



ORIGINAL ARTICLE

Using motivational interviewing for weight feedback to parents of young children

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Aim: To determine whether a single session of motivational interviewing (MI) for feedback of a child's overweight status promotes engagement in treatment following screening.

Methods: One thousand ninety-three children aged 4–8 years were recruited through primary and secondary care to attend health screening, including assessment of parenting practices and motivation (questionnaire). Families with normal-weight children were informed about their child's weight but had no further involvement. Parents of overweight (body mass index ≥ 85 th percentile) children ($n = 271$) were randomised to receive weight feedback via MI or best practice care (BPC) using a traffic light concept to indicate degree of health risk. Follow-up interviews were held 2 weeks later to examine intervention uptake, changes to motivation and behaviour, and parental response to feedback.

Results: Recruitment into the intervention was high (76%) and not altered by feedback condition (percentage difference 6.6 (95% confidence interval $-2.9, 16.0$). High scores on the Health Care Climate Questionnaire (rating of the interviewer) indicated satisfaction with how the information was provided to parents. No differences were observed in multiple indicators of harm. However, self-determined motivation for healthy life-styles was significantly higher in the MI condition at follow-up (0.18: 0.00, 0.35), after only a single session of MI.

Conclusions: MI and BPC were both successful in encouraging parents to participate in a family-based intervention, with MI offering little significant benefit over BPC. A traffic light approach to weight feedback is a suitable way of providing sensitive information to parents not expecting such news.

Key words: body mass index; motivational interviewing; paediatric obesity; primary care.

What is already known on this topic

- 1 Although many countries recommend routine screening for obesity in children, limited research examines how best to communicate this information to parents, and whether harm results from screening.
- 2 Health professionals are often hesitant to discuss this issue, and parents of young children do not typically recognise the presence of overweight at this age.
- 3 Motivational interviewing may provide an acceptable format for discussing weight with parents to encourage appropriate behaviour change.

What this paper adds

- 1 Motivational interviewing and best practice care were equally effective at encouraging parents to participate in a family-based intervention following feedback about their young child's weight.
- 2 A single session of motivational interviewing increased short-term (2 weeks) parents' autonomous (self-determined) motivation to promote healthy life-styles in their child.
- 3 A simple traffic light approach to discuss weight status was well received by parents.

Childhood overweight and the subsequent medical and psychosocial sequelae of obesity continue to be a significant problem

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Conflict of interest: All authors have no conflicts of interest relevant to this article to disclose.

Trial registration: Australian New Zealand Clinical Trials Registry ACTRN12609000749202

Trial protocol: *BMC Public Health* 2010, 10:271–282
doi: 10.1186/1471-2458-10-27

Accepted for publication 30 November 2013.

world-wide.¹ Although early intervention may offer a greater chance of success,² it cannot occur if parents do not perceive that there is an issue.³ This is particularly pertinent in young overweight children, given that up to 90% are incorrectly identified as normal weight by their parents.^{3,4}

Routine screening of height and weight provides the opportunity to increase parental awareness of children's weight status and associated health risks, and potentially encourage engagement in appropriate life-style change. Although the effectiveness of school screening programmes is unknown,^{5,6} parents are generally supportive of the process as long as it is done with privacy and dignity.^{7–10} Despite strong recommendations for weight screening to routinely occur in primary care,^{1,11} it is clear

that this is not happening.¹² Health professionals themselves often do not visually recognise overweight in their paediatric patients.¹³ If they do, they are hesitant to approach the subject with parents,^{14,15} citing a number of barriers including parental dissatisfaction, resistance and potential to negatively impact on the doctor–patient relationship.¹⁶ Guidelines to facilitate this discussion^{15,16} would be enhanced by determining how best to inform parents that their young child is overweight, and whether screening results in any ‘harm’.^{17,18}

Motivational interviewing (MI) may offer such an approach. MI is a therapeutic approach that emphasises an individual’s autonomy to change¹⁹ and aims to increase self-determined forms of motivation (motivation largely driven from within the person),²⁰ which is thought to encourage greater long-term behaviour change.²¹ Interest in the use of MI for child obesity is clearly apparent²² and although pilot studies have not demonstrated significant findings,^{23–25} several larger studies are currently underway.^{26–29}

Although MI is used predominantly over multiple sessions to encourage appropriate behaviour change,³⁰ interest is also growing in the use of MI for providing feedback to patients.³¹ If MI could provide a suitable tool for communicating sensitive weight-based information to parents of young children, it may provide a suitable starting point for encouraging families to make appropriate behaviour changes. However, considerable training and ongoing supervision are required to maintain MI fidelity and skills,^{32,33} which may not be feasible within the constraints of primary care. The primary aim of the current study was to examine whether using MI to deliver weight feedback increased recruitment into a 2-year family-based life-style intervention, relative to best practice care (BPC), following a weight screening initiative. Secondary aims included determining the effect of MI (vs. BPC) on motivation, parenting and life-style behaviours.

Materials and Methods

The Motivational Interviewing and Treatment study is a two-phase randomised controlled trial that has been described in detail elsewhere.²⁶ In brief, phase 1 aimed to determine whether using MI to inform parents of young children that their child was overweight was superior to BPC at encouraging enrolment in intervention. Phase 2 compares two different intervention approaches. Only the findings from phase 1 are reported in this manuscript. Ethical approval for the study was obtained from the Lower South Regional Ethics Committee (LRS/09/09/039).

All families of children aged 4–8.9 years enrolled at nine participating primary care practices (general practitioners) and those attending secondary care clinics (hospital-based referrals) in Dunedin, New Zealand, across two time periods (March 2009 to March 2010 and January 2011 to May 2011) were sent a personalised letter inviting them to participate. Exclusion criteria included cystic fibrosis, severe childhood arthritis, severe asthma, inflammatory bowel disease, congenital or chromosomal abnormalities, severe developmental delay, taking medication that may influence body composition or not planning to remain in the study district for the next 2 years. Potential participants could leave a phone message saying they did not

want to participate; no further contact was undertaken with this group. All remaining families were contacted by phone 1 week later to assess interest. Once verbal consent had been obtained, participants were randomised to feedback conditions (MI or BPC), using random block lengths (STATA 12.0, StataCorp, College Station, TX, USA)³⁴ after stratifying for practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition. Of the 3704 children assessed for eligibility, 198 (5%) were excluded and 1023 (28%) were non-contactable after five attempts. Of the 2483 (67%) eligible participants, 1166 (47%) declined participation when phoned, leaving a total of 1317 (53%) families who were booked into a health check appointment (Fig. 1).

Visit 1: health check appointment and feedback of weight status

Parents and children attended a health check session at university research rooms. After written informed consent was obtained, anthropometry in children was undertaken and parents completed an online questionnaire at the appointment. Height was measured using a portable stadiometer to the nearest 0.1 cm and weight using digital scales (Bioelectrical Impedance, Tanita BC-418³⁵) to the nearest 0.1 kg. Child body mass index (BMI) percentile was calculated using CDC reference norms.³⁶ The questionnaire assessed motivation for healthy life-styles, parental feeding and discipline practices, life-style behaviours and warmth/hostility towards the child, and each measure is described in more detail in Table 1.

Parents of normal weight children whose BMI < 85th percentile were told that the weight status of their child was not a concern and had no further involvement in the study (Fig. 1). Once the questionnaire had been completed, a feedback interview was held with parents of children whose BMI value was at or higher than the 85th percentile, according to their randomised condition (MI vs. BPC). Children were specifically not included in this process. In both conditions, researchers plotted BMI percentiles on a report card and discussed the outcome in a neutral manner using a traffic light approach (Fig. 2) to avoid labelling the child as ‘overweight’ or ‘obese’. Traffic light zone descriptions included discussion of the proportion of children, possible health consequences and the long-term risks associated with each zone. Parents were also told whether their children met recommendations for five life-style behaviours (activity, fruit and vegetable intake, sweet drink intake, television time and sleep) derived from New Zealand guidelines.⁴³ In the BPC condition, the interview included generic advice about how to achieve guidelines derived from publically available materials and best practice guidelines.^{1,22,44} In the MI condition, the measurements were presented using an elicit-provide-elicited (EPE) approach³⁰ to convey the information. This approach allowed interviewers to explore parents’ expectations and prior knowledge about their child’s weight before providing results and invited parents to discuss their reaction to the feedback and reflect on the importance of the information, using MI strategies. Interviewers refrained from giving unsolicited advice to parents and instead emphasised parents’ autonomy and expertise with reference to their child and their family’s life-style.

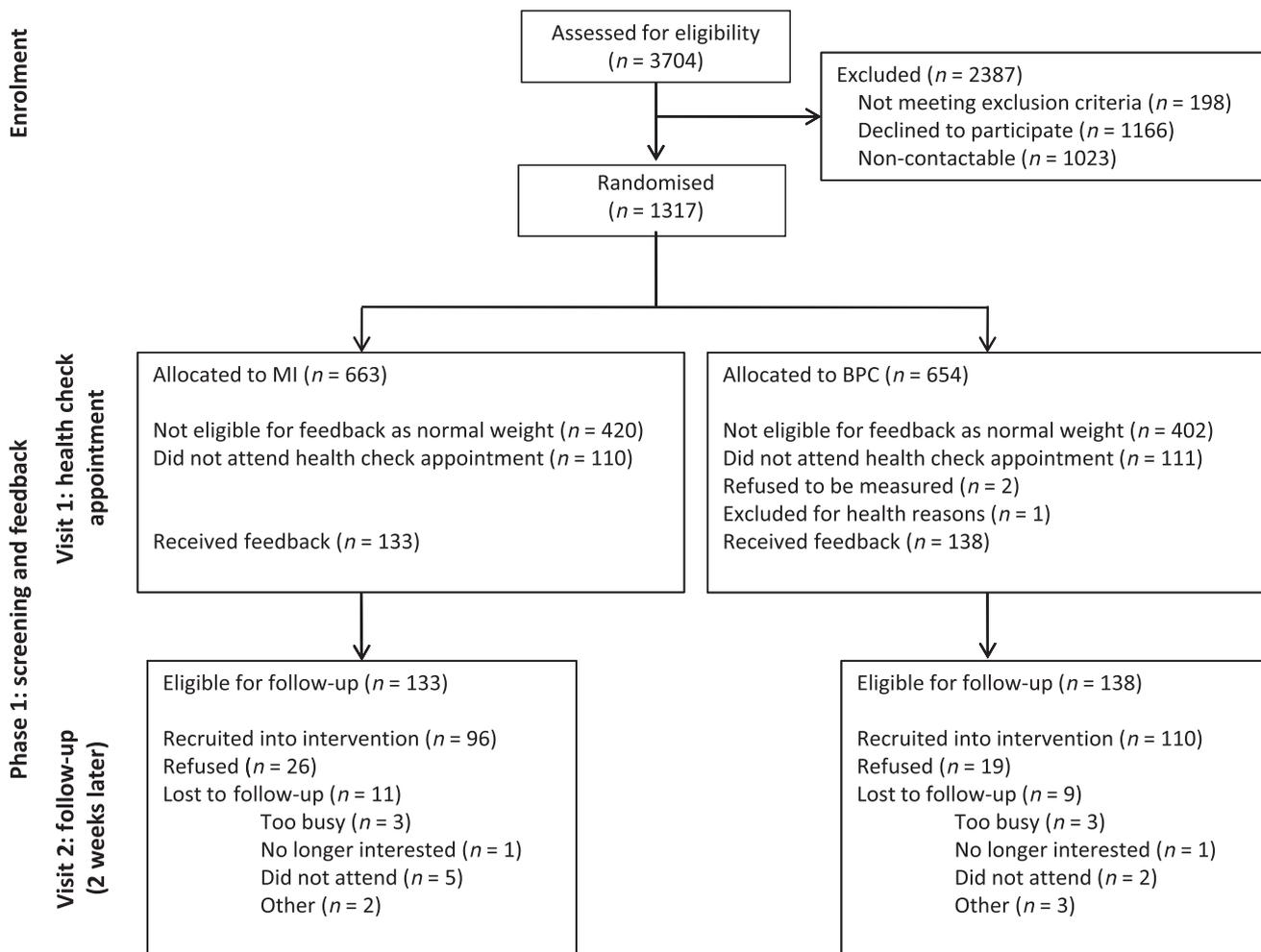


Fig. 1 Participant flow through the study. BPC, best practice care; MI, motivational interviewing.

Visit 2: follow-up interview

All parents of overweight children were invited to attend a follow-up interview approximately 2 weeks after the health check. Parents repeated aspects of the baseline questionnaire (see Table 1), underwent a brief interview to assess response to feedback and completed the Health Care Climate Questionnaire (HCCQ). The HCCQ assessed parental perception of the degree to which their interviewer was autonomy supportive (following self-determination theory principles)⁴² and targets parental response to the interviewer rather than to the information presented.

Training and supervision

Interviewers delivering UC received 12 h of training including 8 h on general interview skills (as they were research assistants rather than clinically trained personnel) and 4 h on the protocol, with ongoing weekly supervision. Those delivering MI completed 40 h of training over 3 months, including an online training course run by the Pacific Centre for Motivation and

Change (<http://www.pacificcmc.com/>), review of the BMI² DVD training series⁴⁵ and a 2-day workshop led by a Motivational Interviewing Network of Trainers accredited trainer. Ongoing weekly supervision was conducted for approximately 1 h. All feedback sessions were video-recorded, and the Motivational Interviewing Treatment Integrity behavioural coding system was used to assess MI fidelity and for supervision purposes.^{46,47}

Statistical analysis

Sample size estimates for the entire two-phase trial were dependent on recruiting 200 participants (100 in each of two conditions) into a 2-year intervention (Phase 2). We estimated a recruitment rate of 50%, based on previous work from our group (A Dawson, unpublished results, 2009). Thus, we planned to randomise families of 400 overweight children to receive MI or BPC feedback assuming 50% uptake. This gave us 80% power at the 5% level of significance to detect a difference of 15% in the proportion of families (MI vs. BPC) recruited into the intervention. Recruitment took approximately 16 months,

Table 1 Secondary outcome measures

Construct	Measure	Internal consistency within our sample (Cronbach's α)	Additional information	Assessed at health check	Assessed at follow-up
Life-style behaviours	Parent report of child's behaviour†	Not appropriate as single-item questions	Parents reported their child's average minutes of activity, television time and sleep. Parents also reported their child's daily servings of fruit, vegetables and sugary drinks.	✓	✓
Motivation for life-style change	Treatment Self-Regulation Questionnaire (TRSQ) ³⁷	0.74 for autonomous 0.68 for controlled	15 items; 7-point Likert scale (1 = not at all true, 7 = very true). Parents rated the extent to which certain factors played a role in the reasons behind making life-style changes to assess autonomous and controlled motivation.	✓	✓
Motivation for life-style change	Motivational Screening Measure (MSM) ³⁸	0.60 for diet 0.59 for physical activity 0.89 for weight	Modified version of the MSM to provide a brief assessment of motivation to change their child's diet, physical activity and weight. 3 items per behaviour; 11-point Likert scale (0 = definitely not, 10 = definitely). Items are 'I am trying to . . .', 'I could . . .' and 'It is important for me to . . .'. A total score per behaviour was calculated by adding the 3 items relevant to that behaviour.	✓	✓
Warmth/hostility	Questionnaire ^{39,40}	0.85 for warmth 0.66 for hostility	Parent ratings on 7-point Likert scale (1 = always, 7 = never) rated over the past fortnight. 5 items relate to warmth (e.g. how often did you let her know you really care about her), 4 items for hostility (e.g. how often did you criticise her ideas).	✓	✓
Parental concern	1 item	Not appropriate as single-item questions	Parent rated concern on a 5-point Likert scale (1 = not at all concerned, 5 = very concerned). Responses of 1–2 were categorised as no concern; responses of 3–5 were categorised as concern.	✓	✓
Feeding practices	Comprehensive Feeding Practices Questionnaire ⁴¹	0.89 for monitoring 0.78 for restriction for weight 0.82 for restriction for health 0.69 for environment 0.62 for child control	5 of the 12 original subscales were included: monitoring, restriction for weight control, restriction for health, environment and child control.	✓	✓
Parent ratings of interviewer behaviour	Health Care Climate Questionnaire (HCCQ) ⁴²	0.90	Parent ratings of the degree to which their interviewer was autonomy supportive (e.g. 'I feel that my advisor has provided me with choices and options'). 6 items; 7-point Likert scale (1 = strongly disagree, 7 = strongly agree).	–	✓

†Questions were devised internally by our research group and asked parents to estimate the time spent each day in (i) physical activity that would make the child puff or sweat and (ii) watching television including videos and DVDs but not computer use for week days and weekend days. Data were weighted to develop a daily average for each measure. Time asleep was measured from questions asking what time the child went to sleep and woke up on a usual week day and usual weekend day. Weighted averages for sleep were also calculated. Parents estimated the number of daily servings of fruit, vegetables and sugary drink from six response options ranging from none to three or more servings (fruit and vegetables) and four or more drinks. –, not applicable; DVD, digital video disk.

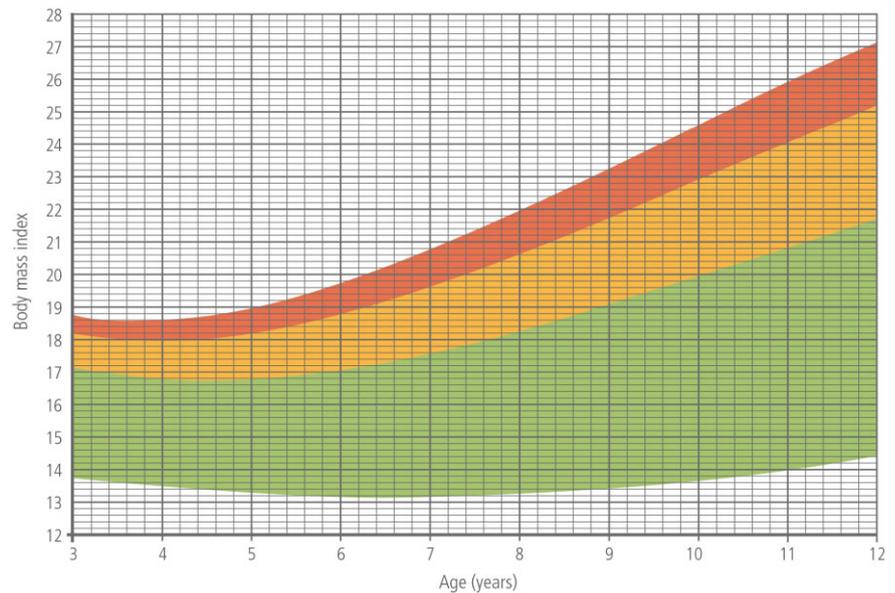


Fig. 2 Traffic light zone and corresponding BMI percentiles. The green zone represents the 3rd–84th percentile range. The orange zone represents the 85th–94th percentile range. The red zone represents the 95th–97th percentile range. BMI, body mass index.

and study funding was dependent on having a maximum of 200 participants entering the phase 2 intervention. However, as our recruitment rate was more than 50%, enrolment had to be stopped at 271 overweight participants receiving feedback. This gave us 80% power to detect a difference of 18% in uptake between the two conditions.

Data were analysed using STATA 12.0 using an intention-to-treat approach. The primary outcome was analysed using a two-group difference in proportion test to estimate the difference in the proportion of those agreeing to participate in the family-based intervention from each feedback condition. Multiple regression was used for the continuous variables, and logistic regression was used for the categorical variables.⁴⁸ Residuals were plotted to ensure they were normal. Those that were skewed were log transformed.⁴⁹ Linear regression comparisons were adjusted for the baseline score of the outcome measure.

Results

One thousand ninety-three children were included in analyses as one child should have been excluded for health reasons and two children refused to be measured. Participants were of similar age ($P = 0.877$) and ethnic distribution ($P = 0.124$) as non-participants (including non-attendees), but more non-participants were male ($P = 0.006$) and came from homes with a higher level of deprivation ($P < 0.001$). Baseline demographic and clinical characteristics are presented in Table 2.

Two hundred fifty-one parents (92.6%) attended follow-up interviews, with 206 (76%) agreeing to participate in the intervention. Mean (standard deviation (SD)) difference in the number of days between the health check appointment and follow-up interview was 18 (7.5) days with no difference between the two feedback conditions ($P = 0.66$). No differences in recruitment were observed by feedback condition (percent difference BPC relative to MI: 6.6 (95% confidence interval (CI) –2.9 to 16.1, $P = 0.17$). Similar results were obtained if analyses were restricted to the 196 (72.3%) participants who actually

attended the first intervention session (Table 3). This high recruitment occurred despite 63% of parents indicating that the weight information was unexpected.

Although parents were also told whether their child met guidelines for various life-style behaviours, there were no significant differences between the two conditions in any behaviour at follow-up (Table 4). The one exception was autonomous (self-determined) motivation, which was significantly higher in the MI condition at follow-up (mean adjusted difference, 95% CI: 0.18, 0.01 to 0.35).

Feeding practices and parental feelings of warmth and hostility towards their child did not differ according to feedback condition (Table 5). After feedback, parents who received BPC feedback were significantly more likely to be concerned about their child's weight than those who received MI feedback (odds ratio 1.73, 95% CI 1.04 to 2.86, $P = 0.03$). However, baseline concern was also higher in the BPC group. Changes in concern tended to be higher for those receiving MI feedback, with a 22% increase in the number of parents who were concerned about their child's weight status compared with 14% of parents who had BPC feedback ($P = 0.054$).

MI feedback sessions were approximately twice as long as UC sessions. Fidelity coding indicated that MI interviewers performed well, meeting beginning proficiency goals for most indicators except for complex reflecting. By contrast and as expected, interviewers in the UC condition displayed a low percentage of MI adherent behaviours and did not meet any proficiency or competency levels (Table 6). High HCCQ scores indicated parental satisfaction with the interviewers (mean scores of 5.8 (SD 1.1) out of a possible score of 7) and were significantly higher for MI interviewers (6.1 vs. 5.6, $P < 0.001$).

Discussion

Our study demonstrated that although many parents were unaware that their young child was overweight, they were receptive to behavioural intervention, with 76% agreeing to

Table 2 Demographic and clinical characteristics of the samples at the health check interview

	Overall sample (<i>n</i> = 1093)†	Overweight children only (<i>n</i> = 271)	
		MI (<i>n</i> = 133)†	BPC (<i>n</i> = 138)†
Age (years)	6.5 (1.4)	6.4 (1.40)	6.5 (1.47)
Sex (female) <i>n</i> (%)	543 (50%)	67 (50%)	83 (60%)
Ethnicity			
European	823 (75%)	93 (70%)	93 (67%)
Maori	151 (14%)	24 (18%)	26 (19%)
Pacific	42 (4%)	10 (8%)	10 (7%)
Asian	47 (4%)	2 (1%)	7 (5%)
MELAA	8 (1%)	1 (1%)	1 (1%)
Other	21 (2%)	3 (2%)	1 (1%)
NZ Deprivation Index‡			
Low deprivation (1–3)	425 (40%)	41 (31%)	56 (42%)
Medium deprivation (4–7)	412 (39%)	49 (38%)	45 (34%)
High deprivation (8–10)	224 (21%)	40 (31%)	31 (24%)
Child weight status			
BMI	16.6 (2.0)	19.0 (1.9)	19.6 (2.3)
BMI z-score	0.5 (0.9)	1.6 (0.4)	1.7 (0.5)
Parent characteristics			
Maternal age	37 (5.4)	36.73 (6.2)	37.21 (5.5)
Maternal BMI	27 (5.8)	29.35 (6.6)	28.92 (5.9)
Paternal age	39 (6.1)	38.95 (6.4)	39.42 (6.6)
Paternal BMI	27 (4.0)	28.79 (4.3)	28.24 (4.1)
Maternal education			
Some secondary school	293 (27%)	45 (34%)	41 (30%)
Completed secondary school	73 (7%)	11 (8%)	8 (6%)
Tertiary qualification	224 (21%)	24 (18%)	32 (24%)
University degree	448 (41%)	43 (32%)	48 (36%)
Other	44 (4%)	10 (8%)	6 (4%)
Number of members in household	4.3 (1.1)	4.3 (1.2)	4.3 (1.2)
Single-parent family	153 (14%)	22 (17%)	24 (17%)
Two-parent family	939 (86%)	111 (83%)	114 (83%)

†Sample size ranges from 939 to 1093 in the total sample, 101–133 in the MI arm and 121–138 in the BPC arm for individual measures. ‡NZDep2006, New Zealand deprivation index where a higher score indicates a greater degree of deprivation.⁵⁰ BMI, body mass index; BPC, best practice care; MELAA, Middle Eastern/Latin American/African; MI, motivational interviewing.

Table 3 Intervention uptake by feedback condition

	MI <i>n</i> = 122	BPC <i>n</i> = 129	Percent difference (95% CI)
Agreed to intervention participation	96 (78.6)	110 (85.2)	6.6 (–2.9 to 16.1)
Attended pre-intervention baseline session	96 (78.6)	107 (82.9)	4.3 (–5.4 to 14.0)
Attended first intervention session	91 (74.5)	105 (81.3)	6.8 (–3.4 to 17.0)

Data are restricted to the families of overweight children who agreed to attend the follow-up interview (*n* = 251, 92.6%). CI, confidence interval; BPC, best practice care; MI, motivational interviewing.

Table 4 Behaviour and motivation by feedback condition

	MI§		BPC§		Difference: MI relative to BPC (95% CI)
	Baseline (n = 133)	Follow-up (n = 122)	Baseline (n = 138)	Follow-up (n = 129)	
Time between health check (baseline) and follow-up appointments (days)	18.3 (6.1)		18.1 (8.5)		0.23 (−1.69 to 2.16)
Life-style behaviours					
Activity (min/day)	83 (57)	79 (53)	83 (77)	81 (69)	0.00 (−0.15 to 0.14)
Sleep (h/day)	11 (0.1)	11 (0.2)	11 (0.1)	11 (0.1)	−0.23 (−0.60 to 0.13)
TV time (min/day)	84 (57)	75 (59)	90 (58)	78 (46)	0.04 (−0.22 to 0.12)
Sedentary behaviour (min/day)	111 (73)	98 (74)	107 (67)	94 (55)	0.05 (−0.22 to 0.11)
Fruit intake (servings/day)	2.1 (0.4)	2.3 (0.8)	2.1 (0.8)	2.3 (0.8)	−0.02 (−0.13 to 0.08)
Vegetable intake (servings/day)	2.0 (0.8)	2.2 (0.8)	2.1 (0.8)	2.2 (0.7)	0.09 (−0.03 to 0.21)
Sweet drink intake (servings/day)	0.5 (0.7)	0.4 (0.6)	0.6 (0.8)	0.5 (0.7)	0.01 (−0.09 to 0.10)
Parent motivation† ³⁷					
Autonomous motivation	5.8 (0.9)	5.9 (1.0)	6.0 (0.8)	5.9 (0.9)	0.18 (0.01 to 0.35)
Controlled motivation	3.0 (1.0)	2.8 (1.1)	3.0 (1.0)	3.0 (1.2)	−0.10 (−0.28 to 0.08)
Reported parental motivation for behaviour change‡ ³⁸					
Exercise change	22 (4)	23 (5)	23 (4)	24 (5)	0.02 (−0.91–0.96)
Diet change	23 (5)	23 (5)	24 (5)	24 (4)	−0.64 (−1.5–0.23)
Weight change	10 (8)	14 (9)	13 (9)	17 (9)	0.09 (−1.5–1.7)

Values are means (standard deviations). Significant differences are in bold. From a total possible score of †7 and ‡30 with higher scores indicating higher motivation. §Sample size varies from 121–133 in the MI condition and 127–138 in the BPC condition for individual measures. CI, confidence interval; BPC, best practice care; MI, motivational interviewing; TV, television.

Table 5 Feeding practices and feelings towards the child by feedback condition

	MI		BPC		Difference: MI relative to BPC (95% CI)
	Baseline (n = 133)†	Follow-up (n = 122)†	Baseline (n = 138)†	Follow-up (n = 129)†	
Feeding practices					
Monitoring	4.1 (0.7)	4.2 (0.7)	3.7 (1.0)	4.1 (0.7)	0.05 (−0.07 to 0.19)
Restriction for weight control	2.1 (0.6)	2.1 (0.6)	2.3 (0.7)	2.3 (0.7)	0.03 (−0.83 to 0.16)
Restriction for health	3.7 (0.9)	3.8 (1.0)	3.7 (1.0)	3.7 (1.0)	0.05 (−0.08 to 0.20)
Environment	4.0 (0.7)	4.1 (0.7)	3.9 (0.6)	4.0 (0.7)	0.07 (−0.02 to 0.17)
Child control	2.4 (0.7)	2.2 (0.5)	2.4 (0.6)	2.3 (0.6)	−0.03 (−0.14 to 0.06)
Feelings towards child					
Warmth	9.4 (3.3)	9.4 (3.4)	9.8 (3.6)	9.6 (3.3)	0.02 (−0.48 to 0.52)
Hostility	21.1 (3.1)	21.9 (3.0)	21.4 (3.0)	22 (2.8)	0.01 (−0.42 to 0.45)

Values are means (standard deviations). Baseline refers to the health check session, and follow-up was completed 2 weeks later. †Sample size varies from 118–133 in the MI condition and 127–138 in the BPC condition for individual measures. CI, confidence interval; BPC, best practice care; MI, motivational interviewing.

participate in a 2-year family-based programme. Somewhat surprisingly, using MI to inform parents about child overweight did not increase intervention engagement more than feedback delivered using BPC. However, parents who underwent only a single session of MI feedback became more autonomously moti-

vated to make changes to improve their child's life-style. The clinical significance of this difference is unclear given the lack of comparable research in this area. Whether such a difference can translate to long-term behaviour change is unknown,^{51,52} but it is an important observation given that it occurred in parents

Table 6 Descriptive information of feedback condition

	MI (n = 133)	BPC (n = 136)
Interview duration (min)	29.9 (10.4)	14.2 (4.7)
MITI ⁴⁵ scores		
Global spirit score	4.4 (0.5)‡	1.6 (0.5)
% MI adherent	93 (13)†	6 (12)
Question: reflection ratio	1.7 (0.9)†	0.5 (0.4)
% open questions	66 (19)†	11 (10)
% complex reflections	32 (14)	13 (23)

Values are means (standard deviation). †Meets beginning proficiency standards for the MITI coding system. ‡Meets competency standards for the MITI coding system. BPC, best practice care; MI, motivational interviewing; MITI, Motivational Interviewing Treatment Integrity.

who were not actively seeking treatment for their children. Obesity interventions in children typically recruit by advertisement or referral from health agencies where it might be expected that parents are more motivated.⁵³ Our study was different in that it undertook a screening programme in a wide cross-section of the population in an effort to include the large number of parents who typically do not recognise overweight in their young child.³ While it is possible that parents who agreed to participate in the health check were already motivated to participate in the intervention, this seems unlikely given the brevity of information offered about the intervention at this point and the lack of awareness regarding child body size. Our participants were also broadly comparable with the local population, with a higher proportion from less disadvantaged homes, but improved representation of ethnic minorities (<http://www.stats.govt.nz>).

The observation that the MI group tended to show a greater increase in concern about the child's weight following feedback should be viewed as a positive outcome for several reasons. Increasing parental awareness and recognition of the health risks⁵⁴⁻⁵⁶ and higher levels of concern⁵⁷ have both been shown to increase the likelihood of appropriate behaviour change. It is possible that MI feedback allowed further time and opportunity for parents to explore their thoughts about excess weight in relation to their child. Furthermore, increases in concern were not accompanied by variation in restrictive feeding practices or the way parents acted towards their child (warmth/hostility questions), which might indicate a negative outcome. The absence of any indicators of 'harm' may be due to the observation that parents often do not believe that excess weight during childhood is problematic.^{3,56,58} Because of the young age of much of our sample, we did not examine other indicators of harm such as child self-esteem, body image or teasing.⁹ However, further qualitative analysis of our follow-up interviews is examining whether (and how) parents discussed the weight information with their child.

Comparison of our findings with the literature is difficult given the paucity of studies that have used MI for health-related feedback. Although MI for feedback has been used in the addiction field,^{31,59} this tends to be for behaviours with very immedi-

ate consequences (such as reduction of alcohol intake during pregnancy),³¹ as opposed to the effects of being overweight in childhood, the consequences of which are generally future focused. MI and the EPE model have also been used with adults in regard to diet and exercise,^{30,60,61} and MI has been recommended as a tool to discuss life-style change with parents.^{22,44} However, our study appears to be the first to examine the use of MI for feedback to inform parents of young children that their child is overweight.

Staff delivering MI in our study received rigorous training and supervision, which is a particular strength of the study. While there was good fidelity to MI spirit, a core component of MI,¹⁹ this extensive training did not translate to highly proficient status for every aspect of MI, a finding that is supported by literature.⁶²⁻⁶⁴ Because significant reflective practice is involved in maintaining MI skills at an optimum level,^{32,33,65} it seems unlikely that this approach would be sustainable in primary care where these skills might not be regularly used and access to supervision and training resources may be limited. The MI interviews, averaging 30 min, were twice as long as the BPC sessions. Therefore, the extended interview duration of the MI condition alone provides a significant barrier to the use of this procedure for feedback in primary care. It is worthwhile to note that despite the increased time spent discussing the growth results in this condition; the additional time did not translate into greater benefits in terms of behaviour change. This may suggest that a 15-min consultation may provide enough time to give parents weight feedback and encourage participation in a life-style intervention.

As recruiting into phase 1 of this study was dependent on numbers entering phase 2, recruitment into phase 1 was terminated at 271 participants rather than the 400 initially specified. This reduced the proposed power of our study to detect a difference in uptake between the two feedback groups. However, our results clearly demonstrated that both types of feedback encouraged participation, despite the majority of parents reporting that they were surprised to learn their child was overweight. In virtually all cases (>90%), it was the mother who attended each appointment and provided her response to feedback. While the verbal discussion often included comments and impressions passed on by the mother from the father, the actual scores used to indicate response to feedback in this study are therefore predominantly from mothers. The current study provides support for a non-judgmental approach to informing parents of their child's BMI status that leads to high intervention uptake. The traffic light approach and explanations used in both conditions intentionally avoided the use of terms that have often been associated with decreased acceptability in parents (obese or overweight).⁷ The high scores on the HCCQ demonstrate that parents found this an acceptable approach and offers a way for health professionals to discuss sensitive information with parents to increase awareness of childhood overweight and associated health risks and promote intervention engagement. Interestingly, the traffic light approach has rarely been examined, but preliminary evidence is supportive of colour-coded BMI charts to improve the communication of BMI results^{66,67} and aid parental understanding.⁶⁸

In conclusion, despite recent interest in MI, the current study did not see significant benefit on treatment uptake in using MI

to feedback a child's weight status, when compared with BPC. However, a single MI session did increase parental concern and autonomous motivation, two factors that may influence the likelihood of behaviour change occurring. Greater autonomy support was also indicated from higher ratings of interviewer behaviour, in parents receiving MI. The use of a traffic light concept provides a suitable method to indicate to unsuspecting parents that their young child is overweight, in a neutral, time-efficient manner that could be easily adopted in primary care.

Acknowledgements

Authorship contributions

RWT was the principal investigator of the project and was responsible for study design, monitored data collection and revised the paper. AMD contributed to study design, undertook data collection and produced the first and subsequent drafts of the paper. DAB, AC and LT contributed to study design, supervised research staff and revised the manuscript. SMW contributed to study design, completed statistical analyses and revised the paper. JH and KM-J undertook data collection and revised the paper. BJT, EH and JR contributed to study design and revised the paper.

Funding

This study is funded by the Health Research Council. AMD is supported by the Freemasons New Zealand and RWT is funded by the KPS research fellowship. The funders had no role in study design; or in the collection, analysis, and interpretation of data; or in the writing of the report or the decision to submit the article for publication.

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