Change talk sequence during brief motivational intervention, towards or away from drinking

Nicolas Bertholet, Mohamed Faouzi, Gerhard Gmel, Jacques Gaume & Jean-Bernard Daeppen

Alcohol Treatment Center, Department of Community Medicine and Health, Lausanne University Hospital, Lausanne, Switzerland

ABSTRACT

Aim To investigate whether different sequences of ‘change talk’ utterances within a brief motivational intervention (BMI) are associated with drinking outcomes. Design Speech content analysis of recorded BMI. Setting BMI delivered in an emergency department for at-risk drinking. Participants Ninety-seven subjects who received a BMI. Measurements Ninety-seven BMI were coded in duplicate by two psychologists with the Motivational Interviewing Skill Code (MISC), a Hidden Markov Model was used to identify three different patient states reflecting attitudes regarding changing their drinking behaviour within a BMI: towards change, away from change and non-determined. Adjusted regression models were used to predict drinking at 12 months’ follow-up using patient attitudes regarding changing drinking at the beginning, during the intervention and at the end. Findings The dynamic process at place within a BMI was marked mainly by stability: at each point during the intervention, staying in the same attitude was far more likely than transitioning from one attitude to another. When subjects did change from one attitude to another, they were more likely to move from an ‘away from change’ to a ‘towards change’ state. At 12 months, subjects with an attitude towards change at the end of the BMI drank significantly less (13.1 drinks per week) than subjects with an attitude away from change, independent of their attitude at the beginning of the intervention. Conclusions Transition in ‘change talk’ between ‘away from change’ and ‘towards change’ appears to be rare in brief motivational intervention for excessive alcohol consumption. Moreover, change talk ‘towards change’ at the end of the intervention is associated with improved outcomes at follow-up, independently of the type of change talk at the beginning of the intervention, suggesting that it is important to end a BMI session with a positive attitude towards change by the client.

Keywords Alcohol, at-risk drinking, attitudes regarding changing drinking, brief motivational intervention, change talk sequence, hidden Markov Model.

INTRODUCTION

Men and women with unhealthy alcohol use are at significant risk for medical problems including liver disease, stroke, cancer, accident and injuries [1,2]. Brief motivational intervention (BMI) was developed as a model for counselling for unhealthy alcohol use. It is a secondary preventive intervention [3–5] based on various theoretical models including self-management approaches and motivational interviewing (MI), which is derived from the integration of psychological theories of attitude and behaviour change, including self-efficacy theory [6], humanistic psychotherapy model [7], health belief model [8], self-perception theory [9] and the transtheoretical model of change [10]. MI theory postulates a central role for ‘change talk’, defined as speech in favour of change during the intervention. Based on self-perception theory [9], MI hypothesizes that speech content has a strong influence on behaviour change. When patients with alcohol problems hear their own speech 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 behaviour. In this sense, MI focuses upon enhancing the emergence of change talk during the intervention [11].

Researchers have been able to show associations between clinician attitudes consistent with MI theory and increased levels of change talk [12–14]. Change talk and discussion concerning change have been associated with reductions in drinking and drug use [12,13,15,16], as have several specific subcategories of change talk, such as commitment and ability and desire and reasons to change [15,17–19].

The Motivational Interviewing Skill Code (MISC) has been used as an instruments for assessing patients’ and clinicians’ communication characteristics and behaviours through analyses of audio and video recordings in MI sessions [12,20,21]. It has also been used successfully to assess BMI content [17], as well as in other therapeutic approaches [13].

Change talk is likely to evolve over the course of a session, and as clinicians are encouraged to enhance it among their patients, it is of interest to describe this evolution throughout a single intervention and to investigate whether change talk within the intervention is associated with drinking outcomes.

Focusing upon the sequence of change talk during a BMI should add additional information about the processes in play. Our group conducted a randomized trial and failed to demonstrate a positive impact of BMI [22]. As part of a reflection on how to develop an effective BMI and in order to generate hypotheses about the potential processes in play for individuals that may benefit from brief intervention, as well as to identify determinants that may be associated with outcomes, we decided to conduct speech content analyses of the BMI.

Therefore, we recorded change talk and analysed sequences during BMI among 97 at-risk drinkers using a Hidden Markov Model (HMM). The use of HMM allows the analysis of the series of change talk utterances and the determination of subject attitudes towards changing drinking throughout the BMI. Assessing the impact of the attitudes at the beginning of the intervention is of particular importance, because if there is an underlying process in play during the intervention, then the impact of that initial attitude on subsequent drinking should be minimal. On one hand, a major impact of the subject attitude at the beginning of the intervention on subsequent drinking will speak against processes in play during the intervention. On the other hand, if underlying processes are in play during the intervention, an association between the subject’s attitude at the end of the intervention and subsequent drinking should be observed, independent of the subject’s attitude at the beginning of the intervention. We determined whether these attitudes were associated with drinking outcomes 12 months later.

**METHODS**

This study is an analysis of data from a randomized controlled BMI trial in an emergency department (ED) for at-risk drinking (>14 drinks/week or >4 drinks/occasion for men, >7 drinks/week or >3 drinks/occasion for women and individuals over 65 years). Recruitment and selection procedures are described elsewhere [22]. Subjects in the intervention group received a single 15–20-minute BMI, comprised of (1) thanking subjects for participation and assuring confidentiality, (2) providing feedback about their drinking (compared to local community standards) and asking them for their opinion on the feedback, (3) exploring the pros and cons of drinking, (4) exploring the importance and readiness to change drinking habits and (5) asking subjects if they feel ready to set an objective, and providing positive reinforcement for their ability to change and achieve this objective. All subjects received written material about their Alcohol Use Disorders Identification Test (AUDIT) score with a comparison of their drinking to local norms, and drinking objectives.

The delivered BMI was inspired by MI, but brevity and structure were those of a brief intervention approach. None the less, we hypothesized mechanisms of action similar to those reported in the MI literature regarding the impact of patient speech on behaviour change. Clinicians, six masters-level psychologists and one nurse, were trained by a senior physician and an experienced psychologist to apply MI techniques and adhered to MI principles, such as empathy, non-judgemental and non-confrontational approach, respect for autonomy and exploration of ambivalence. All received ongoing supervision throughout the trial.

The study was approved by the Lausanne University Institutional Review Board. All subjects gave informed, written consent to participate in BMI, and audio recordings of sessions were contingent upon additional consent. Of the 8833 consecutive patients screened at ED admission, 1366 were positive for at-risk alcohol use; of these, 486 were randomized to BMI and 880 to control groups receiving either usual care or no further assessment. In the intervention group BMI were delivered from January 2003 to June 2004, but systematic recordings took place only from 30 May 2003 to June 2004. During the period of systematic recording, 166 (of 338 sessions) were recorded (49% acceptance rate). Of the randomized subjects, 1055 completed the 12-month follow-up assessment: 367 in the intervention group (including 133 tape-recorded) and 688 in the control groups.

**Coding of audio-recordings**

Of the 367 patients in the intervention group with available follow-up data, 133 interventions were tape-recorded with patient consent. Of those, 97 BMI were
useable for coding. Excluded were 25 with incomplete records, seven with mismatched identification codes, three not fluent in French and one whose partner intruded during the session. The 97 coded and the 270 non-coded subjects with available follow-up data did not differ significantly with respect to age, gender, employment status, baseline AUDIT score, drinking at baseline and 12 months or number of heavy drinking episodes at baseline and 12 months. The mean intervention length in minutes [standard deviation (SD)] was 17.1 (6.2), ranging from 6.5 to 39.0 minutes. Two trained psychologists, blinded to assessment and follow-up data, did the parsing and coding of each interview independently.

**Instruments**

At baseline, weekly alcohol consumption was assessed with the AUDIT and quantity and frequency questions on alcohol use. At 12 months, research assistants blinded to patient group assignment conducted telephone interviews, using standardized procedures and a similar questionnaire.

The Motivational Interviewing Skill Code (MISC) version 2.0 was used to code patient and clinician speech. In the present study, change talk data obtained from subject speech were used; the follow/neutral category was not used as the study aim was to focus upon change talk fluctuations throughout the BMI. Change talk can be expressed either in favour of change (change talk; CT) or away from change (counter-change talk; CCT). CT and CCT consist of six different categories (ability, desire, need, reason, commitment and taking steps). Each CT and CCT subject utterance was graded according to its need, reason, commitment and taking steps. Each CT and CCT subject utterance was graded according to its strength from one to five. The direction of change talk and counter-change talk was indicated with a positive or a negative score: +1 to +5 (CT) indicated talk towards change and −1 to −5 (CCT) indicated talk away from change (or in favour of the status quo). Absolute values reflected the strength of talk towards or away from change.

Because the objective of the present study was to investigate change talk in general and fluctuations throughout the intervention, all categories of change talk were grouped together. The use of aggregated scores for change and counter-change talk is a standard procedure for analysing MI (e.g. [13,17]). As an illustration, here is how a sequence of observations might appear: <...,, +1, +1, +2, +1, +2, +2, −2, −2, −1, +3, −1, +4, −2,...>.

**Hidden Markov Model (HMM)**

When looking at a given sequence of utterances, one option is to compute transitional probabilities, which gives information about what kind of utterance is most probably followed by what other kind of utterance. It is also of interest to have information about ‘the larger picture’ and to take advantage of a sequence of multiple utterances. For example, when a subject produces a series of positive values intertwined with a small number of negative values, this does not necessarily mean that he is changing his mind back and forth. To capture this dynamic process, we assumed that the sequences are generated following a first-degree Markovian process, meaning that an utterance at time t depends upon the utterance at time t−1. We also assumed the presence of three hidden states reflecting attitudes within BMI about changing drinking: towards change, away from change and non-determined. The HMM [23,24] is one of the most popular tools that allows identification of states that are not directly observable, such as underlying attitudes regarding behaviour change based upon both frequency and strength of multiple CT and CCT utterances. It has been applied extensively to a wide range of problem patterns recognition [25]. We purposely gave these states names that differ from the MISC terminology in order to avoid confusion between utterances and states (e.g. a ‘counter-change talk’ utterance could be found in a ‘towards change’ state, see Fig. 2).

The advantages of HMM are:

1. it captures the dynamic process which generated an observable sequence of utterances and takes into account the dependence between the utterances within a sequence;
2. its parameters are directly interpretable;
3. it summarizes transitions between utterances into longer, more parsimoniously represented states; and
4. it reduces measurement error by neglecting unimportant switches between CT and CCT within a longer homogeneous phase of being towards change, away from change or non-determined.

**Characteristics of the HMM used in the present study**

The HMM used in the present study is a discrete time model. It is characterized completely by the following: (i) a defined number of states in the model (three in the present model); (ii) a set of possible observations [utterances measured at values ranging from +1 to +5 (CT) and −1 to −5 (CCT)]; (iii) an initial state distribution; (iv) an initial state transition probability distribution, where a transition matrix defines the transition probabilities between states; and (v) an emission, or conditional probability distribution. The model design and the transition matrix of the estimated final model is shown in Fig. 1. The model was constructed on combined data from the two coders using the RHmm package [R version 2.7.2 (2008-08-25), The R Foundation for Statistical Computing. ISBN 3-900051-07-0, 2008], and the state sequences were obtained using a Viterbi algorithm.
HMM state sequence and summary variables

Ninety-seven derived state sequences corresponding to 97 coded utterance sequences were estimated for each coder. Examples of sequences of change talk utterances and corresponding states identified with the HMM are provided in Fig. 2. The observation sequence lengths are different over the 97 patients, thus the information within each of the 97 decoded state sequences was summarized with these variables: first state in the state sequence, number of towards change observations, away from change and non-determined observations in the state sequence (indicating how much time was spent in each of these three states during the intervention) and last state in the state sequence. We chose these variables a priori, based upon clinical knowledge and study hypotheses, in order to test relationships between BMI content and drinking outcome.

Inter-rater reliability

The present analyses used data from the two coders. We assessed the agreement between the two coders on the raw data and on the HMM modelled data. For raw data from the MISC, mean frequencies (SD) of coded utterances per intervention for each coder were: CT for coder 1 = 22.9 (11.9); CT for coder 2 = 19.5 (9.5); CCT for coder 1 = 18.7 (8.5); and CCT for coder 2 = 16.5 (7.8).

Model (HMM)

![Diagram](image-url)
Reliability between the two coders using intraclass correlations (ICC) was 0.74 for CT and 0.77 for CCT, indicating good inter-rater reliability. Regarding HMM modelled data, we assessed the agreement between the two coders by computing uniform kappas for the first and last state. Agreement was fair to good (first state, kappa = 0.7; last state, kappa = 0.5). For the number of states towards change, away from change and non-determined we computed ICC. Agreement was fair to good (0.6, 0.5 and 0.4, respectively).

Relationships with outcome

We determined the bivariate relationship between 12-month and weekly alcohol consumption and each of the summary variables of interest with regressions. A multiple regression model determined the independent effects of the summary variables in a single model. All the models were adjusted for baseline weekly alcohol consumption. For these analyses, we used a random effects model with a between-regression estimator to take into account correlated error terms due to the fact that two coders (although independent) rated the same 97 individuals.

RESULTS

The characteristics of the 97 included subjects are presented in Table 1.

Figure 1 is the transition matrix that summarizes information about the dynamic processes within BMI. The probability of being in one of the three states at the intervention onset was 78% for non-determined, 17% for away from change last state. Subjects with an away from change last state had a 80% chance of staying there at time t and a 15% chance of moving to a towards change state and a 5% chance of moving to a non-determined state. When subjects moved from one state to another, the largest transition probabilities were observed for a change from ‘away from change’ to ‘towards change’ (15%) and from ‘towards change’ to ‘away from change’ (11%). The dynamic process in place within a BMI was mainly stable; when subjects did move from one state to another they were most likely to shift from away to towards change, and vice versa.

Bivariate regression models were used to evaluate the association between first state, number of towards change, away from change and non-determined state observations and last state, and the 12-month weekly alcohol consumption. Only the last state was associated significantly with consumption at 12 months. Adjusting for weekly alcohol consumption at baseline, subjects with towards change last states averaged [standard error (SE)] 7.3 (3.6) drinks (P = 0.05) fewer per week compared to those with an away from change last state. Subjects with non-determined last states averaged 5.8 (3.3) drinks (P = 0.09) fewer per week compared to those with an away from change last state.

Results of the multiple regression model are presented in Table 2. An association between last state and follow-up consumption was found: subjects with a last

Table 1 Baseline characteristics of the 97 subjects with audio-recorded brief interventions.

<table>
<thead>
<tr>
<th>Age, mean (SD)</th>
<th>38.4 (17.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female, n (%)</td>
<td>18 (18.6)</td>
</tr>
<tr>
<td>Employed, n (%)</td>
<td>56 (57.7)</td>
</tr>
<tr>
<td>AUDIT score &gt;12, n (%)</td>
<td>21 (21.7)</td>
</tr>
<tr>
<td>Drinks per week, mean (SD)a</td>
<td>13.4 (10.2)</td>
</tr>
<tr>
<td>Number of heavy drinking episodes per month, mean (SD)</td>
<td>4.3 (6.2)</td>
</tr>
<tr>
<td>Weekly risky drinking, n (%)</td>
<td>40 (41.2)</td>
</tr>
<tr>
<td>Heavy drinking, past 30 days, n (%)</td>
<td>88 (90.7)</td>
</tr>
<tr>
<td>Current smoker, n (%)</td>
<td>49 (50.5)</td>
</tr>
</tbody>
</table>

AUDIT: Alcohol Use Disorders Identification Test. *Subjects reported their alcohol use in standard drinks. A standard drink was defined as a regular glass of wine (1 dl), a regular beer (25 cl) or a single shot of spirits, straight or mixed in a soft drink (around 10 g pure ethanol each). Weekly risky drinking was defined as >14 drinks per week for men and >7 drinks per week for women and individuals aged more than 65 years. Heavy drinking was defined as >4 drinks on a single occasion in the past 30 days for men and >3 drinks on a single occasion in the past 30 days for women and individuals aged more than 65 years. SD: standard deviation.

Table 2 Multivariable regression model looking at the association between first state, last state, number of observations in each state and 12 months weekly alcohol consumption (in drinks per week).

<table>
<thead>
<tr>
<th>First state (reference group: away from change)</th>
<th>Non-determined state</th>
<th>Towards change state</th>
<th>Number of away from change observations</th>
<th>Number of towards change observations</th>
<th>Last state (reference group: away from change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>SE</td>
<td>P</td>
<td>Coefficient</td>
<td>SE</td>
<td>P</td>
</tr>
<tr>
<td>2.80</td>
<td>4.39</td>
<td>0.5</td>
<td>11.07</td>
<td>8.77</td>
<td>0.2</td>
</tr>
<tr>
<td>-7.05</td>
<td>3.92</td>
<td>0.08</td>
<td>-13.07</td>
<td>5.09</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The model was adjusted for baseline weekly alcohol consumption, length of the sequence and age. Because two coders coded each sequence, we used a random effect model with a between regression estimator. SE: standard error.
state towards change drank significantly less 12 months later than did subjects with an away from change last state. This was independent of the first state, the number of observations towards or away from change and the length of the observed sequence. Compared to subjects with a last state away from change, those with a last state towards change averaged (SE) 13.1 (5.1) drinks fewer per week. Non-determined subjects averaged (SE) 7.1 (3.9) drinks fewer than did subjects with a last state away from change; these findings approached significance ($P = 0.08$).

**DISCUSSION**

ED patients receiving a BMI had a 78% chance of starting the BMI in a non-determined (undecided) state. At each point during the intervention, subjects were far more likely to stay in the same state rather than move from one state to another. When they did shift, the most probable transition was from away from change to towards change, indicating a potential favourable evolution of change talk throughout the session.

Looking at the association of first state, last state, number of towards change, away from change and non-determined observations with weekly alcohol consumption 12 months later, only the last state was associated significantly with drinking. Subjects with an attitude tending towards changing drinking at the end of the intervention drank less 12 months later, compared to subjects with an attitude away from change. The finding that the last state is associated independently with changes in weekly drinking is consistent with the hypothesis that there is some mediating effect regarding change talk over the course of the intervention that potentially affects subsequent drinking.

This is consistent with Amrhein and colleagues [15], who showed that among drug users, commitment to change at the end of the intervention was associated with decreased drug use. Nevertheless, in a recent study conducted among pathological gamblers who received MI, Hodgins, Ching & McEwen [19] found that stronger commitment to change overall during the intervention was associated with subsequent behaviour change at 12 months, but commitment strength during the last part of the interview was not predictive. This might be explained by differences in samples, target behaviours, types of intervention delivered or types of analysis. In order to study the evolution of change talk during the intervention, we had to collapse various dimensions of change talk. Even though this procedure has been used in other studies, it limits conclusions regarding subtypes of change talk. Research is still needed to investigate more fully the role of change talk (particularly commitment to change) and its evolution during intervention. This could be an area for future research.

The present research has several limitations: first, results may apply only to patients who agree to participate in a study where receiving alcohol counselling is possible; these individuals may be more motivated to change than are non-participants. Secondly, the selection of tape-recordings may be biased. Due to several technical problems and the unwillingness of patients to allow taping (49% acceptance rate), not all BMI could be recorded. Consequently, the taped sample may not be representative of the overall study population. Nevertheless, subjects with coded or non-coded BMI were not statistically different with respect to demographics and alcohol consumption variables at baseline and 12 months.

Thirdly, it cannot be concluded that BMI effect is actually mediated by observed changes in speech content. Results herein should be considered exploratory, but still useful in generating hypotheses concerning how BMI works. Fourthly, these results may also depend upon the structure of the intervention itself; clinicians were asked to follow structures and techniques hypothesized to support the emergence of change talk. However, our results indicate that even within a structured intervention change talk sequences differ from one patient to another, and these differences are associated with subsequent drinking changes. These differing sequences may appear as a result of the intervention’s structure and may not appear in brief interventions using another structure. The independent association between the last state and subsequent drinking may be the result of the intervention in general and not be determined by the last state only. Nevertheless, it is interesting to observe that the content of subject speech at the end of an intervention and the underlying attitude regarding changing drinking at that time were associated with subsequent drinking. Lastly, these analyses were conducted with data from a randomized trial that showed no effect of BMI [22]. Our results can serve to generate hypotheses about the potential processes in play for individuals that may benefit from brief intervention, but cannot specify the final causal pathways. Replication of these results is needed in the context of a study demonstrating BMI efficacy. Our results were consistent with MI theory, and the association between the last state and subsequent drinking in the absence of impact of the first state speaks in favour of a dynamic process during the intervention. The role of clinicians during the intervention was not assessed in the present study, yet it has been demonstrated previously that clinician behaviours can impact change talk during counselling interventions [12,13,17], and therefore it is likely that state transitions towards change were facilitated by the counsellors.

This study contains several notable strengths. It focused upon detailed analyses of change talk during
intervention, using a model that takes into account underlying attitudes regarding behaviour change. In addition, a reasonably large sample of audio-tapes was available for conducting the analyses, and two raters coded each of them independently. Our results are consistent with other studies that show a relationship between change talk and subsequent drug or alcohol use [13, 15, 18], and contribute to current evidence that supports the notion of change talk playing an important role in the change process [11]. Other studies have looked at mean change talk scores or at transitional probabilities at the utterance level, but our design adds information about the dynamic processes in play during the intervention over the course of a single BMI. The independent association between subject attitude regarding changing drinking at the end of the BMI and drinking 12 months later should prompt clinicians to encourage more talk towards change, particularly by the end of an intervention. This is consistent with an important hypothesis of the motivational interviewing model. The present study suggests that counsellors should strive to create a positive climate towards change by the conclusion of brief interventions.

Declarations of interest

None.

References