponsored by the pharmaceutical industry. He has received funding for research projects that were indirectly financed through sales of the alcohol and tobacco industry via taxes (i.e., funds from the Swiss Alcohol Monopoly or the Tobacco Prevention Fonds). He has never received direct research funding from any industry. He cannot exclude, however, having collaborated in international projects, in which partners received funding from the industry either directly or indirectly via social aspect organizations. Participating as an expert in Swiss committees such as those planning the new National Alcohol Program or preparing changes of the Swiss Alcohol Law, he has regular connections with representatives of the alcohol industry who similarly participate in these committees.

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Article 3

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Is brief motivational intervention effective in reducing alcohol use among young men voluntarily receiving it? A randomized controlled trial

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ABSTRACT

Background– Heavy drinking is one of the leading causes of morbidity and mortality in young men. Brief motivational intervention (BMI) has shown promising results for young people, but has never been tested in young men in the community who volunteered to receive an intervention. **Methods**– We evaluated the effectiveness of BMI in reducing alcohol use among heavy episodic users and in maintaining low-risk drinking among non-heavy episodic users. Participants were French-speaking young men attending the mandatory Swiss army conscription process. They were offered the opportunity to receive a 20-minute BMI and those interested were randomized into an intervention group (BMI immediately) or into a control group (BMI after the 6-month follow-up assessment, in a waiting list design). Analyses were conducted separately for heavy and non-heavy episodic users (separated using baseline heavy episodic use frequency) since the hypotheses tested were different between both groups (primary vs secondary prevention intervention). **Results**– From a pool of 6,085 young men invited to receive BMI, 727 (11.9%) showed up and 572 were included in the study (after exclusions related to organizational aspects of the conscription process). Among non-heavy episodic users, there was a protective effect of BMI on weekly alcohol use ($p<0.05$). Among heavy episodic users, there were no significant effects of BMI. **Conclusions**– About 12% of young men were interested in addressing their drinking within the BMI framework, suggesting that there is some need for easily-accessible alcohol intervention. The present intervention did have a preventive effect among low-risk young drinkers in helping them maintain their patterns of alcohol use. An explanation for the lack of effectiveness among heavy episodic users might be that those individuals interested in BMI had patterns of more severe alcohol use, thereby making change more difficult.

KEYWORDS

Brief motivational interventions; Alcohol; Heavy episodic use; Young men; Voluntary.

INTRODUCTION

The alcohol use of adolescents and young adults is one of the world's most important and costliest health problems (Rehm et al., 2004). The detrimental effects of alcohol (particularly heavy episodic use) among young people have been widely attributed in the literature to consequences such as injuries, blackouts, unplanned sexual activity, involvement in violent acts, academic failure, and suicide attempts (Hingson et al., 2005; Perkins, 2002; Windle, 2003). Alcohol use constitutes the greatest risk factor for mortality and morbidity among adolescents and young adults in established market economies (Rehm et al., 2006). The transition period from adolescence to adulthood could set the stage for future problems with substance use (Gotham et al., 2003; Schulenberg and Maggs, 2002), and offers an important vantage point for initiating vital preventive actions.

Brief motivational intervention (BMI) is an adaptation of Motivational Interviewing (MI) (Miller and Rollnick, 2002) for single, short sessions of 20 to 60 minutes each (Rollnick et al., 1992). It aims to introduce behavior change perspectives and discussions in a non-judgmental, empathic and collaborative manner in order to elicit motivation to change alcohol use. Adolescents and young adults might be particularly receptive to motivational methods and could be approached within a wide range of settings (Barnett et al., 2001; Tevyaw and Monti, 2004). BMI has great potential among individuals in this age group (Tevyaw & Monti, 2004) because the interviewing style avoids argumentation and hostile confrontation. BMI respects the personality styles of participants and does not lecture them or present ultimatums. This intervention style may foster an atmosphere of self-directed change that teachers, parents or other authority figures have trouble adopting easily, and suggests that techniques designed to increase "intrinsic" motivation might translate effectively into meaningful behavior change. Although reviews of strategies targeting alcohol consumption within the general population show that BMI is among the few effective preventive strategies and is highly cost-effective among individual-centered approaches (Babor et al., 2010), BMI research on young people has shown mixed, though rather promising results (Grenard et al., 2006; Larimer et al., 2004; Tevyaw & Monti, 2004; Toumbourou et al., 2007).

However, most of the research up to now has been conducted on selected groups of individuals, particularly in the college milieu (where individuals are better educated than their counterparts in the

general population) and clinical settings (where serious presenting conditions are more common). The army provides another setting that may be useful for launching preventive efforts, especially in those countries with mandatory conscription mechanisms. In Switzerland, virtually all non-institutionalized men are called for conscription beginning at age 19; using this sample minimizes social status bias and issues of differential access to intervention. This environment thus offers a unique opportunity to reach a large portion of the population at an age where many individuals begin or continue to engage in alcohol-related risky behaviors.

Most BMI studies have relied on universal screening within a selected population followed by a random allocation of “at risk” subjects to a control or to an intervention group. A number of studies in schools and colleges were even conducted on students who were mandated to BMI counseling because of sanctions by school judicial offices for alcohol-related violations (see e.g. Larimer and Cronce, 2007 for a review). These strategies (universal screening with at-risk subject selection and mandated referral) are important to continue, but it also makes sense to assess BMI in the context of voluntary subject pools. So far, this has seldom been done. Because of its non-pressured nature, inviting younger individuals to a voluntary BMI might help them to enter into reflection and change processes, rather than into traditional treatment and prevention approaches that might carry negative stereotypes within this age group. Voluntary participation is also more akin to the MI spirit, in which it is crucial for individuals to control their own decisions (Miller & Rollnick, 2002).

We found some studies investigating BMI using voluntary subjects (Bailey et al., 2004; Berghuis et al., 2006; Brown et al., 2005; D'Amico and Edelen, 2007; Walker et al., 2006). They were conducted on adolescents or young adults and addressed alcohol and/or cannabis use. Self-selection was a consistently successful inclusion strategy, although these projects varied in methodological quality and showed mixed results. Three of them reported positive effects from BMI, but they were not randomized controlled trials: one compared volunteers to non-volunteers (Brown et al., 2005), one was a single-group, pre-post design (Berghuis et al., 2006); the third was a pilot test comparing participating versus non-participating schools, and individual volunteers versus matched controls (D'Amico & Edelen, 2007). Another study was a randomized controlled trial and showed significant reduction of substance use within both the intervention and control group, but no differences between the two groups (Walker

et al., 2006). One other randomized controlled trial showed results in favor of BMI, but was a pilot study on a small sample of 34 individuals (Bailey et al., 2004).

BMI typically is conducted on subjects screened for heavy drinking. Very few researchers tested BMI as a primary prevention strategy among low-risk drinkers. One study of personalized mail feedback for college drinking prevention did include low-risk drinkers, as well as abstainers, and found positive effects (Larimer et al., 2007), indicating that brief interventions designed to help young individuals keep their drinking at low-risk levels can be successful. In the present study, participation in BMI was offered to all conscripts instead of selecting at-risk drinkers from screening questionnaires. This was done to blind the army from potentially identifying at-risk drinkers involved in BMI and to shield them from being penalized in the future, as well as to allow us to determine whether BMI reinforcement of low-risk drinking helps maintain this level of consumption.

A large randomized controlled trial of BMI among voluntary young individuals could offer an important piece of evidence for the effectiveness of this intervention within this age group. The aim of this study was thus to evaluate the success of BMI (compared to no intervention) in decreasing alcohol use among heavy episodic users and to maintain low-risk drinking among non-heavy episodic users in a large representative sample of 19-year-old French-speaking Swiss men.

METHODS

The project protocol was approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School (Protocol No. 15/07), followed the CONSORT statement, and was registered in the International Standard Randomized Controlled Trial Number Register, ISRCTN78822107, http://www.controlled-trials.com/ISRCTN78822107.

Sample

Switzerland has a mandatory two-day army recruitment process for all males beginning at age 19, and virtually all conscripts complete the physical, medical and cognitive assessments necessary to determine eligibility for service in the Swiss military. Only men are recruited for conscription; women

may enter the military on a voluntary basis, but were not included in the present study due to scarcity and non-representativeness. At all research stages, participants were reminded that the research staff had no link with the military and that all information they provided was totally confidential and had no implications for army conscription procedures.

As previously stated in the introduction, participation in BMI was offered to all conscripts instead of selecting at-risk drinkers randomly from screening questionnaires. The major reason for this was to blind the army from potentially identifying at-risk drinkers involved in BMI and to shield them from being penalized in the future. This strategy also allowed researchers to look at the development of alcohol use among initially low-risk users and to determine whether BMI reinforcement of low-risk drinking helps maintain this level of consumption.

Study procedures

We used a waiting list design for conscripts willing to receive BMI. Conscripts were made aware of all study goals and procedures, such as signing informed consent, completing assessment questionnaires, receiving alcohol BMI, etc., as described below. Those interested in receiving BMI were then randomized into two groups, where individuals either were given BMI immediately or six months later (after the follow-up questionnaire).

Between January 2007 and September 2008 there were 50 inclusion weeks, of which 28 were consecutive and 22 were bi-monthly. During this period, 8,673 conscripts presented for recruitment (see Figure 1), but 1,360 (15.7%) of them left the centre before meeting the researchers, and another 1,228 of them were not available to be invited for BMI participation because of various army logistics and requirements. In practice, individuals entered the recruitment centre in groups of 30; every sixth group had psychological tests after the scheduled time for our study. Army psychologists were concerned that BMI might inadvertently influence the results of their testing; therefore, the conscripts in every sixth group were not eligible for BMI (on a random basis) and were unlikely to create any systematic bias.

>> Insert Figure 1 about here <<

The research staff informed 6,085 conscripts about the goals and procedures of the study and invited them to receive BMI. Of these, 727 (11.9%) were interested, but 62 could not be accommodated due to lack of available space and time, 83 others had peremptory appointments for military assessment and could not be seen, and 10 arrived too late to take part. The remaining 572 received written information sheets and were asked to provide informed consent signatures. They filled out a self-assessment questionnaire (see Measures, below) while researchers provided assistance, if needed. Conscripts met in groups of 30, therefore 30 playing cards were placed face down on a table (15 linked to BMI and 15 to control conditions) and subjects were instructed to choose one of them. Individuals had no way of knowing ahead of time which condition their selection would place them in. This process enabled the random assignment of all subjects into an intervention group receiving BMI immediately (N=296) or into a control (waiting list) group receiving telephone counseling at the 6-month follow-up (N=276).

To describe who volunteers for a BMI session, we compared the data of the 572 individuals included in the intervention and control group to the 6341 who were not included but accepted to fill out a short screening questionnaire as part of another study project in the same setting. Whereas volunteers and non-volunteers were comparable as regard to their age, living environment (urban vs. rural area), prevalence of daily tobacco use, and prevalence of weekly cannabis use, volunteers were less educated (52.0% only completed 9-year obligatory school vs. 45.9% in non-volunteers, $p=0.005$) and had heavier alcohol consumption patterns (mean drinks per week (standard deviation, SD): 10.2 (10.6) vs. 9.0 (11.8), $p<0.001$; mean heavy drinking episodes (SD): 3.2 (3.4) vs. 3.1 (3.8), $p=0.06$) than their counterparts.

Intervention

The BMI interventions were provided immediately to each designated individual by a trained counselor in a secluded, confidential setting. The procedure was meant to reinforce motivation to change behaviors related to alcohol use, to maintain changes already accomplished, and/or to reinforce low-risk behaviors. The intervention was inspired by MI techniques (Miller & Rollnick, 2002) and further development of MI adaptations for single, short sessions. Rollnick et al. (1992) developed a model of

30 to 40 minute brief intervention with male heavy drinkers in a hospital setting. McCambridge and Strang (2003) adapted this model for young people using various substances. The intervention outlined in our study was a shorter version of the latter (mean length: 21.8 minutes; standard deviation: 8.5) and involved exploring the use of alcohol and related hazardous behaviors and focusing on one or more aspects of it. The primary aim of this BMI was to introduce behavior change perspectives and discussions in a non-judgmental, empathic and collaborative manner. The hypothesis was that an open discussion, with additional reinforcement by a trained counselor centering around alcohol use and its repercussions on different life areas, would heighten awareness of the importance to change this behavior now (or in the future) and hopefully lead to successful behavior change.

Our BMI model was not a structured intervention with a set succession of phases, but rather a "menu" of strategies in the form of topics or areas of conversation, that the counselor might address or not according to individual drinking status and readiness to change (McCambridge and Strang, 2003). The following strategies were included (see Table 1): a) Opening strategy: lifestyle and alcohol use, alcohol use within a typical day/session; b) The good things and the less good things about drinking alcohol (decisional balance); c) Evoking a hypothetical change; d) Exploring importance, ability, and confidence to change; and e) Eliciting commitment to change, identification of an eventual change.

>> Insert Table 1 about here <<

Counselors were unaware of the drinking status of participants at the beginning of the intervention. For low-risk users, the rationale of the intervention was to maintain low-risk drinking in a period of life characterized by the initiation or reinforcement of heavy drinking patterns. If it appeared during the Opening strategy that the young man was a low-risk user, the BMI strategies would be adapted to focus on the following: b) The good things and the less good things related to past experiences with alcohol use; c) Evoking the future; d) Exploring importance, ability, and confidence to maintain low-risk drinking; and e) Eliciting commitment to maintain low-risk drinking. It should be noted that there were not two different interventions (one for at-risk users and another for non-at-risk users), but a single model that was tailored by the counselor to accommodate each individual's continuum of drinking

status. For example, a young man drinking a large (binge) quantity of alcohol once a year might discuss reasons and motivations to decrease the quantity of alcohol consumed on these risky (though infrequent) occasions, while another young man presenting similar patterns of use might also discuss how and why to keep his (binge) occasions limited to being infrequent (e.g. once a year), but is not especially concerned about the quantity consumed on these occasions. On the other hand, a young man that already has cut down on his drinking but is still exceeding the recommended limits might discuss how to maintain this current, less risky behavior, while someone else with similar alcohol use might talk about quitting completely.

Counselors training

Counselors were four masters-level psychologists trained in MI, BMI, and applied research procedures. Training was given by senior physicians and psychologists experienced in teaching MI and BMI, and most of the trainers were part of the Motivational Interviewing Network of Trainers (MINT). To guarantee high quality and consistency of BMI delivery throughout the whole project, counselors received weekly individual supervision in which difficulties and challenges were discussed, as well as monthly joint supervision with two senior psychologists. Audiotapes of the interventions were reviewed and qualitative feedback was given on the quality of BMI practice (e.g. MI spirit, reflective listening techniques, eliciting change talk, etc.).

Follow-up

Follow-up procedures took place 6 months after baseline and were conducted by telephone, using the same measures as in the baseline assessment. Follow-up rates were 88.5% for the BMI group and 87.3% for the control group. The follow-up assessment was a computer-assisted telephone interview (CATI). At the end of the CATI, a pop-up informed each interviewer whether BMI should be proposed to the participant (in the waiting list control group). Therefore, all follow-up assessments were done by staff blinded to the treatment status thus far. If indicated by the pop-up, the BMI was then conducted on the same call, or scheduled for a more convenient time chosen by the participant.

Measures

Main outcomes measures were defined as a) number of standard (about 10 grams of pure alcohol) drinks per week; and b) number of heavy drinking episodes (6 drinks or more on one occasion) per month. These outcomes were assessed both at baseline and at follow-up using the first three questions of the Quick Drinking Screen (Sobell et al., 2003), framed as "typical" drinking rather than "drinking over the last year" in order to avoid overlapping of 6-month follow-up measures with the pre-intervention period. Number of standard drinks per week was obtained by multiplying the first two questions (drinking days per week x standard drinks per drinking days).

Other variables of interest were importance to change, readiness to change, and confidence to change (on visual analog scales of 1 to 10), prevalence of daily tobacco use, and prevalence of weekly cannabis use; all measured both at baseline and at follow-up.

Additionally, the following items were used to characterize the sample: age; education (coded as 9 years obligatory school only versus further education); professional status (coded as employed, in training, or inactive (social welfare or sabbatical); living environment (urban versus rural area); prevalence of alcohol problems in the family (coded as 0 versus 1 or more relatives); the Alcohol Use Disorder Identification Test (AUDIT), with cut-offs of 8 for hazardous use (Babor et al., 2001) and 12 for probable dependence (Gache et al., 2005), as well as the number of alcohol-related consequences [12 items linked to alcohol similar to those of Wechsler et al. (1994) that assess the occurrence of various consequences in the past 12 months (e.g. argue with friends, miss a class or work, engage in unplanned sexual activity, or get into trouble with police); the number of events endorsed was summed, yielding scores between 0 and 12].

Statistical analyses

All analyses were conducted separately for heavy and non-heavy episodic users, since the hypotheses tested in the trial were different between these groups (i.e. the ability of BMI to decrease alcohol use among heavy episodic users and to maintain low-risk drinking among non-heavy episodic users). Individuals were classified into these categories since heavy episodic use typically characterizes heavy drinking in young men. This split was done *a posteriori* (baseline questionnaire

data), defining heavy episodic users as having one or more episodes per month of six or more drinks on a single occasion, and non-heavy episodic users as having these episodes less than once a month, or never.

The BMI and the control group were compared at baseline using non-parametric procedures (Pearson Chi Square test for categorical variables and Mann-Whitney U test for continuous variables) since the variables were not normally distributed. Changes in the groups from baseline to 6-months follow-up were compared using the Mann-Whitney U test for continuous variables and the two-sample McNemar test of change (Levin and Serlin, 2000) for categorical variables. BMI effectiveness was addressed by fitting negative binomial regression models for the two main outcomes, using each follow-up measure as the dependent variable and adjusting for the baseline measure and any variables for which we found significant differences between groups at baseline. Negative binomial regression models were selected because they performed better than other models on our counts according to the *countfit* procedure in Stata 10 (StataCorp, 2007). All regressions were repeated in sensitivity analyses by replacing missing values from cases lost to follow-up with their baseline values in order to account for attrition.

RESULTS

Heavy episodic users subsample

At baseline, heavy episodic users (Table 2, first 3 columns) consumed an average of about 12 drinks per week, had about 4 heavy episodes per month, encountered between 3 to 4 alcohol-related consequences during the last year, and had high prevalence of daily smoking (about 40%) and weekly cannabis use (about 20%). AUDIT scores using cut-offs of 12 points indicated that about half of all the heavy episodic users had severe alcohol use patterns with probable dependence. There were no significant differences between BMI and the control group on alcohol-related measures, tobacco or cannabis use, or most of the socio-demographic variables. Several exceptions were that the BMI group was significantly more educated ($p<0.05$), and marginally ($p=0.10$) less employed and more often residents of urban areas than were those in the control group. These three variables were accounted for in regression models adjusting for potential confounding effects.

>> Insert Table 2 about here <<

From baseline to the 6-month follow-up, there were no significant differences between the two groups on any variables (Table 2, last 3 columns).

Negative binomial regression models adjusting for baseline alcohol consumption and potential group differences in socio-demographic variables confirmed that there was no significant effect of BMI in this sub-sample of heavy episodic users (Table 3). Data are not presented, but replication of regression analyses by replacing missing values from cases lost to follow-up with their baseline values in order to account for attrition showed similar (non-significant) results.

>> Insert Table 3 about here <<

Non-heavy episodic users subsample

At baseline, non-heavy episodic users (Table 4, first 3 columns) consumed an average of about two and a half drinks per week, had about one alcohol-related consequence during the last year, and had low prevalence of daily smoking (about 21.4%) and weekly cannabis use (about 9%). There were no significant differences between the BMI and the control group. The number of individuals with AUDIT scores high enough to indicate hazardous drinking or probable dependence was small. Members of the control group were marginally (p=0.08) more often employed and less in training or inactive, and showed less readiness to change (p=0.06) than did their counterparts in BMI. These two variables were adjusted for in the regressions.

>> Insert Table 4 about here <<

From baseline to the 6-month follow-up, there was a significant difference (p=0.04) in weekly alcohol consumption. On average, the BMI group drank only 0.4 drinks more, while the control group drank 1.7 drinks more (Table 4, last 3 columns).

Negative binomial regression models (Table 5) provided evidence of a significant ($p < 0.05$) protective effect of BMI on increases in drinks per week within the initially low-risk group of non-heavy episodic users. The incidence rate ratio (IRR=0.67) can be interpreted to mean that there was 33% less drinking in the BMI group at follow-up. However, there was no effect of BMI on the number of heavy episodes per month. The data are not presented, but replication of the regressions by replacing missing values from cases lost to follow-up with their baseline values showed an identical IRR (0.67, 95% CI=0.46-0.98, $p<0.05$) for weekly alcohol consumption, while the heavy episodes per month outcome remained non-significant.

>> Insert Table 5 about here <<

DISCUSSION

The present study is of interest because it evaluated the efficacy of BMI among young individuals who showed interest in voluntarily participating in an intervention. We believe that inviting young individuals to a voluntary BMI is more akin to the MI spirit, in which it is crucial for individuals to control their own decisions, and might help them enter into reflection and change processes, rather than into traditional treatment and prevention approaches that might carry negative stereotypes within this age group. Findings indicate that the intervention was effective for individuals with low-risk alcohol use patterns (non-heavy episodic users), but not for those with high-risk alcohol use patterns (heavy episodic users).

Although research on BMI for young people has shown promising results in some evaluations of its efficacy (Grenard et al., 2006; Larimer et al., 2004; Tevyaw & Monti, 2004; Toumbourou et al., 2007), few studies have concentrated primarily on voluntary adolescents or young adults. For example, in the five reports previously identified (Bailey et al., 2004; Berghuis et al., 2006; Brown et al., 2005; D'Amico & Edelen, 2007; Walker et al., 2006) that incorporated volunteer samples, a number of methodological concerns preclude drawing any clear conclusions. Three of these studies were not randomized controlled trials (Berghuis et al., 2006; Brown et al., 2005; D'Amico & Edelen, 2007) and one was a pilot randomized controlled trial on a small sample of 34 individuals (Bailey et al., 2004).

An explanation for non-significant findings among heavy episodic users in the present research may be that self-selection of the voluntary process resulted in a unique sample of heavy alcohol consumers. Comparing the data of the 572 individuals who voluntarily showed up for a BMI and were included in the present study to the 6341 who were not included but accepted to fill out a short screening questionnaire as part of another study project in the same setting and time frame showed that those who voluntarily showed up had heavier drinking patterns (more drinks per week, more heavy drinking episodes) whereas they did not use more tobacco or cannabis than their counterparts. Furthermore, about half of this group had AUDIT scores above 12 points, indicating severe alcohol use patterns with probable dependence (Gache et al., 2005). It has been argued (Moyer et al., 2002) that BMI is less effective on heavy drinkers, with or without dependence, who may need treatment that is more intensive. In the same way, Saitz and colleagues (2009) found that BMI was not significantly associated with fewer drinks per day among subjects with alcohol dependence, whereas it was among those with nondependent, unhealthy alcohol use. In most of the screening and brief intervention studies, individuals with severe alcohol use were excluded, thus there is no clear evidence of the success or failure of this type of brief intervention on his sub-sample of drinkers (Saitz, 2010). We did not use a screening tool in this research and a positive feature of our study is that there appears to be a number of young men who are seeking some type of help for their drinking problem(s). Therefore, interventions that are more intensive could be developed in order to produce effects that are more potent. Our design consisted of a short intervention lasting about 20 minutes and had no booster component built in. Expanding the scope of the sessions and following through with some type of "refresher" course (such as a booster) might increase intervention effectiveness and seems worthy of further exploration. Additionally, the BMI setting itself may provide a timely opportunity to provide helpful feedback, including recommendations or referral to further treatment.

An unexpected finding herein was that BMI might be instrumental in helping young men with low-risk alcohol use, especially those who are interested in discussing their alcohol issues and desire to maintain their current level of consumption. Our study highlights a type of BMI intervention that potentially has promising uses in primary prevention efforts. To our knowledge, this aspect of face-to-face interviewing and intervention has not been well documented. One recent study did evaluate the

efficacy of a mailed feedback intervention for college student drinking prevention (Larimer et al., 2007). It showed that this format did have some preventive influence, both on overall drinking rates and on abstainers in the feedback condition, who were twice as likely to remain abstinent at follow-up than were the controls. This suggests that motivational interventions designed to help young individuals keeping their drinking at low-risk levels can be successful, but does need further empirical validation.

An important strength of our study lies in its capability to offer feasible interventions to a large number of individuals. Since virtually all males at age 19 have to undergo the conscription procedures in Switzerland, the sample well represents the general population of young men in this country. However, the research environment that exists at the army conscription centre also presents some challenges and disadvantages. Military service is not mandatory for females, thus those who choose to enrol are highly selective and were not eligible to be included in our research. Because of the busyness and high activity level present within the centre, this may not be the best place to discover and recruit young men who are highly motivated to actively seek alcohol or drug interventions. There are other obstacles as well. Access to confidential spaces and time slots for our research was often difficult to obtain, and many conscripts who did seek intervention could not be accommodated. Still, this study demonstrates that offering help or brief intervention for this population was a generally well-received idea, and points to the need for somehow making these offers more widely available.

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Table 1. Use of the different BMI strategies within BMI involving heavy episodic users (N=219 BMI) and non-heavy episodic users (N=77 BMI)

	BMI involving heavy episodic users		BMI involving non-heavy episodic users	
Strategies:	Used N (%)	Not used N (%)	Used N (%)	Not used N (%)
a) Opening strategy: lifestyle and alcohol use, alcohol use within a typical day/session	219 (100)	0 (0)	77 (100)	0 (0)
b1) The good things about drinking alcohol / past alcohol experiences	209 (95.4)	10 (4.6)	61 (79.2)	16 (20.8)
b2) The less good things about drinking alcohol / past alcohol experiences	217 (99.1)	2 (0.9)	75 (97.4)	2 (2.6)
c) Evoking a hypothetical change / Evoking the future	203 (92.7)	16 (7.3)	64 (83.2)	13 (16.8)
d) Exploring importance, ability, and confidence to change / to maintain low-risk drinking	52 (23.8)	167 (76.2)	12 (15.6)	65 (84.4)
e) Eliciting commitment to change, identification of an eventual change / Eliciting commitment to maintain low-risk drinking	78 (35.6)	141 (64.4)	14 (18.2)	63 (81.8)

Table 2. Baseline characteristics and baseline to 6-month follow-up differences between BMI and the control group among heavy episodic users

		Baseline			Baseline to 6-month difference		
		BMI group N=219	Control group N=227	p value	BMI group N=192	Control group N=198	p value
Age, mean (SD)		19.9 (1.0)	19.9 (1.0)	0.64 (u)	.	.	.
Education: obligatory school only (vs. further), n (%)		104 (47.5)	129 (57.1)	0.04 (c)	.	.	.
Professional status	- Employed, n (%)	39 (17.8)	48 (21.3)	0.10 (c)	.	.	.
	- In training, n (%)	170 (77.6)	174 (77.3)		.	.	
	- Inactive, n (%)	10 (4.6)	3 (1.3)		.	.	
Living environment: Urban area, n (%)		112 (51.6)	99 (43.8)	0.10 (c)	.	.	.
Drinks per week, mean (SD)		13.2 (12.0)	11.7 (9.9)	0.34 (u)	-0.4 (13.1)	0.7 (19.1)	0.90 (u)
Heavy episodes (6 drinks or more) per month, mean (SD)		4.3 (3.5)	3.8 (3.2)	0.12 (u)	-0.7 (3.2)	-0.8 (3.8)	0.61 (u)
Alcohol-related consequences (12 possible), mean (SD)		3.5 (2.1)	3.4 (2.3)	0.38 (u)	.	.	.
AUDIT score greater or equal to 8 (hazardous drinking), n (%)		174 (79.5)	168 (74.0)	0.17 (c)	.	.	.
AUDIT score greater or equal to 12 (probability of dependence), n (%)		95 (43.4)	95 (41.9)	0.74 (c)	.	.	.
Any family member with alcohol problems, n (%)		42 (19.3)	45 (19.8)	0.88 (c)	.	.	.
Importance to change (VAS 1-10), mean (SD)		2.8 (2.0)	2.9 (2.2)	0.49 (u)	-0.4 (2.0)	-0.6 (2.1)	0.80 (u)
Readiness to change (VAS 1-10), mean (SD)		4.0 (3.0)	3.9 (3.2)	0.50 (u)	0.1 (4.0)	-0.2 (4.2)	0.78 (u)
Confidence to change (VAS 1-10), mean (SD)		7.8 (2.6)	7.6 (3.0)	0.63 (u)	0.5 (2.8)	0.4 (3.3)	0.55 (u)
Daily tobacco use, n (%)		97 (44.3)	94 (41.4)	0.54 (c)	-1 (-0.5)	3 (1.5)	0.51 (m)
Cannabis use once a week or more, n (%)		44 (20.1)	42 (18.5)	0.67 (c)	0 (0.0)	0 (0.0)	1.00 (m)

Notes:
BMI: Brief motivational intervention; SD: standard deviation; AUDIT: alcohol use disorder identification test; VAS: visual analog scale; (u): Mann-Whitney U test; (c): Pearson Chi Square test; (m): two-sample McNemar test of change; NA: not applicable.

Table 3. Regression models testing BMI effectiveness on three main outcomes among heavy episodic users

Outcome	IRR	SE	z	P value	95% CI
Drinks per week	1.01	0.08	0.13	0.90	0.87 - 1.18
Heavy episodes (6 drinks or more) per month	1.06	0.10	0.68	0.50	0.89 - 1.27

Notes:

Negative binomial regressions with follow-up measure as dependent variable, condition as independent variable (control group as reference) and adjusted for the measure at baseline, education, professional status, and living environment. IRR: incidence risk ratio; SE: standard error; CI: confidence interval. N=390.

Table 4. Baseline characteristics and baseline to 6-month follow-up differences between BMI and the control group among non-heavy episodic users

		Baseline			Baseline to 6-month difference		
		BMI group N=77	Control group N=49	p value	BMI group N=70	Control group N=43	p value
Age, mean (SD)		20.1 (1.1)	20.1 (1.3)	0.69 (u)	.	.	.
Education: obligatory school only (vs further), n (%)		39 (50.6)	25 (51.0)	0.97 (c)	.	.	.
Professional status	- Employed, n (%)	12 (15.6)	12 (24.5)	0.08 (c)	.	.	.
	- In training, n (%)	65 (84.4)	35 (71.4)		.	.	
	- Inactive, n (%)	0 (0.0)	2 (4.1)		.	.	
Living environment: Urban area, n (%)		35 (45.5)	24 (49.0)	0.70 (c)	.	.	.
Drinks per week, mean (SD)		2.4 (2.9)	2.4 (2.2)	0.38 (u)	0.4 (3.7)	1.7 (4.2)	0.04 (u)
Heavy episodes (6 drinks or more) per month, mean (SD)		0.0 (0.0)	0.0 (0.0)	NA	0.5 (1.4)	0.4 (1.4)	0.46 (u)
Alcohol-related consequences (12 possible), mean (SD)		1.2 (1.4)	1.4 (1.7)	0.44 (u)	.	.	.
AUDIT score greater or equal to 8 (hazardous drinking), n (%) [a]		6 (7.8)	5 (10.2)	0.64 (c)	.	.	.
AUDIT score greater or equal to 12 (probability of dependence), n (%) [a]		4 (5.2)	0 (0.0)	0.11 (c)	.	.	.
Any family member with alcohol problems, n (%)		9 (11.7)	6 (12.2)	0.93 (c)	.	.	.
Importance to change (VAS 1-10), mean (SD)		2.2 (2.7)	1.6 (1.5)	0.79 (u)	-0.4 (2.0)	-0.3 (1.7)	0.87 (u)
Readiness to change (VAS 1-10), mean (SD)		4.0 (3.8)	2.8 (3.0)	0.06 (u)	0.0 (5.1)	-0.5 (3.8)	0.91 (u)
Confidence to change (VAS 1-10), mean (SD)		8.3 (3.2)	8.2 (2.9)	0.72 (u)	0.2 (3.4)	0.0 (3.2)	0.91 (u)
Daily tobacco use, n (%)		14 (18.2)	13 (26.5)	0.27 (c)	3 (4.3)	4 (9.3)	NA
Cannabis use once a week or more, n (%)		7 (9.1)	4 (8.2)	0.86 (c)	0 (0.0)	0 (0.0)	1.00 (m)

Notes:
BMI: Brief motivational intervention; SD: standard deviation; AUDIT: alcohol use disorder identification test; VAS: visual analog scale; (u): Mann-Whitney U test; (c): Pearson Chi Square test; (m): two-sample McNemar test of change; NA: not applicable.
[a] The AUDIT is framed over the 12 last months, whereas heavy episodic alcohol use was assessed as 'typical' current use. The 11 young men having AUDIT scores greater or equal to 8 and the 4 having scores greater or equal to 12 had points on AUDIT item 2 (number of drinks per drinking day) and items 4 to 12 (alcohol-related consequences). These young men either had consequences during the 12 last months but were not currently drinking heavily anymore, or drank heavily and with consequences but infrequently (less than monthly).

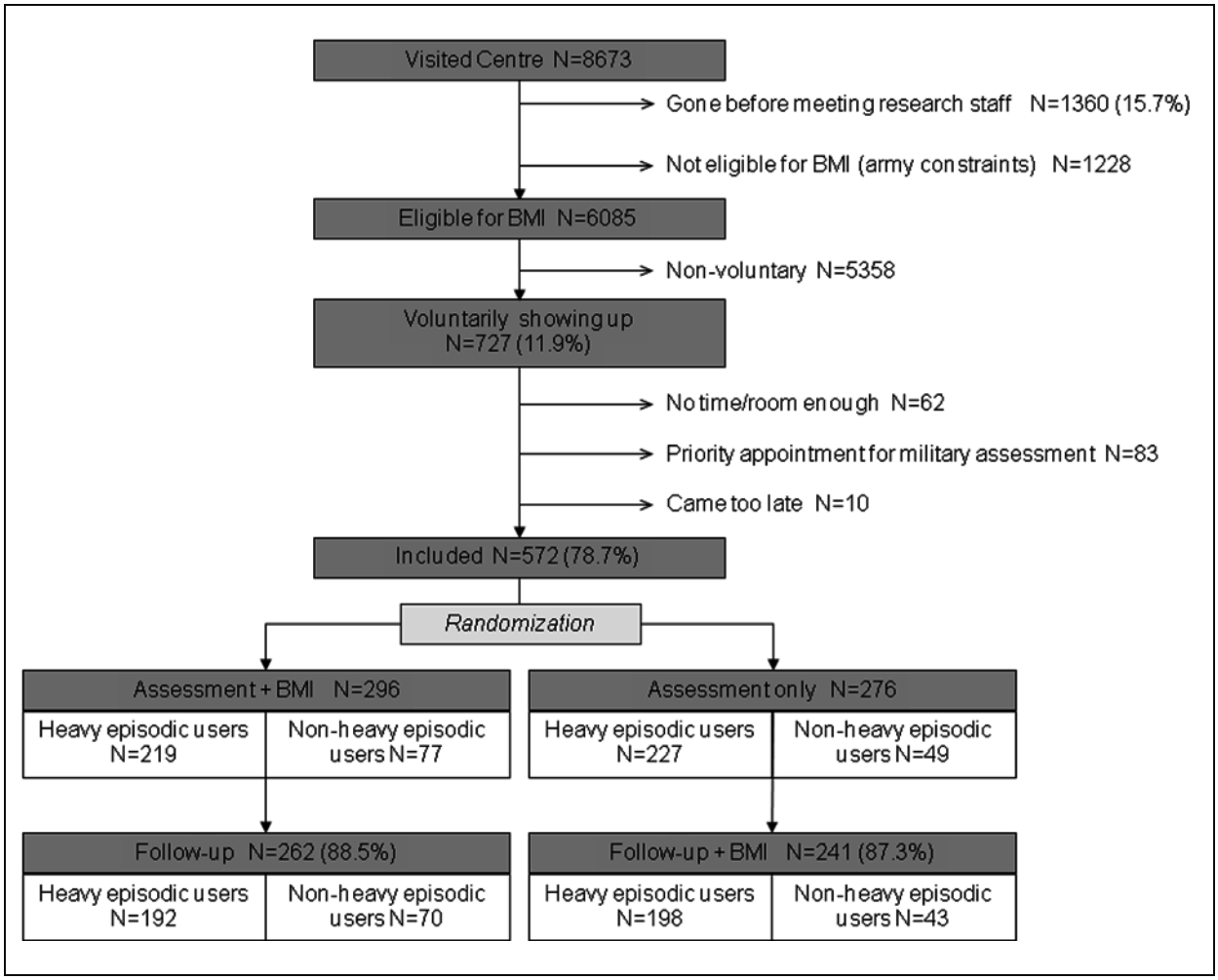
Table 5. Regression models testing BMI effectiveness on three main outcomes among non-heavy episodic users

Outcome	IRR	SE	z	P value	95% CI
Drinks per week	0.67	0.14	-1.97	0.049	0.45 - 1.00
Heavy episodes (6 drinks or more) per month	1.15	0.67	0.25	0.81	0.37 - 3.59

Notes:

Negative binomial regressions with measure at follow-up as dependent variable, condition as independent variable (control group as reference) and adjusted for the measure at baseline, professional status, and readiness to change scale. IRR: incidence risk ratio; SE: standard error; CI: confidence interval. N=113.

Figure 1. Trial flow chart



Notes:

BMI: brief motivational intervention.

Article 4

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Counselor motivational interviewing skills and young adult change talk articulation during brief motivational interventions

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Abstract

The process of eliciting client language toward change (change talk [CT]) is implicated as a causal mechanism in motivational interviewing (MI) and brief motivational interventions (BMI). We investigated the articulation of counselor behaviors and CT during BMI with young men. We coded 149 sessions using the Motivational Interviewing Skill Code and summarized these codes into three counselor categories (MI-consistent [MICO], MI-inconsistent [MIIN], other) and three client categories (CT, counter CT [CCT], follow/neutral [F/N]). We then computed immediate transition frequencies and odds ratios using sequential analysis software. CT was significantly more likely following MICO behaviors, whereas MIIN behaviors only led to CCT and F/N. This strongly supports the use of MI skills to elicit CT during BMI with young men, whose speech also predicted counselor behaviors (particularly CT to MICO and CCT to MIIN). Additional analyses showed that among MICO behaviors, reflective listening may be a particularly powerful technique to elicit CT.

Keywords: Brief motivational interventions; Motivational Interviewing; Change talk; Transition analysis; Young men

1. Introduction

Brief motivational intervention (BMI) is adapted from motivational interviewing (MI; Miller & Rollnick, 2002) and consists of single, 20- to 60-minute sessions. Adolescents and young adults are particularly receptive to motivational methods and can be approached within a wide range of settings (Barnett, Monti, & Wood, 2001; Tevyaw & Monti, 2004). A promising time to address young adult substance use is during army conscription procedures in countries where it is mandatory, such as in Switzerland. Here, virtually all noninstitutionalized men are called for conscription at age 19; assessing this sample could minimize social status bias, sample selectivity, and issues of differential access to intervention.

BMI has great potential among adolescents and young adults because of accepting them as individuals, focusing on avoiding argumentation and hostile confrontation without giving lectures or ultimatums (Tevyaw & Monti, 2004). This intervention style fosters an atmosphere of self-directed change that teachers, parents, and other authority figures have difficulty developing easily. This suggests that the techniques designed to increase *intrinsic* motivation might translate effectively into meaningful behavior change. Research on BMI for young people has shown some promising results (Tevyaw & Monti, 2004; Grenard, Ames, Pentz, & Sussman, 2006; Toumbourou et al., 2007). However, little is known about how it works and which elements of the counselor and youth communication behaviors during the intervention are most effective in triggering behavior changes.

The process of eliciting and shaping client language in favor of change (change talk [CT]) during sessions has been implicated as a causal mechanism in MI (Miller & Rollnick, 2002), and a hypothetical causal chain between therapist MI behaviors, subsequent client CT, and actual behavior change has been postulated (Miller & Rose, 2009; Moyers & Martin, 2006). Some empirical explorations in this domain tend to

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support the assumption of a causal mechanism, both in MI and in BMI. In an early study, Miller, Benefield, and Tonigan (1993) did not observe a beneficial causal path of MI-consistent (MICO) behaviors for change but did see a detrimental path of MI-inconsistent (MIIN) behaviors, that is, a directive–confrontational counseling style created high resistance in clients, which in turn predicted less reduction in drinking 1 year later. More recently, Moyers et al. (2007) observed a more complete chain in two studies. The first showed that CT was more likely after counselor behaviors consistent with MI (MICO), and counter CT (CCT) was more likely after behaviors inconsistent with MI (MIIN); the second demonstrated that CT was found to be a powerful predictor of reduced substance abuse (Moyers et al., 2007). More recently, these authors showed that MICO behaviors predicted client CT and that CT had a direct link to drinking outcomes and was a mediator between therapist behavior and client drinking outcomes (Moyers, Martin, Houck, Christopher, & Tonigan, 2009).

Other studies investigated each part of the causal chain separately and were consistent with these hypotheses: (a) CT is more likely after MICO behaviors (Catley et al., 2006; Moyers & Martin, 2006; Gaume, Gmel, Faouzi, & Daeppen, 2008), and (b) CT predicts better outcomes (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003; Baer et al., 2008; Gaume, Gmel, & Daeppen, 2008; Hodgins, Ching, & McEwen, 2009; Strang & McCambridge, 2004). In the first literature review on mechanisms of change during MI to date, Apodaca and Longabaugh (2009) concluded that despite the small number of published studies and the presence of mixed effect sizes, there was evidence that clients receiving MI were more likely to engage in CT that was predictive of better outcomes. However, none of these studies looked at the link between counselor MI skills and subsequent reactions in adolescents or young adults. Baer et al. (2008) did address CT during BMI with homeless adolescents and actual change. They reported that specific aspects of adolescent speech predicted both negative change (i.e., desire or ability away from change) and positive change (i.e., reasons to change) in substance use.

Among the few studies addressing the in-session link between counselor and client behaviors, major portions of the analyses were undertaken to summarize counselor behaviors into MICO or MIIN behaviors (Gaume, Gmel, Faouzi, et al., 2008; Moyers & Martin, 2006; Moyers et al., 2007). To our knowledge, only two studies went further and investigated which of the counselor behaviors more strongly influenced in-session client behaviors (Catley et al., 2006; Moyers et al., 2009). Interestingly, both studies found that reflections were strongly related to CT. Catley et al. (2006) found that CT was negatively related to giving advice without permission and (surprisingly) positively related to raising concern without permission (MIIN behaviors). In 2009, Moyers et al. found that CT was more likely than expected by chance following questions about both positive and negative aspects of the target behavior and less likely than expected by chance following MIIN behaviors, reflections of CCT, and "other" therapist behaviors. Thus, more evidence is needed to identify which behaviors among the MICO, MIIN, and other counselor behaviors are more likely or are less likely to lead to CT.

Although there is some evidence that counselors might influence interviewee speech during sessions, less is known about counselor reactions to interviewee behaviors. Francis et al. (2005) showed that higher patient resistance probably leads to an increase in confrontation and other negative behaviors among health professionals attempting to promote behavior change. In a previous study (Gaume, Gmel, & Daeppen, 2008; Gaume, Gmel, Faouzi, et al., 2008), we showed that MICO behaviors were more likely after change exploration by the patient, whereas neither MICO nor MIIN, but other counselor behaviors were more likely only after patient utterances not linked with the alcohol topic during BMI alcohol interventions. To our knowledge, no other study has addressed how interviewee speech (particularly CT and CCT) may influence counselor behaviors in a feedback loop. This is an important point. For example, if client CCT leads to counselor MIIN behaviors, which in turn reinforce client CCT, this would advocate for more intensive training of counselors so that they might consistently employ MICO (and avoid MIIN) techniques.

It is therefore of interest to describe counselor and interviewee behaviors and their articulation during BMI. A deeper understanding of this process will help efforts to develop interventions that are more effective on young adults. The primary aim of this study was to address BMI processes by analyzing the articulation of young adult and counselor communication interactions during in a large representative nonclinical setting.

2. Methods

The BMI sessions in this study were from two alcohol BMI randomized controlled trials conducted at the Swiss army recruitment center of Lausanne. The project protocol was approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School (Protocol No. 15/07) and was registered in the International Standard Randomized Controlled Trial Number Register (http://www.controlled-trials.com/ISRCTN78822107).

2.1. Sample and research procedures

Switzerland has a mandatory 2-day army recruitment process for all males at age 19, and virtually all conscripts complete the physical, medical, and cognitive assessments to determine eligibility for service in the Swiss military. Only men are recruited for conscription; women are allowed to join the military service on a voluntary basis but were not included here because of their scarcity and resulting nonrepresentativeness. At all research stages, participants

were reminded that the research staff had no connection with the army and that all information was confidential and had no implications or influence on the recruitment procedures.

Data were from two randomized controlled trials conducted in the Lausanne recruitment center. In the first trial, inclusion relied on inviting unscreened conscripts to benefit from a psychologist-led BMI session focusing on alcohol use. Those who accepted were asked to provide written informed consent, filled out an assessment questionnaire, and were then randomized either to an intervention group (BMI immediately after) or to a control group on a waiting list (BMI after 6-month follow-up). Five hundred seventy-two young men were included; 296 were in the intervention group and received BMI at baseline (see Fig. 1). In the second trial, inclusion relied on an a priori randomization of conscripts between intervention and control groups. Randomized conscripts were asked to provide informed consent, then filled out an assessment questionnaire and received BMI (intervention group), or filled out the questionnaire only. Four hundred eighteen young men were included, of whom 199 were in the intervention group and received BMI. The sessions were all tape-recorded, following participant consent.

In both studies, we offered the participation in BMI to all eligible conscripts and did not select at-risk drinkers based on their screening questionnaires, as in most BMI studies. We did this in order (a) to blind the army personnel from potentially identifying at-risk drinkers receiving BMI and penalizing them in the future and (b) to see whether BMI-type reinforcement of low-risk consumption maintains this level (i.e., primary prevention effect). For the present analysis, however, we used only the recordings from at-risk drinkers due to conceptual concerns when using the CT dimensions of the coding instrument (i.e., low risk drinkers would not have to change but only maintain their alcohol use). Baseline at-risk drinking was defined as more than 21 standard drinks per week or more than 1 instance per month of having more than 5 drinks per occasion. (Each standard drink consisted of 10 g of pure alcohol.)

Among the 264 BMI sessions with at-risk drinkers in both study designs, 149 were recorded successfully and coded (Fig. 1). The 115 remaining sessions were not recorded due to the following reasons: no recorder available (n = 43), refusal to be tape-recorded (n = 41), technical problems (n = 23), incomplete records (n = 7), and BMI mainly focused on other substance use (n = 1). Comparing interviewees with BMI recordings to those without showed no significant differences on sociodemographics, alcohol use, and readiness to change (Table 1).

2.2. Intervention

The proposed BMI intended to reinforce motivation, either to change alcohol use and/or alcohol-related behaviors or to sustain changes already accomplished. This approach is described elsewhere in detail (Seneviratne, Fortini, Gaume, & Daeppen, 2007). Briefly, the intervention was inspired by MI techniques and spirit (Miller & Rollnick, 1991, 2002) and underwent further development and adaptations to use in single, short sessions. McCambridge and Strang (2003) adapted this model for young people using various substances. The intervention in our study was modeled after them but was given in a 20- to 30-minute short version. It involved exploring the use of alcohol and related

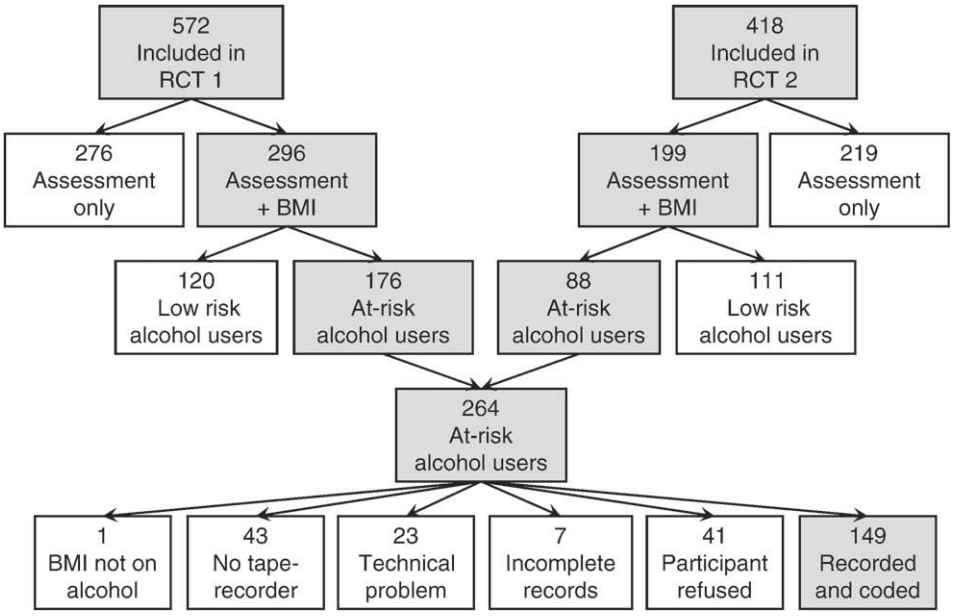

Fig. 1. Coded BMI sessions flowchart. RCT = randomized controlled trial. At-risk alcohol use defined as more than 21 standard drinks (210 g of pure alcohol) per week or more than one episode with 6 standard drinks or more per month.

Table 1
Comparison of baseline sociodemographic and alcohol use data among at-risk young men whose interventions were coded or noncoded

Characteristics	Coded (n = 149)	Noncoded (n = 115)	p
Age, M (SD)	20.0 (0.9)	19.9 (1.0)	.41 (u)
Education: obligatory school level only, n (%)	67 (45.0)	52 (45.2)	.97 (c)
Professional status, n (%)			
Employed	27 (18.1)	20 (17.4)	.93 (c)
In training	118 (79.2)	91 (79.1)	
Inactive	4 (2.7)	4 (3.5)	
Living environment: urban area, n (%)	70 (47.3)	62 (53.9)	.29 (c)
Standard drinks[a] per week, M (SD)	15.8 (13.7)	13.7 (9.9)	.47 (u)
RSOD per month, M (SD)	5.0 (3.3)	5.2 (3.9)	.84 (u)
Alcohol-related consequences experienced during last year (12 possible), M (SD)	3.7 (2.1)	3.6 (2.2)	.86 (u)
AUDIT score ≥8, n (%)	129 (86.6)	99 (86.1)	.91 (c)
Importance to change (VAS 1–10), M (SD)	2.8 (1.9)	3.1 (2.1)	.21 (u)
Readiness to change (VAS 1–10), M (SD)	3.8 (2.9)	3.9 (2.8)	.74 (u)
Confidence to change (VAS 1–10), M (SD)	7.2 (2.8)	7.5 (2.6)	.76 (u)

Note. RSOD = risky single occasion drinking (more than five drinks in 1 occasion); AUDIT = Alcohol Use Disorders Identification Test; VAS = visual analog scale; (u) = Mann–Whitney U test; (c) = Pearson's chi-square test.

[a] One standard drink = 10 g of pure alcohol (e.g., a 100-ml glass of wine, a 250-ml glass of beer, a 25-ml glass of spirits straight or mixed with soft drinks).

hazardous behaviors before focusing on one or more of their aspects. The first aim of this BMI was to introduce a behavior change perspective and talk about it in a nonjudgmental, empathic, and collaborative manner. The hypothesis was that an open discussion with additional reinforcement by a trained counselor about alcohol use and its repercussions on different life areas could heighten the conscript's awareness of the importance to modify this behavior, now or in the future, and lead to successful behavior change.

2.3. Counselors training

Counselors were four master's-level psychologists. Two were involved in both studies, whereas two were in the first (invited young men design) only. All four counselors received the same training in MI and BMI by a senior physician and psychologists experienced in teaching MI and BMI. To guarantee uniformity and good quality of BMI delivery, counselors received weekly individual supervision in which they discussed difficulties and challenges, as well as monthly joint supervision with two senior psychologists throughout the whole project.

Although all counselors had similar backgrounds and received the same training and supervision, preliminary analyses of the present data (not reported herein) showed substantial differences for in-session performance. This lack of uniformity may constitute a potential limitation of the counseling process in general (Gaume, Gmel, Faouzi, & Daeppen, 2009; Project MATCH Research Group, 1998; Najavits & Weiss, 1994; Luborsky et al., 1986; Luborsky, McLellan, Diguer, Woody, & Seligman, 1997) but might not be the case when evaluating counselor behaviors at the utterance level. It is important to note that this study focused on the effect of different, separate behaviors rather than on the overall effect of counselor skills.

2.4. Coding process

Communication behaviors were coded using the MI Skill Code (MISC), version 2.1 (Miller, Moyers, Ernst, & Amrhein, 2008). Details for this process are described in the coding manual (Miller et al., 2008). Briefly, the MISC is composed of global ratings (not used in the present analyses) and behavior counts. Tape recordings were exported to Dartfish Team Pro 4.0 video analysis software (Dartfish, 2006), where content could be parsed and categorized. Recorded utterances were parsed by one coder and categorized by another. Coders went completely through each session but were allowed to stop and replay utterances for clarification.

MISC codes are composed of 19 counselor and 8 interviewee codes. The counselor behaviors are advise with permission, advise without permission, affirm, confront, direct, emphasize control, facilitate, filler (i.e., salutations, pleasantries, and so on), giving information, closed question, open question, raise concern with permission, raise concern without permission, simple reflections, complex reflections, reframe, structure, support, and warn. Interviewee (CT) behaviors are ability or inability to change, commitment to change or not to change, desire to change or not to change, need to change or lack of need for change (or a need not to change), reasons to change or reasons not to change, and taking steps toward or away from change. An "other" category allowed coders to capture language that clearly reflects interviewee movement toward or away from change but does not necessarily fit easily into any CT category (e.g., problem recognition or minimization, and hypothetical language). Each interviewee CT and other utterance is also assigned a strength value ranging from +3 (strong inclination toward change) to −3 (strong inclination away from change). Finally, the so-called follow/neutral (F/N) category allowed coders to characterize interviewee

Table 2
Cross-tabulation of MISC codes summarized into six categories in a random subsample of 31 sessions independently double-coded

			Coder 2						
			Counselor			Interviewee			Total
			MICO	MIIN	Other	CT	CCT	F/N	
Coder 1	Counselor	MICO	1,845	0	105	1	0	1	1,952
		MIIN	4	5	1	0	0	0	10
		Other	133	0	278	1	0	1	413
	Interviewee	CT	0	0	0	924	132	172	1,228
		CCT	1	0	1	76	759	153	990
		F/N	4	0	2	153	137	730	1,026
		Total	1,987	5	387	1,155	1,028	1,057	5,619

Note. Other = other counselor skills.

utterances with no inclination or link with the target behavior change and interviewee questions.

2.5. Coders training

Four master's-level students were trained in using the MISC, then they independently parsed and coded interventions while blinded to assessment and follow-up data. One additional person did only parsing. Training consisted of (a) a short presentation on MI; (b) presentation of the coding instrument; (c) detailed reading of the coding manual; (d) independent, then group coding of training MI sessions precoded by the trainers; (e) quizzes; and (f) independent, then group coding of BMI from another study. Throughout this training, an incremental learning approach was used, starting with simple codes and building up to more complex ones. Each coder received about 60 total hours of training. Discrepancies and challenges were addressed weekly in joint trainer–coder meetings, which lasted throughout the entire coding period.

2.6. Transition analysis

Processing of session data resulted in strings of consecutive codes for each intervention, which were then entered into the sequential analysis software, GSEQ for Windows 4.5 (Bakeman & Quera, 2000). Transition probabilities were calculated based on all "same-type transitions," that is, within four subtables (counselor to interviewee transitions, interviewee to interviewee transitions, interviewee to counselor transitions, and counselor to counselor transitions). For example, the MICO-to-CT transitions were evaluated only among all "counselor to interviewee transitions" but not with respect to all other possible transitions (such as interviewee-to-counselor or interviewee-to-interviewee). Counselor autotransitions were computed for completeness of data tabulation but not used because they fell outside the scope of this study.

Statistical significance to determine whether observed transitions frequencies deviated from expected transition frequencies (under the assumption of statistical independence, i.e., occurred only by chance) was computed using odds ratios (ORs) based on 2 × 2 cross-tabs (initial event present/not present by subsequent event present/not present; Bakeman, Quera, McArthur, & Robinson, 1997). Transitions with or greater than 1 were considered more likely than expected by chance (meaning that on the OR scale, the likelihood is greater to transit to this particular category vs. to some other category), whereas OR smaller than 1 were less likely than expected to occur by chance.

The transition analysis of all codes showed that about 76% of all cells in the matrix had expected frequencies of less than 5, which is the threshold for obtaining reliable estimates of transition probabilities (Wickens, 1982). In light of this, the codes were reduced to three counselor and three interviewee categories (Miller et al., 2008; Moyers, Miller, & Hendrickson, 2005; Moyers & Martin, 2006). Counselor behaviors were summarized into (a) MICO behaviors, recommended in the MI literature (advise with permission, affirm, emphasize control, open question, simple and complex reflections, reframe, and support); (b) MIIN behaviors not recommended (advise without permission, confront, direct, raise concern without permission, and warn); and (c) other counselor behaviors (facilitate, filler, giving information, closed question, raise concern with permission, and structure). Interviewee speech was summarized into (a) CT inclined toward change (+1 to +3 in strength); (b) CCT inclined away from change or toward the status quo (−1 to −3); and (c) F/N, consisting of following and neutral utterances (i.e., not linked with exploration of alcohol topics). The direction (+/−), but not the strength (−3 to +3), was used as final code because separating CT by strength resulted in a matrix containing too many cells having expected frequencies less than 5.

The following dialog illustrates the coding and recoding process:

(1) Client: "I really must do something about my drinking"
(2) Counselor: "You can't stand it any longer"
(3) Client: "Yes, you see, it's embarrassing not to remember what I did"
(4) Counselor: "So, do you want to quit or cut down?"
(5) Client: "Well, I still do enjoy the taste of good wine…"

(6) Counselor: "Yes but even good wine before driving can cause an accident!"
(7) Client: "Cannabis also causes accidents and nobody speaks about it..."

The initial coding would be:
[(1) (Need +3) – (2) (Simple reflection) – (3) (Reason +2) – (4) (Closed question) – (5) (Desire −2) – (6) (Warn) – (7) (Neutral)]

The recodes would then be:
[(1) CT – (2) MICO – (3) CT – (4) Other – (5) CCT – (6) MIIN – (7) F/N]

In a secondary analysis, MICO and other categories were split into subcategories to further investigate which of several counselor behaviors were more likely than expected by chance to be followed by CT, CCT, and F/N. To obtain a transition matrix containing no expected frequencies less than 5 (Wickens, 1982), counselor behaviors were grouped as follows:

- MICO behaviors were split into open questions (QUO), simple reflections (RES), complex reflections (REC), and "other MICO" (oMICO, comprised of affirm, emphasize control, reframe, and support);
- Other counselor behaviors were split into closed questions (QUC) and "other Other" (oOTHER, composed of facilitate, filler, giving information, raise concern with permission, and structure).

MIIN behaviors were retained as a single category.

To consider the aggregation of data from two different trials in this study, we repeated all analyses separately for the data of each trial.

2.7. Interrater reliability

A random subsample of 31 BMI sessions (about 20%) was double-coded to assess interrater reliability. Raters were blinded to whether the session they coded was simple- or double-coded. Because independent raters did parsing a priori, double coding could be done on the same utterances. Cohen's kappa was used to address interrater reliability at the utterance level (pooling all sessions together). For the overall MISC codes, it was 0.63; recoding into six categories resulted in a value of 0.75 (see Table 2). When counselor behaviors were split into seven categories and interviewee

Table 3
Transition analysis

Initial event → subsequent event	Observed frequencies	Conditional probabilities	Expected frequencies	OR	*p*
Counselor-to-interviewee transitions					
MICO → CT	3,227	0.40	3,069.5	1.72	<.001
MICO → F/N	2,733	0.34	2,961.5	0.49	<.001
MICO → CCT	2,035	0.25	1,964.0	1.37	<.001
MIIN → CT	4	0.11	13.8	0.20	<.001
MIIN → F/N	17	0.47	13.3	1.52	.21
MIIN → CCT	15	0.42	8.8	2.20	.02
Other → CT	437	0.29	584.7	0.60	<.001
Other → F/N	789	0.52	564.2	2.06	<.001
Other → CCT	297	0.20	374.1	0.71	<.001
Interviewee-to-counselor transitions					
CT → MICO	3,270	0.87	3,155.9	1.47	<.001
CT → MIIN	8	0.00	17.0	0.35	.005
CT → Other	479	0.13	584.1	0.70	<.001
F/N → MICO	2,571	0.78	2,785.5	0.49	<.001
F/N → MIIN	18	0.01	15.0	1.34	.34
F/N → Other	727	0.22	515.5	2.04	<.001
CCT → MICO	2,129	0.88	2,028.6	1.57	<.001
CCT → MIIN	17	0.01	10.9	1.92	.03
CCT → Other	269	0.11	375.4	0.61	<.001
Interviewee autotransitions					
CT → CT	2,148	0.64	1,341.4	5.41	<.001
CT → F/N	460	0.14	882.1	0.31	<.001
CT → CCT	754	0.22	1,138.5	0.41	<.001
F/N → CT	560	0.23	968.7	0.35	<.001
F/N → F/N	1,376	0.57	637.0	7.80	<.001
F/N → CCT	492	0.20	822.2	0.40	<.001
CCT → CT	744	0.26	1,141.9	0.40	<.001
CCT → F/N	434	0.15	750.9	0.39	<.001
CCT → CCT	1,684	0.59	969.2	5.21	<.001

Note. Other = other counselor behaviors.

Table 4
Detailed counselor skills to interviewee language transition analysis

Initial event → subsequent event	Observed frequencies	Conditional probabilities	Expected frequencies	OR	*p*
MICO					
QUO → CT	1,027	0.35	1,114.9	0.83	<.001
QUO → F/N	1,150	0.40	1,075.7	1.17	<.001
QUO → CCT	727	0.25	713.4	1.04	.48
RES → CT	1,650	0.43	1,457.4	1.43	<.001
RES → F/N	1,104	0.29	1,406.1	0.56	<.001
RES → CCT	1,042	0.27	932.5	1.29	<.001
REC → CT	427	0.50	325.2	1.72	<.001
REC → F/N	174	0.21	313.8	0.41	<.001
REC → CCT	246	0.29	208.1	1.29	.002
oMICO → CT	123	0.27	172.0	0.59	<.001
oMICO → F/N	305	0.68	166.0	3.87	<.001
oMICO → CCT	20	0.04	110.1	0.14	<.001
MIIN					
MIIN → CT	4	0.11	13.8	0.20	<.001
MIIN → F/N	17	0.47	13.3	1.52	.21
MIIN → CCT	15	0.42	8.8	2.20	.02
Other					
QUC → CT	297	0.31	365.9	0.70	<.001
QUC → F/N	480	0.50	353.0	1.84	<.001
QUC → CCT	176	0.18	234.1	0.67	<.001
oOTHER → CT	140	0.25	218.8	0.50	<.001
oOTHER → F/N	309	0.54	211.1	2.11	<.001
oOTHER → CCT	121	0.21	140.0	0.82	.06

language was kept at three categories (see above), Cohen's kappa was 0.72. These three values indicate substantial reliability between raters with respect to codes attributed to each utterance overall (Landis & Koch, 1977).

We then assessed interrater reliability for each code individually using intraclass correlations (ICC). Results for the coding into six categories indicated good to excellent reliability according to Cicchetti's ICC categorization (Cicchetti, 1994; MICO: 0.96, MIIN: 0.79, other: 0.80, CT: 0.66, F/N: 0.73, and CCT: 0.79). For our secondary analysis, splitting counselor behaviors in seven categories and keeping interviewee language in three categories, interrater reliability was good to excellent, except for REC, for which ICC was still fair (QUO: 0.98, RES: 0.85, REC: 0.43, oMICO: 0.91, QUC: 0.70, oOTHER: 0.89). The ICC for MIIN, CT, F/N, and CCT were the same as reported above).

Coding reserved for analyses was randomly selected from each available double-coded BMI.

3. Results

The complete transition matrix consisted of 29,590 transitions from 149 BMI sessions. There were 9,554 counselor-to-interviewee transitions, 9488 interviewee-to-counselor transitions, 8652 interviewee autotransitions, and 1896 counselor autotransitions (not analyzed further). There were very few transitions involving MIIN behaviors, but these codes were kept in the analyses because they were of primary interest. Each kind of transition is statistically evaluated below.

3.1. Counselor-to-Interviewee transitions

As shown in Table 3, MICO behaviors were significantly more likely to be followed by change exploration, either toward (CT) or away (CCT) from change, and significantly less likely to be followed by F/N. MIIN behaviors were significantly more likely to be followed by CCT and significantly less likely to be followed by CT. Other counselor behaviors were significantly more likely to be followed by F/N and significantly less likely to be followed by CT or CCT. MICO behaviors were thus the only type of counselor behaviors that led to CT by interviewees.

3.2. Interviewee-to-Counselor transitions

When interviewees made CT statements, counselors were significantly more likely to follow with MICO behaviors and significantly less likely to follow with MIIN or other behaviors. CCT significantly more often transitioned to MICO or MIIN and significantly less often to other counselor behaviors. F/N transitioned to other counselor behaviors more often and less often to MICO behaviors. Counselors followed with MICO behaviors more often after either type of change talk exploration (CT or CCT), but not after F/N. MIIN behaviors were more likely only after CCT.

3.3. Interviewee auto-transitions

Consecutive utterances made by an interviewee were significantly more likely to be of the same type, that is, CT

transitioned to CT, CCT to CCT, and F/N to F/N. All other transitions were significantly less likely than expected by chance, indicating that interviewees more often than not continue with the same type of utterance.

3.4. Detailed counselor behaviors to interviewee language transition analysis

RES and REC were the only counselor behaviors that were significantly more likely than expected by chance to be followed by CT (Table 4). Both behaviors were also significantly more likely to be followed by CCT but significantly less likely by F/N. Surprisingly, QUO and oMICO behaviors were significantly less likely to be followed by CT and more likely by F/N.

When other counselor behaviors were split into QUC and oOTHER behaviors, both subcategories were significantly less likely to be followed by CT and significantly more likely to be followed by F/N. QUC were also significantly less likely to lead to CCT.

Because of their scarcity, MIIN behaviors were not split; thus, these results are the same as presented in Section 3.1 above.

3.5. Separate analysis for data of each of both primary trials

To justify the aggregation of data from two different trials in this study, we repeated all analyses separately on the data from each trial. Results were all similar, except for a minor loss of significance due to the corresponding decrease in sample sizes.

4. Discussion

We analyzed the articulation of counselor and young adult communication behaviors during BMI to evaluate and understand the process in a large representative nonclinical setting. Consistent with the hypothetical causal mechanism developed in MI theory (Miller & Rollnick, 2002; Miller & Rose, 2009; Moyers et al., 2007), MICO behaviors were more likely than expected by chance to be followed by change talk exploration. Conversely, MIIN behaviors were significantly more likely to lead to CCT or F/N. These transitions are important because interviewee utterances were more likely to be followed with a similar utterance (i.e., CT to CT, CCT to CCT, and F/N to F/N) and are probably self-reinforcing. The speech of young men may be influential on eliciting (desired) counselor responses, especially because counselor MICO behaviors were more likely to follow client CT. Similarly, (less desired) MIIN behaviors by counselors were more likely after client CCT.

This findings are concordant with several previous studies (Catley et al., 2006; Gaume, Gmel, & Daeppen, 2008, Gaume, Gmel, Faouzi, et al., 2008; Moyers & Martin, 2006); Moyers et al., 2009) and add to the strong emerging evidence that recommends the use of MI behaviors when trying to promote interviewee speech toward change. Also concordant with previous research (Catley et al., 2006; Moyers et al., 2009) is the finding that reflections are strongly related to CT. The sequential nature of the present data, as well as that of Moyers et al. (2009), suggests that reflective listening might be a powerful skill, which is useful in eliciting CT.

QUO and oMICO behaviors were less likely to be followed by CT and CCT and more likely to be followed by F/N in our study. According to MI theory and literature, it is hypothesized that these behaviors should lead to CT. However, when considering QUO, one can also hypothesize that asking QUO might lead either to general considerations about alcohol or to factual information (both coded as F/N), or to CT or CCT. In our study, counselors started the discussion with young men who were not seeking help; therefore, the first part of the discussion might have revolved around general considerations before focusing (using reflections rather than questions) on more critical points related to alcohol use raised by the interviewee. If this hypothesis were to be confirmed by future research, a potential implication for MI counselors and trainers would be to focus not only on using QUO, as apposed to QUC, but also on using *CT-oriented* versus *general* QUO. Regarding oMICO behaviors, our coding process might limit our findings. Indeed, there were very few (892 of 11,533, averaging 6 per session) oMICO counselor behaviors, and most of them were counselor affirmations of the interviewee (835 in total, averaging 5.6 per session). For example, in the MISC 2.1, a counselor thanking an interviewee for coming is compiled in the affirm category. Most of our counselors thanked the interviewee for coming and for participating (at least once in the beginning and once at the end of the session). About half of those behaviors were likely to be followed by neutral statements, such as "You're welcome." The rest of those codes have been used to categorize the counselors affirming or reinforcing interviewee statements in favor of change or steps already taken and were expected to be followed by more CT. Our failure to show this transition pattern might reflect the complexity of using this skill effectively or might suggest that affirming is actually perceived as reinforcement, but does not result in more CT. The latter hypothesis might be supported by the findings of Moyers et al. (2009), who showed similar transitions from oMICO to F/N, despite the fact that very experienced and well-trained counselors conducted their motivational enhancement therapy sessions.

Although the beneficial role of MICO behaviors in general (and of reflections in particular) in effecting change is encouraging, findings regarding MIIN behaviors are more equivocal. Concordant with Moyers and Martin (2006), we found in this study that MIIN behaviors were significantly more likely than expected by chance to be followed by CCT. In a prior, similar BMI study in an emergency department (ED), we found that MIIN behaviors were significantly more

likely to be followed only by F/N, and not by CCT statements (Gaume, Gmel, & Daeppen, 2008, Gaume, Gmel, Faouzi, et al., 2008). In the discussion of speech transitions in that study, we argued that this difference might be attributed to the modalities of the intervention, which influenced the nature of interviewee *nondesired* behaviors. In MI sessions, CCT might be viewed as a nondesired behavior because MI aims to elicit CT while avoiding CCT. The BMI in the ED focused largely on exploring the pros and cons of alcohol consumption. Statements not related to alcohol exploration (i.e., F/N) can be viewed as exploration avoidance, hence a nondesired behavior, whereas CCT might not necessarily represent negative or resisting behavior but rather an active self-exploration of drinking pros and cons. Interestingly, the intervention in this study was developed with an emphasis on eliciting CT. Elaboration of the benefits and liabilities of alcohol consumption was only one of several strategies use to initiate CT. Thus, the stronger focus on eliciting CT in this study compared to the stronger focus on pros and cons elaboration in the ED study may explain why, in the present study, the expected MI link (MIIN leading to CTT) was also found.

Looking at interviewee-to-counselor transitions, MICO behaviors more often followed change explorations, both CT and CCT, but not F/N. MIIN behaviors were used more often after CCT, but not CT. Even if our study design does not allow any conclusions about causation, these transitions highlight the apparent influence that speech behaviors of young men have on counselor reaction. Viewing CCT as a nondesired behavior, the present findings indicate that this attitude might *provoke* counselors into using MIIN behaviors, as previously observed by others (Francis et al., 2005; Gaume, Gmel, Faouzi, et al., 2008). This phenomenon may create a negative feedback loop of MIIN behaviors, perpetuating more CCT. An important implication of this study is that counselors should receive MI training that equips them with skills that can help them avoid using MIIN behaviors when confronted with client nondesired behaviors.

This study has multiple strengths. Data were gathered from a large representative sample of young men, all at a critical age for receiving alcohol counseling within a modality that can encourage positive motivation to alter their drinking habits. A large number of sessions (149) were available for coding, which yielded more than 29,000 observed transitions for analysis and interpretation. However, there were also several weaknesses of the research. First, it was not possible to code all of the sessions conducted due to interviewee refusal, technical problems, and equipment unavailability. We were able to demonstrate the lack of differences between coded and noncoded interventions on sociodemographic and alcohol data (countering potential selection bias somewhat), although it could still be present in some underlying, unmeasured context. Second, there were very few observed transitions involving MIIN behaviors. Although there were enough to detect significant transition likelihoods, this underrepresentation limits making definitive conclusions about these transitions. Further studies should incorporate sessions led by counselors not trained in MI or optimally experimentally manipulate counselor behaviors by purposely increasing MIIN behaviors to warrant stronger conclusions. Third, although we had a very large and comprehensive sample, they were all French-speaking Swiss young men, so our results might not generalize to women or to other young men in this or other cultures. Finally, preliminary analyses not reported in the present article show substantial differences between the in-session performances of the four counselors, despite having similar backgrounds and having the same training and supervision. As already mentioned in our introduction, this lack of uniformity may constitute a limitation when analyzing the counseling process (Gaume et al., 2009; Luborsky et al., 1986, 1997; Najavits & Weiss, 1994; Project MATCH Research Group, 1998), even when the focus of our research was on the effects of different, separate behaviors rather than on overall counselor skills.

Nevertheless, the present findings lend strong support for the use of MICO behaviors (particularly reflections) and the avoidance of MIIN behaviors to elicit CT during BMI with young men who are at-risk alcohol consumers. CT is viewed as an important predictor of actual behavior change, so these findings highlight the usefulness of MI skills in enhancing this change. On the other hand, findings show that interviewee behaviors also may influence counselor behavior; this is sometimes undesirable, particularly when an interviewee is resistant to counseling. In this vein, MIIN behaviors can lead to further CCT and result in lack of actual behavioral change. It seems especially important to furnish counselors with intensive MICO skills training, which could be quite effective, even in settings where clients are not very receptive to change. Further, it would be helpful to confirm the hypothesis that CT is a consistent predictor of actual behavioral change in young men. The findings herein should be replicated, within other settings and populations. Even with the above reservations, this study has documented and analyzed a large number of transitions articulated in a nonclinical, population-based application of brief MI in young men and is thus a solid first step toward demonstrating the usefulness of MICO behaviors in general, and of reflections in particular.

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Article 5

Gaume J, Bertholet N, Faouzi M, Gmel G, Daeppen JB (in preparation for submission) Does change talk during brief motivational interventions with young men predict change in alcohol use?

Does change talk during brief motivational interventions with young men predict change in alcohol use?

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Abstract

Background

Client change talk (CT) during motivational interviewing (MI) and brief motivational interventions (BMI) have been described as predictors of behavior change, but these links have not been clearly evaluated in research on young people. Furthermore, various ways of categorizing and measuring CT have been proposed in the literature, but have never been compared or tested.

Objective

To test which of several CT dimensions measured during BMI with 20-year-old men are predictive of change in alcohol use.

Methods

We coded 127 BMI using the Motivational Interviewing Skill Code 2.1. Each CT utterance was categorized as Reason, Ability, Desire, Need, Commitment, Taking steps or Other, and was given a strength rating ranging from -3 (strongly away from change) to +3 (strongly towards change). Ability, Desire, and Need were grouped together afterwards since these codes were too scarce to conduct analyses. The frequency and average strength of each CT sub-dimension and summary categories (e.g. overall talk toward change, or CT, and overall talk away from change, or CCT) were computed. The exact length in seconds for each CT dimension was recorded. Each variable of interest, adjusted for alcohol use at baseline, was used in negative binomial regression models to predict alcohol use (number of standard drinks per week) at 6-month follow-up. Stepwise regression procedures were employed to find the best predictors.

Results

Overall CT and CCT were not significantly related to changes in drinking. However, the frequency of Ability/Desire/Need to change and of Ability/Desire/Need not to change independently predicted significant change in the expected direction (Incidence rate ratio [IRR]=0.91, p=0.05, and IRR=1.07, p=0.01, respectively). The average strength of Ability/Desire/Need was also a robust predictor of change (IRR=0.84, p=0.001), while CT dimension length was not significantly linked to outcome.

Discussion

As expected in the MI literature, some dimensions of CT were associated with better drinking outcome in young men. The frequency and strength with which ability, desire, and need to change (or not to change) are expressed during BMI seemed to be important predictors of drinking (either of change or of status quo) among young men. CT speech might thus be especially important for clinicians to notice.

Introduction

Brief Motivational Intervention (BMI) is adapted from Motivational Interviewing (MI) (Miller & Rollnick, 2002) and consists of single, 20-60 minute sessions. BMI has great potential among adolescents and young adults because of accepting them as individuals, focusing on avoiding argumentation and hostile confrontation without giving lectures or ultimatums (Tevyaw & Monti, 2004). This suggests that the techniques designed to increase intrinsic motivation might translate effectively into meaningful behavior change. Research on BMI for young people has shown some promising results (Grenard, Ames, Pentz, & Sussman, 2006; Tevyaw & Monti, 2004; Toumbourou et al., 2007). However, little is known about how it works, or which elements of the counselor and youth communication during the intervention are most effective in triggering behavior changes.

The process of eliciting and shaping client language in favor of change (i.e. change talk, or CT) during sessions has been implicated as a causal mechanism in MI (Miller & Rollnick, 2002). A hypothetical causal chain between therapist MI behaviors, subsequent client CT and actual behavior change has been postulated (Miller & Rose, 2009; Moyers & Martin, 2006). Some empirical explorations in this domain tend to support the assumption of a causal mechanism, both in MI and in BMI. Moyers and colleagues observed this complete chain in two studies (Moyers et al., 2007; Moyers, Martin, Houck, Christopher, & Tonigan, 2009). The first (Moyers et al., 2007) showed that CT was more likely after counselor behaviors consistent with MI (MICO), and counter-CT (CCT) was more likely following behaviors inconsistent with MI (MIIN), and demonstrated that CT is a powerful predictor of reduced substance abuse. The second (Moyers et al., 2009) showed that MICO behaviors predicted client CT, and that CT had a direct link to drinking outcome and mediated therapist behavior and client drinking outcome. Other studies investigated each part of the causal chain separately and were consistent with the hypotheses that: 1) CT is more likely after MICO behaviors (Catley et al., 2006; Gaume, Gmel, Faouzi, & Daeppen, 2008; Moyers & Martin, 2006); and 2) that CT predicts favorable outcomes (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003; Baer et al., 2008; Bertholet, Faouzi, Gmel, Gaume, & Daeppen, 2010; Gaume, Gmel, & Daeppen, 2008; Hodgins, Ching, & McEwen, 2009; Strang & McCambridge, 2004). Among those studies, only one assessed the link between CT and outcome in adolescents or young adults. Baer et al., (2008) observed CT during BMI with homeless adolescents and found that some dimensions of CT predicted actual change in substance use in the expected direction.

In a first study using the same data collection as herein, the articulation of counselor and 20-year-old men communication behaviors during an alcohol BMI was investigated, in order to evaluate this process in a large representative non-clinical setting (Gaume, Bertholet, Faouzi, Gmel, & Daeppen, 2010). Consistent with the first part of the hypothetical causal chain developed under MI theory, MICO behaviors were more likely than expected by chance to be followed by CT. Conversely, MIIN behaviors were significantly more likely to lead to CCT or to following or neutral utterances (FN) not linked to change exploration. We also

showed that utterances by young men were more likely to be followed with similar utterances (i.e. CT to CT, CCT to CCT, and FN to FN) and thus were probably self-reinforcing. The next step was to investigate the second part of the hypothetical causal chain by testing whether CT predicts any actual change in the alcohol use of young men.

Of further interest is the way CT is categorized and measured and the potentially differential link to intervention outcome. In studies investigating the links between CT and outcome, several ways of characterizing CT were used. In two papers, Moyers and colleagues (Moyers et al., 2007; Moyers et al., 2009) counted the frequency of all utterances toward change (overall CT), away from change (overall CCT), or not linked to change (or Follow/Neutral (FN) statements). Strang and McCambridge (Strang & McCambridge, 2004) also used a global construct of CT, assessed with a 4-point scale summarizing the entire session. Amrhein and colleagues (Amrhein et al., 2003) categorized each utterance of CT on several sub-dimensions (Ability, Commitment, Desire, Need, Readiness, and Reasons to change or not to change) and assigned a strength value ranging from -5 (strongly against change) to +5 (strongly toward change). Frequencies of CT sub-dimensions were not linked to outcome, whereas the average strength of Commitment to change was. Gaume and colleagues (Gaume et al., 2008) used comparable measures (except for dropping the Readiness category and adding the Taking steps category) and found that the averaged strength of Ability to change was a predictor of BMI outcomes. Hodgins and colleagues (Hodgins et al., 2009) used the same CT sub-dimensions with the addition of Readiness as in Amrhein and colleagues, but used a strength scale from -2 to +2. They found that the frequency of positive Commitment (+1 and +2) weighted by its strength was a predictor of favorable gambling outcomes. Baer and colleagues (Baer et al., 2008) used Commitment, Reasons, and Ability/Desire together with its valence (toward vs. away from change). The frequency of Ability/Desire away from change predicted negative change and Reasons toward change predicted positive change. Bertholet and colleagues (Bertholet et al., 2010) used a (-5 to +5) scale but summarized all CT sub-dimensions in two global constructs (CT and CCT) to investigate the dynamic process within BMI sessions. They found that subjects with an attitude towards change at the end of the BMI drank significantly less at follow-up than did subjects with an attitude away from change, independent of attitude at the beginning of the intervention.

In the present paper, several ways of categorizing and measuring CT and its sub-dimensions were explored and tested as predictors of change in alcohol use at 6-months follow-up among 20-year-old men in a large, representative sample who received a single BMI session in a non-clinical setting.

Methods

The sample and the coding process are described in detail in another publication (Gaume et al., 2010).The BMI sessions herein are from two alcohol BMI randomized controlled trials conducted at the Swiss Army Recruitment Centre of Lausanne (Daeppen et al., 2010; Gaume, Gmel, Faouzi, Bertholet, & Daeppen, 2011), as approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School.

Sample and research procedures

Switzerland has a two-day army recruitment process mandatory for all males at age 19, and virtually all conscripts complete the physical, medical and cognitive assessments to determine eligibility for service in the Swiss military. Only men are recruited for conscription; women are allowed to join the military service on a voluntary basis but were not included here because of their scarcity and resulting non-representativeness. At all research stages, participants were reminded that the research staff had no connection with the army and that all information was confidential and had no implications or influence on the recruitment procedures.

Data are from two randomized controlled trials conducted at the Lausanne recruitment centre. In the first trial (Gaume et al., 2011), inclusion relied on inviting unscreened conscripts to benefit from a psychologist-led BMI session focusing on alcohol use; 302 of them were in the intervention group and received BMI at baseline (see Figure 1). In the second trial (Daeppen et al., 2010), inclusion relied on an *a priori* randomization of conscripts into an intervention or a control group; 193 of them were in the intervention group and received BMI. The sessions were all tape-recorded, following participant consent.

>> Insert Figure 1 about here <<

In both studies, participation in BMI was offered to all eligible conscripts instead of selecting at-risk drinkers based on their screening questionnaires. This was done in order to blind the army personnel from potentially identifying at-risk drinkers receiving BMI and to shield them from being penalized in the future, and to see whether BMI-type reinforcement of low-risk drinking (i.e. primary prevention effect) helps individuals maintain this level. For the present analysis, however, we used only the recordings from at-risk drinkers due to conceptual concerns when using the CT dimensions of the coding instrument (i.e. low risk drinkers would not have to change but only maintain their alcohol use). Baseline at-risk drinking was defined as more than 21 standard drinks (i.e. 210 grams of pure alcohol) per week, or more than 1 instance per month of having more than five drinks per occasion.

From the 264 BMI sessions with at-risk drinkers in both study designs, 149 were recorded successfully and coded (Figure 1). Comparing interviewees with BMI recordings to those without showed no significant

differences on socio-demographics, alcohol use, or readiness to change. Of the 149 interviewees with recorded sessions, 127 were successfully followed-up 6 months after baseline and had complete data for the present study.

Intervention

The proposed BMI was intended to reinforce motivation, either to change alcohol use and/or alcohol-related behaviors or to sustain changes already accomplished. This approach is described elsewhere in detail in the parent publications (Daeppen et al., 2010; Gaume et al., 2011). Briefly, the intervention was inspired by MI techniques and spirit (Miller & Rollnick, 1991; Miller & Rollnick, 2002) and underwent further development and adaptations for use in single, short sessions. McCambridge and Strang (McCambridge & Strang, 2003) adapted this framework for young people using various substances. The intervention in our study was modeled after this, but was reduced to a 20-30 minute short version and involved exploring the use of alcohol and related hazardous behaviors, before focusing on one or more of those aspects. The primary aim of our BMI was to introduce a behavior change perspective and discuss it in a non-judgmental, empathic and collaborative manner. The hypothesis was that an open discussion and additional reinforcement by a trained counselor concerning alcohol use and its repercussions on different life areas could heighten the conscript's awareness of the importance to modify this behavior, now or in the future, and lead to successful behavior change. A particular focus of our intervention model was on eliciting CT.

Coding process

Communication behaviors were coded using the Motivational Interviewing Skill Code (MISC), version 2.1 (Miller, Moyers, Ernst, & Amrhein, 2008). Details for this process are described in the coding manual (Miller et al., 2008). Briefly, the MISC is comprised of global ratings (not used in the present analyses) and behavior counts. Tape-recordings were exported to Dartfish Team Pro 4.0 video analysis software (Dartfish, 2006), where recorded utterances could be parsed by one coder and categorized by another. Our coders went completely through each session, but were allowed to stop and replay utterances for clarification.

MISC codes are comprised of 19 counselor and eight interviewee codes. The counselor behaviors were not used in the present study. Interviewee (CT) behaviors were: Reasons to change or reasons not to change; Ability or inability to change; Desire to change or not to change; Need to change or need not to change; Commitment to change or not to change; and Taking steps toward or away from change. An "Other" category allowed coders to capture language that clearly reflects interviewee movement toward or away from change but does not necessarily fit easily into any change talk category (e.g. problem recognition or minimization and hypothetical language). Each interviewee CT utterance was also assigned a strength value ranging from +3 (strong inclination toward change) to –3 (strong inclination away from

change). Finally, the so-called Follow/Neutral (FN) category allowed coders to characterize interviewee utterances with no inclination or link to the target behavior change and interviewee questions.

Four master-level students were trained in using the MISC and then independently parsed and coded interventions while blinded to assessment and follow-up data. An additional person did only parsing. Each coder received a total of about 60 hours of training. Discrepancies and challenges were addressed weekly in joint trainer-coder meetings that lasted throughout the entire coding period.

Variables of interest

Various ways of measuring CT are reported in the MI literature. In the present study, the Dartfish analysis software allowed us to obtain a matrix of 18,206 interviewee utterances with their codes, strengths and exact lengths (recorded in milliseconds and further converted to seconds). For each session, we could thus compute a large set of variables of interest to test several ways of categorizing and measuring CT as predictors of change.

First, the frequency of overall CT, CCT, and FN in three categories was computed. Overall CT frequency was described as all codes given a positive strength (+1 to +3), overall CCT frequency as all codes given a negative strength (-1 to -3), and FN frequency as the original FN code (not linked with alcohol exploration). Then, the frequency of each sub-dimension of CT proposed in the MISC 2.1 (e.g. Reason to change, Reason not to change, Commitment to change, Commitment not to change, etc.) was calculated. To do this, the utterance code and its valence (+/-) were kept, but not the strength.

Second, the average strength over the session was computed on the -3 to +3 scale, first for overall CT, then for each sub-dimension of CT. Third, total length of overall CT, CCT and FN, as well as of each sub-dimension of CT, was computed by summing the length in seconds over the session for each category.

Finally, in order to conduct exploratory analyses, the frequency and total length for each sub-dimension of CT was combined with its strength (e.g. Reason+1, Reason+2, Reason+3, Reason-1, Reason-2, Reason-3, Commitment+1, Commitment+2, Commitment+3, etc.). The underlying hypotheses of these analyses were that different levels of strength might express different meanings, and that these differences might be hidden when averaging strength over a session or taking only the frequencies of each code.

Inter-rater reliability

A random subsample of 31 BMI sessions (about 20%) was double-coded to assess inter-rater reliability (IR). Raters were blinded to whether the session they rated was simple- or double-coded. Coding reserved for analyses was randomly selected from each available double-coded BMI.

Since independent raters did parsing a priori, double coding could be done on the same utterances. Cohen's Kappa was used to address IR at the utterance level (i.e. pooling all sessions together). For interviewee codes summarized in overall CT, overall CCT, and FN categories, Kappa was 0.62, indicating substantial reliability, according to Landis & Koch (1971). For all interviewee codes with signs (e.g. Reason+, Reason-, Commitment+, Commitment-, etc.), Kappa was 0.49, indicating moderate reliability. For CT strength (all CT sub-dimensions pooled together using the -3 to +3 scale only), a weighted kappa was used, since strength is ordered. This kappa was 0.61, showing substantial reliability.

IR for each individual code was assessed using intra-class correlations (ICC); the results were interpreted according to the Cicchetti (1994) categorization. For the frequency of interviewee codes summarized in three categories, IR was good (FN: 0.73) to excellent for overall CT (0.76) and CCT (0.82). Averaged strength of CT overall was fair (0.55). For separate CT sub-dimension frequencies, IR was fair to excellent for those that occurred often (Reason+, 0.67; Other+, 0.43; Reason-, 0.78; Desire-, 0.70; and Other-, 0.59), but was poor for less frequent codes (Ability+, 0.00; Desire+, 0.08; Need+, 0.00; Commitment+, 0.30; Ability-, -0.03; Need-, -0.05; and Taking steps-, -0.05). This was due to the small sample (N=31) of double-coded sessions, where less frequent codes were distributed sparsely and thus had poor reliability. Taking steps+ and Commitment- were exceptions, since they were rarely used but reliably coded (0.49 and 0.70, respectively). Similar patterns were found for averaged CT strength (Reason, 0.77; Ability, -0.83; Desire, 0.37; Need, 0.00; Commitment, 0.46; Taking steps, 0.05, and Other, 0.42).

In light of the exploratory nature of the present study and since IR at the utterance level was good, we decided to keep variables with poor IR in the analyses. Nevertheless, we grouped Ability, Desire, and Need in a same dimension since they are similar in nature and are sub-categories of Reason in MISC (2.1). ICC for Ability/Desire/Need– was good (0.71), but remained poor for Ability/Desire/Need+ (0.00), and was fair for Ability/Desire/Need averaged strength (0.49).

Statistical analysis

Descriptive statistics for all variables of interest were computed to explore interviewee speech within the 127 sessions coded for this study. Then, all variables were introduced separately as independent variables in negative binomial regressions predicting alcohol use at 6 months, adjusted for alcohol use at baseline and trial design, in order to consider the aggregation of data from two different trials, as in the present study. These models were chosen because they were used in the parent studies (Daeppen et al., 2010; Gaume et al., 2011), where they performed better than other models on our counts, according to the *countfit* procedure in Stata 10 (StataCorp, 2007). Alcohol use at baseline and at 6-months was defined as typical weekly alcohol drinking (10-grams pure alcohol per standard drink), measured by multiplying the first two questions (frequency x quantity) of the Quick Drinking Screen (Sobell et al., 2003).

Due to the large number of tests evaluated in this univariate approach, stepwise multivariate regression procedures were used to retain only the more robust predictors. All variables having values of $p < 0.10$ in the univariate models were introduced as independent variables in the multivariate negative binomial regressions predicting alcohol use at 6-months follow-up, and adjusted for alcohol use at baseline and trial design. Stepwise forward entry (i.e. introducing the variable with the smallest p, then the second smallest, etc., and excluding variables with p greater than 0.10 from the model) was used. In the final model, we further excluded all variables having p values greater than 0.05 in order to keep only those reaching standard alpha levels. To confirm these results, we repeated all analyses using stepwise backward entry (i.e. introducing all variables simultaneously, then excluding those with $p >0.10$ by dropping the variable with the highest p first, then the second highest, etc., until the final model keeps only those variables having $p <0.05$). These regressions were conducted separately for each CT categorization and measurement (i.e. overall CT, CCT, and FN frequencies; all CT sub-dimensions frequencies; all CT sub-dimensions averaged strength; overall CT, CCT, and FN length; and all CT sub-dimensions length).

The same sequence (i.e. univariate adjusted negative binomial regressions, then stepwise multivariate models) was repeated using frequency and total length for each sub-dimension of CT combined with its strength (e.g. Reason+1, Reason+2, Reason+3, Reason-1, Reason-2, Reason-3, Commitment+1, Commitment+2, Commitment+3, etc.) as further exploratory analyses.

In order to confirm that our results captured the effects of CT during the BMI session and were not a confound of pre-existing readiness to change, we ran all final multivariate models again by adjusting for importance to change, readiness to change, and confidence to change that was measured on visual analog (1-10) scales in baseline assessment questionnaires filled out before the BMI.

Results

Descriptive statistics

Descriptive statistics are reported in Table 1. Overall, young men expressed CT longer (length) and more often (frequency) than they did FN or CCT. CT strength averaged over the session was negative, indicating a global inclination toward the status quo, in spite of a large standard deviation indicating important variability. CT frequency and length sub-dimensions showed that the most frequent codes were Reason and Other, in both directions. Desire– (desiring not to change, or liking the current behavior) was also expressed longer and more frequently. Most of the other CT sub-dimensions, such as Ability, Need, Commitment, and Taking steps (both directions) and Desire+ were scarcer, having lower mean frequency and length). Regarding averaged strength, Desire and Commitment were expressed more against change,

whereas Reason, Ability, Need, Taking steps, and Other were more toward change. The standard deviations for these dimension also indicated wide variability among the young men.

>> Insert Table 1 about here <<

Univariate adjusted negative binomial regression models

Contrary to the main hypothesis that overall CT is a predictor of actual change, no significant effects for overall CT+ frequency and length or for CT– frequency and length were found in the univariate adjusted negative binomial regressions (Table 2). Averaged strength for overall CT was negatively related to outcome (showing 19% less drinking at follow-up for each increase of one point on the -3 to +3 scale), but only approached significance (p=0.08).

>> Insert Table 2 about here <<

The other univariate adjusted models showed that the frequency of Ability, Desire, and Need not to change grouped together (Ability/Desire/Need–) was an important and significant predictor of poor outcome at 6-months, while averaged strength (Ability/Desire/Need) was strongly related to better outcome. Taking steps averaged strength was significantly related to outcome in the expected direction. The frequency of Ability/Desire/Need+ and Taking steps+ was related to change in the expected direction, but only approached significance.

The length (in seconds) of each of the CT sub-dimensions was not significantly associated with outcome in these models, though length of Ability/Desire/Need+ approached significance and was in the expected direction.

Since Ability/Desire/Need was a dimension related to outcome in most of these regressions, an exploratory model was conducted for each code separately. There were significant associations for the frequency of Ability+ and Desire–, as well as for the averaged strength of Desire and Need. Frequency of Need+ and Need– was related to outcome in the expected direction, but only approached significance.

Stepwise multivariate analysis

A stepwise procedure confirmed a strong association of the Ability/Desire/Need dimension with outcome. In the final CT model, frequencies of Ability/Desire/Need+ and Ability/Desire/Need– significantly and independently predicted change in the expected direction, while Taking steps+ was excluded from the equation (Table 3). In the final averaged strength model, Taking steps was also excluded, leaving Ability/Desire/Need as the unique predictor of change.

>> Insert Table 3 about here <<

Since Ability/Desire/Need was a robust, significant dimension in both models, an exploratory analysis was conducted, using the three components separately (Table 4). In the final CT model, frequencies of Desire–, Ability+, and Need– were significant and robust independent predictors of change, while Need+ and Taking steps+ were dropped from the equation. In the final averaged strength model, Need and Desire were significant and independent predictors of change, while Taking steps was excluded.

>> Insert Table 4 about here <<

In order to confirm our results, the analyses were repeating using backward instead of forward entry of variables, and similar results were obtained.

Exploratory stepwise multivariate analysis using combined code and strength

In further exploratory analyses, the same procedure as presented above for variables combining code and strength was followed to see if different levels of strength might show different patterns (Table 5). For the frequency of each of those combinations, Desire–2, Desire+1, Ability+2, and Commitment+1 were significantly related to changes in drinking in the univariate models. However, it is worth noting that Commitment+1 was related in the non-expected direction, and showed 15% more drinking for each increase of one utterance of Commitment+1). Need–2, Taking steps+3, and Commitment+3 were associated with outcome in the expected direction, but only approached significance. Using a stepwise procedure, the final multivariate model showed that the frequencies of Desire–2, Ability+2, Commitment+1 (again in the non-expected direction), and Need–2 were independent and significant predictors of change in drinking at 6-months follow-up.

>> Insert Table 5 about here <<

For length of each combination of code and strength, Desire+1 was a significant predictor in the univariate analyses, whereas Commitment+3 and Ability+2 only approached significance. Desire+1 remained significant in the stepwise procedure, though the effect on outcome was slight and accounted for only 0.007% less drinking for every increase of one second in Desire+1 talk.

Adjustment for pre-existing readiness to change

All of the final multivariate models were repeated, adjusting for importance to change, readiness to change, and confidence to change, as measured on visual analog scales of 1-10 on the baseline assessment questionnaires. This was done in order to confirm that prior results reflected the effect of CT during the BMI session and were not confounded by pre-existing readiness to change. Comparable results in all models were obtained.

Discussion

We explored several ways to categorize and measure CT and its sub-dimensions during BMI with young men and tested them as predictors of change in alcohol use 6 months later. Neither frequency nor length of overall, summarized measures of CT, CCT, and FN were significantly related to change during follow-up. Overall CT averaged strength was related to the outcome in the expected direction, but only approached significance (p=0.08). Performing a large number of statistical tests, as herein, precludes interpreting this finding as evidence of effect of CCT on BMI outcomes. When observing CT sub-dimensions, important and robust effects were found on the dimension regrouping Ability, Desire, and Need to change (or not to change). The frequency of Ability/Desire/Need + and Ability/Desire/Need –, as well as the averaged strength of Ability/Desire/Need significantly predicted change in alcohol use in the expected direction. Furthermore, the length in seconds of Ability, Desire, and Need to change talk grouped together was the only length variable to approach (p=0.07) significance. These results were confirmed after adjusting for pre-intervention importance, readiness, and confidence to change measured on visual analog scales at baseline.

Ability, Desire, and Need were grouped together since inter-rater reliability (IR) for the separate codes was not very satisfactory. Poor IR is a limitation of the present study and deserves some explanation. One plausible explanation is that it might be due to the scarcity of several CT sub-dimension codes in the present database. Since only 31 sessions (or roughly 20%) were double-coded, the likelihood of categorizing those scarce codes reliably is low. Future studies foreseeing similar analyses of CT sub-dimensions should structure more double-coding, in order to avoid these reliability concerns. Nevertheless, since the grouped Ability/Desire/Need dimension had robust relationships with outcome changes in alcohol use in the present study, further exploratory analyses were undertaken in order to help understand which of its sub-dimensions best predict change. The frequency of utterances expressing Desire not to change, Ability to change, and Need not to change (or no need to change) were significant and were independent predictors of change, as were the averaged strength of Need and Desire. These findings demonstrate that even though some sub-dimensions of CT were scarce, their presence and the strength with which they were expressed are still important clues to subsequent, actual behavior change.

Our results do not support the hypothesis in MI that overall CT during sessions predicts actual change following intervention. However, they do strongly agree with previous findings showing that several sub-dimensions of CT accomplish this (Amrhein et al., 2003; Baer et al., 2008; Gaume et al., 2008; Hodgins et al., 2009). The fact that overall CT was not predictive of change in the present study, though it was in other studies (Bertholet et al., 2010; Moyers et al., 2007; Moyers et al., 2009; Strang & McCambridge, 2004) might have several alternative explanations. First, measurement of CT differed in the research of Strang

and McCambridge and Bertholet and colleagues, thus preventing any pertinent comparisons. Second, the type of intervention (20-minute BMI) and target population (young men from the general population) differed from that of Moyers and colleagues (Moyers et al., 2007; Moyers et al., 2009), who used Motivational Enhancement Therapy with adult problem drinkers in a clinical setting. Change language expressed in those settings and populations might differ in type and quality, and influence actual subsequent behavior change differently. Hypotheses involving the type of intervention might be relevant, since two other studies investigating BMI (Baer et al., 2008; Gaume et al., 2008) found similar findings, namely, that some CT sub-dimensions predict change well. In both those papers and the present study, Ability talk was predictive of change at follow-up. This suggests that this particular type of language, when expressed by patients, might give valuable clues to future beneficial change. Concordant with those of Baer and colleagues (Baer et al., 2008) the present findings also showed that Desire talk is related to outcome. The Need to change (or lack of need to change) sub-dimension was a predictor in the present findings, but was not measured in the Baer and colleagues research.

Finally, further exploratory analyses using combined code and strength (e.g. Reason+1, Commitment–1, etc.), showed interesting and sharper patterns. Desire–2, Ability+2, and Need–2 were significant and independent predictors of change, confirming again the importance of those categories of language. The findings regarding Commitment language are also interesting. In the present study, neither the frequency of Commitment to change (or not to change) nor the average strength of Commitment are significantly linked to outcome, contrary to some MI literature hypotheses (Miller & Rollnick, 2002; Miller & Rose, 2009) and previous empirical findings (Amrhein et al., 2003; Hodgins et al., 2009). In the present analysis, Commitment+1 and Commitment+3 are related to outcome in univariate models, but with opposite signs. More Commitment+1 predicts poorer outcome, whereas more Commitment+3 predicts better outcome. Unfortunately, Commitment+3 only approached significance (p=0.09) and was excluded in the multivariate stepwise model. Nevertheless, those results could indicate that differential levels of strength might express different meanings. For example, saying “I’m sure I will cut off my drinking” (coded Commitment+3) is different than saying “I might cut off my drinking a bit” (coded Commitment+1). Lesser commitment might express some distance or a lack of conviction whereas strong commitment would be expected in the MI literature. The nearly significant (p=0.09) link of length of Commitment+3 with outcome might lend further support to this hypothesis, provided the lack of significance is interpreted as reflecting scarcity of this type of talk.

Regarding ways of categorizing and measuring CT, the present findings might yield some valuable indications. First, using sub-dimensions of CT is of major importance since several CT sub-dimensions were predictive of change, whereas overall CT measures were not. Measuring frequencies versus averaged strength provided close results, even though averaged strength of Ability/Desire/Need was more strongly linked to outcome (p=0.001). Recorded CT dimensions length showed no significant association with outcome. To our knowledge, this was done for the first time in the present study. This demonstrated

that it is not so much the time during which CT is expressed, but rather the frequency and the strength with which it is expressed that is consequential. However, more research is needed to confirm the present findings. One clinical implication of this finding is that counselors should be attentive to the utterances of several sub-dimensions of CT (e.g. Ability, Desire, and Need) and to the strength with which they are expressed, and view these as indicators of potential actual behavior change in future.

The present study has numerous strengths, such as a large sample of coded sessions (N=127) and a comprehensive coding system (MISC 2.1, implemented in analysis software) resulting in a large dataset permitting several ways of categorizing and measuring CT. Still, some limitations are to be noted. First, inter-rater reliability was not satisfactory for several sub-dimensions of CT (Commitment+, Taking steps-, as well as Ability, Desire, and Need measured separately). Even if IR at the utterance level (i.e. pooling all sessions together) was substantial, poor IR for individual codes restricts the analyses and some of the conclusions. Second, our results are confined to the setting and population of the present study. BMI was conducted with 20-year-old men from a large general population sample and might not apply to women, persons younger or older, or in clinical or other specific settings. Finally, not all of the sessions conducted within the parent trials were recorded and coded, due to interviewee refusal, technical problems, or equipment unavailability. There were no statistical differences between coded and non-coded interventions on socio-demographic data, alcohol use, and readiness to change, indicating low probability of a potential selection bias (although it could still be present in some underlying, unmeasured context).

The present study adds to accumulating evidence that CT, or at least some of its sub-dimensions, predicts subsequent actual change. The present findings, appended to those of a previous study using the same dataset (Gaume et al., 2010), also partially confirm the causal chain hypothesized in the MI literature (Miller & Rose, 2009; Moyers & Martin, 2006). In our first study (Gaume et al., 2010), MICO behaviors were more likely to be followed by overall CT, whereas MIIN behaviors were significantly more likely to lead to overall CCT or to FN, lending support for the first part of the chain. In the present study, overall CT or CCT did not predict change (as expected in the second part of the chain), but some CT dimensions were associated with better drinking outcome. Ability, Desire, and Need language were strongly and consistently associated with change at 6 months, even if those dimensions were not among the ones most often expressed.

Our analyses showed that young men expressing that they like their current drinking behaviors and do not desire to change them, or expressing they do not need to change were more likely to maintain the status quo, or even drink more. However, those expressing that they feel able to change were more likely to achieve significant reductions in their drinking. Clinicians noticing such speech thus receive important clues as to the direction their clients are moving (either positively or negatively). Eliciting Ability, Desire, and Need to change and avoiding Ability, Desire, and Need not to change might also be a goal worth

pursuing for clinicians. Further research using good experimental designs, is now needed to confirm the hypotheses tested in the current study.

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Figure 1. Subjects inclusion profile

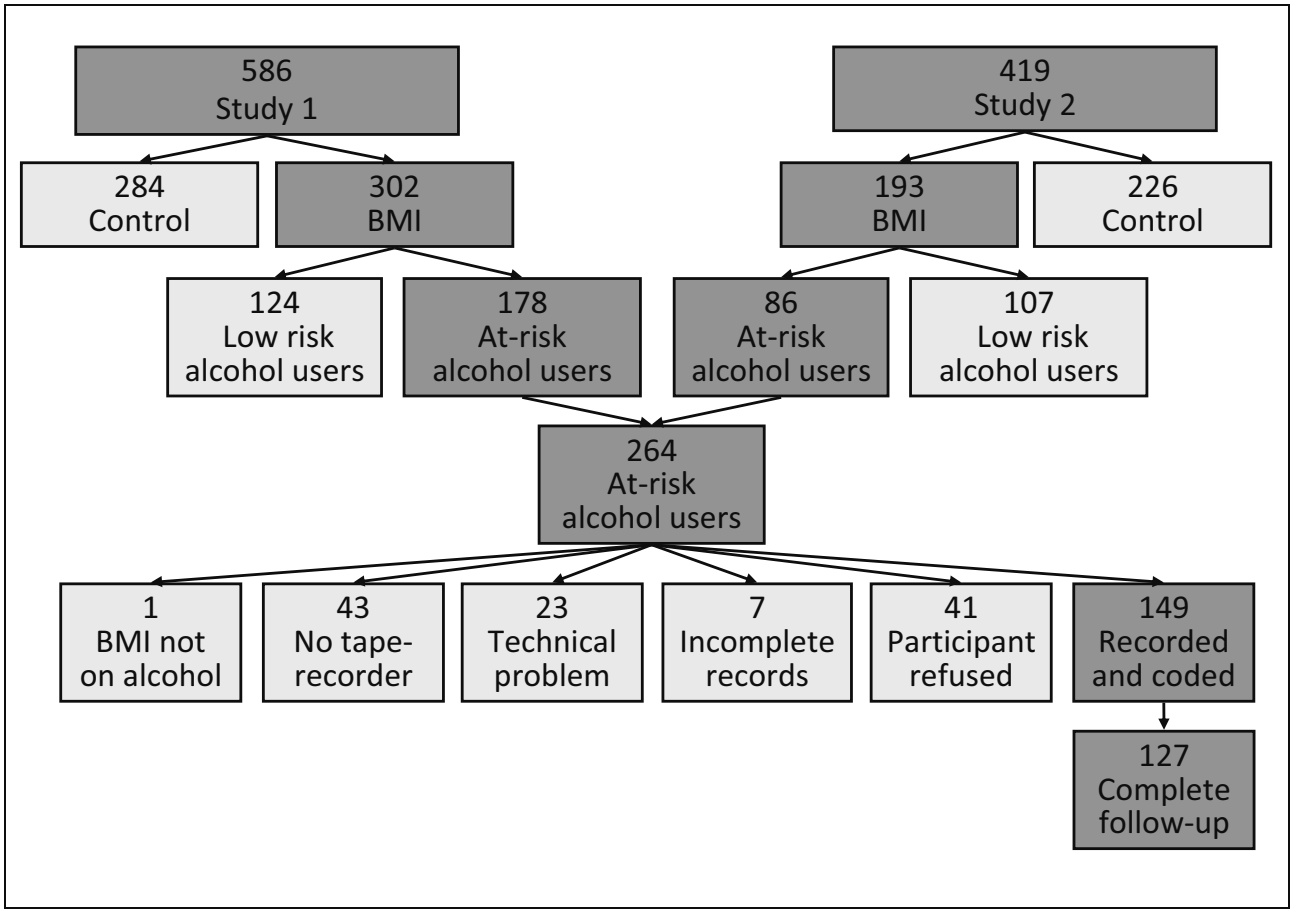

Table 1. Descriptive statistics for all MISC change talk dimensions (N=127 BMI)

	Mean	SD	Min.	Max.
Frequencies				
Overall change talk +	48.6	24.2	7	131
Reason +	19.6	11.7	0	56
Ability/Desire/Need + *	0.6	1.3	0	7
Ability + *	0.2	0.7	0	4
Desire + *	0.3	0.8	0	6
Need + *	0.1	0.4	0	2
Commitment + *	0.5	1.2	0	7
Taking steps + *	0.4	1.1	0	6
Other +	27.5	18.0	3	99
Overall counter change talk -	34.9	19.5	6	148
Reason -	13.9	8.7	0	51
Ability/Desire/Need -	2.2	2.4	0	12
Ability - *	0.1	0.5	0	5
Desire -	2.0	2.4	0	12
Need - *	0.1	0.3	0	2
Commitment -	0.9	1.0	0	5
Taking steps - *	0.0	0.1	0	1
Other -	17.9	14.4	1	120
Follow/Neutral	38.4	20.9	8	155
Averaged strength (-3 to +3 scale)				
Change talk overall	-0.1	0.5	-1.0	1.5
Reason	0.3	0.9	-2.0	1.9
Ability/Desire/Need	-0.9	1.2	-2.1	2.3
Ability *	0.1	0.7	-2.0	2.5
Desire *	-1.0	1.1	-2.1	2.0
Need *	0.0	0.7	-2.0	2.0
Commitment	-0.5	1.2	-3.0	2.3
Taking steps *	0.4	0.8	0	3.0
Other	0.3	0.6	-1.1	1.8
Length (in seconds)				
Overall change talk +	277.9	156.1	37.8	1036.8
Reason +	114.3	75.6	0	420.5
Ability/Desire/Need +	3.3	8.3	0	59.2
Ability +	1.0	4.1	0	31.8
Desire +	1.3	3.9	0	20.3
Need +	1.0	4.0	0	32.2
Commitment +	2.1	4.7	0	22.4
Taking steps +	3.0	8.7	0	65.5
Other +	155.2	118.4	13.2	777.8
Overall counter change talk -	206.2	124.4	21.4	698.6
Reason -	82.6	58.3	0	256.2
Ability/Desire/Need -	11.4	13.4	0	88.2
Ability -	0.3	1.8	0	14.5
Desire -	10.5	13.3	0	88.2
Need -	0.6	2.3	0	17.8
Commitment -	4.2	5.7	0	32.3
Taking steps -	0.2	1.4	0	13.1
Other -	107.8	88.6	3.0	554.6
Follow/Neutral	242.5	147.0	44.0	741.8

Notes: * Variables with poor interrater reliability, considered for exploratory reasons.

Table 2. Univariate adjusted regression models

	IRR	SE	z	P>z	[95% CI]	
Frequencies						
Overall change talk +	1.00	0.00	0.69	0.49	1.00	1.01
Reason +	1.01	0.01	1.24	0.22	1.00	1.02
Ability/Desire/Need +	0.91	0.05	-1.81	0.07	0.83	1.01
Ability +	0.82	0.08	-2.10	0.04	0.68	0.99
Desire +	0.97	0.07	-0.37	0.71	0.84	1.13
Need +	0.76	0.12	-1.75	0.08	0.55	1.03
Commitment +	1.06	0.06	1.18	0.24	0.96	1.18
Taking steps +	0.91	0.05	-1.69	0.09	0.81	1.02
Other +	1.00	0.00	0.16	0.88	0.99	1.01
Overall counter change talk -	1.00	0.00	1.20	0.23	1.00	1.01
Reason -	1.00	0.01	-0.06	0.96	0.99	1.01
Ability/Desire/Need -	1.06	0.03	2.48	0.01	1.01	1.12
Ability -	0.84	0.12	-1.26	0.21	0.64	1.10
Desire -	1.06	0.03	2.39	0.02	1.01	1.11
Need -	1.34	0.24	1.63	0.10	0.94	1.90
Commitment -	1.02	0.06	0.25	0.81	0.90	1.15
Taking steps -	0.72	0.35	-0.69	0.49	0.28	1.85
Other -	1.01	0.00	1.19	0.23	1.00	1.01
Follow/Neutral	1.00	0.00	1.29	0.20	1.00	1.01
Averaged strength (-3 to +3 scale)						
Change talk overall	0.81	0.10	-1.74	0.08	0.63	1.03
Reason	1.08	0.08	1.05	0.29	0.94	1.25
Ability/Desire/Need	0.84	0.04	-3.42	0.001	0.76	0.93
Ability	0.86	0.09	-1.53	0.13	0.70	1.04
Desire	0.89	0.05	-2.17	0.03	0.79	0.99
Need	0.83	0.07	-2.21	0.03	0.70	0.98
Commitment	1.04	0.05	0.77	0.44	0.94	1.15
Taking steps	0.85	0.07	-2.01	0.04	0.73	1.00
Other	0.94	0.10	-0.57	0.57	0.77	1.15
Length (seconds)						
Overall change talk +	1.00	0.00	0.60	0.55	1.00	1.00
Reason +	1.00	0.00	1.07	0.28	1.00	1.00
Ability/Desire/Need +	0.99	0.01	-1.81	0.07	0.97	1.00
Ability +	0.98	0.01	-1.43	0.15	0.95	1.01
Desire +	0.99	0.02	-0.76	0.45	0.96	1.02
Need +	0.98	0.01	-1.53	0.13	0.95	1.01
Commitment +	1.00	0.01	-0.01	0.99	0.97	1.03
Taking steps +	0.99	0.01	-0.86	0.39	0.98	1.01
Other +	1.00	0.00	0.22	0.83	1.00	1.00
Overall counter change talk -	1.00	0.00	0.51	0.61	1.00	1.00
Reason -	1.00	0.00	-0.74	0.46	1.00	1.00
Ability/Desire/Need -	1.01	0.00	1.40	0.16	1.00	1.02
Ability -	0.96	0.03	-1.08	0.28	0.90	1.03
Desire -	1.01	0.00	1.37	0.17	1.00	1.02
Need -	1.03	0.03	0.89	0.37	0.97	1.08
Commitment -	1.00	0.01	0.31	0.76	0.98	1.02
Taking steps -	0.98	0.04	-0.51	0.61	0.90	1.06
Other -	1.00	0.00	0.94	0.35	1.00	1.00
Follow/Neutral	1.00	0.00	1.50	0.13	1.00	1.00

Notes: Negative binomial regression models (1 per CT dimension) with weekly alcohol drinking at follow-up as dependent variable, CT sub-dimension as independent variable, and adjusted by weekly alcohol drinking at baseline and trial design. IRR: Incidence rate ratio, SE: Standard error, CI: Confidence interval.

Table 3. Stepwise multivariate analysis

	IRR	SE	z	P>z	[95%	CI]
Frequencies						
Ability/Desire/Need +	0.91	0.04	-1.97	0.05	0.83	1.00
Ability/Desire/Need -	1.07	0.03	2.59	0.01	1.02	1.12
Taking steps +			excluded at step 3 (p=0.41)			
Averaged strength (-3 to +3 scale)						
Ability/Desire/Need	0.84	0.04	-3.42	0.001	0.76	0.93
Taking steps			excluded at step 2 (p=0.30)			

Notes: Negative binomial regression models (1 for CT sub-dimensions frequencies, 1 for averaged strength) with weekly alcohol drinking at follow-up as dependent variables, CT sub-dimensions as independent variable, and adjusted by weekly alcohol drinking at baseline and trial design. IRR: Incidence rate ratio, SE: Standard error, CI: Confidence interval.

Table 4. Exploratory stepwise multivariate analysis using Ability, Desire, and Need as non-combined categories

	IRR	SE	z	P>z	[95%	CI]
Frequencies						
Desire -	1.06	0.03	2.59	0.01	1.02	1.12
Ability +	0.81	0.08	-2.26	0.02	0.67	0.97
Need -	1.44	0.25	2.08	0.04	1.02	2.02
Need +			excluded at step 3 (p=0.23)			
Taking steps +			excluded at step 4 (p=0.27)			
Averaged strength (-3 to +3 scale)						
Need	0.83	0.07	-2.14	0.03	0.70	0.98
Desire	0.89	0.05	-2.11	0.04	0.80	0.99
Taking steps			excluded at step 3 (p=0.28)			

Notes: Negative binomial regression models (1 for CT sub-dimensions frequencies, 1 for averaged strength) with weekly alcohol drinking at follow-up as dependent variables, CT sub-dimensions as independent variable, and adjusted by weekly alcohol drinking at baseline and trial design. IRR: Incidence rate ratio, SE: Standard error, CI: Confidence interval.

Table 5. Exploratory stepwise analysis using combined code and strength

	Univariate models (variables with p<0.1)						Multivariate model					
	IRR	**SE**	**z**	**P>z**	**[95%**	**CI]**	**IRR**	**SE**	**z**	**P>z**	**[95%**	**CI]**
Frequencies												
Desire – 2	1.07	0.03	2.48	0.01	1.01	1.12	1.06	0.03	2.64	0.01	1.02	1.12
Desire + 1	0.73	0.09	-2.49	0.01	0.57	0.94	excluded from final model (p=0.06)					
Ability + 2	0.64	0.12	-2.43	0.02	0.45	0.92	0.58	0.10	-3.13	0.002	0.41	0.81
Commitment + 1	1.15	0.08	2.02	0.04	1.00	1.32	1.20	0.08	2.70	0.01	1.05	1.37
Need - 2	1.40	0.26	1.82	0.07	0.97	2.01	1.54	0.27	2.49	0.01	1.10	2.17
Taking steps + 3	0.41	0.21	-1.75	0.08	0.15	1.11	excluded at step 6 (p=0.32)					
Commitment + 3	0.68	0.15	-1.68	0.09	0.44	1.06	excluded at step 7 (p=0.20)					
Length (in seconds)												
Desire + 1	0.99993	0.00003	-2.57	0.01	0.99988	0.99998	0.99993	0.00003	-2.57	0.01	0.99988	0.99998
Commitment + 3	0.99983	0.00010	-1.68	0.09	0.99964	1.00003	excluded at step 3 (p=0.12)					
Ability + 2	0.99996	0.00003	-1.67	0.10	0.99991	1.00001	excluded at step 3 (p=0.17)					

Notes: Negative binomial regression models with weekly alcohol drinking at follow-up as dependent variables, CT sub-dimensions as independent variable, and adjusted by weekly alcohol drinking at baseline and trial design. IRR: Incidence rate ratio, SE: Standard error, CI: Confidence interval.