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Fidelity of motivational interviewing with families in high-caries-risk children

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Fidelity of motivational interviewing with families in high-caries-risk children

Abstract

Objectives: Motivational interviewing (MI) is a promising behavioural intervention for prevention of dental caries in children. Few studies have reported on fidelity of MI delivered in dental settings. The aim of this paper is to explore the fidelity of implementing MI in a clinical dental practice setting, as part of an intervention study investigating caries-preventive effects of MI delivered to high-caries-risk children and their primary caregivers.

Methods: Three oral health therapy clinicians trained in MI (counsellors) provided MI to high-caries-risk children and their primary caregivers. All MI sessions (n=34) were audio-recorded and analysed using the MI Treatment Integrity code 4.2.1. Qualitative analysis of counsellor self-reflections identified barriers to MI delivery.

Results: All counsellors were found to adhere to the MI process and demonstrated fair to good MI proficiency for global scores, with a mean (95% CI) of 3.3 (3.1-3.4) recorded for technical scores and 3.6 (3.5-3.8) for relational scores. The mean (95% CI) percent complex reflections was 23% (19.4-27.1) and the mean reflection:question ratio was 0.7 (0.6-0.9). No significant differences were observed between counsellors for MI proficiency. Cultural barriers, environmental distractions, participant dental anxiety and counsellor tendency toward prescriptive advice-giving were identified by counsellors as hindrances to effective MI.

Conclusions: MI is a skill which requires multifaceted training, practice and mentoring to meet accepted proficiency thresholds. Monitoring of MI using a validated tool is essential to ensure delivery as intended and accurately attribute outcomes to the intervention. Dental organisations intending to implement MI for caries prevention should be aware of the demands on time and resources required to deliver proficient MI and monitor fidelity.

Keywords: behavioural science, oral health, general practice/methods, motivational interview/methods, caries

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Introduction

Dental caries is one of the world's most prevalent chronic diseases, affecting 50-90% of the world's school-aged children.[1] The numerous potential consequences of dental caries on child health and wellbeing include pain, bacteraemia, eating and speech problems, learning difficulties, malocclusion and growth disturbances.[2] Furthermore, the treatment of dental caries places an immense burden on the healthcare system and is one of the most common causes of potentially preventable hospitalisations in young children.[1]

A fundamental strategy underpinning prevention of dental caries in children includes the delivery of oral health education (OHE), with the aim of modifying patient and caregiver knowledge, attitudes and behaviours that place children at risk of oral disease.[3] Traditionally, OHE is delivered in an instructive fashion and while some studies have reported its effectiveness for reducing caries increment,[4-6] many others have reported no significant effect.[7-10] The most effective method of OHE delivery is currently in question, with a recent systematic review finding insufficient evidence to recommend any specific method of one-to-one OHE as being more effective than another for maintaining or improving oral health.[3]

Considering the shortcomings of traditional OHE, several psychological theory-based behavioural interventions are being investigated for caries prevention.[11] One promising intervention to produce positive behaviour change is motivational interviewing (MI), which is a patient-centred, collaborative and focused counselling technique that aims to activate a person's own desire to enact change.[12] Multiple studies in adult and child populations have demonstrated the efficacy of MI for addressing varied health problems including addictive behaviours, poor diet, overweight and obesity, diabetes and smoking.[13,14] MI has shown effectiveness in caries prevention for children[15-18] and adolescents,[19] although other studies in paediatric populations have shown no significant effect.[20-23]

Assessment and monitoring of an MI intervention, to determine its appropriate and consistent delivery as intended, is crucial to the validity and reliability of any behaviour intervention study.[24] Fidelity is defined as the degree to which an intervention remains true to its intended implementation and encompasses both adherence (conformation with the process and to the *a priori* design) and proficiency (counsellor skills).[24] Fidelity monitoring can provide assurance that outcomes are a result of delivery of the intended intervention, assist in identifying adverse events, and can provide information to health organisations and other stakeholders

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regarding implementation of the proposed intervention.[24] Few published studies have provided detailed reports on MI fidelity when MI was delivered for caries prevention in dental settings.[25-27]

The purpose of this paper is to explore the fidelity of implementing MI in a clinical dental practice setting, as part of an investigation into the caries-preventive effects of MI conducted with high-caries-risk children and their primary caregivers. This paper will assist researchers and clinicians in understanding how the MI intervention works, measures required to maintain fidelity and potential implementation barriers.

Materials and methods

This study was conducted at an inner-city major public dental service in Victoria, Australia, as part of a larger intervention study examining the effectiveness of MI for caries prevention. Three dental clinicians with an oral health therapy background were trained to deliver the MI intervention. All three counsellors participated in self-study of core texts,[12] six hours of face-to-face lectures and attended an eight-hour advanced face-to-face, didactic and practical MI workshop delivered by a certified expert. Attainment of MI counselling skills was confirmed through simulated participant sessions prior to the intervention.

Primary caregivers with high-caries-risk children aged 14 years and younger were recruited from the oral health therapy undergraduate student clinic between April and October 2018. The modified Caries Management by Risk Assessment tool[28] was used to assess caries risk. Children with medical or behavioural problems likely to influence their ability to accept oral health care and families with language barriers were excluded. Written consent was obtained from the participating primary caregiver and assent gained from children six years-of-age and older. Approval to conduct the project was gained from the University of Melbourne Human Research Ethics Committee (Ethics ID 1851102) and Dental Health Services Victoria Research Review Group (DHSV Project ID 319).

Participants received a timed, 20 minutes or less, face-to-face session of MI, aiming to engage the primary caregiver and their child in contemplating and planning ways to reduce caries risk behaviours, using a flexible MI guide (Appendix 1). Three attempts were made to rebook participants who did not attend for their scheduled intervention appointment. Through collaboration between counsellor and participant, specific change goals were selected from a menu of eight options and participants rated the importance of making the change and their confidence in doing so on a scale of one to ten. Following the intervention, child participants

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were provided with dental treatment required. Participants received brief (5-10 minute) follow-up phone calls at three and six months to reinforce the goals set at the initial MI session and maintain motivation for behavioural changes.

All initial MI sessions were recorded. Audio-recordings were analysed following the MI Treatment Integrity (MITI) coding manual 4.2.1 (Figure 1).[29] The lead counsellor completed the recommended 40 hours of practice to develop the required skills for coding.[29] 10% of the recordings were chosen by the select random sample of cases function in IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, N.Y., USA) and coded again by a blinded external experienced coder using the same coding manual.

The MITI 4.2.1 is a one-pass behavioural coding system which evaluates component processes of MI (engaging, focusing, evoking and planning).[29] This latest version has two components: firstly, the assignment of four global scores (cultivating change talk, softening sustain talk, partnership and empathy), rated on a five-point Likert scale (minimum 1, maximum 5); secondly, the recording of ten specific counsellor behaviours (Figure 1). Summary scores are calculated from the global scores and behaviour counts which serve as outcome measures for MI proficiency.[29] Summary scores include: technical (cultivating change talk plus softening sustain talk divided by two) and relational (partnership plus empathy divided by two) global scores; total MI adherent (affirming, seeking collaboration and emphasising autonomy) and non-adherent (persuading and confronting) behaviours; percent complex reflections (number of complex reflections divided by the sum of simple and complex reflections); and, reflection to question ratio.[30] Simple reflections convey understanding of participant statements, whereas complex reflections convey deeper insight.[12] From expert opinion, fair proficiency in MI requires at least 3.5 and 3 for relational and technical global scores, respectively, 40% complex reflections and 1:1 reflection:question ratio.[29] Good proficiency in MI requires at least 4 for both relational and technical scores, 50% complex reflections and 2:1 reflection:question ratio.[29]

After each MI conversation, counsellors completed a self-reflection tool adapted from the MITI 4.2.1 (Appendix 2). Throughout the intervention, findings from the MITI 4.2.1 coding analysis and the self-reflection tool were used to provide feedback to counsellors. Comments made on the self-reflection tool by counsellors were thematically analysed using an inductive approach to identify potential barriers to effective delivery of MI in the clinical dental practice setting.

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Quantitative data was analysed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, N.Y., USA). Fidelity-related characteristics of MI conversations were compared between counsellors using the independent samples Kruskal Wallis test. Statistical significance was considered at $P < 0.05$. Inter-rater reliability was assessed between internal and external coders using two-way mixed effects, absolute agreement, average-measures intraclass correlations.[30]

Results

Recruitment of 50 primary caregiver-child dyads was achieved. Female gender was recorded for 56% of child participants and 60% of primary caregivers. The mean (SD) age of children was 7.6 (2.4) years and caregivers was 38.4 (6.0) years. A majority of participants (96%) resided in metropolitan Melbourne; however, 71% of caregivers were born outside Australia, emigrating from a total of 17 different countries. Most caregivers (56%) had completed some form of tertiary education, with only 12% having not graduated from high school. Just under half (48%) of caregivers reported an annual household income of between $40,000 and $60,000, with 6% reporting an annual household income of less than $20,000 and 16% reporting an annual household income higher than $80,000. Caregivers generally reported two adults currently living in the household (74%), with 14% reporting three or more adults and 12% reporting they were the only adult currently living in the household. Most households (39%) had two children, 18% had one child, 18% had three children and 25% had four or more children.

MI was performed with 35 out of the original 50 recruited participants. Eight participants did not attend their rescheduled MI intervention session more than twice, three participants were referred to other clinics, two participants changed their mind and challenging behaviour of two participant children triggered their caregivers to request withdrawal. All completed MI sessions were audio-recorded and included in the analysis, except for one, where the audio quality was deemed inadequate, resulting in a total of 34 coded conversations. The inter-rater reliability score between the internal and external comparison coder was overall good, according to accepted published benchmarks, with an intraclass coefficient of 0.7 (95% CI 0.6-0.8).

All MI conversations resulted in identification of a target change (Table 1). The most frequently identified primary target change was reducing lollies and junk food, followed by brushing teeth twice daily, drinking more tap water and reducing soft drink. Target change

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rating for importance (maximum score 10) by participants were 39% 10/10, 30% 9/10, 24% 8/10, 3% 7/10 and 3% 6/10. Participants generally rated their confidence in making the target change lower than the importance, with only 24% rating 10/10, 21% 9/10, 27% 8/10, 12% 7/10 and 15% 5/10.

Counsellors were found to adhere to the MI process, with all counsellors using MI-adherent behaviours in all conversations with minimal use of non-adherent behaviours. Table 2 presents fidelity-related characteristics of the MI conversations in relation to counsellor proficiency benchmarks.[29] Mean duration of MI conversations was 10.7 minutes (SD 4.9). Counsellors two and three demonstrated significantly longer average conversation times than counsellor one ($P < 0.01$). The overall mean (95% CI) technical score was 3.3 (3.1-3.4) and the mean relational score was 3.6 (3.4-3.7), out of a possible 5.0. Mean (95% CI) percent of complex reflections was 23% (19.4-27.1) and mean (95% CI) reflection:question ratio was 0.7 (0.6-0.9). Mean (95% CI) MI adherent behaviours per conversation was 10.2 (8.6-11.8) and mean MI non-adherent behaviours was 0.6 (0.4-0.9). All counsellors exhibited incidences of giving information in all conversations and persuasion in 16 conversations. There were no significant differences in proficiency scores between counsellors; although significant differences in some behaviour counts were noted (Table 3).

Themes which emerged from counsellor self-reflections representing potential barriers to effective MI in the dental setting were: issues conversing with the highly multicultural cohort (despite all participants demonstrating good command of the English language); environmental distractions (such as presence of siblings); challenges incorporating MI and dental treatment in the same visit; participant apprehension in the dental setting; and counsellor tendency to revert to prescriptive advice-giving.

Discussion

Fidelity is essential to maintain when integrating behaviour change interventions into health settings; however, adherence to fidelity strategies in MI intervention studies is often low or insufficiently reported.[14] The approach to fidelity monitoring in this study was based on the framework of Bellg et al[24] and incorporated multiple facets including standardised counsellor training by a certified expert, implementation of an MI guide and ongoing observation, feedback, self-reflection and analysis of MI conversations using a validated tool.[30] Through audio-recording and coding of all MI conversations using the MITI 4.2.1, all counsellors in this study demonstrated acceptable intervention adherence, by using MI adherent behaviours

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with minimal non-adherent behaviours. The counsellors achieved fair to good proficiency for their ability to cultivate change talk and redirect sustain talk (technical scores) and ability to form a partnership and convey accurate empathy (relational scores), although percent complex reflections and ratio of reflection:question ratio were below fair proficiency.[30]

The acceptable level of MI fidelity for caries prevention is currently unknown, with conflicting associations reported between MI proficiency and caries-related outcomes.[25] The level of MI training and proficiency for global scores in this study was comparable to other studies investigating caries-preventive effects of MI in rural American[27] and Indigenous Australian[26] children. Weinstein et al[27] reported a range of 2.7-3.2 on a five-point Likert scale for overall MI counsellor proficiency and Jamieson et al[26] reported an overall mean (95% CI) global score of 3.8 (3.7-3.9). For behaviour counts, Wilson et al[25] reported a similarly low mean (SD) reflection:question ratio of 0.6 (0.6-0.7) and found two counsellors out of four demonstrated low mean (SD) percent complex reflections of 20.0 (12.1-27.9) and 29.6 (25.2-34.0). Jamieson et al[26] also reported a low mean (95% CI) reflection:question ratio of 0.9 (0.8-1.0). In the present study, counsellors reported difficulties conversing effectively due to differing cultural behaviours; highlighting the incongruent social discourses which are pervasive in healthcare interactions.[31] These difficulties might have compelled counsellors to generate simple rather than complex reflections and more questions than reflections, in their attempt to comprehend diverse family situations.[25,26] For enhanced MI fidelity, training should focus on delivery of complex reflections, with further investigations required into the influence of cultural nuances on this essential MI skill.

Potential barriers to delivery of proficient MI specific to the dental setting were discovered in this study. Some clinicians might face difficulties transitioning away from overt information-giving and persuading,[32] as was identified both through examining behaviour counts and counsellor self-reflections. Patient anxiety, distractions and demand for concurrent dental treatment were also common in this dental setting. MI proficiency might have been enhanced if MI was delivered in an environment of the participants' choosing, rather than in the potentially anxiety-provoking and distracting setting of a noisy operating clinic.[33] Other studies have successfully used MI for caries prevention in more patient-centred locations (for example, participant homes);[18] although recognised this significantly increases the cost and complexity of an intervention.

Organisational challenges were also identified while implementing MI in dental practice. In resource-constrained dental environments, interventions must be effective both for disease

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prevention and in terms of cost and time.[33] MI is adaptable into a brief (less than 20 minute) intervention, which is reported to be as effective for behaviour change as lengthier psychological interventions.[34] However, even brief MI is known to be more time consuming than traditional OHE and modifications to appointment timings are usually required.[27] Many study participants were excluded after multiple failed attempts to reschedule their MI conversations, potentially reflecting participant perception of low intervention value or because participants' time was consumed by other significant life priorities.[20] Another challenge is that preventive services such as MI are not appropriately incentivised in current fee-for-service arrangements in Australian public dental programs.[35] The willingness of patients attending private dental practices to fund and participate in MI is also unknown. To effectively integrate MI into dental practice, its importance as an integral part of caries management will need to be appreciated by patients, clinicians and organisations alike.[35] Recent emphasis on value-based dental care increases the possibility that suitably reimbursed item coding will be designated to patient-centred services including MI.[35] This essential shift in ethos should translate into improved resources, training and mentoring, which could enhance MI fidelity.[36]

A few limitations of this study should be considered. Although the MITI 4.2.1 addresses shortcomings of previous versions by analysing both counsellor dialogue as well as counsellor-participant relationships;[25] it cannot analyse participant characteristics, which are also likely to influence counsellor proficiency.[30] Second, another important measure of fidelity could have been gained by recording participant-reported experience measures to examine receipt of the intervention;[24] however, there are currently no validated tools specific for MI in the dental setting.[37]

In conclusion, fidelity assessment is essential for the successful integration of MI into dental practice for caries prevention and was found to be useful for providing feedback to counsellors and identifying barriers. Counsellors in this study maintained adherence to the MI process and achieved adequate proficiency in technical and relational scores. However, the proportion and complexity of reflections fell short of attaining fair proficiency, so training should be concentrated in this area. Participant characteristics should also be further explored for their ability to influence MI fidelity. Finally, to attain optimal MI fidelity when used for caries prevention, MI will need to be supported by organisations, clinicians and the patient community, with appropriate allocation of funding, time and resources.

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List of abbreviations

CI	Confidence intervals
MI	Motivational interviewing
MITI	Motivational Interviewing Treatment Integrity
OHE	Oral health education
SD	Standard deviation

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Declarations

Ethics approval and consent to participate

Approval to conduct the project was gained from the University of Melbourne Human Research Ethics Committee (Ethics ID 1851102) and Dental Health Services Victoria Research Review Group (DHSV Project ID 319). Written consent was obtained from the participating primary caregiver and assent gained from children six years-of-age and older.

Consent for publication

Not applicable

Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

S.R., J.S., C.M. and N.B. conceived the ideas; A.L. and C.M. collected the data; A.L. and S.R. analysed the data; A.L. and S.R. led the writing and A.L., S.R., C.M., J.S. and N.B contributed to the final manuscript.

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Tables and figures

Table 1. Frequency of primary target changes identified during motivational interviewing conversations and mean participant rated level of importance to make the change and confidence in making the change (brackets contain standard deviations)

Target Change	Number	Percent (%)	Participant rated importance	Participant rated confidence
Less or no lollies and junk food	17	49	9.1 (0.8)	7.7 (2.0)
Brush teeth twice a day	13	37	8.9 (1.2)	8.6 (1.2)

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Drink more tap water	3	9	9.0 (1.7)	8.7 (1.5)
Less or no soft drinks	2	5	9.0 (1.4)	8.0 (0.0)
Eat healthy snacks	0	0	-	-
Less or no juice	0	0	-	-
Chew sugar-free gum	0	0	-	-
Floss your teeth before bed	0	0		
Total	35	100		

Table 2. Fidelity-related characteristics of motivational interviewing conversations as measured by the Motivational Interviewing Treatment Integrity code 4.2.1; total and by individual counsellors compared to currently available proficiency benchmarks (brackets contain 95% confidence intervals)

	Counsellor proficiency thresholds					
	Fair	Good	Total	Counsellor 1	Counsellor 2	Counsellor 3
Number of conversations	-	-	34	14	8	12

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Mean conversation time in minutes	-	-	10.7 (9.0-12.4)	7.1[a] (6.1-8.1)	11.8[a] (7.9-15.7)	14.3[a] (11.1-17.4)
Mean cultivating change talk	-	-	3.4 (3.2-3.6)	3.2 (3.0-3.5)	3.4 (2.9-3.8)	3.6 (3.3-3.9)
Mean softening sustain talk	-	-	3.1 (2.9-3.3)	3.0 (2.7-3.3)	3.0 (2.6-3.4)	3.3 (3.0-3.7)
Mean partnership	-	-	3.6 (3.5- 3.8)	3.6 (3.4-3.9)	3.6 (3.2-4.1)	3.7 (3.4-4.0)
Mean empathy	-	-	3.5 (3.3-3.7)	3.4 (3.0-3.7)	3.6 (3.2-4.1)	3.6 (3.3-3.9)
Mean technical score	3.0	4.0	3.3 (3.1-3.4)	3.1 (2.9-3.4)	3.2 (2.9-3.5)	3.5 (3.2-3.7)
Mean relational score	3.5	4.0	3.6 (3.4-3.7)	3.5 (3.2-3.8)	3.6 (3.3-4.0)	3.6 (3.3-3.9)
Mean percent complex reflections	40	50	23.2 (19.4-27.1)	20.9 (14.9-26.9)	22.0 (14.4-29.6)	26.8 (18.8-34.8)
Mean reflection: question ratio	1.0	2.0	0.7 (0.6-0.9)	0.8 (0.5-1.1)	0.7 (0.4-1.1)	0.7 (0.6-0.8)
Mean MI-adherent behaviours	-	-	10.2 (8.6-11.8)	8.0 [b] (6.2-9.8)	9.1 [b] (6.8-11.5)	13.4 [b] (9.9-16.9)
Mean MI-non-adherent behaviours	-	-	0.6 (0.4-0.9)	1.0 [b] (0.5-1.5)	0.8 [b] (0.2-1.3)	0.2 [b] (-0.1-0.4)

[a] $P < 0.01$: Independent samples Kruskal-Wallis test

[b] $P < 0.05$: Independent samples Kruskal-Wallis test

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Table 3. Mean behaviour counts recorded in motivational interviewing conversations using the Motivational Interviewing Treatment Integrity code 4.2.1 (brackets contain 95% confidence intervals)

	Total	Counsellor 1	Counsellor 2	Counsellor 3
Giving information	3.8 (3.2-4.4)	3.1 (2.3-3.8)	4.1 (2.4-5.8)	4.4 (3.2-5.7)
Persuade	0.5 (0.3-0.7)	0.8[a] (0.4-1.2)	0.6[a] (0.2-1.1)	0.2[a] (-0.1-0.4)
Persuade with permission	1.1 (0.7-1.5)	0.7 (0.1-1.3)	1.3 (0.7-1.8)	1.5 (0.7-2.3)
Question	13.2 (11.3-15.0)	11.0[b] (8.4-13.6)	10.9[b] (7.3-14.4)	17.2[b] (14.0-20.4)
Simple reflection	6.8 (5.7-7.8)	6.0[a] (4.5-7.6)	5.3[a] (3.3-7.2)	8.7[a] (6.9-10.5)
Complex reflection	2.1 (1.6-2.6)	1.4[a] (1.0-1.9)	1.4[a] (0.8-2.0)	3.3[a] (2.2-4.5)
Affirm	5.4 (4.5-6.4)	4.6 (3.3-6.0)	5.0 (3.0-7.0)	6.7 (4.6-8.8)
Seeking collaboration	3.2 (2.6-3.8)	2.6[a] (1.9-3.4)	2.4[a] (1.6-3.1)	4.3[a] (3.1-5.6)
Emphasising autonomy	1.6 (1.1-2.0)	0.7[b] (0.4-1.0)	1.8[b] (0.8-2.7)	2.4[b] (1.5-3.3)
Confront	0.1 (0.0-0.2)	0.2 (0.0-0.5)	0.0 (0.0-0.0)	0.0 (0.0-0.0)

[a] $P < 0.05$: Independent samples Kruskal-Wallis test

[b] $P < 0.01$: Independent samples Kruskal-Wallis test

Figure Legends

Figure 1. Motivational Interviewing Treatment Integrity code 4.2.1 coding sheet

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Appendices

File name: Appendix 1

- File format: Word document (.docx)
- Title/description of data: Motivational interviewing guide for initial motivational interviewing conversation. Adapted from Dental Health Services Victoria Motivational Interviewing Guide 2013

File name: Appendix 2

- File format: Word document (.docx)
- Title/description of data: Motivational interviewing counsellor self-reflection tool

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Figure 1. Motivational Interviewing Treatment Integrity code 4.2.1 coding sheet

Recording #:__________________Coder:__________________________Date:____/____/____

Global Ratings

Technical components					
Cultivating Change Talk	1	2	3	4	5
Softening Sustain Talk	1	2	3	4	5
Relational components					
Partnership	1	2	3	4	5
Empathy	1	2	3	4	5

Target change:________________________

Behaviour counts	**Tally**	**Total**
Giving Information		
Persuade		
Persuade with Permission		
Question		
Simple Reflection		
Complex Reflection		
Affirm		
Seeking Collaboration		
Emphasising Autonomy		
Confront		

Start time and sentence:____

End time and sentence:____

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