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Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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ABSTRACT

Objectives: As parents of young children are often unaware their child is overweight, screening provides the opportunity to inform parents and provide the impetus for behaviour change. We aimed to determine if parents could recall and understand the information they received about their overweight child after weight screening.

Design: Randomised controlled trial

Setting: Participants were recruited through primary and secondary care but appointments took place at a University research clinic.

Participants and intervention: 1093 children aged 4-8 years were screened of which 271 were overweight (24.7%). Only overweight children are included in this study. Parents of overweight children were randomised to receive feedback regarding their child's weight using best practice care (BPC) or motivational interviewing (MI). Sessions were face-to-face interviews and typically lasted 20-40 minutes. Two hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to assess recall and understanding of information from the feedback session.

Primary and secondary outcome measures: Interviews were audio-taped and transcribed verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall and sub-categories of interest.

Results: Overall, 39% of the information was recalled (mean score 6.3 from possible score of 16). Parents given feedback via BPC recalled more than those in the MI group (difference in total score 0.47; 95% CI 0.05, 0.88). Although 94% of parents were able to correctly recall their child's weight status, only 11-50% of parents could accurately describe what the measurements meant. Maternal education (0.79; 95% CI 0.30, 1.28) and parental ratings of how useful they

found the information (0.20; 95% CI 0.05, 0.36) were significant predictors of recall score in multivariate analyses.

Conclusions: While parents remember that their child's BMI is higher than recommended, they are unable to remember much of the information and advice provided about the result.

CLINICAL TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry ACTRN12609000749202

ARTICLE SUMMARY

Strengths and limitations of this study

- First study to assess what parents remember and understand from a 20-40 minute face-to-face session dedicated to discussing the weight status of their child
- Recall and accuracy were studied extensively through the use of transcripts which were transcribed verbatim and coding according to an extensive coding schedule
- Large (n = 248), demographically diverse sample of overweight children and their parents
- Not originally designed to specifically test parental memory, and thus exhaustively prompt parents for complete recall

INTRODUCTION

Approximately one in three children are overweight in New Zealand,[1] a problem that is poorly recognised, particularly by parents.[2-4] It has therefore been suggested that routine consultations in primary care include measurement of body mass index (BMI) in an effort to improve recognition and awareness of excess weight during childhood.[5]

Although the primary care environment might seem suitable for routine screening given established relationships between families and their health practitioner, patients often present with multiple problems making it difficult for health practitioners to address each problem adequately within a standard consultation time.[6] While adding measurement of height and weight may add little time to the overall appointment, discussion of overweight status, particularly for unsuspecting parents, is considerably more complicated. Whether parents have the ability to recall and understand this information, and thus potentially make the behavioural changes required, is unknown.

The extent to which patients are able to recall their medical information has important implications for treatment adherence, patient satisfaction and subsequent health outcomes.[7,8] In general, recall of medical information is low.[9-12] Health information is often complex and may be incongruent with patients' perceptions. Furthermore, factors such as patient age, education, literacy levels, anxiety and stress impact upon a patient's ability to remember the information presented.[13-16] Not surprisingly, several studies have demonstrated that parents recall pertinent details about their child's health (such as diagnoses or major injuries) more than peripheral details (such as tests completed in a consultation, prescriptions or follow-up appointments).[15,17,18]

In the context of screening for overweight in children, it would appear that parents can recall important information, such as their child's weight status following a posted letter.[19] However, understanding of the results and BMI charts and/or percentiles is very low.[20] To date, most evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a few studies[20-22] have assessed whether parents *understand* BMI charts and percentiles, and none have done so after receiving BMI results in a face-to-face consultation, as would occur in a primary care setting. This is an important distinction as it may be that a letter of results provides an enduring memory cue or resource which enables parents to better retain the information and refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding given the opportunity to discuss the results and ask questions, thereby strengthening encoding of the information and creating stronger recall.

Therefore, this study investigated parental recall of information given in a BMI screening and face-to-face feedback session. Specifically, we examined how much information parents could recall from the BMI screening session, which types of information were more likely to be recalled, the accuracy of parental recall and how recall varied according to feedback style. Factors that may predict better recall performance were also explored.

SUBJECTS AND METHODS

This manuscript presents data from a large randomised controlled study (MInT) which has been described in detail previously.[23] In brief, MInT was a BMI screening initiative followed by a two-year family-based intervention in overweight children. Ethical approval was obtained from

the Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

Participants

1093 children between the ages of 4 and 8 years, recruited from local primary care practices and secondary care clinics in Dunedin, New Zealand were screened for overweight at a University research clinic. Parents were randomised to receive feedback delivered using a best practice care (BPC) or motivational interviewing (MI) approach (*screening*).[24] Only those parents with overweight children (BMI $\geq$ 85th percentile)[25] were eligible for the current study (n = 271). These parents were invited to participate in a recall interview at the University approximately two weeks later to discuss the feedback they received about their child's growth (*follow-up*). Twenty parents declined participation in the recall interview. A further seven participants were excluded due to technical difficulties with audio recordings (n = 6) and one had brought the feedback booklet with them to the interview making them unsuitable for assessing *recall* of feedback.

Procedures

Screening

Parents (virtually all mothers, fathers < 2%) completed a comprehensive online questionnaire assessing demographic characteristics including ethnicity, maternal education, an index of socioeconomic status (New Zealand deprivation index, NZDep2006[26]) and maternal age. Parental concern about their child's weight and perception of their weight status were both assessed using a 5-point Likert scale question (where 1 = not at all concerned and 5 = very concerned for concern and 1 = underweight, 2 = a little underweight, 3 = about right, 4 = a little

overweight, 5 = overweight for perception). We calculated a discrepancy score to indicate the extent to which the parent under- or over-rated their child's weight status by comparing the parental perception of their child's weight status with their actual BMI classification (underweight = <3rd percentile, normal weight = 3rd-84th percentile, a little overweight = 85th-94th percentile, overweight = ≥95th percentile). Scores of 1 or 2 for the perception of underweight were combined in this comparison. Duplicate anthropometric measurements (height, weight and waist) and blood pressure (BP) (Dinamap: GE Medical Systems, Waukesha, WI) were obtained from children using standard techniques. BMI was calculated using CDC reference norms[25] and waist (cm) to height (cm) ratio (WHtR) was compared with recommendations from Aswell and colleagues.[27] Researchers plotted BP, BMI and WHtR onto colour-coded charts relative to age and sex in a booklet that parents were able to take home. The booklet also included a glossary of key terms, a summary of the child's lifestyle behaviours (e.g., physical activity, fruit and vegetable intake) as reported by parents, as well as current New Zealand guidelines for these behaviours.[28]

Feedback interview: Researchers explained each measure and then discussed the lifestyle behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid labelling the child as "overweight" or "obese". Implications of each colour zone were explained in terms of how many children were in each zone, possible health consequences and the long-term risk of carrying excess weight associated with each zone. Researchers delivering the feedback were from different backgrounds (e.g., dietetics, nutrition, exercise science). Therefore, researchers delivering BPC feedback (n = 2) received 6 hours of general interviewing skills

training and 6 hours training on the feedback protocol. Researchers delivering MI feedback (n = 3) received approximately 40 hours training in MI and the feedback protocol.

BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that the primary focus of the BPC interview was on anthropometric results and discussion of the lifestyle behaviours. Interviews typically lasted 15 minutes.

MI feedback condition: Parents were given information using an Elicit-Provide-Elicit (E-P-E) approach[29] that allowed researchers to check in with parents' prior knowledge before giving feedback. This approach also allowed parents the opportunity to explore the meaning and importance of the results. Therefore, in contrast to the BPC interview, the focus of the MI interview was on the *implications* of the health check results to the family. Interviews typically lasted 30 minutes. All interviews were video-taped and transcribed verbatim so that accuracy of recall could be determined.

Follow-up

The recall interview took place approximately two weeks after the screening and feedback session and an independent interviewer, not involved in the feedback process interviewed the parents (n = 3). Parents repeated aspects of the BMI screening questionnaire and completed a semi-structured interview (questions are presented in Table 1). In summary, these assessed recall and usefulness of the information, and parental experience of the feedback. Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for coding.

Coding

The number of pieces of information given at the feedback session were identified and defined by two authors (AMD, DAB). Lists of acceptable responses were developed and the coding framework was applied (initially collaboratively, then independently) to transcripts and codes compared. Discrepancies were resolved through discussion and the coding rules were finalised. The pieces of information (n = 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a large number of discrete items of information to receive, the six categories were the main point of interest and the individual items were included to provide details on the type of information recalled. Scores were weighted according to their importance in the feedback interview. Weighting decisions were made through author discussion of the most important clinical messages delivered to parents. For example, the main result discussed was BMI, therefore this was allocated the highest weighting of 4 from a maximum of 12.5. Only the weighted figures were used in analyses presented here but results did not differ whether weighted or unweighted scores were used (data not shown).

Coding was completed in two passes. The first pass assessed *how much* information was recalled. Coders identified relevant statements on the transcript and allocated a score under one or more categories. One statement could be coded in several categories (e.g., "her BMI was in the overweight category" would gain a score for indicating that BMI was measured and for giving the BMI result). If a piece of information was mentioned more than once, only the first statement was allocated a score. As recall may be prompted by discussion that occurs later in the interview, recall of the implications associated with carrying excess weight was divided by stage of interview, into free and prompted recall (Table 1). Recall of the other five information categories was not divided into free and prompted recall as the majority of relevant information

was recalled following question 1, and the interview was not set up to prompt exhaustively as would be expected in a memory interview. Implications recalled in response to the first recall question and non-specific prompts were considered free recall. Implications recalled following a specific prompt or additional interview questions were considered prompted recall. The second coding pass identified whether the information recalled was accurate or not. Each piece of information identified in the first pass was compared with the transcript of the BMI feedback interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter- and intra-reliability were moderate to excellent[30] (0.48-0.96).

Data analysis

Linear regression was conducted to examine the overall effects of interview condition, recall interviewer and time between feedback and recall interview. To examine the amount of information recalled, scores were converted to a proportion of the total number of items in each category and regression was used to compare the relative frequencies of information category (within-subjects factor) and the interaction of feedback condition (between-subjects factor). Accuracy is presented as the proportion of parents who correctly recalled each type of information. Accuracy was analysed using a two-group difference in proportion test to detect any difference between the two feedback conditions. A mixed model was used to compare recall of the meaning of results by stage of interview (within-subjects factor) and feedback condition (between-subjects factor). The model included an interaction term. To investigate which factors are associated with better recall, variables were analysed using multiple linear regression.

Variables with p < 0.2 in the univariate model were included in the multivariate model. To adjust for feedback condition and time between feedback and recall session, these variables were also included in the multivariate models.

RESULTS

Parents that did not participate in recall interviews (n = 27) had children who did not differ in age (P = 0.66), sex (P = 1.00), maternal education (P = 0.57), or BMI z-score (P = 0.59) from children who did participate (n = 244). Table 3 presents the mean number of items recalled and weighted score by information category. On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they were given at the feedback session. There was no difference in total recall score by recall interviewer (P = 0.65), but total recall score decreased by 0.02 (95% CI -0.05 to 0.00) for each extra day between the feedback and recall interview (P = 0.051). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time between interviews (days). There was a significantly higher total recall score for those in the best practice care condition (*M* = 6.01, *SD* = 1.42 from a total possible score of 12.5) compared with the MI condition (*M* = 5.55, *SD* = 1.83) (difference 0.47 (95% CI 0.05 to 0.88), P = 0.02).

Table 4 reports the number of people who recalled each category of information. Table 4 illustrates that while very few parents recalled information about their child's fat distribution (28%) or blood pressure findings (21%), virtually every parent recalled that their child had a high BMI (97%). However, it is clear that many parents did not know what this actually meant, whether in terms of understanding the concept of these measurements (only 26% could say that BMI was a measure of weight in relation to height) or, more importantly, the *implications* of a

high BMI (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the implications of their child having a high BMI and a further 38% recalled only one of four possible implications that they were told when they were given their child's BMI result. Logistic regression demonstrated a significant interaction between the type of information recalled (e.g., BMI result) and feedback condition (BPC or MI) ($P < 0.01$). Further examination demonstrated that those in the BPC condition were more likely to report that lifestyle behaviours had been discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40, $P < 0.01$), whereas the *implications* of the BMI results was more likely to be reported by those in the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01 to -0.27, $P = 0.02$).

Table 4 also presents the proportion of parents who correctly recalled each *type* of information. As mentioned 97% of parents remembered their child had a high BMI and 97% of these were accurate in their recollection. Parents recalled their child's BP and WHtR results less often, however when recalled, 86-97% of parents were accurate. Although the number of parents recalling what high BMI meant for their child (implications) was considerably lower, those parents who did recall implications, were generally very accurate (i.e., child was overweight and were more at risk of carrying this weight into adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e., whether the child's weight and height are in proportion for their age) was poorly understood with only 11-50% of parents correctly remembering this information. Interestingly, feedback condition made no difference to the accuracy of parental recall.

Not surprisingly, there was significantly higher recall of the meaning of results following prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P < 0.01). This was particularly apparent for those in the MI group who showed a larger increase in meaning recall after prompting (*M* = 0.55, *SD* = 0.45) than BPC (*M* = 0.40, *SD* = 0.41, P = 0.02 for interaction).

Table 5 presents the models for the association between total recall scores and predictors of interest. Total recall was higher in more educated mothers (P < 0.001) and those who were more concerned about their child's weight prior to feedback (P = 0.01). Lower recall was observed in parents who were less accurate about their child's true weight status (P = 0.01), or if their child's overweight status had been unexpected (P = 0.01). Parents who reported poorer understanding (P = 0.02) of the feedback process or did not find it as useful (P < 0.001) also produced lower recall scores. However, the only variables which remained statistically significant in the multivariate model were maternal education and the parental rating of how useful they found the information.

DISCUSSION

Our study demonstrated that although parents were only able to recall 39% of the information that was given to them at the BMI screening session, virtually all (97%) recalled that their child was overweight. Our findings are consistent with previous research demonstrating that while overall recall of medical information is poor,[9] parents are good at recalling important details such as their child's diagnosis[15] or weight status.[19] In contrast, information from other categories was not as readily reported and in particular, concepts were poorly understood with less than 50% of parents able to accurately describe what was done. These findings are consistent with the

attentional narrowing hypothesis which suggests that the most salient information is attended to leaving less attention for peripheral information.[31] Given the poor recognition of overweight in children, it is likely that receiving such feedback will elicit distress in some people, which may accentuate attentional narrowing.[31,32] However, it is important to note that the child's *actual* BMI was supported by a graph that parents were able to take home, and therefore may have aided recall of the key results, similar to BMI screening studies which provide results in a letter that parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the session but was not supported by a take home message. While the provision of take home written information to aid recall of medical information has produced inconsistent results,[7] there is some evidence to suggest that simple pictorial messages can aid recall.[33] It is also important to note that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a take home visual and yet were poorly recalled. This may suggest that a take home message may not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical healthcare appointments, the feedback was given in an environment that minimised distractions (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to process the information being communicated.

Findings from the current study suggest that parents have limited capacity for processing a large amount of information and although they are able to remember some key pieces of information (that their child was overweight), important details were forgotten (such as why being an overweight child is a concern). While it could be argued that 6 categories of information is an unrealistic target, a considerable amount of time was spent within the interviews on BMI and what it means for health; more than would be spent during a typical primary care consultation.

This has important implications for including BMI screening within routine healthcare, especially if the information is unexpected. Thus health professionals need to limit the amount of information given in one session, provide personalised take-home information, or use multiple sessions to assess gaps in patient recall or understanding and provide clarification, especially if the information is unexpected or includes unfamiliar concepts.

Despite our best efforts to present information to promote optimal recall and understanding,[7] (spending a significant portion of time on the key message (BMI and health), providing pictorial information and providing simple non-technical explanations),[7] our findings suggest that the implications were poorly recalled and concepts were poorly understood. While a diagnosis is important, it is not meaningful without an understanding of the implications and a clear treatment pathway. This is particularly relevant in primary care, where doctors are often reluctant[34] to discuss childhood overweight and unsure how to communicate this information to families.[35] This may inadvertently lead to ambiguous information or brief communication, making it easy for parents to become confused about the messages they are being given, particularly if the information conflicts with parental beliefs. Poor understanding also has implications for the transfer of this information beyond the direct medical setting and into the child's wider context. For example, if parents are unable to understand what their child's results mean, there is the potential for miscommunication with significant people in the child's life who might need to be involved in changing lifestyle factors.

Literature examining parental recall of child weight status information is very limited[19,20,36] and no studies appear to have assessed recall and understanding of BMI information and related

concepts following a targeted face-to-face interview. Johnson and colleagues[19] investigated parent reactions to a screening program and included measures of recall of the information provided in a BMI results letter. Consistent with the current study, important information was recalled well (e.g., 94% of the parents recalled their child's weight category), and other details were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were lower than that observed in the current study. This may have arisen because of different methods of informing parents (letter versus face-to-face) or due to the more stringent accuracy classification used by Johnson et al.[19]

Although it may seem surprising that parents receiving BPC feedback were able to remember more than those who received MI, more structured and specific information is more likely to be remembered.[7,37] The BPC interview was highly structured and the advice given to parents to achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the MI session, reflecting the intention of MI,[38] was not structured, with research assistants intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC sessions it is also possible that the additional time spent on the exploration of the meaning and implication of results took focus away from the central details of the message, resulting in lower recall of the information.

Higher maternal education was related to improved overall recall, consistent with the literature in other health contexts.[7,14] While a relationship between recall and child and maternal BMI,[19] ethnicity[19] and age[39] have previously been suggested, they were unrelated in this study. Here, beliefs about weight played a more important role: parents who found the information

unexpected or did not understand the feedback process or find it useful, had lower recall. By contrast, those who were already concerned about their child's weight had higher overall recall. These findings are consistent with the hypothesis that memory is heightened for information that is consistent with one's current beliefs[40] and has implications for health practitioners giving parents results that they may not expect. Prior to delivering feedback health practitioners may benefit from assessing parents' expectations, concerns and current knowledge, to assist in prioritising and explaining results that may not align with these.

This study examined recall and understanding in a large sample of families with overweight children. This study was not originally constructed to assess parental memory, and as such it was not set up to exhaustively prompt parents for complete recall. It is possible that had we interviewed differently, parents may have recalled more information. However, much of the information used in this interview was based on free recall, which is particularly relevant in this context as it likely reflects the information that is most salient and easily accessible to parents.

In summary, our findings appear to be the first to examine parental recall of BMI and growth information following a BMI screening and face-to-face feedback session. While our results suggest that parents were able to remember their child's overweight diagnosis very well, 61% of the information was forgotten. This finding suggests that the inclusion of BMI screening within current appointments may negatively impact parental ability to remember and understand this information. In addition, the way that the information is given, and parental education, values and expectations, were associated with recall of the information and therefore suggest that health professionals need to be aware of these factors when discussing results with parents.

CONTRIBUTORS' STATEMENT

Anna M Dawson: Ms. Dawson contributed to study design, undertook data collection, coded the transcripts, produced the first and subsequent drafts of the paper and approved the final manuscript as submitted.

Rachael W Taylor: Assoc Prof. Taylor was the principal investigator of the project and was responsible for study design, monitored data collection, critically reviewed and revised the manuscript, and is guarantor.

Sheila M Williams: Assoc Prof. Williams contributed to study design, completed statistical analysis, critically reviewed manuscript and approved the final manuscript as submitted.

Barry J Taylor: Professor Taylor contributed to study design, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

Deirdre A Brown: Dr. Brown contributed to study design, supervised research staff, provided reliability coding, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

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Table 1. Recall interview questions

Free recall question

1. What information were you given about your child's growth?

Non-specific prompts

Were you given any other information about your child at the initial session?
Tell me more about that…
What information were you given?

Specific prompt for implications

2. What were you told that the information means for him/her?

Additional interview questions – prompted recall

3. How easy was it to follow and use the information presented in the health check booklet?

1	2	3	4	5	6	7
very easy		somewhat easy		somewhat difficult		very difficult

4. How useful did you find the information presented in the health check booklet?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

5. How easy was it to understand and follow the explanations of terms (such as Body Mass Index, Blood Pressure and Waist to Height ratio?)

1	2	3	4	5	6	7
very difficult		somewhat difficult		somewhat easy		very easy

6. How useful did you find the traffic light system (green, orange and red zones) to explain your child's weight status?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

7. How did you feel about the way the information about your child's weight status was given to you?
8. I felt upset by the information given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

9. I felt upset by the way the information was given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

10. I felt it was useful to be given this information?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

11. The information about my child's weight was unexpected?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

12. I'm interested in your decision to tell/not tell your child.
13. If you did discuss the information with your child, what did you tell them?
14. How did your child react to this information?
15. Are there any other things we could do to improve the way our health check results are discussed with parents? Or any other comments?

Table 2. Coding category definitions and possible scores

Coding Categories	Definition	Total number of items	Total weighted score
Growth measurement	Recall of each measurement taken: height, weight, waist circumference, body mass index (BMI) and waist to height ratio (WhtR).	5	2.5
Growth concept	Recall reflecting knowledge or understanding of the concept of BMI – looking at a person's weight in relation to their height (proportion) and WhtR – a measure of how big they are around their waist, taking their height into consideration.	2	1.5
Growth result	Recall of child's BMI and/or WhtR result	2	4
Growth implication	Recall of the implications of childhood overweight for health, severity of problem, long-term weight problems, the need to act	4	2
Blood pressure	Recall that blood pressure was measured and the child's blood pressure result	2	1.5
Behavior	Recall of discussion of behavioral recommendations	1	1
Total recall		16	12.5

Abbreviations: BMI – body mass index; WhtR – waist to height ratio

Table 3. Mean (SD) number of items recalled and weighted score, reported by information category

	Total sample (n = 244)		MI (n = 121)	BPC (n = 122)
Information category	Number of items m (SD)	Weighted scores m (SD)	Weighted scores m (SD)	Weighted scores m (SD)
Growth measurement	2.5 (1.39)	1.2 (0.69)	1.16 (0.77)	1.28 (0.61)
Growth concept	0.3 (0.51)	0.3 (0.46)	0.19 (0.42)	0.36 (0.49)
Growth result	0.5 (0.75)	2.9 (0.75)	2.84 (0.75)	2.87 (0.76)
Growth implication	1.5 (0.90)	0.8 (0.49)	0.83 (0.49)	0.66 (0.47)
Blood pressure	0.5 (0.75)	0.4 (0.56)	0.32 (0.55)	0.36 (0.57)
Behaviour	0.3 (0.46)	0.3 (0.46)	0.19 (0.40)	0.45 (0.50)
Total recall	6.3 (2.28)	5.8 (1.66)	5.55 (1.83)	6.01 (1.42)

Abbreviations: BPC – best practice care; MI – motivational interviewing

Table 4. Parent recall of each type of information in the overall sample and by feedback condition

	Total recall (%)			Correct recall (%)		
Information category	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC
Results						
BMI result	238 (97)	119 (98)	119 (97)	230 (97)	115 (97)	115 (97)
WHtR result	68 (28)	30 (25)	38 (31)	61 (90)	26 (87)	35 (92)
Blood pressure	51 (21)	22 (18)	29 (24)	47 (92)	19 (86)	28 (97)
Meaning of results						
0 implications recalled	37 (15)	11 (9)	26 (21)	-	-	-
1 implication recalled	92 (38)	47 (39)	45 (36)	85 (92)	43 (91)	42 (93)
2 implications recalled	75 (31)	40 (33)	35 (29)	67 (89)	38 (95)	29 (83)
3 or 4 implications recalled	40 (16)	23 (19)	17 (14)	33 (83)	19 (83)	14 (83)
Behavior discussion	80 (33)	24 (20)	56 (46)	-	-	-
Concepts discussed						
BMI concept	63 (26)	21 (17)	42 (34)	7 (11)	3 (14)	4 (10)
WHtR concept	11 (5)	5 (4)	6 (5)	3 (27)	0 (0)	3 (50)

Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition. For correct recall, percentages are calculated from only those who recalled the information.

Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio

Table 5. Models for the association between total recall and predictors of interest

Variable	Univariate model (95% CI)	Multivariate model 1 (95% CI)	Multivariate model 2 (95% CI)
Maternal education			
Tertiary†	0.78 (0.23 to 1.34)*	0.59 (0.04 to 1.14)*	0.67 (0.13 to 1.22)*
University degree†	0.85 (0.37 to 1.33)*	0.71 (0.23 to 1.19)*	0.79 (0.30 to 1.28)*
Ethnicity			
Maori††	-0.55 (-1.11 to 0.00)	-0.40 (-0.96 to 0.17)	
Pacific††	-0.24 (-1.05 to 0.56)	-0.07 (-0.90 to 0.75)	
Asian††	0.73 (-0.38 to 1.84)	0.51 (-0.57 to 1.60)	
Other††	0.49 (-1.15 to 2.14)	0.63 (-0.97 to 2.23)	
Maternal BMI	-0.01 (-0.04 to 0.01)	-0.01 (-0.04 to 0.02)	
Maternal age	0.02 (-0.01 to 0.05)	0.02 (-0.01 to 0.05)	
Child BMI (z-score)	-0.01 (-0.11 to 0.07)	-0.03 (-0.12 to 0.06)	
Parental concern before feedback	0.26 (0.05 to 0.47)*	0.18 (-0.02 to 0.40)	0.06 (-0.16 to 0.29)
Discrepancy between perceived and actual weight	-0.52 (-0.84 to -0.19)*	-0.42 (-0.75 to -0.10)*	-0.19 (-0.55 to 0.16)
Weight information unexpected	-0.09 (-0.18 to -0.00)*	-0.11 (-0.20 to -0.02)*	-0.07 (-0.16 to 0.02)
Understand information presented in HC booklet	0.27 (0.04 to 0.51)*	0.28 (0.06 to 0.51)*	0.16 (0.68 to 0.39)

Usefulness of information presented in HC booklet	0.22 (0.07 to 0.37)*	0.20 (0.04 to 0.35)*	0.20 (0.05 to 0.36)*
Time between feedback and recall session (days)	-0.02 (-0.05 to 0.00)		-0.01 (-0.04 to 0.00)
Feedback condition	0.47 (0.05 to 0.88)*		0.21 (-0.21 to 0.63)

β estimates refer to the difference in total recall weighted score (from possible of 12.5) explained by each predictor of interest.

Model 1 estimates are adjusted for time between feedback and recall interview and feedback condition.

Model 2 estimates are adjusted for all other variables in the model.

Abbreviations: BMI – body mass index; HC – health check

†Reference group was some schooling

††Reference group was New Zealand European

*P<0.05

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	3-4
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	6-7
	2b	Specific objectives or hypotheses	7
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	7-8
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	N/A
Participants	4a	Eligibility criteria for participants	8
	4b	Settings and locations where the data were collected	8
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	8-10
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	10-12
	6b	Any changes to trial outcomes after the trial commenced, with reasons	N/A
Sample size	7a	How sample size was determined	Ref 23
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	Ref 24
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	Ref 24
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	Ref 24
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	Ref 24
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those	Ref 24

		assessing outcomes) and how	
	11b	If relevant, description of the similarity of interventions	N/A
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	12-13
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	N/A
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	8
	13b	For each group, losses and exclusions after randomisation, together with reasons	8
Recruitment	14a	Dates defining the periods of recruitment and follow-up	Ref 24
	14b	Why the trial ended or was stopped	N/A
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	Ref 24 – or could be added as web only
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	Tables 3 & 4
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	Tables
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	N/A
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	16-17
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17-19
Other information			
Registration	23	Registration number and name of trial registry	4
Protocol	24	Where the full trial protocol can be accessed, if available	7
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	20

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

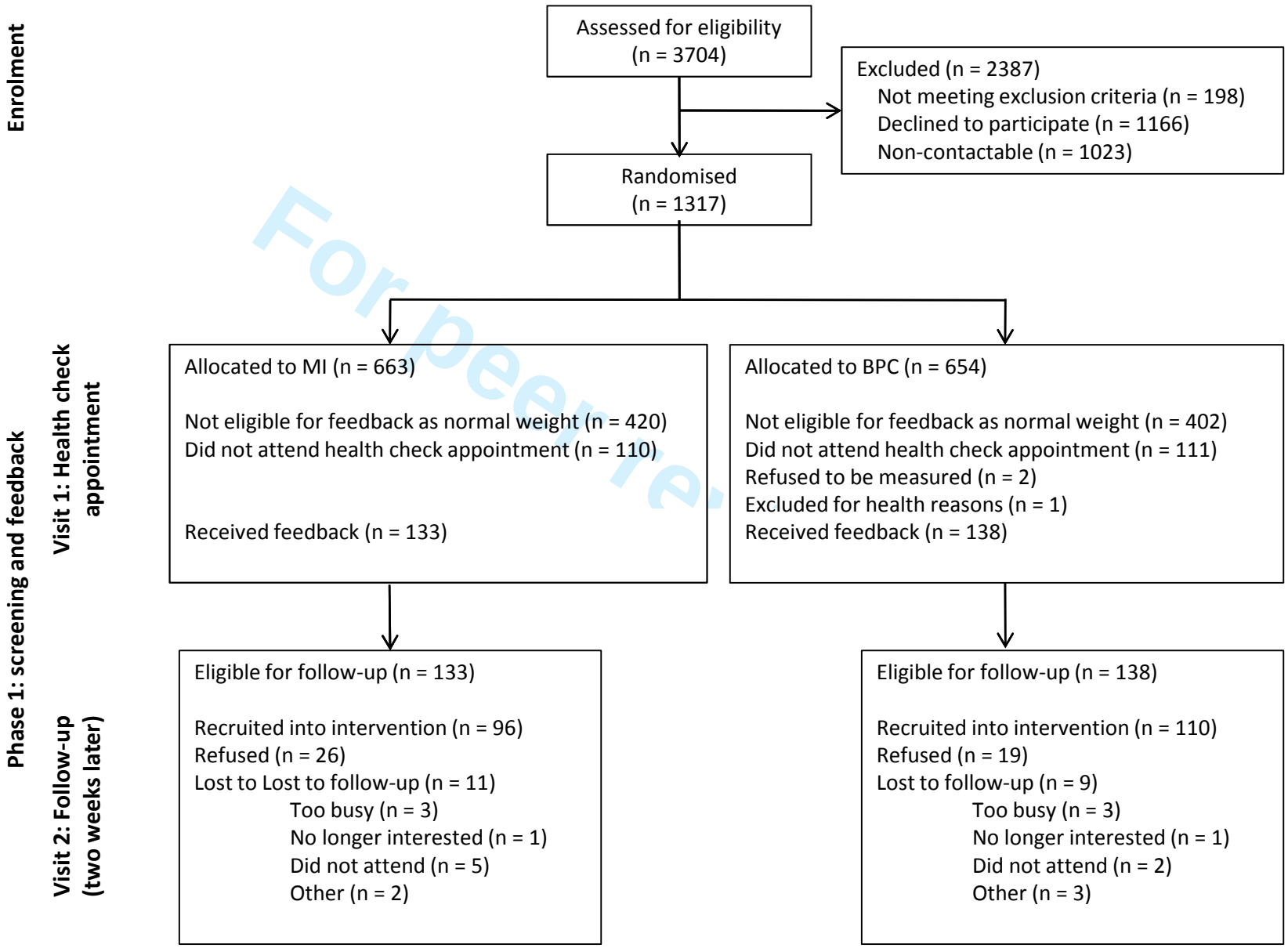

Figure 1. Participant flow through the study

BMJ Open

Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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Primary Subject Heading:	Paediatrics
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Keywords:	BMI screening, Parental recall, Memory, Health information, Overweight

Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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Key words: BMI screening; parental recall; memory; health information; overweight

ABSTRACT

Objectives: As parents of young children are often unaware their child is overweight, screening provides the opportunity to inform parents and provide the impetus for behaviour change. We aimed to determine if parents could recall and understand the information they received about their overweight child after weight screening.

Design: Randomised controlled trial of different methods of feedback.

Setting: Participants were recruited through primary and secondary care but appointments took place at a University research clinic.

Participants and intervention: 1093 children aged 4-8 years were screened. Only overweight children (n = 271, 24.7%) are included in this study. Parents of overweight children were randomised to receive feedback regarding their child's weight using best practice care (BPC) or motivational interviewing (MI) as face-to-face interviews typically lasting 20-40 minutes. Two hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to assess recall and understanding of information from the feedback session.

Primary and secondary outcome measures: Interviews were audio-taped and transcribed verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall and sub-categories of interest.

Results: Overall, 39% of the information was recalled (mean score 6.3 from possible score of 16). Parents given feedback via BPC recalled more than those in the MI group (difference in total score 0.48; 95% CI 0.05 to 0.92). Although 94% of parents were able to correctly recall their child's weight status, fewer than 10 parents could accurately describe what the measurements meant. Maternal education (0.81; 0.25 to 1.37) and parental ratings of how useful

they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in multivariate analyses.

Conclusions: While parents remember that their child's BMI is higher than recommended, they are unable to remember much of the information and advice provided about the result.

CLINICAL TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry ACTRN12609000749202

ARTICLE SUMMARY

Strengths and limitations of this study

- First study to assess what parents remember and understand from a 20-40 minute face-to-face session dedicated to discussing the weight status of their child
- Recall and accuracy were studied extensively through the use of transcripts which were transcribed verbatim and coding according to an extensive coding schedule
- Large (n = 244), demographically diverse sample of overweight children and their parents
- Not originally designed to specifically test parental memory, and thus exhaustively prompt parents for complete recall

INTRODUCTION

Approximately one in three children are overweight in New Zealand,[1] a problem that is poorly recognised, particularly by parents.[2-4] It has therefore been suggested that routine consultations in primary care include measurement of body mass index (BMI) in an effort to improve recognition and awareness of excess weight during childhood.[5]

Although the primary care environment might seem suitable for routine screening given established relationships between families and their health practitioner, patients often present with multiple problems making it difficult for health practitioners to address each problem adequately within a standard consultation time.[6] While adding measurement of height and weight may add little time to the overall appointment, discussion of overweight status, particularly for unsuspecting parents, is considerably more complicated. Whether parents have the ability to recall and understand this information, and thus potentially make the behavioural changes required, is unknown.

The extent to which patients are able to recall their medical information has important implications for treatment adherence, patient satisfaction and subsequent health outcomes.[7,8] In general, recall of medical information is low.[9-12] Health information is often complex and may be incongruent with patients' perceptions. Furthermore, factors such as patient age, education, literacy levels, anxiety and stress impact upon a patient's ability to remember the information presented.[13-16] Not surprisingly, several studies have demonstrated that parents recall pertinent details about their child's health (such as diagnoses or major injuries) more than peripheral details (such as tests completed in a consultation, prescriptions or follow-up appointments).[15,17,18]

In the context of screening for overweight in children, it would appear that parents can recall important information, such as their child's weight status following a posted letter.[19] However, understanding of the results and BMI charts and/or percentiles is very low.[20] To date, most evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a few studies[20-22] have assessed whether parents *understand* BMI charts and percentiles, and none have done so after receiving BMI results in a face-to-face consultation, as would occur in a primary care setting. This is an important distinction as it may be that a letter of results provides an enduring memory cue or resource which enables parents to better retain the information and refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding given the opportunity to discuss the results and ask questions, thereby strengthening encoding of the information and creating stronger recall.

Therefore, this study investigated parental recall of information given in a BMI screening and face-to-face feedback session. Specifically, we examined how much information parents could recall from the BMI screening session, which types of information were more likely to be recalled, the accuracy of parental recall and how recall varied according to feedback style. Factors that may predict better recall performance were also explored.

SUBJECTS AND METHODS

This manuscript presents data from a large randomised controlled study (MInT) which has been described in detail previously.[23] In brief, MInT was a BMI screening initiative (phase 1) to recruit children into a two-year family-based intervention in overweight children (phase 2).

Phase 1 entailed a comparison of weight feedback delivered using best practice care or motivational interviewing whereas phase 2 compared a usual care intervention with a more intense intervention tailored to the needs of each family. Ethical approval was obtained from the Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

Participants

1093 children between the ages of 4 and 8 years, recruited from local primary care practices and secondary care clinics in Dunedin, New Zealand were screened for overweight at a University research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553) using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.[24] Only those parents with overweight children (BMI $\geq$ 85th percentile)[25] were eligible for the current study (n = 271, Figure 1). These parents were invited to participate in a recall interview at the University approximately two weeks later to discuss the feedback they received about their child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview. A further seven participants were excluded due to technical difficulties with audio recordings (n = 6) and one had brought the feedback booklet with them to the interview making them unsuitable for assessing *recall* of feedback.

Procedures

Screening

Parents (virtually all mothers, fathers < 2%) completed a comprehensive online questionnaire

assessing demographic characteristics including ethnicity, maternal education, an index of socioeconomic status (New Zealand deprivation index, NZDep2006[26]) and maternal age. Parental concern about their child's weight and perception of their weight status were both assessed using a 5-point Likert scale question (where 1 = not at all concerned and 5 = very concerned for concern and 1 = underweight, 2 = a little underweight, 3 = about right, 4 = a little overweight, 5 = overweight for perception). We calculated a discrepancy score to indicate the extent to which the parent under- or over-rated their child's weight status by comparing the parental perception of their child's weight status with their actual BMI classification (underweight = <3rd percentile, normal weight = 3rd-84th percentile, a little overweight = 85th-94th percentile, overweight = ≥95th percentile). Scores of 1 or 2 for the perception of underweight were combined in this comparison. Duplicate anthropometric measurements (height, weight and waist) and blood pressure (BP) (Dinamap: GE Medical Systems, Waukesha, WI) were obtained from children using standard techniques. All data report the mean values. BMI was calculated using CDC reference norms[25] and waist (cm) to height (cm) ratio (WHtR) was compared with recommendations from Aswell and colleagues.[27] Researchers plotted BP, BMI and WHtR onto colour-coded charts relative to age and sex in a booklet that parents were able to take home. The booklet also included a glossary of key terms, a summary of the child's lifestyle behaviours (e.g., physical activity, fruit and vegetable intake) as reported by parents, as well as current New Zealand guidelines for these behaviours.[28]

Feedback interview: Researchers explained each measure and then discussed the lifestyle behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid labelling the child as "overweight" or "obese". Implications of each colour zone were explained

in terms of how many children were in each zone, possible health consequences and the long-term risk of carrying excess weight associated with each zone. Researchers delivering the feedback were from different backgrounds (e.g., dietetics, nutrition, exercise science). Therefore, researchers delivering BPC feedback (n = 2) received 6 hours of general interviewing skills training and 6 hours training on the feedback protocol. Researchers delivering MI feedback (n = 3) received approximately 40 hours training in MI and the feedback protocol.

BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that the primary focus of the BPC interview was on anthropometric results and discussion of the lifestyle behaviours. Interviews typically lasted 15 minutes.

MI feedback condition: Parents were given information using an Elicit-Provide-Elicit (E-P-E) approach[29] that allowed researchers to check in with parents' prior knowledge before giving feedback. This approach also allowed parents the opportunity to explore the meaning and importance of the results. Therefore, in contrast to the BPC interview, the focus of the MI interview was on the *implications* of the health check results to the family. Interviews typically lasted 30 minutes. All interviews were video-taped and transcribed verbatim so that accuracy of recall could be determined.

Follow-up

The recall interview took place approximately two weeks after the screening and feedback session and an independent interviewer (n = 3), not involved in the feedback process, interviewed the parents. Parents repeated aspects of the BMI screening questionnaire and completed a semi-structured interview (questions are presented in Table 1). In summary, these

assessed recall and usefulness of the information, and parental experience of the feedback. Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for coding by a professional transcriber blinded to feedback group.

Coding

The number of pieces of information given at the feedback session were identified and defined by two authors (AMD, DAB). The first phase of the coding was developed a priori from the interview schedule, which was designed and developed prior to the study, based on the information we expected to elicit. The second phase of the coding, involving the development of specific codes and weightings, were developed after the data had been collected and researchers became familiar with the categories of responses that parents gave (Supplementary Table 1). Lists of acceptable responses were developed and the coding framework was applied (initially collaboratively, then independently) to transcripts and codes compared. Discrepancies were resolved through discussion and the coding rules were finalised. The pieces of information (n = 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a large number of discrete items of information to receive, the six categories were the main point of interest and the individual items were included to provide details on the type of information recalled. Scores were weighted according to their importance in the feedback interview. Weighting decisions were made through author discussion of the most important clinical messages delivered to parents. For example, the main result discussed was BMI, therefore this was allocated the highest weighting of 4 from a maximum of 12.5. Only the weighted figures were used in analyses presented here but results did not differ whether weighted or unweighted scores were used (data not shown).

Coding was completed in two passes. The first pass assessed *how much* information was recalled. Coders identified relevant statements on the transcript and allocated a score under one or more categories. One statement could be coded in several categories (e.g., "her BMI was in the overweight category" would gain a score for indicating that BMI was measured and for giving the BMI result). If a piece of information was mentioned more than once, only the first statement was allocated a score. As recall may be prompted by discussion that occurs later in the interview, recall of the implications associated with carrying excess weight was divided by stage of interview, into free and prompted recall (Table 1). Recall of the other five information categories was not divided into free and prompted recall as the majority of relevant information was recalled following question 1, and the interview was not set up to prompt exhaustively as would be expected in a memory interview. Implications recalled in response to the first recall question and non-specific prompts were considered free recall. Implications recalled following a specific prompt or additional interview questions were considered prompted recall. The second coding pass identified whether the information recalled was accurate or not. Each piece of information identified in the first pass was compared with the transcript of the BMI feedback interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter- and intra-reliability were moderate to excellent[30] (0.48-0.96).

Data analysis

Linear regression was conducted to examine the overall effects of interview condition, recall interviewer and time between feedback and recall interview. To examine the amount of information recalled, scores were converted to a proportion of the total number of items in each category and regression was used to compare the relative frequencies of information category (within-subjects factor) and the interaction of feedback condition (between-subjects factor). Accuracy was calculated as the number who correctly recalled the information from 1) just those who actually mentioned each type of information and 2) from all parents. Thus accuracy for the former calculation reflects errors of commission, whereas using the total number of parents as the denominator also includes errors of omission. Accuracy was analysed using a two-group difference in proportion test to detect any difference between the two feedback conditions. A mixed model was used to compare recall of the meaning of results by stage of interview (within-subjects factor) and feedback condition (between-subjects factor). The model included an interaction term to find out whether the type of information (lifestyle changes versus implications) was different in the MI and BPC groups. To investigate which factors are associated with better recall, variables were analysed using multiple linear regression. Variables with $p < 0.2$ in the univariate model were included in the multivariate models. To adjust for feedback condition and time between feedback and recall session, these variables were also included in the multivariate models. Data were also adjusted for clustering within families given that one family enrolled 3 overweight siblings and 9 families enrolled 2 siblings.

The larger MInT study from which this data are derived is adequately powered as it required a minimum of 250 participants to detect the main outcomes of interest, with a final sample size of 271.[24] No sample size calculations were performed prior to analysis for this paper as it was a

secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have presented analyses for the available data.

RESULTS

Table 3 presents the characteristics of the overall sample and according to participation. Parents that did not participate in recall interviews (n = 27) had children who did not differ from children who did participate (n = 244) in terms of age, sex, ethnicity, household deprivation, maternal BMI, maternal education, height, weight, or BMI z-score. Reasons given for non-participation included too busy (n = 8), equipment malfunction (n = 6), no reason given (n = 3), families were moving out of town (n = 2), non-contactable (n = 2) or missed multiple appointments (n = 2), child did not want to (n = 1), traumatised by recent Christchurch earthquakes (n = 1), belief that the child was not overweight (n = 1), and brought the information booklet to the recall interview (n = 1).

Table 4 presents the mean number of items recalled and weighted score by information category. On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they were given at the feedback session. There was no difference in total recall score by recall interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P = 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time between interviews (days). There was a significantly higher total recall score for those in the best

practice care condition (*M* = 6.01, *SD* = 1.42 from a total possible score of 12.5) compared with the MI condition (*M* = 5.55, *SD* = 1.83) (difference 0.48 (95% CI 0.05 to 0.92), P = 0.030).

Table 5 reports the number of people who recalled each category of information and illustrates that while very few parents recalled information about their child's fat distribution (28%) or blood pressure findings (21%), virtually every parent recalled that their child had a high BMI (97%). However, it is clear that many parents did not know what this actually meant, whether in terms of understanding the concept of these measurements (only 26% could say that BMI was a measure of weight in relation to height) or, more importantly, the *implications* of a high BMI (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the implications of their child having a high BMI and a further 38% recalled only one of four possible implications that they were told when they were given their child's BMI result. Logistic regression demonstrated a significant interaction between the type of information recalled (e.g., BMI result) and feedback condition (BPC or MI) (P < 0.01). Further examination demonstrated that those in the BPC condition were more likely to report that lifestyle behaviours had been discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40, P < 0.01), whereas the *implications* of the BMI results was more likely to be reported by those in the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01 to 0.27, P = 0.02).

Table 5 also presents the proportion of parents who correctly recalled each *type* of information. As mentioned 97% (n = 238) of parents remembered their child had a high BMI and 97% (n = 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their

child's BP and WHtR results less often (n = 51 - 68 parents). Estimates of accuracy were based on errors of commission (i.e. parents who reported the information but did so incorrectly) of which 86-97% accurately recalled the information. When we included errors of omission (i.e., parents who left the information out of their account) then accuracy was substantially lower (19-25%). Although the number of parents recalling what high BMI meant for their child (implications) was considerably lower, those parents who did recall implications, were generally very accurate (i.e., child was overweight and were more at risk of carrying this weight into adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e., whether the child's weight and height are in proportion for their age) was poorly understood with only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR. Interestingly, feedback condition made no difference to the accuracy of parental recall.

Not surprisingly, there was significantly higher recall of the meaning of results following prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P < 0.01). This was particularly apparent for those in the MI group who showed a larger increase in meaning recall after prompting (M = 0.55, SD = 0.45) than BPC (M = 0.40, SD = 0.41) (interaction term 0.14, 0.00 to 0.28, P = 0.04).

Table 6 presents the models for the association between total recall scores and predictors of interest. As the univariate models demonstrated that both time between feedback and recall session (P = 0.029) and feedback condition (P = 0.030) were significantly related to total recall score, only the multivariate models are discussed here. After adjustment for these two variables, mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to

1.32) than less educated mothers, whereas no differences were observed for child ethnicity or BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total recall score appeared to be related to the experience of the feedback process. Having a larger discrepancy between perceived and actual weight was associated with lower recall scores (-0.44, -0.76 to -0.14). Conversely, understanding the information presented in the feedback process (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher recall scores to a similar degree. Once all significant variables were entered in multivariate model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.

DISCUSSION

Our study demonstrated that although parents were only able to recall 39% of the information that was given to them at the BMI screening session, virtually all (97%) recalled that their child was overweight. Our findings are consistent with previous research demonstrating that while overall recall of medical information is poor,[9] parents are good at recalling important details such as their child's diagnosis[15] or weight status.[19] In contrast, information from other categories was not as readily reported and in particular, concepts were poorly understood with less than 50% of parents able to accurately describe what was done. These findings are consistent with the attentional narrowing hypothesis which suggests that the most salient information is attended to leaving less attention for peripheral information.[31] Given the poor recognition of overweight in children, it is likely that receiving such feedback will elicit distress in some people, which may accentuate attentional narrowing.[31,32] However, it is important to note that the child's *actual* BMI was supported by a graph that parents were able to take home, and therefore may have aided

recall of the key results, similar to BMI screening studies which provide results in a letter that parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the session but was not supported by a take home message. While the provision of take home written information to aid recall of medical information has produced inconsistent results,[7] there is some evidence to suggest that simple pictorial messages can aid recall.[33] It is also important to note that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a take home visual and yet were poorly recalled. This may suggest that a take home message may not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical healthcare appointments, the feedback was given in an environment that minimised distractions (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to process the information being communicated.

Findings from the current study suggest that parents have limited capacity for processing a large amount of information and although they are able to remember some key pieces of information (that their child was overweight), important details were forgotten (such as why being an overweight child is a concern). While it could be argued that 6 categories of information is an unrealistic target, a considerable amount of time was spent within the interviews on BMI and what it means for health; more than would be spent during a typical primary care consultation. This has important implications for including BMI screening within routine healthcare, especially if the information is unexpected. Thus health professionals need to limit the amount of information given in one session, provide personalised take-home information, or use multiple sessions to assess gaps in patient recall or understanding and provide clarification, especially if the information is unexpected or includes unfamiliar concepts.

Despite our best efforts to present information to promote optimal recall and understanding,[7] (spending a significant portion of time on the key message (BMI and health), providing pictorial information and providing simple non-technical explanations),[7] our findings suggest that the implications were poorly recalled and concepts were poorly understood. While a diagnosis is important, it is not meaningful without an understanding of the implications and a clear treatment pathway. This is particularly relevant in primary care, where doctors are often reluctant[34] to discuss childhood overweight and unsure how to communicate this information to families.[35] This may inadvertently lead to ambiguous information or brief communication, making it easy for parents to become confused about the messages they are being given, particularly if the information conflicts with parental beliefs. Poor understanding also has implications for the transfer of this information beyond the direct medical setting and into the child's wider context. For example, if parents are unable to understand what their child's results mean, there is the potential for miscommunication with significant people in the child's life who might need to be involved in changing lifestyle factors.

Literature examining parental recall of child weight status information is very limited[19,20,36] and no studies appear to have assessed recall and understanding of BMI information and related concepts following a targeted face-to-face interview. Johnson and colleagues[19] investigated parent reactions to a screening program and included measures of recall of the information provided in a BMI results letter. Consistent with the current study, important information was recalled well (e.g., 94% of the parents recalled their child's weight category), and other details were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were

lower than that observed in the current study. This may have arisen because of different methods of informing parents (letter versus face-to-face) or due to the more stringent accuracy classification used by Johnson et al.[19]

Although it may seem surprising that parents receiving BPC feedback were able to remember more than those who received MI, more structured and specific information is more likely to be remembered.[7,37] The BPC interview was highly structured and the advice given to parents to achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the MI session, reflecting the intention of MI,[38] was not structured, with research assistants intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC sessions it is also possible that the additional time spent on the exploration of the meaning and implication of results took focus away from the central details of the message, resulting in lower recall of the information.

Higher maternal education was related to improved overall recall, consistent with the literature in other health contexts.[7,14] While a relationship between recall and child and maternal BMI,[19] ethnicity[19] and age[39] have previously been suggested, they were unrelated in this study. Here, beliefs about weight played a more important role: parents who found the information unexpected or did not understand the feedback process or find it useful, had lower recall. By contrast, those who were already concerned about their child's weight had higher overall recall. These findings are consistent with the hypothesis that memory is heightened for information that is consistent with one's current beliefs[40] and has implications for health practitioners giving parents results that they may not expect. Prior to delivering feedback health practitioners may

benefit from assessing parents' expectations, concerns and current knowledge, to assist in prioritising and explaining results that may not align with these.

This study examined recall and understanding in a large sample of families with overweight children. This study was not originally constructed to assess parental memory, and as such it was not set up to exhaustively prompt parents for complete recall. It is possible that had we interviewed differently, parents may have recalled more information. However, much of the information used in this interview was based on free recall, which is particularly relevant in this context as it likely reflects the information that is most salient and easily accessible to parents.

In summary, our findings appear to be the first to examine parental recall of BMI and growth information following a BMI screening and face-to-face feedback session. While our results suggest that parents were able to remember their child's overweight diagnosis very well, 61% of the information was forgotten. This finding suggests that the inclusion of BMI screening within current appointments may negatively impact parental ability to remember and understand this information. In addition, the way that the information is given, and parental education, values and expectations, were associated with recall of the information and therefore suggest that health professionals need to be aware of these factors when discussing results with parents.

Figure Legend

Participant flow throughout the study

CONTRIBUTORS' STATEMENT

Anna M Dawson: Ms. Dawson contributed to study design, undertook data collection, coded the transcripts, produced the first and subsequent drafts of the paper and approved the final manuscript as submitted.

Rachael W Taylor: Assoc Prof. Taylor was the principal investigator of the project and was responsible for study design, monitored data collection, critically reviewed and revised the manuscript, and is guarantor.

Sheila M Williams: Assoc Prof. Williams contributed to study design, completed statistical analysis, critically reviewed manuscript and approved the final manuscript as submitted.

Barry J Taylor: Professor Taylor contributed to study design, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

Deirdre A Brown: Dr. Brown contributed to study design, supervised research staff, provided reliability coding, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

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Table 1. Recall interview questions

Free recall question

1. What information were you given about your child's growth?

Non-specific prompts

Were you given any other information about your child at the initial session?
Tell me more about that…
What information were you given?

Specific prompt for implications

2. What were you told that the information means for him/her?

Additional interview questions – prompted recall

3. How easy was it to follow and use the information presented in the health check booklet?

1	2	3	4	5	6	7
very easy		somewhat easy		somewhat difficult		very difficult

4. How useful did you find the information presented in the health check booklet?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

5. How easy was it to understand and follow the explanations of terms (such as Body Mass Index, Blood Pressure and Waist to Height ratio?)

1	2	3	4	5	6	7
very difficult		somewhat difficult		somewhat easy		very easy

6. How useful did you find the traffic light system (green, orange and red zones) to explain your child's weight status?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

7. How did you feel about the way the information about your child's weight status was given to you?
8. I felt upset by the information given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

9. I felt upset by the way the information was given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

10. I felt it was useful to be given this information?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

11. The information about my child's weight was unexpected?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

12. I'm interested in your decision to tell/not tell your child.
13. If you did discuss the information with your child, what did you tell them?
14. How did your child react to this information?
15. Are there any other things we could do to improve the way our health check results are discussed with parents? Or any other comments?

Table 2. Coding category definitions and possible scores

Coding Categories	Definition	Total number of items	Total weighted score
Growth measurement	Recall of each measurement taken: height, weight, waist circumference, body mass index (BMI) and waist to height ratio (WhtR).	5	2.5
Growth concept	Recall reflecting knowledge or understanding of the concept of BMI – looking at a person's weight in relation to their height (proportion) and WhtR – a measure of how big they are around their waist, taking their height into consideration.	2	1.5
Growth result	Recall of child's BMI and/or WhtR result	2	4
Growth implication	Recall of the implications of childhood overweight for health, severity of problem, long-term weight problems, the need to act	4	2
Blood pressure	Recall that blood pressure was measured and the child's blood pressure result	2	1.5
Behavior	Recall of discussion of behavioral recommendations	1	1
Total recall		16	12.5

Abbreviations: BMI – body mass index; WhtR – waist to height ratio

Table 3. Baseline characteristics of the study population

		Total (n = 271)	Participants (n = 244)	Non-participants (n = 27)	Difference or Odds ratio (95% CI)
Girls n (%)		150 (55)	135 (55)	15 (56)	-0.99 (-2.21 to 0.44)†
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity[a] n (%)	New Zealand European and others	200 (74)	182 (75)	18 (67)	1.00
	Maori	50 (19)	43 (18)	7 (26)	0.61 (0.24 to 1.55)†
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19)†
Household deprivation[b]		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years)[c]		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education[d] n (%)	Some secondary school	86 (32)	79 (33)	7 (12)	1.00
	Completed secondary school or tertiary education (not University)	91 (34)	79 (33)	12 (44)	0.58 (0.21 to 1.55)†
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64)†
Maternal BMI[e] (kg/m^2)		29.1 (6.2)	29.2 (6.4)	28.6 (4.4)	0.63 (-1.25 to 2.50)*
Height (cm)		120.7 (11.2)	120.9 (11.0)	118.8 (12.4)	2.09 (-2.76 to 6.94)*
Weight (kg)		28.7 (7.8)	28.9 (7.8)	27.5 (7.4)	1.39 (-1.52 to 4.32)*
BMI z-score		1.61 (0.45)	1.61 (0.46)	1.56 (0.36)	0.04 (-0.10 to 0.19)*

Data were missing for 1[a], 9[b], 9[c], 3[d] and 13[e] participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as *difference or †odds ratios as shown.

Table 4. Mean (SD) number of items recalled and weighted score, reported by information category

	Total sample (n = 244)		MI (n = 121)	BPC (n = 122)
Information category	Number of items m (SD)	Weighted scores m (SD)	Weighted scores m (SD)	Weighted scores m (SD)
Growth measurement	2.5 (1.39)	1.2 (0.69)	1.16 (0.77)	1.28 (0.61)
Growth concept	0.3 (0.51)	0.3 (0.46)	0.19 (0.42)	0.36 (0.49)
Growth result	0.5 (0.75)	2.9 (0.75)	2.84 (0.75)	2.87 (0.76)
Growth implication	1.5 (0.90)	0.8 (0.49)	0.83 (0.49)	0.66 (0.47)
Blood pressure	0.5 (0.75)	0.4 (0.56)	0.32 (0.55)	0.36 (0.57)
Behaviour	0.3 (0.46)	0.3 (0.46)	0.19 (0.40)	0.45 (0.50)
Total recall	6.3 (2.28)	5.8 (1.66)	5.55 (1.83)	6.01 (1.42)

Abbreviations: BPC – best practice care; MI – motivational interviewing

Table 5. Parent recall of each type of information in the overall sample and by feedback condition

	Total recall (%)			[1]Correct recall (%)			[2]Correct recall (%)		
Information category	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
Results									
BMI result	238 (97)	119 (98)	119 (97)	230 (97)	115 (97)	115 (97)	230 (94)	115 (95)	115 (93)
WHtR result	68 (28)	30 (25)	38 (31)	61 (90)	26 (87)	35 (92)	61 (25)	26 (21)	35 (28)
Blood pressure	51 (21)	22 (18)	29 (24)	47 (92)	19 (86)	28 (97)	47 (19)	19 (17)	28 (23)
Meaning of results									
0 implications recalled	37 (15)	11 (9)	26 (21)	-	-	-	-	-	-
1 implication recalled	92 (38)	47 (39)	45 (36)	85 (92)	43 (91)	42 (93)	85 (35)	43 (36)	42 (34)
2 implications recalled	75 (31)	40 (33)	35 (29)	67 (89)	38 (95)	29 (83)	67 (27)	38 (31)	29 (24)
3 or 4 implications recalled	40 (16)	23 (19)	17 (14)	33 (83)	19 (83)	14 (83)	33 (14)	19 (16)	14 (11)
Behavior discussion	80 (33)	24 (20)	56 (46)	-	-	-	-	-	-
Concepts discussed									
BMI concept	63 (26)	21 (17)	42 (34)	7 (11)	3 (14)	4 (10)	7 (3)	3 (2)	4 (3)
WHtR concept	11 (5)	5 (4)	6 (5)	3 (27)	0 (0)	3 (50)	3 (0)	0 (0)	3 (2)

Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition. For correct recall, percentages are calculated from [1]only from those who recalled the information (errors of comission) and [2]the total sample (errors of omission).

Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio

Table 6. Models for the association between total recall and predictors of interest

Variable	Univariate model (95% CI)	Multivariate model 1 (95% CI)	Multivariate model 2 (95% CI)
Maternal education			
Tertiary[†]	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree[†]	0.82 (0.27 to 1.38)[*]	0.76 (0.20 to 1.32)[*]	0.81 (0.25 to 1.37)[*]
Ethnicity			
Maori[††]	-0.61 (-1.17 to -0.05)[*]	-0.52 (-1.09 to 0.04)	
Pacific[††]	-0.30 (-1.10 to 0.51)	-0.30 (-1.08 to 0.48)	
Maternal BMI	-0.01 (-0.05 to 0.02)	-0.01 (-0.04 to 0.02)	
Maternal age	0.02 (-0.02, 0.06)	0.02 (-0.02 to 0.06)	
Child BMI (z-score)	0.19 (-0.31 to 0.71)	0.12 (-0.37 to 0.61)	
Parental concern before feedback	0.27 (0.06 to 0.47)[*]	0.20 (-0.01 to 0.42)	0.10 (-0.13 to 0.33)
Discrepancy between perceived and actual weight	-0.52 (-0.84 to -0.21)[*]	-0.44 (-0.76 to -0.14)[*]	-0.23 (-0.58 to 0.11)
Weight information unexpected	-0.10 (-0.19 to -0.002)[*]	-0.09 (-0.18 to 0.01)	-0.03 (-0.13 to 0.07)
Understand information presented in HC booklet	0.28 (0.06 to 0.49)[*]	0.29 (0.07 to 0.50)[*]	0.19 (-0.04 to 0.42)
Usefulness of information presented in HC booklet	0.22 (0.07 to 0.37)[*]	0.20 (0.04 to 0.35)[*]	0.19 (0.04 to 0.35)[*]
Time between feedback and recall session (days)	-0.03 (-0.05 to -0.004)[*]		-0.02 (-0.04 to 0.01)

Feedback condition	0.48 (0.05 to 0.92)*	0.28 (-0.18 to 0.73)

β estimates refer to the difference in total recall weighted score (from possible of 12.5) explained by each predictor of interest.

Multivariate model 1 estimates are adjusted for time between feedback and recall interview and feedback condition.

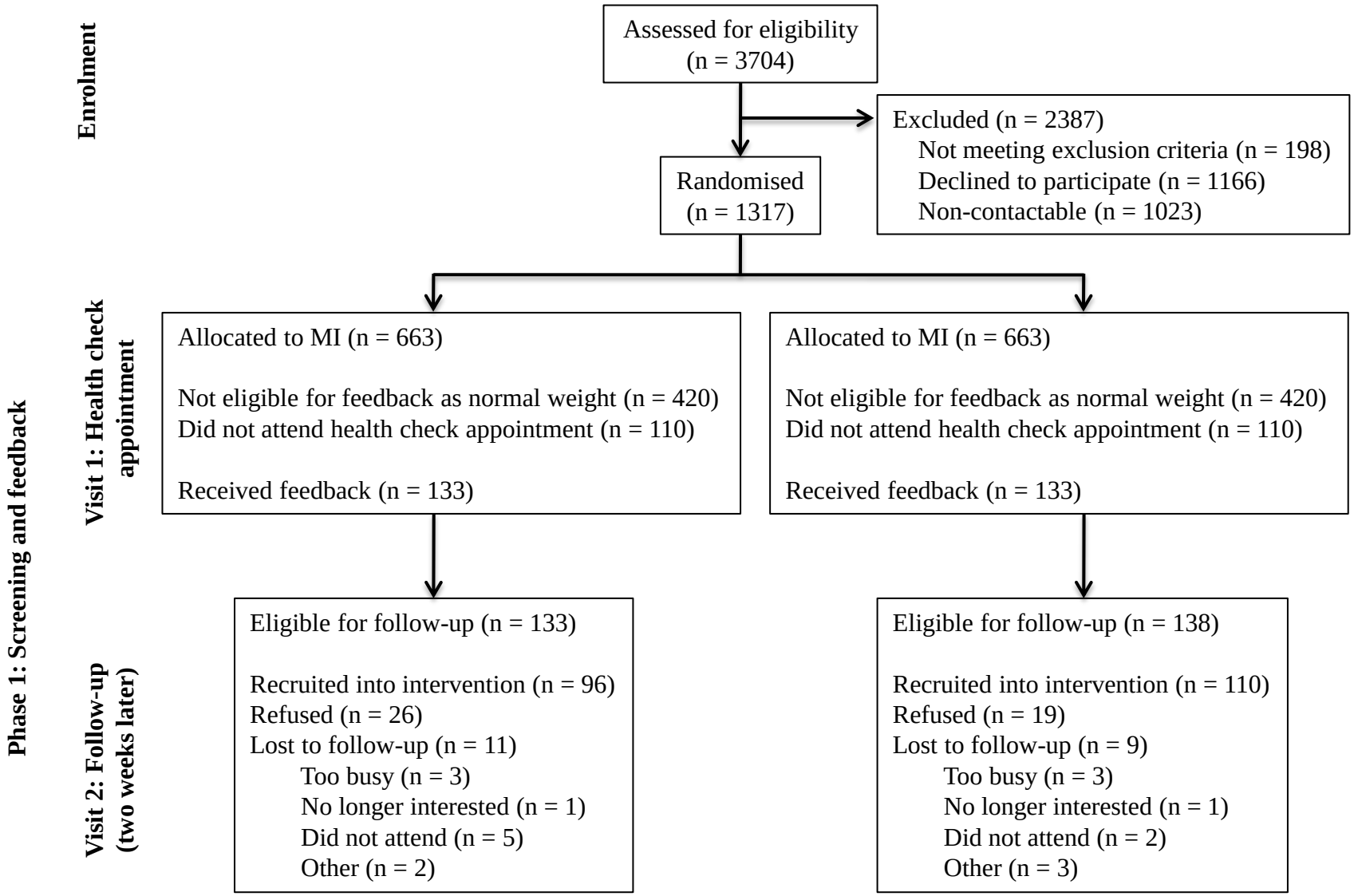
Multivariate model 2 estimates are adjusted for all other variables in the model.

Abbreviations: BMI – body mass index; HC – health check

†Reference group was some secondary school

††Reference group was New Zealand European and others

*P<0.05


Phase 1: Screening and feedback
Enrolment
Assessed for eligibility (n = 3704)
Excluded (n = 2387)
Not meeting exclusion criteria (n = 198)
Declined to participate (n = 1166)
Non-contactable (n = 1023)
Randomised (n = 1317)
Visit 1: Health check appointment
Allocated to MI (n = 663)
Not eligible for feedback as normal weight (n = 420)
Did not attend health check appointment (n = 110)
Received feedback (n = 133)
Allocated to MI (n = 663)
Not eligible for feedback as normal weight (n = 420)
Did not attend health check appointment (n = 110)
Received feedback (n = 133)
Visit 2: Follow-up (two weeks later)
Eligible for follow-up (n = 133)
Recruited into intervention (n = 96)
Refused (n = 26)
Lost to follow-up (n = 11)
Too busy (n = 3)
No longer interested (n = 1)
Did not attend (n = 5)
Other (n = 2)
Eligible for follow-up (n = 138)
Recruited into intervention (n = 110)
Refused (n = 19)
Lost to follow-up (n = 9)
Too busy (n = 3)
No longer interested (n = 1)
Did not attend (n = 2)
Other (n = 3)

Supplementary Table 1. Broad and specific coding categories

Broad coding categories developed from the interview schedule (Table 1) prior to data collection	Example notes and parental responses to help development of specific categories	Specific categories
1. Evaluation of the traffic light BMI chart	*"it was easier than plunket's version of the graphs as it gave you an indication of what was average and then the next stages so it was really good"* P125 "*It was really good to see where she fitted*" P123]	Good Easy to understand Clear visual message Meaningful metaphor Didn't give enough information Other
2. Evaluation of the overall process	"*I went away thinking gosh we need to do something about this*" P249 Parents noting that the study was conducted well, that they wouldn't have wanted children in the room hearing the feedback and that children really liked the wii for entertainment.	Good Good that child was entertained Good child was in different room for feedback Impetus for change Other
What parents did with the information after feedback 3. Spontaneously reported behaviour change 4. Spontaneously reported discussion with other 5. Discussion with child	"*we didn't tell her she was overweight or fat we told her her belly was too big because she knows that because of the way her clothes fit compared with her friends"* P125 "*It was very useful. To be honest I needed a second opinion it shocked me so much I went to the doctor"* P38	Behaviour change Discussion with another adults (e.g., doctor, parent, friend, family) Discussion with child (including why/why not, what told the child, child reaction to the information)
6. Parental feelings about the way feedback was given	Too clinical presentation, very professional but maybe too much so, responses too scripted (e.g., P37) "*I don't know it could have been given in a better way. I mean its hard to hear, regardless"* P125 Researchers maybe a bit nervous to be giving this information - "*felt like you are reassuring the researcher…I'm fine*" P260 Repeated questioning of what information means to parents coming up as making them uncomfortable. "*calm, matter of fact, how I'd want it to be presented*" P164 "*the fact that a practitioner takes time to recognise concerns and validate..I found it was very supportive*" P139 "*It was confirming how I felt..I was quite relieved to get it*" P108	Non-judgmental Couldn't have been done another way/no easy way Fine/good Makes you think about change Lack of empathy/too clinical Uncomfortable Judgmental Concern about labeling child

7.	Parental acceptance of the information	Parents indicating that they are unsure about how we got this information, unsure where the charts were from and if they were relevant (e.g., P264) "*I suppose if your child is overweight then it (traffic light system) would be useful*" P22 Could be included as evaluation of traffic light but also included in acceptance as the person does not believe their child is overweight.	Acceptance – no challenging of the message, no querying the accuracy of the results. May by upset by result but accepts that their child is overweight and that it is a problem for their child. Ambivalence – Moves between accepting and rejecting result, provide lots of minimizations, reasons that it is not a problem. Inconsistent in their response. Uncertainty about whether the results are accurate. Rejection – Does not believe that their child is overweight. Indicates that it is not a problem, very similar to other children, and may also state that the results are inaccurate.

Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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Key words: BMI screening; parental recall; memory; health information; overweight

ABSTRACT

Objectives: As parents of young children are often unaware their child is overweight, screening provides the opportunity to inform parents and provide the impetus for behaviour change. We aimed to determine if parents could recall and understand the information they received about their overweight child after weight screening.

Design: Randomised controlled trial of different methods of feedback.

Setting: Participants were recruited through primary and secondary care but appointments took place at a University research clinic.

Participants and intervention: 1093 children aged 4-8 years were screened. Only overweight children (n = 271, 24.7%) are included in this study. Parents of overweight children were randomised to receive feedback regarding their child's weight using best practice care (BPC) or motivational interviewing (MI) as face-to-face interviews typically lasting 20-40 minutes. Two hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to assess recall and understanding of information from the feedback session.

Primary and secondary outcome measures: Interviews were audio-taped and transcribed verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall and sub-categories of interest.

Results: Overall, 39% of the information was recalled (mean score 6.3 from possible score of 16). Parents given feedback via BPC recalled more than those in the MI group (difference in total score 0.48; 95% CI 0.05 to 0.92). Although 94% of parents were able to correctly recall their child's weight status, fewer than 10 parents could accurately describe what the measurements meant. Maternal education (0.81; 0.25 to 1.37) and parental ratings of how useful

they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in multivariate analyses.

Conclusions: While parents remember that their child's BMI is higher than recommended, they are unable to remember much of the information and advice provided about the result.

CLINICAL TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry ACTRN12609000749202

ARTICLE SUMMARY

Strengths and limitations of this study

- First study to assess what parents remember and understand from a 20-40 minute face-to-face session dedicated to discussing the weight status of their child
- Recall and accuracy were studied extensively through the use of transcripts which were transcribed verbatim and coding according to an extensive coding schedule
- Large (n = 244), demographically diverse sample of overweight children and their parents
- Not originally designed to specifically test parental memory, and thus exhaustively prompt parents for complete recall

INTRODUCTION

Approximately one in three children are overweight in New Zealand,[1] a problem that is poorly recognised, particularly by parents.[2-4] It has therefore been suggested that routine consultations in primary care include measurement of body mass index (BMI) in an effort to improve recognition and awareness of excess weight during childhood.[5]

Although the primary care environment might seem suitable for routine screening given established relationships between families and their health practitioner, patients often present with multiple problems making it difficult for health practitioners to address each problem adequately within a standard consultation time.[6] While adding measurement of height and weight may add little time to the overall appointment, discussion of overweight status, particularly for unsuspecting parents, is considerably more complicated. Whether parents have the ability to recall and understand this information, and thus potentially make the behavioural changes required, is unknown.

The extent to which patients are able to recall their medical information has important implications for treatment adherence, patient satisfaction and subsequent health outcomes.[7,8] In general, recall of medical information is low.[9-12] Health information is often complex and may be incongruent with patients' perceptions. Furthermore, factors such as patient age, education, literacy levels, anxiety and stress impact upon a patient's ability to remember the information presented.[13-16] Not surprisingly, several studies have demonstrated that parents recall pertinent details about their child's health (such as diagnoses or major injuries) more than peripheral details (such as tests completed in a consultation, prescriptions or follow-up appointments).[15,17,18]

In the context of screening for overweight in children, it would appear that parents can recall important information, such as their child's weight status following a posted letter.[19] However, understanding of the results and BMI charts and/or percentiles is very low.[20] To date, most evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a few studies[20-22] have assessed whether parents *understand* BMI charts and percentiles, and none have done so after receiving BMI results in a face-to-face consultation, as would occur in a primary care setting. This is an important distinction as it may be that a letter of results provides an enduring memory cue or resource which enables parents to better retain the information and refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding given the opportunity to discuss the results and ask questions, thereby strengthening encoding of the information and creating stronger recall.

Therefore, this study investigated parental recall of information given in a BMI screening and face-to-face feedback session. Specifically, we examined how much information parents could recall from the BMI screening session, which types of information were more likely to be recalled, the accuracy of parental recall and how recall varied according to feedback style. Factors that may predict better recall performance were also explored.

SUBJECTS AND METHODS

This manuscript presents data from a large randomised controlled study (MInT) which has been described in detail previously.[23] In brief, MInT was a BMI screening initiative (phase 1) to recruit children into a two-year family-based intervention in overweight children (phase 2).

Phase 1 entailed a comparison of weight feedback delivered using best practice care or motivational interviewing whereas phase 2 compared a usual care intervention with a more intense intervention tailored to the needs of each family. Ethical approval was obtained from the Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

Participants

1093 children between the ages of 4 and 8 years, recruited from local primary care practices and secondary care clinics in Dunedin, New Zealand were screened for overweight at a University research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553) using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.[24] Only those parents with overweight children (BMI $\geq$ 85th percentile)[25] were eligible for the current study (n = 271, Figure 1). These parents were invited to participate in a recall interview at the University approximately two weeks later to discuss the feedback they received about their child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview. A further seven participants were excluded due to technical difficulties with audio recordings (n = 6) and one had brought the feedback booklet with them to the interview making them unsuitable for assessing *recall* of feedback.

Procedures

Screening

Parents (virtually all mothers, fathers < 2%) completed a comprehensive online questionnaire

assessing demographic characteristics including ethnicity, maternal education, an index of socioeconomic status (New Zealand deprivation index, NZDep2006[26]) and maternal age. Parental concern about their child's weight and perception of their weight status were both assessed using a 5-point Likert scale question (where 1 = not at all concerned and 5 = very concerned for concern and 1 = underweight, 2 = a little underweight, 3 = about right, 4 = a little overweight, 5 = overweight for perception). We calculated a discrepancy score to indicate the extent to which the parent under- or over-rated their child's weight status by comparing the parental perception of their child's weight status with their actual BMI classification (underweight = <3rd percentile, normal weight = 3rd-84th percentile, a little overweight = 85th-94th percentile, overweight = ≥95th percentile). Scores of 1 or 2 for the perception of underweight were combined in this comparison. Duplicate anthropometric measurements (height, weight and waist) and blood pressure (BP) (Dinamap: GE Medical Systems, Waukesha, WI) were obtained from children using standard techniques. All data report the mean values. BMI was calculated using CDC reference norms[25] and waist (cm) to height (cm) ratio (WHtR) was compared with recommendations from Aswell and colleagues.[27] Researchers plotted BP, BMI and WHtR onto colour-coded charts relative to age and sex in a booklet that parents were able to take home. The booklet also included a glossary of key terms, a summary of the child's lifestyle behaviours (e.g., physical activity, fruit and vegetable intake) as reported by parents, as well as current New Zealand guidelines for these behaviours.[28]

Feedback interview: Researchers explained each measure and then discussed the lifestyle behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid labelling the child as "overweight" or "obese". Implications of each colour zone were explained

in terms of how many children were in each zone, possible health consequences and the long-term risk of carrying excess weight associated with each zone. Researchers delivering the feedback were from different backgrounds (e.g., dietetics, nutrition, exercise science). Therefore, researchers delivering BPC feedback (n = 2) received 6 hours of general interviewing skills training and 6 hours training on the feedback protocol. Researchers delivering MI feedback (n = 3) received approximately 40 hours training in MI and the feedback protocol.

BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that the primary focus of the BPC interview was on anthropometric results and discussion of the lifestyle behaviours. Interviews typically lasted 15 minutes.

MI feedback condition: Parents were given information using an Elicit-Provide-Elicit (E-P-E) approach[29] that allowed researchers to check in with parents' prior knowledge before giving feedback. This approach also allowed parents the opportunity to explore the meaning and importance of the results. Therefore, in contrast to the BPC interview, the focus of the MI interview was on the *implications* of the health check results to the family. Interviews typically lasted 30 minutes. All interviews were video-taped and transcribed verbatim so that accuracy of recall could be determined.

Follow-up

The recall interview took place approximately two weeks after the screening and feedback session and an independent interviewer (n = 3), not involved in the feedback process, interviewed the parents. Parents repeated aspects of the BMI screening questionnaire and completed a semi-structured interview (questions are presented in Table 1). In summary, these

assessed recall and usefulness of the information, and parental experience of the feedback. Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for coding by a professional transcriber blinded to feedback group.

Coding

The number of pieces of information given at the feedback session were identified and defined by two authors (AMD, DAB). The first phase of the coding was developed a priori from the interview schedule, which was designed and developed prior to the study, based on the information we expected to elicit. The second phase of the coding, involving the development of specific codes and weightings, were developed after the data had been collected and researchers became familiar with the categories of responses that parents gave (Supplementary Table 1). Lists of acceptable responses were developed and the coding framework was applied (initially collaboratively, then independently) to transcripts and codes compared. Discrepancies were resolved through discussion and the coding rules were finalised. The pieces of information (n = 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a large number of discrete items of information to receive, the six categories were the main point of interest and the individual items were included to provide details on the type of information recalled. Scores were weighted according to their importance in the feedback interview. Weighting decisions were made through author discussion of the most important clinical messages delivered to parents. For example, the main result discussed was BMI, therefore this was allocated the highest weighting of 4 from a maximum of 12.5. Only the weighted figures were used in analyses presented here but results did not differ whether weighted or unweighted scores were used (data not shown).

Coding was completed in two passes. The first pass assessed *how much* information was recalled. Coders identified relevant statements on the transcript and allocated a score under one or more categories. One statement could be coded in several categories (e.g., "her BMI was in the overweight category" would gain a score for indicating that BMI was measured and for giving the BMI result). If a piece of information was mentioned more than once, only the first statement was allocated a score. As recall may be prompted by discussion that occurs later in the interview, recall of the implications associated with carrying excess weight was divided by stage of interview, into free and prompted recall (Table 1). Recall of the other five information categories was not divided into free and prompted recall as the majority of relevant information was recalled following question 1, and the interview was not set up to prompt exhaustively as would be expected in a memory interview. Implications recalled in response to the first recall question and non-specific prompts were considered free recall. Implications recalled following a specific prompt or additional interview questions were considered prompted recall. The second coding pass identified whether the information recalled was accurate or not. Each piece of information identified in the first pass was compared with the transcript of the BMI feedback interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter- and intra-reliability were moderate to excellent[30] (0.48-0.96).

Data analysis

Linear regression was conducted to examine the overall effects of interview condition, recall interviewer and time between feedback and recall interview. To examine the amount of information recalled, scores were converted to a proportion of the total number of items in each category and regression was used to compare the relative frequencies of information category (within-subjects factor) and the interaction of feedback condition (between-subjects factor). Accuracy was calculated as the number who correctly recalled the information from 1) just those who actually mentioned each type of information and 2) from all parents. Thus accuracy for the former calculation reflects errors of commission, whereas using the total number of parents as the denominator also includes errors of omission. Accuracy was analysed using a two-group difference in proportion test to detect any difference between the two feedback conditions. A mixed model was used to compare recall of the meaning of results by stage of interview (within-subjects factor) and feedback condition (between-subjects factor). The model included an interaction term to find out whether the type of information (lifestyle changes versus implications) was different in the MI and BPC groups. To investigate which factors are associated with better recall, variables were analysed using multiple linear regression. Variables with $p < 0.2$ in the univariate model were included in the multivariate models. To adjust for feedback condition and time between feedback and recall session, these variables were also included in the multivariate models. Data were also adjusted for clustering within families given that one family enrolled 3 overweight siblings and 9 families enrolled 2 siblings.

The larger MInT study from which this data are derived is adequately powered as it required a minimum of 250 participants to detect the main outcomes of interest, with a final sample size of 271.[24] No sample size calculations were performed prior to analysis for this paper as it was a

secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have presented analyses for the available data.

RESULTS

Table 3 presents the characteristics of the overall sample and according to participation. Parents that did not participate in recall interviews (n = 27) had children who did not differ from children who did participate (n = 244) in terms of age, sex, ethnicity, household deprivation, maternal BMI, maternal education, height, weight, or BMI z-score. Reasons given for non-participation included too busy (n = 8), equipment malfunction (n = 6), no reason given (n = 3), families were moving out of town (n = 2), non-contactable (n = 2) or missed multiple appointments (n = 2), child did not want to (n = 1), traumatised by recent Christchurch earthquakes (n = 1), belief that the child was not overweight (n = 1), and brought the information booklet to the recall interview (n = 1).

Table 4 presents the mean number of items recalled and weighted score by information category. On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they were given at the feedback session. There was no difference in total recall score by recall interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P = 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time between interviews (days). There was a significantly higher total recall score for those in the best

practice care condition ($M = 6.01$, $SD = 1.42$ from a total possible score of 12.5) compared with the MI condition ($M = 5.55$, $SD = 1.83$) (difference 0.48 (95% CI 0.05 to 0.92), P = 0.030).

Table 5 reports the number of people who recalled each category of information and illustrates that while very few parents recalled information about their child's fat distribution (28%) or blood pressure findings (21%), virtually every parent recalled that their child had a high BMI (97%). However, it is clear that many parents did not know what this actually meant, whether in terms of understanding the concept of these measurements (only 26% could say that BMI was a measure of weight in relation to height) or, more importantly, the *implications* of a high BMI (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the implications of their child having a high BMI and a further 38% recalled only one of four possible implications that they were told when they were given their child's BMI result. Logistic regression demonstrated a significant interaction between the type of information recalled (e.g., BMI result) and feedback condition (BPC or MI) (P < 0.01). Further examination demonstrated that those in the BPC condition were more likely to report that lifestyle behaviours had been discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40, P < 0.01), whereas the *implications* of the BMI results was more likely to be reported by those in the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01 to 0.27, P = 0.02).

Table 5 also presents the proportion of parents who correctly recalled each *type* of information. As mentioned 97% (n = 238) of parents remembered their child had a high BMI and 97% (n = 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their

child's BP and WHtR results less often (n = 51 - 68 parents). Estimates of accuracy were based on errors of commission (i.e. parents who reported the information but did so incorrectly) of which 86-97% accurately recalled the information. When we included errors of omission (i.e., parents who left the information out of their account) then accuracy was substantially lower (19-25%). Although the number of parents recalling what high BMI meant for their child (implications) was considerably lower, those parents who did recall implications, were generally very accurate (i.e., child was overweight and were more at risk of carrying this weight into adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e., whether the child's weight and height are in proportion for their age) was poorly understood with only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR. Interestingly, feedback condition made no difference to the accuracy of parental recall.

Not surprisingly, there was significantly higher recall of the meaning of results following prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P < 0.01). This was particularly apparent for those in the MI group who showed a larger increase in meaning recall after prompting ($M = 0.55$, $SD = 0.45$) than BPC ($M = 0.40$, $SD = 0.41$) (interaction term 0.14, 0.00 to 0.28, P = 0.04).

Table 6 presents the models for the association between total recall scores and predictors of interest. As the univariate models demonstrated that both time between feedback and recall session (P = 0.029) and feedback condition (P = 0.030) were significantly related to total recall score, only the multivariate models are discussed here. After adjustment for these two variables, mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to

1.32) than less educated mothers, whereas no differences were observed for child ethnicity or BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total recall score appeared to be related to the experience of the feedback process. Having a larger discrepancy between perceived and actual weight was associated with lower recall scores (-0.44, -0.76 to -0.14). Conversely, understanding the information presented in the feedback process (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher recall scores to a similar degree. Once all significant variables were entered in multivariate model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.

DISCUSSION

Our study demonstrated that although parents were only able to recall 39% of the information that was given to them at the BMI screening session, virtually all (97%) recalled that their child was overweight. Our findings are consistent with previous research demonstrating that while overall recall of medical information is poor,[9] parents are good at recalling important details such as their child's diagnosis[15] or weight status.[19] In contrast, information from other categories was not as readily reported and in particular, concepts were poorly understood with less than 50% of parents able to accurately describe what was done. These findings are consistent with the attentional narrowing hypothesis which suggests that the most salient information is attended to leaving less attention for peripheral information.[31] Given the poor recognition of overweight in children, it is likely that receiving such feedback will elicit distress in some people, which may accentuate attentional narrowing.[31,32] However, it is important to note that the child's *actual* BMI was supported by a graph that parents were able to take home, and therefore may have aided

recall of the key results, similar to BMI screening studies which provide results in a letter that parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the session but was not supported by a take home message. While the provision of take home written information to aid recall of medical information has produced inconsistent results,[7] there is some evidence to suggest that simple pictorial messages can aid recall.[33] It is also important to note that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a take home visual and yet were poorly recalled. This may suggest that a take home message may not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical healthcare appointments, the feedback was given in an environment that minimised distractions (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to process the information being communicated.

Findings from the current study suggest that parents have limited capacity for processing a large amount of information and although they are able to remember some key pieces of information (that their child was overweight), important details were forgotten (such as why being an overweight child is a concern). While it could be argued that 6 categories of information is an unrealistic target, a considerable amount of time was spent within the interviews on BMI and what it means for health; more than would be spent during a typical primary care consultation. This has important implications for including BMI screening within routine healthcare, especially if the information is unexpected. Thus health professionals need to limit the amount of information given in one session, provide personalised take-home information, or use multiple sessions to assess gaps in patient recall or understanding and provide clarification, especially if the information is unexpected or includes unfamiliar concepts.

Despite our best efforts to present information to promote optimal recall and understanding,[7] (spending a significant portion of time on the key message (BMI and health), providing pictorial information and providing simple non-technical explanations),[7] our findings suggest that the implications were poorly recalled and concepts were poorly understood. While a diagnosis is important, it is not meaningful without an understanding of the implications and a clear treatment pathway. This is particularly relevant in primary care, where doctors are often reluctant[34] to discuss childhood overweight and unsure how to communicate this information to families.[35] This may inadvertently lead to ambiguous information or brief communication, making it easy for parents to become confused about the messages they are being given, particularly if the information conflicts with parental beliefs. Poor understanding also has implications for the transfer of this information beyond the direct medical setting and into the child's wider context. For example, if parents are unable to understand what their child's results mean, there is the potential for miscommunication with significant people in the child's life who might need to be involved in changing lifestyle factors.

Literature examining parental recall of child weight status information is very limited[19,20,36] and no studies appear to have assessed recall and understanding of BMI information and related concepts following a targeted face-to-face interview. Johnson and colleagues[19] investigated parent reactions to a screening program and included measures of recall of the information provided in a BMI results letter. Consistent with the current study, important information was recalled well (e.g., 94% of the parents recalled their child's weight category), and other details were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were

lower than that observed in the current study. This may have arisen because of different methods of informing parents (letter versus face-to-face) or due to the more stringent accuracy classification used by Johnson et al.[19]

Although it may seem surprising that parents receiving BPC feedback were able to remember more than those who received MI, more structured and specific information is more likely to be remembered.[7,37] The BPC interview was highly structured and the advice given to parents to achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the MI session, reflecting the intention of MI,[38] was not structured, with research assistants intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC sessions it is also possible that the additional time spent on the exploration of the meaning and implication of results took focus away from the central details of the message, resulting in lower recall of the information.

Higher maternal education was related to improved overall recall, consistent with the literature in other health contexts.[7,14] While a relationship between recall and child and maternal BMI,[19] ethnicity[19] and age[39] have previously been suggested, they were unrelated in this study. Here, beliefs about weight played a more important role: parents who found the information unexpected or did not understand the feedback process or find it useful, had lower recall. By contrast, those who were already concerned about their child's weight had higher overall recall. These findings are consistent with the hypothesis that memory is heightened for information that is consistent with one's current beliefs[40] and has implications for health practitioners giving parents results that they may not expect. Prior to delivering feedback health practitioners may

benefit from assessing parents' expectations, concerns and current knowledge, to assist in prioritising and explaining results that may not align with these.

This study examined recall and understanding in a large sample of families with overweight children. This study was not originally constructed to assess parental memory, and as such it was not set up to exhaustively prompt parents for complete recall. It is possible that had we interviewed differently, parents may have recalled more information. However, much of the information used in this interview was based on free recall, which is particularly relevant in this context as it likely reflects the information that is most salient and easily accessible to parents.

In summary, our findings appear to be the first to examine parental recall of BMI and growth information following a BMI screening and face-to-face feedback session. While our results suggest that parents were able to remember their child's overweight diagnosis very well, 61% of the information was forgotten. This finding suggests that the inclusion of BMI screening within current appointments may negatively impact parental ability to remember and understand this information. In addition, the way that the information is given, and parental education, values and expectations, were associated with recall of the information and therefore suggest that health professionals need to be aware of these factors when discussing results with parents.

Figure Legend

Participant flow throughout the study

CONTRIBUTORS' STATEMENT

Anna M Dawson: Ms. Dawson contributed to study design, undertook data collection, coded the transcripts, produced the first and subsequent drafts of the paper and approved the final manuscript as submitted.

Rachael W Taylor: Assoc Prof. Taylor was the principal investigator of the project and was responsible for study design, monitored data collection, critically reviewed and revised the manuscript, and is guarantor.

Sheila M Williams: Assoc Prof. Williams contributed to study design, completed statistical analysis, critically reviewed manuscript and approved the final manuscript as submitted.

Barry J Taylor: Professor Taylor contributed to study design, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

Deirdre A Brown: Dr. Brown contributed to study design, supervised research staff, provided reliability coding, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

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Table 1. Recall interview questions

Free recall question

1. What information were you given about your child's growth?

Non-specific prompts

Were you given any other information about your child at the initial session?
Tell me more about that…
What information were you given?

Specific prompt for implications

2. What were you told that the information means for him/her?

Additional interview questions – prompted recall

3. How easy was it to follow and use the information presented in the health check booklet?

1	2	3	4	5	6	7
very easy		somewhat easy		somewhat difficult		very difficult

4. How useful did you find the information presented in the health check booklet?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

5. How easy was it to understand and follow the explanations of terms (such as Body Mass Index, Blood Pressure and Waist to Height ratio?)

1	2	3	4	5	6	7
very difficult		somewhat difficult		somewhat easy		very easy

6. How useful did you find the traffic light system (green, orange and red zones) to explain your child's weight status?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

7. How did you feel about the way the information about your child's weight status was given to you?
8. I felt upset by the information given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

9. I felt upset by the way the information was given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

10. I felt it was useful to be given this information?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

11. The information about my child's weight was unexpected?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

12. I'm interested in your decision to tell/not tell your child.
13. If you did discuss the information with your child, what did you tell them?
14. How did your child react to this information?
15. Are there any other things we could do to improve the way our health check results are discussed with parents? Or any other comments?

Table 2. Coding category definitions and possible scores

Coding Categories	Definition	Total number of items	Total weighted score
Growth measurement	Recall of each measurement taken: height, weight, waist circumference, body mass index (BMI) and waist to height ratio (WhtR).	5	2.5
Growth concept	Recall reflecting knowledge or understanding of the concept of BMI – looking at a person's weight in relation to their height (proportion) and WhtR – a measure of how big they are around their waist, taking their height into consideration.	2	1.5
Growth result	Recall of child's BMI and/or WhtR result	2	4
Growth implication	Recall of the implications of childhood overweight for health, severity of problem, long-term weight problems, the need to act	4	2
Blood pressure	Recall that blood pressure was measured and the child's blood pressure result	2	1.5
Behavior	Recall of discussion of behavioral recommendations	1	1
Total recall		16	12.5

Abbreviations: BMI – body mass index; WhtR – waist to height ratio

Table 3. Baseline characteristics of the study population

		Total (n = 271)	Participants (n = 244)	Non-participants (n = 27)	Difference or Odds ratio (95% CI)
Girls n (%)		150 (55)	135 (55)	15 (56)	-0.99 (-2.21 to 0.44)†
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity[a] n (%)	New Zealand European and others	200 (74)	182 (75)	18 (67)	1.00
	Maori	50 (19)	43 (18)	7 (26)	0.61 (0.24 to 1.55)†
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19)†
Household deprivation[b]		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years)[c]		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education[d] n (%)	Some secondary school	86 (32)	79 (33)	7 (12)	1.00
	Completed secondary school or tertiary education (not University)	91 (34)	79 (33)	12 (44)	0.58 (0.21 to 1.55)†
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64)†
Maternal BMI[e] (kg/m^2)		29.1 (6.2)	29.2 (6.4)	28.6 (4.4)	0.63 (-1.25 to 2.50)*
Height (cm)		120.7 (11.2)	120.9 (11.0)	118.8 (12.4)	2.09 (-2.76 to 6.94)*
Weight (kg)		28.7 (7.8)	28.9 (7.8)	27.5 (7.4)	1.39 (-1.52 to 4.32)*
BMI z-score		1.61 (0.45)	1.61 (0.46)	1.56 (0.36)	0.04 (-0.10 to 0.19)*

Data were missing for 1[a], 9[b], 9[c], 3[d] and 13[e] participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as *difference or †odds ratios as shown.

Table 4. Mean (SD) number of items recalled and weighted score, reported by information category

	Total sample (n = 244)		MI (n = 121)	BPC (n = 122)
Information category	Number of items m (SD)	Weighted scores m (SD)	Weighted scores m (SD)	Weighted scores m (SD)
Growth measurement	2.5 (1.39)	1.2 (0.69)	1.16 (0.77)	1.28 (0.61)
Growth concept	0.3 (0.51)	0.3 (0.46)	0.19 (0.42)	0.36 (0.49)
Growth result	0.5 (0.75)	2.9 (0.75)	2.84 (0.75)	2.87 (0.76)
Growth implication	1.5 (0.90)	0.8 (0.49)	0.83 (0.49)	0.66 (0.47)
Blood pressure	0.5 (0.75)	0.4 (0.56)	0.32 (0.55)	0.36 (0.57)
Behaviour	0.3 (0.46)	0.3 (0.46)	0.19 (0.40)	0.45 (0.50)
Total recall	6.3 (2.28)	5.8 (1.66)	5.55 (1.83)	6.01 (1.42)

Abbreviations: BPC – best practice care; MI – motivational interviewing

Table 5. Parent recall of each type of information in the overall sample and by feedback condition

	Total recall (%)			[1]Correct recall (%)			[2]Correct recall (%)		
Information category	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
Results									
BMI result	238 (97)	119 (98)	119 (97)	230 (97)	115 (97)	115 (97)	230 (94)	115 (95)	115 (93)
WHtR result	68 (28)	30 (25)	38 (31)	61 (90)	26 (87)	35 (92)	61 (25)	26 (21)	35 (28)
Blood pressure	51 (21)	22 (18)	29 (24)	47 (92)	19 (86)	28 (97)	47 (19)	19 (17)	28 (23)
Meaning of results									
0 implications recalled	37 (15)	11 (9)	26 (21)	-	-	-	-	-	-
1 implication recalled	92 (38)	47 (39)	45 (36)	85 (92)	43 (91)	42 (93)	85 (35)	43 (36)	42 (34)
2 implications recalled	75 (31)	40 (33)	35 (29)	67 (89)	38 (95)	29 (83)	67 (27)	38 (31)	29 (24)
3 or 4 implications recalled	40 (16)	23 (19)	17 (14)	33 (83)	19 (83)	14 (83)	33 (14)	19 (16)	14 (11)
Behavior discussion	80 (33)	24 (20)	56 (46)	-	-	-	-	-	-
Concepts discussed									
BMI concept	63 (26)	21 (17)	42 (34)	7 (11)	3 (14)	4 (10)	7 (3)	3 (2)	4 (3)
WHtR concept	11 (5)	5 (4)	6 (5)	3 (27)	0 (0)	3 (50)	3 (0)	0 (0)	3 (2)

Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition. For correct recall, percentages are calculated from [1]only from those who recalled the information (errors of comission) and [2]the total sample (errors of omission).

Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio

Table 6. Models for the association between total recall and predictors of interest

Variable	Univariate model (95% CI)	Multivariate model 1 (95% CI)	Multivariate model 2 (95% CI)
Maternal education			
Tertiary[†]	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree[†]	0.82 (0.27 to 1.38)*	0.76 (0.20 to 1.32)*	0.81 (0.25 to 1.37)*
Ethnicity			
Maori[††]	-0.61 (-1.17 to -0.05)*	-0.52 (-1.09 to 0.04)	
Pacific[††]	-0.30 (-1.10 to 0.51)	-0.30 (-1.08 to 0.48)	
Maternal BMI	-0.01 (-0.05 to 0.02)	-0.01 (-0.04 to 0.02)	
Maternal age	0.02 (-0.02, 0.06)	0.02 (-0.02 to 0.06)	
Child BMI (z-score)	0.19 (-0.31 to 0.71)	0.12 (-0.37 to 0.61)	
Parental concern before feedback	0.27 (0.06 to 0.47)*	0.20 (-0.01 to 0.42)	0.10 (-0.13 to 0.33)
Discrepancy between perceived and actual weight	-0.52 (-0.84 to -0.21)*	-0.44 (-0.76 to -0.14)*	-0.23 (-0.58 to 0.11)
Weight information unexpected	-0.10 (-0.19 to -0.002)*	-0.09 (-0.18 to 0.01)	-0.03 (-0.13 to 0.07)
Understand information presented in HC booklet	0.28 (0.06 to 0.49)*	0.29 (0.07 to 0.50)*	0.19 (-0.04 to 0.42)
Usefulness of information presented in HC booklet	0.22 (0.07 to 0.37)*	0.20 (0.04 to 0.35)*	0.19 (0.04 to 0.35)*
Time between feedback and recall session (days)	-0.03 (-0.05 to -0.004)*		-0.02 (-0.04 to 0.01)

Feedback condition	0.48 (0.05 to 0.92)*	0.28 (-0.18 to 0.73)

β estimates refer to the difference in total recall weighted score (from possible of 12.5) explained by each predictor of interest.

Multivariate model 1 estimates are adjusted for time between feedback and recall interview and feedback condition.

Multivariate model 2 estimates are adjusted for all other variables in the model.

Abbreviations: BMI – body mass index; HC – health check

†Reference group was some secondary school

††Reference group was New Zealand European and others

*P<0.05

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	3-4
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	6-7
	2b	Specific objectives or hypotheses	7
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	7-8
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	N/A
Participants	4a	Eligibility criteria for participants	8
	4b	Settings and locations where the data were collected	8
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	8-10
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	10-12
	6b	Any changes to trial outcomes after the trial commenced, with reasons	N/A
Sample size	7a	How sample size was determined	Ref 23
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	Ref 24
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	Ref 24
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	Ref 24
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	Ref 24
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those	Ref 24

		assessing outcomes) and how	
	11b	If relevant, description of the similarity of interventions	N/A
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	12-13
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	N/A
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	8
	13b	For each group, losses and exclusions after randomisation, together with reasons	8
Recruitment	14a	Dates defining the periods of recruitment and follow-up	Ref 24
	14b	Why the trial ended or was stopped	N/A
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	Ref 24 – or could be added as web only
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	Tables 3 & 4
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	Tables
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	N/A
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	16-17
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17-19
Other information			
Registration	23	Registration number and name of trial registry	4
Protocol	24	Where the full trial protocol can be accessed, if available	7
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	20

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

BMJ Open

Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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ABSTRACT

Objectives: As parents of young children are often unaware their child is overweight, screening provides the opportunity to inform parents and provide the impetus for behaviour change. We aimed to determine if parents could recall and understand the information they received about their overweight child after weight screening.

Design: Randomised controlled trial of different methods of feedback.

Setting: Participants were recruited through primary and secondary care but appointments took place at a University research clinic.

Participants and intervention: 1093 children aged 4-8 years were screened. Only overweight children (n = 271, 24.7%) are included in this study. Parents of overweight children were randomised to receive feedback regarding their child's weight using best practice care (BPC) or motivational interviewing (MI) as face-to-face interviews typically lasting 20-40 minutes. Two hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to assess recall and understanding of information from the feedback session.

Primary and secondary outcome measures: Interviews were audio-taped and transcribed verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall and sub-categories of interest.

Results: Overall, 39% of the information was recalled (mean score 6.3 from possible score of 16). Parents given feedback via BPC recalled more than those in the MI group (difference in total score 0.48; 95% CI 0.05 to 0.92). Although 94% of parents were able to correctly recall their child's weight status, fewer than 10 parents could accurately describe what the measurements meant. Maternal education (0.81; 0.25 to 1.37) and parental ratings of how useful

they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in multivariate analyses.

Conclusions: While parents remember that their child's BMI is higher than recommended, they are unable to remember much of the information and advice provided about the result.

CLINICAL TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry ACTRN12609000749202

ARTICLE SUMMARY

Strengths and limitations of this study

- First study to assess what parents remember and understand from a 20-40 minute face-to-face session dedicated to discussing the weight status of their child
- Recall and accuracy were studied extensively through the use of transcripts which were transcribed verbatim and coding according to an extensive coding schedule
- Large (n = 244), demographically diverse sample of overweight children and their parents
- Not originally designed to specifically test parental memory, and thus exhaustively prompt parents for complete recall

INTRODUCTION

Approximately one in three children are overweight in New Zealand,[1] a problem that is poorly recognised, particularly by parents.[2-4] It has therefore been suggested that routine consultations in primary care include measurement of body mass index (BMI) in an effort to improve recognition and awareness of excess weight during childhood.[5]

Although the primary care environment might seem suitable for routine screening given established relationships between families and their health practitioner, patients often present with multiple problems making it difficult for health practitioners to address each problem adequately within a standard consultation time.[6] While adding measurement of height and weight may add little time to the overall appointment, discussion of overweight status, particularly for unsuspecting parents, is considerably more complicated. Whether parents have the ability to recall and understand this information, and thus potentially make the behavioural changes required, is unknown.

The extent to which patients are able to recall their medical information has important implications for treatment adherence, patient satisfaction and subsequent health outcomes.[7,8] In general, recall of medical information is low.[9-12] Health information is often complex and may be incongruent with patients' perceptions. Furthermore, factors such as patient age, education, literacy levels, anxiety and stress impact upon a patient's ability to remember the information presented.[13-16] Not surprisingly, several studies have demonstrated that parents recall pertinent details about their child's health (such as diagnoses or major injuries) more than peripheral details (such as tests completed in a consultation, prescriptions or follow-up appointments).[15,17,18]

In the context of screening for overweight in children, it would appear that parents can recall important information, such as their child's weight status following a posted letter.[19] However, understanding of the results and BMI charts and/or percentiles is very low.[20] To date, most evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a few studies[20-22] have assessed whether parents *understand* BMI charts and percentiles, and none have done so after receiving BMI results in a face-to-face consultation, as would occur in a primary care setting. This is an important distinction as it may be that a letter of results provides an enduring memory cue or resource which enables parents to better retain the information and refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding given the opportunity to discuss the results and ask questions, thereby strengthening encoding of the information and creating stronger recall.

We recently examined whether motivational interviewing was an appropriate way of informing parents that their young child was overweight following BMI screening.[23, 24] Parents attended a second session two weeks later providing the opportunity for us to examine how well they recalled the information given in this face-to-face feedback session. Specifically, we examined how much information parents could recall from the BMI screening session, which types of information were more likely to be recalled, the accuracy of parental recall and how recall varied according to feedback style. Factors that may predict better recall performance were also explored. This manuscript represents a secondary data analysis from our main trial.[24] While recall was not specified *a priori* as a variable of interest, it was considered a component of how well parents understood the feedback process.[23]

SUBJECTS AND METHODS

This manuscript presents data from a large randomised controlled study (RCT) which has been described in detail previously.[23] In brief, MInT was a BMI screening initiative (phase 1) to recruit children into a two-year family-based intervention in overweight children (phase 2). Phase 1 entailed a comparison of weight feedback delivered using best practice care or motivational interviewing whereas phase 2 compared a usual care intervention with a more intense intervention tailored to the needs of each family. Ethical approval was obtained from the Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

Participants

1093 children between the ages of 4 and 8 years, recruited from local primary care practices and secondary care clinics in Dunedin, New Zealand were screened for overweight at a University research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553) using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.[24] Only those parents with overweight children (BMI $\geq$ 85th percentile)[25] were eligible for the current study (n = 271, Figure 1). These parents were invited to participate in a recall interview at the University approximately two weeks later to discuss the feedback they received about their child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview. A further seven participants were excluded due to technical difficulties with audio recordings (n

= 6) and one had brought the feedback booklet with them to the interview making them unsuitable for assessing *recall* of feedback.

Procedures

Screening

Parents (virtually all mothers, fathers < 2%) completed a comprehensive online questionnaire assessing demographic characteristics including ethnicity, maternal education, an index of socioeconomic status (New Zealand deprivation index, NZDep2006[26]) and maternal age. Parental concern about their child's weight and perception of their weight status were both assessed using a 5-point Likert scale question (where 1 = not at all concerned and 5 = very concerned for concern and 1 = underweight, 2 = a little underweight, 3 = about right, 4 = a little overweight, 5 = overweight for perception). We calculated a discrepancy score to indicate the extent to which the parent under- or over-rated their child's weight status by comparing the parental perception of their child's weight status with their actual BMI classification (underweight = <3rd percentile, normal weight = 3rd-84th percentile, a little overweight = 85th-94th percentile, overweight = ≥95th percentile). Scores of 1 or 2 for the perception of underweight were combined in this comparison. Duplicate anthropometric measurements (height, weight and waist) and blood pressure (BP) (Dinamap: GE Medical Systems, Waukesha, WI) were obtained from children using standard techniques. All data report the mean values. BMI was calculated using CDC reference norms[25] and waist (cm) to height (cm) ratio (WHtR) was compared with recommendations from Aswell and colleagues.[27] Researchers plotted BP, BMI and WHtR onto colour-coded charts relative to age and sex in a booklet that parents were able to take home. The booklet also included a glossary of key terms, a summary of the child's lifestyle behaviours (e.g.,

physical activity, fruit and vegetable intake) as reported by parents, as well as current New Zealand guidelines for these behaviours.[28]

Feedback interview: Researchers explained each measure and then discussed the lifestyle behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid labelling the child as "overweight" or "obese". Implications of each colour zone were explained in terms of how many children were in each zone, possible health consequences and the long-term risk of carrying excess weight associated with each zone. Researchers delivering the feedback were from different backgrounds (e.g., dietetics, nutrition, exercise science). Therefore, researchers delivering BPC feedback (n = 2) received 6 hours of general interviewing skills training and 6 hours training on the feedback protocol. Researchers delivering MI feedback (n = 3) received approximately 40 hours training in MI and the feedback protocol.

BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that the primary focus of the BPC interview was on anthropometric results and discussion of the lifestyle behaviours. Interviews typically lasted 15 minutes.

MI feedback condition: Parents were given information using an Elicit-Provide-Elicit (E-P-E) approach[29] that allowed researchers to check in with parents' prior knowledge before giving feedback. This approach also allowed parents the opportunity to explore the meaning and importance of the results. Therefore, in contrast to the BPC interview, the focus of the MI interview was on the *implications* of the health check results to the family. Interviews typically lasted 30 minutes. All interviews were video-taped and transcribed verbatim so that accuracy of recall could be determined.

Follow-up

The recall interview took place approximately two weeks after the screening and feedback session and an independent interviewer (n = 3), not involved in the feedback process, interviewed the parents. Parents repeated aspects of the BMI screening questionnaire and completed a semi-structured interview (questions are presented in Table 1). In summary, these assessed recall and usefulness of the information, and parental experience of the feedback. Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for coding by a professional transcriber blinded to feedback group.

Coding

The number of pieces of information given at the feedback session were identified and defined by two authors (AMD, DAB). The first phase of the coding was developed a priori from the interview schedule, which was designed and developed prior to the study, based on the information we expected to elicit. The second phase of the coding, involving the development of specific codes and weightings, were developed after the data had been collected and researchers became familiar with the categories of responses that parents gave (Supplementary Table 1). Lists of acceptable responses were developed and the coding framework was applied (initially collaboratively, then independently) to transcripts and codes compared. Discrepancies were resolved through discussion and the coding rules were finalised. The pieces of information (n = 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a large number of discrete items of information to receive, the six categories were the main point of interest and the individual items were included to provide details on the type of information

recalled. Scores were weighted according to their importance in the feedback interview. Weighting decisions were made through author discussion of the most important clinical messages delivered to parents. For example, the main result discussed was BMI, therefore this was allocated the highest weighting of 4 from a maximum of 12.5. Only the weighted figures were used in analyses presented here but results did not differ whether weighted or unweighted scores were used (data not shown).

Coding was completed in two passes. The first pass assessed *how much* information was recalled. Coders identified relevant statements on the transcript and allocated a score under one or more categories. One statement could be coded in several categories (e.g., "her BMI was in the overweight category" would gain a score for indicating that BMI was measured and for giving the BMI result). If a piece of information was mentioned more than once, only the first statement was allocated a score. As recall may be prompted by discussion that occurs later in the interview, recall of the implications associated with carrying excess weight was divided by stage of interview, into free and prompted recall (Table 1). Recall of the other five information categories was not divided into free and prompted recall as the majority of relevant information was recalled following question 1, and the interview was not set up to prompt exhaustively as would be expected in a memory interview. Implications recalled in response to the first recall question and non-specific prompts were considered free recall. Implications recalled following a specific prompt or additional interview questions were considered prompted recall. The second coding pass identified whether the information recalled was accurate or not. Each piece of information identified in the first pass was compared with the transcript of the BMI feedback interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview

transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter- and intra-reliability were moderate to excellent[30] (0.48-0.96).

Data analysis

Linear regression was conducted to examine the overall effects of interview condition, recall interviewer and time between feedback and recall interview. To examine the amount of information recalled, scores were converted to a proportion of the total number of items in each category and regression was used to compare the relative frequencies of information category (within-subjects factor) and the interaction of feedback condition (between-subjects factor). Accuracy was calculated as the number who correctly recalled the information from 1) just those who actually mentioned each type of information and 2) from all parents. Thus accuracy for the former calculation reflects errors of commission, whereas using the total number of parents as the denominator also includes errors of omission. Accuracy was analysed using a two-group difference in proportion test to detect any difference between the two feedback conditions. A mixed model was used to compare recall of the meaning of results by stage of interview (within-subjects factor) and feedback condition (between-subjects factor). The model included an interaction term to find out whether the type of information (lifestyle changes versus implications) was different in the MI and BPC groups. To investigate which factors are associated with better recall, variables were analysed using multiple linear regression. Variables with $p < 0.2$ in the univariate model were included in the multivariate models. To adjust for feedback condition and time between feedback and recall session, these variables were also

included in the multivariate models. Data were also adjusted for clustering within families given that one family enrolled 3 overweight siblings and 9 families enrolled 2 siblings.

The larger MInT study from which this data are derived is adequately powered as it required a minimum of 250 participants to detect the main outcomes of interest, with a final sample size of 271.[24] No sample size calculations were performed prior to analysis for this paper as it was a secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have presented analyses for the available data.

RESULTS

Table 3 presents the characteristics of the overall sample and according to participation. Parents that did not participate in recall interviews (n = 27) had children who did not differ from children who did participate (n = 244) in terms of age, sex, ethnicity, household deprivation, maternal BMI, maternal education, height, weight, or BMI z-score. Reasons given for non-participation included too busy (n = 8), equipment malfunction (n = 6), no reason given (n = 3), families were moving out of town (n = 2), non-contactable (n = 2) or missed multiple appointments (n = 2), child did not want to (n = 1), traumatised by recent Christchurch earthquakes (n = 1), belief that the child was not overweight (n = 1), and brought the information booklet to the recall interview (n = 1).

Table 4 presents the mean number of items recalled and weighted score by information category. On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they were given at the feedback session. There was no difference in total recall score by recall interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P = 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time between interviews (days). There was a significantly higher total recall score for those in the best practice care condition (M = 6.01, SD = 1.42 from a total possible score of 12.5) compared with the MI condition (M = 5.55, SD = 1.83) (difference 0.48 (95% CI 0.05 to 0.92), P = 0.030).

Table 5 reports the number of people who recalled each category of information and illustrates that while very few parents recalled information about their child's fat distribution (28%) or blood pressure findings (21%), virtually every parent recalled that their child had a high BMI (97%). However, it is clear that many parents did not know what this actually meant, whether in terms of understanding the concept of these measurements (only 26% could say that BMI was a measure of weight in relation to height) or, more importantly, the *implications* of a high BMI (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the implications of their child having a high BMI and a further 38% recalled only one of four possible implications that they were told when they were given their child's BMI result. Logistic regression demonstrated a significant interaction between the type of information recalled (e.g., BMI result) and feedback condition (BPC or MI) (P < 0.01). Further examination demonstrated that those in the BPC condition were more likely to report that lifestyle behaviours had been discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40, P

< 0.01), whereas the *implications* of the BMI results was more likely to be reported by those in the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01 to 0.27, P = 0.02).

Table 5 also presents the proportion of parents who correctly recalled each *type* of information. As mentioned 97% (n = 238) of parents remembered their child had a high BMI and 97% (n = 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their child's BP and WHtR results less often (n = 51 - 68 parents). Estimates of accuracy were based on errors of commission (i.e. parents who reported the information but did so incorrectly) of which 86-97% accurately recalled the information. When we included errors of omission (i.e., parents who left the information out of their account) then accuracy was substantially lower (19-25%). Although the number of parents recalling what high BMI meant for their child (implications) was considerably lower, those parents who did recall implications, were generally very accurate (i.e., child was overweight and were more at risk of carrying this weight into adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e., whether the child's weight and height are in proportion for their age) was poorly understood with only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR. Interestingly, feedback condition made no difference to the accuracy of parental recall.

Not surprisingly, there was significantly higher recall of the meaning of results following prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P < 0.01). This was particularly apparent for those in the MI group who showed a larger increase in

meaning recall after prompting (*M* = 0.55, *SD* = 0.45) than BPC (*M* = 0.40, *SD* = 0.41) (interaction term 0.14, 0.00 to 0.28, P = 0.04).

Table 6 presents the models for the association between total recall scores and predictors of interest. As the univariate models demonstrated that both time between feedback and recall session (P = 0.029) and feedback condition (P = 0.030) were significantly related to total recall score, only the multivariate models are discussed here. After adjustment for these two variables, mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to 1.32) than less educated mothers, whereas no differences were observed for child ethnicity or BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total recall score appeared to be related to the experience of the feedback process. Having a larger discrepancy between perceived and actual weight was associated with lower recall scores (-0.44, -0.76 to -0.14). Conversely, understanding the information presented in the feedback process (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher recall scores to a similar degree. Once all significant variables were entered in multivariate model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.

DISCUSSION

Our study demonstrated that although parents were only able to recall 39% of the information that was given to them at the BMI screening session, virtually all (97%) recalled that their child was overweight. Our findings are consistent with previous research demonstrating that while overall recall of medical information is poor,[9] parents are good at recalling important details such

as their child's diagnosis[15] or weight status.[19] In contrast, information from other categories was not as readily reported and in particular, concepts were poorly understood with less than 50% of parents able to accurately describe what was done. These findings are consistent with the attentional narrowing hypothesis which suggests that the most salient information is attended to leaving less attention for peripheral information.[31] Given the poor recognition of overweight in children, it is likely that receiving such feedback will elicit distress in some people, which may accentuate attentional narrowing.[31,32] However, it is important to note that the child's *actual* BMI was supported by a graph that parents were able to take home, and therefore may have aided recall of the key results, similar to BMI screening studies which provide results in a letter that parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the session but was not supported by a take home message. While the provision of take home written information to aid recall of medical information has produced inconsistent results,[7] there is some evidence to suggest that simple pictorial messages can aid recall.[33] It is also important to note that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a take home visual and yet were poorly recalled. This may suggest that a take home message may not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical healthcare appointments, the feedback was given in an environment that minimised distractions (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to process the information being communicated.

Findings from the current study suggest that parents have limited capacity for processing a large amount of information and although they are able to remember some key pieces of information (that their child was overweight), important details were forgotten (such as why being an

overweight child is a concern). While it could be argued that 6 categories of information is an unrealistic target, a considerable amount of time was spent within the interviews on BMI and what it means for health; more than would be spent during a typical primary care consultation. This has important implications for including BMI screening within routine healthcare, especially if the information is unexpected. Thus health professionals need to limit the amount of information given in one session, provide personalised take-home information, or use multiple sessions to assess gaps in patient recall or understanding and provide clarification, especially if the information is unexpected or includes unfamiliar concepts.

Despite our best efforts to present information to promote optimal recall and understanding,[7] (spending a significant portion of time on the key message (BMI and health), providing pictorial information and providing simple non-technical explanations),[7] our findings suggest that the implications were poorly recalled and concepts were poorly understood. While a diagnosis is important, it is not meaningful without an understanding of the implications and a clear treatment pathway. This is particularly relevant in primary care, where doctors are often reluctant[34] to discuss childhood overweight and unsure how to communicate this information to families.[35] This may inadvertently lead to ambiguous information or brief communication, making it easy for parents to become confused about the messages they are being given, particularly if the information conflicts with parental beliefs. Poor understanding also has implications for the transfer of this information beyond the direct medical setting and into the child's wider context. For example, if parents are unable to understand what their child's results mean, there is the potential for miscommunication with significant people in the child's life who might need to be involved in changing lifestyle factors.

Literature examining parental recall of child weight status information is very limited[19,20,36] and no studies appear to have assessed recall and understanding of BMI information and related concepts following a targeted face-to-face interview. Johnson and colleagues[19] investigated parent reactions to a screening program and included measures of recall of the information provided in a BMI results letter. Consistent with the current study, important information was recalled well (e.g., 94% of the parents recalled their child's weight category), and other details were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were lower than that observed in the current study. This may have arisen because of different methods of informing parents (letter versus face-to-face) or due to the more stringent accuracy classification used by Johnson et al.[19]

Although it may seem surprising that parents receiving BPC feedback were able to remember more than those who received MI, more structured and specific information is more likely to be remembered.[7,37] The BPC interview was highly structured and the advice given to parents to achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the MI session, reflecting the intention of MI,[38] was not structured, with research assistants intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC sessions it is also possible that the additional time spent on the exploration of the meaning and implication of results took focus away from the central details of the message, resulting in lower recall of the information.

Higher maternal education was related to improved overall recall, consistent with the literature in other health contexts.[7,14] While a relationship between recall and child and maternal BMI,[19] ethnicity[19] and age[39] have previously been suggested, they were unrelated in this study. Here, beliefs about weight played a more important role: parents who found the information unexpected or did not understand the feedback process or find it useful, had lower recall. By contrast, those who were already concerned about their child's weight had higher overall recall. These findings are consistent with the hypothesis that memory is heightened for information that is consistent with one's current beliefs[40] and has implications for health practitioners giving parents results that they may not expect. Prior to delivering feedback health practitioners may benefit from assessing parents' expectations, concerns and current knowledge, to assist in prioritising and explaining results that may not align with these.

This study examined recall and understanding in a large sample of families with overweight children. This study was not originally constructed to assess parental memory, and as such it was not set up to exhaustively prompt parents for complete recall. It is possible that had we interviewed differently, parents may have recalled more information. However, much of the information used in this interview was based on free recall, which is particularly relevant in this context as it likely reflects the information that is most salient and easily accessible to parents.

In summary, our findings appear to be the first to examine parental recall of BMI and growth information following a BMI screening and face-to-face feedback session. While our results suggest that parents were able to remember their child's overweight diagnosis very well, 61% of the information was forgotten. This finding suggests that the inclusion of BMI screening within

current appointments may negatively impact parental ability to remember and understand this information. In addition, the way that the information is given, and parental education, values and expectations, were associated with recall of the information and therefore suggest that health professionals need to be aware of these factors when discussing results with parents

CONTRIBUTORS' STATEMENT

Anna M Dawson: Ms. Dawson contributed to study design, undertook data collection, coded the transcripts, produced the first and subsequent drafts of the paper and approved the final manuscript as submitted.

Rachael W Taylor: Assoc Prof. Taylor was the principal investigator of the project and was responsible for study design, monitored data collection, critically reviewed and revised the manuscript, and is guarantor.

Sheila M Williams: Assoc Prof. Williams contributed to study design, completed statistical analysis, critically reviewed manuscript and approved the final manuscript as submitted.

Barry J Taylor: Professor Taylor contributed to study design, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

Deirdre A Brown: Dr. Brown contributed to study design, supervised research staff, provided reliability coding, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

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Table 1. Recall interview questions

Free recall question

1. What information were you given about your child's growth?

Non-specific prompts

Were you given any other information about your child at the initial session?
Tell me more about that…
What information were you given?

Specific prompt for implications

2. What were you told that the information means for him/her?

Additional interview questions – prompted recall

3. How easy was it to follow and use the information presented in the health check booklet?

1	2	3	4	5	6	7
very easy		somewhat easy		somewhat difficult		very difficult

4. How useful did you find the information presented in the health check booklet?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

5. How easy was it to understand and follow the explanations of terms (such as Body Mass Index, Blood Pressure and Waist to Height ratio?)

1	2	3	4	5	6	7
very difficult		somewhat difficult		somewhat easy		very easy

6. How useful did you find the traffic light system (green, orange and red zones) to explain your child's weight status?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

7. How did you feel about the way the information about your child's weight status was given to you?
8. I felt upset by <u>the information</u> given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

9. I felt upset by <u>the way</u> the information was given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

10. I felt it was useful to be given this information?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

11. The information about my child's weight was unexpected?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

12. I'm interested in your decision to tell/not tell your child.
13. If you did discuss the information with your child, <u>what</u> did you tell them?
14. How did your child react to this information?
15. Are there any other things we could do to improve the way our health check results are discussed with parents? Or any other comments?

Table 2. Coding category definitions and possible scores

Coding Categories	Definition	Total number of items	Total weighted score
Growth measurement	Recall of each measurement taken: height, weight, waist circumference, body mass index (BMI) and waist to height ratio (WhtR).	5	2.5
Growth concept	Recall reflecting knowledge or understanding of the concept of BMI – looking at a person's weight in relation to their height (proportion) and WhtR – a measure of how big they are around their waist, taking their height into consideration.	2	1.5
Growth result	Recall of child's BMI and/or WhtR result	2	4
Growth implication	Recall of the implications of childhood overweight for health, severity of problem, long-term weight problems, the need to act	4	2
Blood pressure	Recall that blood pressure was measured and the child's blood pressure result	2	1.5
Behavior	Recall of discussion of behavioral recommendations	1	1
Total recall		16	12.5

Abbreviations: BMI – body mass index; WhtR – waist to height ratio

Table 3. Baseline characteristics of the study population

		Total (n = 271)	Participants (n = 244)	Non-participants (n = 27)	Difference or Odds ratio (95% CI)
Girls n (%)		150 (55)	135 (55)	15 (56)	-0.99 (-2.21 to 0.44)†
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity[a] n (%)	New Zealand European and others	200 (74)	182 (75)	18 (67)	1.00
	Maori	50 (19)	43 (18)	7 (26)	0.61 (0.24 to 1.55)†
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19)†
Household deprivation[b]		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years)[c]		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education[d]	Some secondary school	86 (32)	79 (33)	7 (12)	1.00
n (%)	Completed secondary school or tertiary education (not University)	91 (34)	79 (33)	12 (44)	0.58 (0.21 to 1.55)†
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64)†
Maternal BMI[e] (kg/m^2)		29.1 (6.2)	29.2 (6.4)	28.6 (4.4)	0.63 (-1.25 to 2.50)*
Height (cm)		120.7 (11.2)	120.9 (11.0)	118.8 (12.4)	2.09 (-2.76 to 6.94)*
Weight (kg)		28.7 (7.8)	28.9 (7.8)	27.5 (7.4)	1.39 (-1.52 to 4.32)*
BMI z-score		1.61 (0.45)	1.61 (0.46)	1.56 (0.36)	0.04 (-0.10 to 0.19)*

Data were missing for 1[a], 9[b], 9[c], 3[d] and 13[e] participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as *difference or †odds ratios as shown.

Table 4. Mean (SD) number of items recalled and weighted score, reported by information category

	Total sample (n = 244)		MI (n = 121)	BPC (n = 122)
Information category	Number of items m (SD)	Weighted scores m (SD)	Weighted scores m (SD)	Weighted scores m (SD)
Growth measurement	2.5 (1.39)	1.2 (0.69)	1.16 (0.77)	1.28 (0.61)
Growth concept	0.3 (0.51)	0.3 (0.46)	0.19 (0.42)	0.36 (0.49)
Growth result	0.5 (0.75)	2.9 (0.75)	2.84 (0.75)	2.87 (0.76)
Growth implication	1.5 (0.90)	0.8 (0.49)	0.83 (0.49)	0.66 (0.47)
Blood pressure	0.5 (0.75)	0.4 (0.56)	0.32 (0.55)	0.36 (0.57)
Behaviour	0.3 (0.46)	0.3 (0.46)	0.19 (0.40)	0.45 (0.50)
Total recall	6.3 (2.28)	5.8 (1.66)	5.55 (1.83)	6.01 (1.42)

Abbreviations: BPC – best practice care; MI – motivational interviewing

Table 5. Parent recall of each type of information in the overall sample and by feedback condition

	Total recall (%)			[1]Correct recall (%)			[2]Correct recall (%)		
Information category	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
Results									
BMI result	238 (97)	119 (98)	119 (97)	230 (97)	115 (97)	115 (97)	230 (94)	115 (95)	115 (93)
WHtR result	68 (28)	30 (25)	38 (31)	61 (90)	26 (87)	35 (92)	61 (25)	26 (21)	35 (28)
Blood pressure	51 (21)	22 (18)	29 (24)	47 (92)	19 (86)	28 (97)	47 (19)	19 (17)	28 (23)
Meaning of results									
0 implications recalled	37 (15)	11 (9)	26 (21)	-	-	-	-	-	-
1 implication recalled	92 (38)	47 (39)	45 (36)	85 (92)	43 (91)	42 (93)	85 (35)	43 (36)	42 (34)
2 implications recalled	75 (31)	40 (33)	35 (29)	67 (89)	38 (95)	29 (83)	67 (27)	38 (31)	29 (24)
3 or 4 implications recalled	40 (16)	23 (19)	17 (14)	33 (83)	19 (83)	14 (83)	33 (14)	19 (16)	14 (11)
Behavior discussion	80 (33)	24 (20)	56 (46)	-	-	-	-	-	-
Concepts discussed									
BMI concept	63 (26)	21 (17)	42 (34)	7 (11)	3 (14)	4 (10)	7 (3)	3 (2)	4 (3)
WHtR concept	11 (5)	5 (4)	6 (5)	3 (27)	0 (0)	3 (50)	3 (0)	0 (0)	3 (2)

Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition. For correct recall, percentages are calculated from [1]only from those who recalled the information (errors of comission) and [2]the total sample (errors of omission).

Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio

Table 6. Models for the association between total recall and predictors of interest

Variable	Univariate model (95% CI)	Multivariate model 1 (95% CI)	Multivariate model 2 (95% CI)
Maternal education			
Tertiary[†]	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree[†]	0.82 (0.27 to 1.38)[*]	0.76 (0.20 to 1.32)[*]	0.81 (0.25 to 1.37)[*]
Ethnicity			
Maori[††]	-0.61 (-1.17 to -0.05)[*]	-0.52 (-1.09 to 0.04)	
Pacific[††]	-0.30 (-1.10 to 0.51)	-0.30 (-1.08 to 0.48)	
Maternal BMI	-0.01 (-0.05 to 0.02)	-0.01 (-0.04 to 0.02)	
Maternal age	0.02 (-0.02, 0.06)	0.02 (-0.02 to 0.06)	
Child BMI (z-score)	0.19 (-0.31 to 0.71)	0.12 (-0.37 to 0.61)	
Parental concern before feedback	0.27 (0.06 to 0.47)[*]	0.20 (-0.01 to 0.42)	0.10 (-0.13 to 0.33)
Discrepancy between perceived and actual weight	-0.52 (-0.84 to -0.21)[*]	-0.44 (-0.76 to -0.14)[*]	-0.23 (-0.58 to 0.11)
Weight information unexpected	-0.10 (-0.19 to -0.002)[*]	-0.09 (-0.18 to 0.01)	-0.03 (-0.13 to 0.07)
Understand information presented in HC booklet	0.28 (0.06 to 0.49)[*]	0.29 (0.07 to 0.50)[*]	0.19 (-0.04 to 0.42)
Usefulness of information presented in HC booklet	0.22 (0.07 to 0.37)[*]	0.20 (0.04 to 0.35)[*]	0.19 (0.04 to 0.35)[*]
Time between feedback and recall session (days)	-0.03 (-0.05 to -0.004)[*]		-0.02 (-0.04 to 0.01)

Feedback condition	0.48 (0.05 to 0.92)*	0.28 (-0.18 to 0.73)

β estimates refer to the difference in total recall weighted score (from possible of 12.5) explained by each predictor of interest.

Multivariate model 1 estimates are adjusted for time between feedback and recall interview and feedback condition.

Multivariate model 2 estimates are adjusted for all other variables in the model.

Abbreviations: BMI – body mass index; HC – health check

†Reference group was some secondary school

††Reference group was New Zealand European and others

*P<0.05

Figure Legend

Participant flow throughout the study

Do parents recall and understand children's weight status information after BMI screening? A Randomised Controlled Trial.

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ABSTRACT

Objectives: As parents of young children are often unaware their child is overweight, screening provides the opportunity to inform parents and provide the impetus for behaviour change. We aimed to determine if parents could recall and understand the information they received about their overweight child after weight screening.

Design: Randomised controlled trial of different methods of feedback.

Setting: Participants were recruited through primary and secondary care but appointments took place at a University research clinic.

Participants and intervention: 1093 children aged 4-8 years were screened. Only overweight children (n = 271, 24.7%) are included in this study. Parents of overweight children were randomised to receive feedback regarding their child's weight using best practice care (BPC) or motivational interviewing (MI) as face-to-face interviews typically lasting 20-40 minutes. Two hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to assess recall and understanding of information from the feedback session.

Primary and secondary outcome measures: Interviews were audio-taped and transcribed verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall and sub-categories of interest.

Results: Overall, 39% of the information was recalled (mean score 6.3 from possible score of 16). Parents given feedback via BPC recalled more than those in the MI group (difference in total score 0.48; 95% CI 0.05 to 0.92). Although 94% of parents were able to correctly recall their child's weight status, fewer than 10 parents could accurately describe what the measurements meant. Maternal education (0.81; 0.25 to 1.37) and parental ratings of how useful

they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in multivariate analyses.

Conclusions: While parents remember that their child's BMI is higher than recommended, they are unable to remember much of the information and advice provided about the result.

CLINICAL TRIAL REGISTRATION: Australian New Zealand Clinical Trials Registry ACTRN12609000749202

ARTICLE SUMMARY

Strengths and limitations of this study

- First study to assess what parents remember and understand from a 20-40 minute face-to-face session dedicated to discussing the weight status of their child
- Recall and accuracy were studied extensively through the use of transcripts which were transcribed verbatim and coding according to an extensive coding schedule
- Large (n = 244), demographically diverse sample of overweight children and their parents
- Not originally designed to specifically test parental memory, and thus exhaustively prompt parents for complete recall

INTRODUCTION

Approximately one in three children are overweight in New Zealand,[1] a problem that is poorly recognised, particularly by parents.[2-4] It has therefore been suggested that routine consultations in primary care include measurement of body mass index (BMI) in an effort to improve recognition and awareness of excess weight during childhood.[5]

Although the primary care environment might seem suitable for routine screening given established relationships between families and their health practitioner, patients often present with multiple problems making it difficult for health practitioners to address each problem adequately within a standard consultation time.[6] While adding measurement of height and weight may add little time to the overall appointment, discussion of overweight status, particularly for unsuspecting parents, is considerably more complicated. Whether parents have the ability to recall and understand this information, and thus potentially make the behavioural changes required, is unknown.

The extent to which patients are able to recall their medical information has important implications for treatment adherence, patient satisfaction and subsequent health outcomes.[7,8] In general, recall of medical information is low.[9-12] Health information is often complex and may be incongruent with patients' perceptions. Furthermore, factors such as patient age, education, literacy levels, anxiety and stress impact upon a patient's ability to remember the information presented.[13-16] Not surprisingly, several studies have demonstrated that parents recall pertinent details about their child's health (such as diagnoses or major injuries) more than peripheral details (such as tests completed in a consultation, prescriptions or follow-up appointments).[15,17,18]

In the context of screening for overweight in children, it would appear that parents can recall important information, such as their child's weight status following a posted letter.[19] However, understanding of the results and BMI charts and/or percentiles is very low.[20] To date, most evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a few studies[20-22] have assessed whether parents *understand* BMI charts and percentiles, and none have done so after receiving BMI results in a face-to-face consultation, as would occur in a primary care setting. This is an important distinction as it may be that a letter of results provides an enduring memory cue or resource which enables parents to better retain the information and refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding given the opportunity to discuss the results and ask questions, thereby strengthening encoding of the information and creating stronger recall.

We recently examined whether motivational interviewing was an appropriate way of informing parents that their young child was overweight following BMI screening.[23, 24] Parents attended a second session two weeks later providing the opportunity for us to examine how well they recalled the information given in this face-to-face feedback session. Specifically, we examined how much information parents could recall from the BMI screening session, which types of information were more likely to be recalled, the accuracy of parental recall and how recall varied according to feedback style. Factors that may predict better recall performance were also explored. This manuscript represents a secondary data analysis from our main trial.[24] While recall was not specified *a priori* as a variable of interest, it was considered a component of how well parents understood the feedback process.[23]

SUBJECTS AND METHODS

This manuscript presents data from a large randomised controlled study (RCT) which has been described in detail previously.[23] In brief, MInT was a BMI screening initiative (phase 1) to recruit children into a two-year family-based intervention in overweight children (phase 2). Phase 1 entailed a comparison of weight feedback delivered using best practice care or motivational interviewing whereas phase 2 compared a usual care intervention with a more intense intervention tailored to the needs of each family. Ethical approval was obtained from the Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

Participants

1093 children between the ages of 4 and 8 years, recruited from local primary care practices and secondary care clinics in Dunedin, New Zealand were screened for overweight at a University research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553) using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.[24] Only those parents with overweight children (BMI $\geq$ 85th percentile)[25] were eligible for the current study (n = 271, Figure 1). These parents were invited to participate in a recall interview at the University approximately two weeks later to discuss the feedback they received about their child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview. A further seven participants were excluded due to technical difficulties with audio recordings (n

= 6) and one had brought the feedback booklet with them to the interview making them unsuitable for assessing *recall* of feedback.

Procedures

Screening

Parents (virtually all mothers, fathers < 2%) completed a comprehensive online questionnaire assessing demographic characteristics including ethnicity, maternal education, an index of socioeconomic status (New Zealand deprivation index, NZDep2006[26]) and maternal age. Parental concern about their child's weight and perception of their weight status were both assessed using a 5-point Likert scale question (where 1 = not at all concerned and 5 = very concerned for concern and 1 = underweight, 2 = a little underweight, 3 = about right, 4 = a little overweight, 5 = overweight for perception). We calculated a discrepancy score to indicate the extent to which the parent under- or over-rated their child's weight status by comparing the parental perception of their child's weight status with their actual BMI classification (underweight = <3rd percentile, normal weight = 3rd-84th percentile, a little overweight = 85th-94th percentile, overweight = ≥95th percentile). Scores of 1 or 2 for the perception of underweight were combined in this comparison. Duplicate anthropometric measurements (height, weight and waist) and blood pressure (BP) (Dinamap: GE Medical Systems, Waukesha, WI) were obtained from children using standard techniques. All data report the mean values. BMI was calculated using CDC reference norms[25] and waist (cm) to height (cm) ratio (WHtR) was compared with recommendations from Aswell and colleagues.[27] Researchers plotted BP, BMI and WHtR onto colour-coded charts relative to age and sex in a booklet that parents were able to take home. The booklet also included a glossary of key terms, a summary of the child's lifestyle behaviours (e.g.,

physical activity, fruit and vegetable intake) as reported by parents, as well as current New Zealand guidelines for these behaviours.[28]

Feedback interview: Researchers explained each measure and then discussed the lifestyle behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid labelling the child as "overweight" or "obese". Implications of each colour zone were explained in terms of how many children were in each zone, possible health consequences and the long-term risk of carrying excess weight associated with each zone. Researchers delivering the feedback were from different backgrounds (e.g., dietetics, nutrition, exercise science). Therefore, researchers delivering BPC feedback (n = 2) received 6 hours of general interviewing skills training and 6 hours training on the feedback protocol. Researchers delivering MI feedback (n = 3) received approximately 40 hours training in MI and the feedback protocol.

BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that the primary focus of the BPC interview was on anthropometric results and discussion of the lifestyle behaviours. Interviews typically lasted 15 minutes.

MI feedback condition: Parents were given information using an Elicit-Provide-Elicit (E-P-E) approach[29] that allowed researchers to check in with parents' prior knowledge before giving feedback. This approach also allowed parents the opportunity to explore the meaning and importance of the results. Therefore, in contrast to the BPC interview, the focus of the MI interview was on the *implications* of the health check results to the family. Interviews typically lasted 30 minutes. All interviews were video-taped and transcribed verbatim so that accuracy of recall could be determined.

Follow-up

The recall interview took place approximately two weeks after the screening and feedback session and an independent interviewer (n = 3), not involved in the feedback process, interviewed the parents. Parents repeated aspects of the BMI screening questionnaire and completed a semi-structured interview (questions are presented in Table 1). In summary, these assessed recall and usefulness of the information, and parental experience of the feedback. Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for coding by a professional transcriber blinded to feedback group.

Coding

The number of pieces of information given at the feedback session were identified and defined by two authors (AMD, DAB). The first phase of the coding was developed a priori from the interview schedule, which was designed and developed prior to the study, based on the information we expected to elicit. The second phase of the coding, involving the development of specific codes and weightings, were developed after the data had been collected and researchers became familiar with the categories of responses that parents gave (Supplementary Table 1). Lists of acceptable responses were developed and the coding framework was applied (initially collaboratively, then independently) to transcripts and codes compared. Discrepancies were resolved through discussion and the coding rules were finalised. The pieces of information (n = 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a large number of discrete items of information to receive, the six categories were the main point of interest and the individual items were included to provide details on the type of information

recalled. Scores were weighted according to their importance in the feedback interview. Weighting decisions were made through author discussion of the most important clinical messages delivered to parents. For example, the main result discussed was BMI, therefore this was allocated the highest weighting of 4 from a maximum of 12.5. Only the weighted figures were used in analyses presented here but results did not differ whether weighted or unweighted scores were used (data not shown).

Coding was completed in two passes. The first pass assessed *how much* information was recalled. Coders identified relevant statements on the transcript and allocated a score under one or more categories. One statement could be coded in several categories (e.g., "her BMI was in the overweight category" would gain a score for indicating that BMI was measured and for giving the BMI result). If a piece of information was mentioned more than once, only the first statement was allocated a score. As recall may be prompted by discussion that occurs later in the interview, recall of the implications associated with carrying excess weight was divided by stage of interview, into free and prompted recall (Table 1). Recall of the other five information categories was not divided into free and prompted recall as the majority of relevant information was recalled following question 1, and the interview was not set up to prompt exhaustively as would be expected in a memory interview. Implications recalled in response to the first recall question and non-specific prompts were considered free recall. Implications recalled following a specific prompt or additional interview questions were considered prompted recall. The second coding pass identified whether the information recalled was accurate or not. Each piece of information identified in the first pass was compared with the transcript of the BMI feedback interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview

transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter- and intra-reliability were moderate to excellent[30] (0.48-0.96).

Data analysis

Linear regression was conducted to examine the overall effects of interview condition, recall interviewer and time between feedback and recall interview. To examine the amount of information recalled, scores were converted to a proportion of the total number of items in each category and regression was used to compare the relative frequencies of information category (within-subjects factor) and the interaction of feedback condition (between-subjects factor). Accuracy was calculated as the number who correctly recalled the information from 1) just those who actually mentioned each type of information and 2) from all parents. Thus accuracy for the former calculation reflects errors of commission, whereas using the total number of parents as the denominator also includes errors of omission. Accuracy was analysed using a two-group difference in proportion test to detect any difference between the two feedback conditions. A mixed model was used to compare recall of the meaning of results by stage of interview (within-subjects factor) and feedback condition (between-subjects factor). The model included an interaction term to find out whether the type of information (lifestyle changes versus implications) was different in the MI and BPC groups. To investigate which factors are associated with better recall, variables were analysed using multiple linear regression. Variables with $p < 0.2$ in the univariate model were included in the multivariate models. To adjust for feedback condition and time between feedback and recall session, these variables were also

included in the multivariate models. Data were also adjusted for clustering within families given that one family enrolled 3 overweight siblings and 9 families enrolled 2 siblings.

The larger MInT study from which this data are derived is adequately powered as it required a minimum of 250 participants to detect the main outcomes of interest, with a final sample size of 271.[24] No sample size calculations were performed prior to analysis for this paper as it was a secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have presented analyses for the available data.

RESULTS

Table 3 presents the characteristics of the overall sample and according to participation. Parents that did not participate in recall interviews (n = 27) had children who did not differ from children who did participate (n = 244) in terms of age, sex, ethnicity, household deprivation, maternal BMI, maternal education, height, weight, or BMI z-score. Reasons given for non-participation included too busy (n = 8), equipment malfunction (n = 6), no reason given (n = 3), families were moving out of town (n = 2), non-contactable (n = 2) or missed multiple appointments (n = 2), child did not want to (n = 1), traumatised by recent Christchurch earthquakes (n = 1), belief that the child was not overweight (n = 1), and brought the information booklet to the recall interview (n = 1).

Table 4 presents the mean number of items recalled and weighted score by information category. On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they were given at the feedback session. There was no difference in total recall score by recall interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P = 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time between interviews (days). There was a significantly higher total recall score for those in the best practice care condition (*M* = 6.01, *SD* = 1.42 from a total possible score of 12.5) compared with the MI condition (*M* = 5.55, *SD* = 1.83) (difference 0.48 (95% CI 0.05 to 0.92), P = 0.030).

Table 5 reports the number of people who recalled each category of information and illustrates that while very few parents recalled information about their child's fat distribution (28%) or blood pressure findings (21%), virtually every parent recalled that their child had a high BMI (97%). However, it is clear that many parents did not know what this actually meant, whether in terms of understanding the concept of these measurements (only 26% could say that BMI was a measure of weight in relation to height) or, more importantly, the *implications* of a high BMI (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the implications of their child having a high BMI and a further 38% recalled only one of four possible implications that they were told when they were given their child's BMI result. Logistic regression demonstrated a significant interaction between the type of information recalled (e.g., BMI result) and feedback condition (BPC or MI) (P < 0.01). Further examination demonstrated that those in the BPC condition were more likely to report that lifestyle behaviours had been discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40, P

< 0.01), whereas the *implications* of the BMI results was more likely to be reported by those in the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01 to 0.27, P = 0.02).

Table 5 also presents the proportion of parents who correctly recalled each *type* of information. As mentioned 97% (n = 238) of parents remembered their child had a high BMI and 97% (n = 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their child's BP and WHtR results less often (n = 51 - 68 parents). Estimates of accuracy were based on errors of commission (i.e. parents who reported the information but did so incorrectly) of which 86-97% accurately recalled the information. When we included errors of omission (i.e., parents who left the information out of their account) then accuracy was substantially lower (19-25%). Although the number of parents recalling what high BMI meant for their child (implications) was considerably lower, those parents who did recall implications, were generally very accurate (i.e., child was overweight and were more at risk of carrying this weight into adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e., whether the child's weight and height are in proportion for their age) was poorly understood with only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR. Interestingly, feedback condition made no difference to the accuracy of parental recall.

Not surprisingly, there was significantly higher recall of the meaning of results following prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P < 0.01). This was particularly apparent for those in the MI group who showed a larger increase in

meaning recall after prompting (*M* = 0.55, *SD* = 0.45) than BPC (*M* = 0.40, *SD* = 0.41) (interaction term 0.14, 0.00 to 0.28, P = 0.04).

Table 6 presents the models for the association between total recall scores and predictors of interest. As the univariate models demonstrated that both time between feedback and recall session (P = 0.029) and feedback condition (P = 0.030) were significantly related to total recall score, only the multivariate models are discussed here. After adjustment for these two variables, mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to 1.32) than less educated mothers, whereas no differences were observed for child ethnicity or BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total recall score appeared to be related to the experience of the feedback process. Having a larger discrepancy between perceived and actual weight was associated with lower recall scores (-0.44, -0.76 to -0.14). Conversely, understanding the information presented in the feedback process (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher recall scores to a similar degree. Once all significant variables were entered in multivariate model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.

DISCUSSION

Our study demonstrated that although parents were only able to recall 39% of the information that was given to them at the BMI screening session, virtually all (97%) recalled that their child was overweight. Our findings are consistent with previous research demonstrating that while overall recall of medical information is poor,[9] parents are good at recalling important details such

as their child's diagnosis[15] or weight status.[19] In contrast, information from other categories was not as readily reported and in particular, concepts were poorly understood with less than 50% of parents able to accurately describe what was done. These findings are consistent with the attentional narrowing hypothesis which suggests that the most salient information is attended to leaving less attention for peripheral information.[31] Given the poor recognition of overweight in children, it is likely that receiving such feedback will elicit distress in some people, which may accentuate attentional narrowing.[31,32] However, it is important to note that the child's *actual* BMI was supported by a graph that parents were able to take home, and therefore may have aided recall of the key results, similar to BMI screening studies which provide results in a letter that parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the session but was not supported by a take home message. While the provision of take home written information to aid recall of medical information has produced inconsistent results,[7] there is some evidence to suggest that simple pictorial messages can aid recall.[33] It is also important to note that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a take home visual and yet were poorly recalled. This may suggest that a take home message may not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical healthcare appointments, the feedback was given in an environment that minimised distractions (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to process the information being communicated.

Findings from the current study suggest that parents have limited capacity for processing a large amount of information and although they are able to remember some key pieces of information (that their child was overweight), important details were forgotten (such as why being an

overweight child is a concern). While it could be argued that 6 categories of information is an unrealistic target, a considerable amount of time was spent within the interviews on BMI and what it means for health; more than would be spent during a typical primary care consultation. This has important implications for including BMI screening within routine healthcare, especially if the information is unexpected. Thus health professionals need to limit the amount of information given in one session, provide personalised take-home information, or use multiple sessions to assess gaps in patient recall or understanding and provide clarification, especially if the information is unexpected or includes unfamiliar concepts.

Despite our best efforts to present information to promote optimal recall and understanding,[7] (spending a significant portion of time on the key message (BMI and health), providing pictorial information and providing simple non-technical explanations),[7] our findings suggest that the implications were poorly recalled and concepts were poorly understood. While a diagnosis is important, it is not meaningful without an understanding of the implications and a clear treatment pathway. This is particularly relevant in primary care, where doctors are often reluctant[34] to discuss childhood overweight and unsure how to communicate this information to families.[35] This may inadvertently lead to ambiguous information or brief communication, making it easy for parents to become confused about the messages they are being given, particularly if the information conflicts with parental beliefs. Poor understanding also has implications for the transfer of this information beyond the direct medical setting and into the child's wider context. For example, if parents are unable to understand what their child's results mean, there is the potential for miscommunication with significant people in the child's life who might need to be involved in changing lifestyle factors.

Literature examining parental recall of child weight status information is very limited[19,20,36] and no studies appear to have assessed recall and understanding of BMI information and related concepts following a targeted face-to-face interview. Johnson and colleagues[19] investigated parent reactions to a screening program and included measures of recall of the information provided in a BMI results letter. Consistent with the current study, important information was recalled well (e.g., 94% of the parents recalled their child's weight category), and other details were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were lower than that observed in the current study. This may have arisen because of different methods of informing parents (letter versus face-to-face) or due to the more stringent accuracy classification used by Johnson et al.[19]

Although it may seem surprising that parents receiving BPC feedback were able to remember more than those who received MI, more structured and specific information is more likely to be remembered.[7,37] The BPC interview was highly structured and the advice given to parents to achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the MI session, reflecting the intention of MI,[38] was not structured, with research assistants intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC sessions it is also possible that the additional time spent on the exploration of the meaning and implication of results took focus away from the central details of the message, resulting in lower recall of the information.

Higher maternal education was related to improved overall recall, consistent with the literature in other health contexts.[7,14] While a relationship between recall and child and maternal BMI,[19] ethnicity[19] and age[39] have previously been suggested, they were unrelated in this study. Here, beliefs about weight played a more important role: parents who found the information unexpected or did not understand the feedback process or find it useful, had lower recall. By contrast, those who were already concerned about their child's weight had higher overall recall. These findings are consistent with the hypothesis that memory is heightened for information that is consistent with one's current beliefs[40] and has implications for health practitioners giving parents results that they may not expect. Prior to delivering feedback health practitioners may benefit from assessing parents' expectations, concerns and current knowledge, to assist in prioritising and explaining results that may not align with these.

This study examined recall and understanding in a large sample of families with overweight children. This study was not originally constructed to assess parental memory, and as such it was not set up to exhaustively prompt parents for complete recall. It is possible that had we interviewed differently, parents may have recalled more information. However, much of the information used in this interview was based on free recall, which is particularly relevant in this context as it likely reflects the information that is most salient and easily accessible to parents.

In summary, our findings appear to be the first to examine parental recall of BMI and growth information following a BMI screening and face-to-face feedback session. While our results suggest that parents were able to remember their child's overweight diagnosis very well, 61% of the information was forgotten. This finding suggests that the inclusion of BMI screening within

current appointments may negatively impact parental ability to remember and understand this information. In addition, the way that the information is given, and parental education, values and expectations, were associated with recall of the information and therefore suggest that health professionals need to be aware of these factors when discussing results with parents.

Figure Legend

Participant flow throughout the study

CONTRIBUTORS' STATEMENT

Anna M Dawson: Ms. Dawson contributed to study design, undertook data collection, coded the transcripts, produced the first and subsequent drafts of the paper and approved the final manuscript as submitted.

Rachael W Taylor: Assoc Prof. Taylor was the principal investigator of the project and was responsible for study design, monitored data collection, critically reviewed and revised the manuscript, and is guarantor.

Sheila M Williams: Assoc Prof. Williams contributed to study design, completed statistical analysis, critically reviewed manuscript and approved the final manuscript as submitted.

Barry J Taylor: Professor Taylor contributed to study design, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

Deirdre A Brown: Dr. Brown contributed to study design, supervised research staff, provided reliability coding, critically reviewed and revised the manuscript and approved the final manuscript as submitted.

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Table 1. Recall interview questions

Free recall question

1. What information were you given about your child's growth?

Non-specific prompts

Were you given any other information about your child at the initial session?
Tell me more about that…
What information were you given?

Specific prompt for implications

2. What were you told that the information means for him/her?

Additional interview questions – prompted recall

3. How easy was it to follow and use the information presented in the health check booklet?

1	2	3	4	5	6	7
very easy		somewhat easy		somewhat difficult		very difficult

4. How useful did you find the information presented in the health check booklet?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

5. How easy was it to understand and follow the explanations of terms (such as Body Mass Index, Blood Pressure and Waist to Height ratio?)

1	2	3	4	5	6	7
very difficult		somewhat difficult		somewhat easy		very easy

6. How useful did you find the traffic light system (green, orange and red zones) to explain your child's weight status?

1	2	3	4	5	6	7
very useful		somewhat useful		not very useful		not at all useful

7. How did you feel about the way the information about your child's weight status was given to you?
8. I felt upset by the information given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

9. I felt upset by the way the information was given in the health check?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

10. I felt it was useful to be given this information?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

11. The information about my child's weight was unexpected?

1	2	3	4	5	6	7
Not at all true			somewhat true			very true

12. I'm interested in your decision to tell/not tell your child.
13. If you did discuss the information with your child, what did you tell them?
14. How did your child react to this information?
15. Are there any other things we could do to improve the way our health check results are discussed with parents? Or any other comments?

Table 2. Coding category definitions and possible scores

Coding Categories	Definition	Total number of items	Total weighted score
Growth measurement	Recall of each measurement taken: height, weight, waist circumference, body mass index (BMI) and waist to height ratio (WhtR).	5	2.5
Growth concept	Recall reflecting knowledge or understanding of the concept of BMI – looking at a person's weight in relation to their height (proportion) and WhtR – a measure of how big they are around their waist, taking their height into consideration.	2	1.5
Growth result	Recall of child's BMI and/or WhtR result	2	4
Growth implication	Recall of the implications of childhood overweight for health, severity of problem, long-term weight problems, the need to act	4	2
Blood pressure	Recall that blood pressure was measured and the child's blood pressure result	2	1.5
Behavior	Recall of discussion of behavioral recommendations	1	1
Total recall		16	12.5

Abbreviations: BMI – body mass index; WhtR – waist to height ratio

Table 3. Baseline characteristics of the study population

		Total (n = 271)	Participants (n = 244)	Non-participants (n = 27)	Difference or Odds ratio (95% CI)
Girls n (%)		150 (55)	135 (55)	15 (56)	-0.99 (-2.21 to 0.44)†
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity[a] n (%)	New Zealand European and others	200 (74)	182 (75)	18 (67)	1.00
	Maori	50 (19)	43 (18)	7 (26)	0.61 (0.24 to 1.55)†
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19)†
Household deprivation[b]		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years)[c]		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education[d] n (%)	Some secondary school	86 (32)	79 (33)	7 (12)	1.00
	Completed secondary school or tertiary education (not University)	91 (34)	79 (33)	12 (44)	0.58 (0.21 to 1.55)†
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64)†
Maternal BMI[e] (kg/m^2)		29.1 (6.2)	29.2 (6.4)	28.6 (4.4)	0.63 (-1.25 to 2.50)*
Height (cm)		120.7 (11.2)	120.9 (11.0)	118.8 (12.4)	2.09 (-2.76 to 6.94)*
Weight (kg)		28.7 (7.8)	28.9 (7.8)	27.5 (7.4)	1.39 (-1.52 to 4.32)*
BMI z-score		1.61 (0.45)	1.61 (0.46)	1.56 (0.36)	0.04 (-0.10 to 0.19)*

Data were missing for 1[a], 9[b], 9[c], 3[d] and 13[e] participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as *difference or †odds ratios as shown.

Table 4. Mean (SD) number of items recalled and weighted score, reported by information category

	Total sample (n = 244)		MI (n = 121)	BPC (n = 122)
Information category	Number of items m (SD)	Weighted scores m (SD)	Weighted scores m (SD)	Weighted scores m (SD)
Growth measurement	2.5 (1.39)	1.2 (0.69)	1.16 (0.77)	1.28 (0.61)
Growth concept	0.3 (0.51)	0.3 (0.46)	0.19 (0.42)	0.36 (0.49)
Growth result	0.5 (0.75)	2.9 (0.75)	2.84 (0.75)	2.87 (0.76)
Growth implication	1.5 (0.90)	0.8 (0.49)	0.83 (0.49)	0.66 (0.47)
Blood pressure	0.5 (0.75)	0.4 (0.56)	0.32 (0.55)	0.36 (0.57)
Behaviour	0.3 (0.46)	0.3 (0.46)	0.19 (0.40)	0.45 (0.50)
Total recall	6.3 (2.28)	5.8 (1.66)	5.55 (1.83)	6.01 (1.42)

Abbreviations: BPC – best practice care; MI – motivational interviewing

Table 5. Parent recall of each type of information in the overall sample and by feedback condition

	Total recall (%)			[1]Correct recall (%)			[2]Correct recall (%)		
Information category	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
Results									
BMI result	238 (97)	119 (98)	119 (97)	230 (97)	115 (97)	115 (97)	230 (94)	115 (95)	115 (93)
WHtR result	68 (28)	30 (25)	38 (31)	61 (90)	26 (87)	35 (92)	61 (25)	26 (21)	35 (28)
Blood pressure	51 (21)	22 (18)	29 (24)	47 (92)	19 (86)	28 (97)	47 (19)	19 (17)	28 (23)
Meaning of results									
0 implications recalled	37 (15)	11 (9)	26 (21)	-	-	-	-	-	-
1 implication recalled	92 (38)	47 (39)	45 (36)	85 (92)	43 (91)	42 (93)	85 (35)	43 (36)	42 (34)
2 implications recalled	75 (31)	40 (33)	35 (29)	67 (89)	38 (95)	29 (83)	67 (27)	38 (31)	29 (24)
3 or 4 implications recalled	40 (16)	23 (19)	17 (14)	33 (83)	19 (83)	14 (83)	33 (14)	19 (16)	14 (11)
Behavior discussion	80 (33)	24 (20)	56 (46)	-	-	-	-	-	-
Concepts discussed									
BMI concept	63 (26)	21 (17)	42 (34)	7 (11)	3 (14)	4 (10)	7 (3)	3 (2)	4 (3)
WHtR concept	11 (5)	5 (4)	6 (5)	3 (27)	0 (0)	3 (50)	3 (0)	0 (0)	3 (2)

Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition. For correct recall, percentages are calculated from [1]only from those who recalled the information (errors of comission) and [2]the total sample (errors of omission).

Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio

Table 6. Models for the association between total recall and predictors of interest

Variable	Univariate model (95% CI)	Multivariate model 1 (95% CI)	Multivariate model 2 (95% CI)
Maternal education			
Tertiary†	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree†	0.82 (0.27 to 1.38)*	0.76 (0.20 to 1.32)*	0.81 (0.25 to 1.37)*
Ethnicity			
Maori††	-0.61 (-1.17 to -0.05)*	-0.52 (-1.09 to 0.04)	
Pacific††	-0.30 (-1.10 to 0.51)	-0.30 (-1.08 to 0.48)	
Maternal BMI	-0.01 (-0.05 to 0.02)	-0.01 (-0.04 to 0.02)	
Maternal age	0.02 (-0.02, 0.06)	0.02 (-0.02 to 0.06)	
Child BMI (z-score)	0.19 (-0.31 to 0.71)	0.12 (-0.37 to 0.61)	
Parental concern before feedback	0.27 (0.06 to 0.47)*	0.20 (-0.01 to 0.42)	0.10 (-0.13 to 0.33)
Discrepancy between perceived and actual weight	-0.52 (-0.84 to -0.21)*	-0.44 (-0.76 to -0.14)*	-0.23 (-0.58 to 0.11)
Weight information unexpected	-0.10 (-0.19 to -0.002)*	-0.09 (-0.18 to 0.01)	-0.03 (-0.13 to 0.07)
Understand information presented in HC booklet	0.28 (0.06 to 0.49)*	0.29 (0.07 to 0.50)*	0.19 (-0.04 to 0.42)
Usefulness of information presented in HC booklet	0.22 (0.07 to 0.37)*	0.20 (0.04 to 0.35)*	0.19 (0.04 to 0.35)*
Time between feedback and recall session (days)	-0.03 (-0.05 to -0.004)*		-0.02 (-0.04 to 0.01)

Feedback condition	0.48 (0.05 to 0.92)*	0.28 (-0.18 to 0.73)

β estimates refer to the difference in total recall weighted score (from possible of 12.5) explained by each predictor of interest.

Multivariate model 1 estimates are adjusted for time between feedback and recall interview and feedback condition.

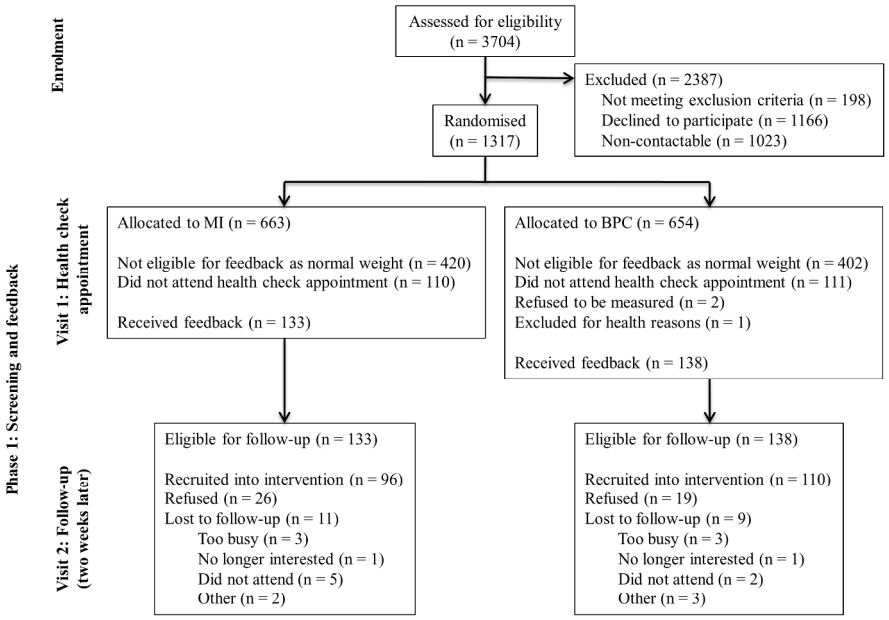
Multivariate model 2 estimates are adjusted for all other variables in the model.

Abbreviations: BMI – body mass index; HC – health check

†Reference group was some secondary school

††Reference group was New Zealand European and others

*P<0.05



Participant flow throughout the study
254x190mm (300 x 300 DPI)

Supplementary Table 1. Broad and specific coding categories

Broad coding categories developed from the interview schedule (Table 1) prior to data collection	Example notes and parental responses to help development of specific categories	Specific categories
1. Evaluation of the traffic light BMI chart	*"it was easier than plunket's version of the graphs as it gave you an indication of what was average and then the next stages so it was really good"* P125 "*It was really good to see where she fitted*" P123]	Good Easy to understand Clear visual message Meaningful metaphor Didn't give enough information Other
2. Evaluation of the overall process	"*I went away thinking gosh we need to do something about this*" P249 Parents noting that the study was conducted well, that they wouldn't have wanted children in the room hearing the feedback and that children really liked the wii for entertainment.	Good Good that child was entertained Good child was in different room for feedback Impetus for change Other
What parents did with the information after feedback 3. Spontaneously reported behaviour change 4. Spontaneously reported discussion with other 5. Discussion with child	"*we didn't tell her she was overweight or fat we told her her belly was too big because she knows that because of the way her clothes fit compared with her friends"* P125 "*It was very useful. To be honest I needed a second opinion it shocked me so much I went to the doctor"* P38	Behaviour change Discussion with another adults (e.g., doctor, parent, friend, family) Discussion with child (including why/why not, what told the child, child reaction to the information)
6. Parental feelings about the way feedback was given	Too clinical presentation, very professional but maybe too much so, responses too scripted (e.g., P37) "*I don't know it could have been given in a better way. I mean its hard to hear, regardless"* P125 Researchers maybe a bit nervous to be giving this information - "*felt like you are reassuring the researcher…I'm fine*" P260 Repeated questioning of what information means to parents coming up as making them uncomfortable. "*calm, matter of fact, how I'd want it to be presented*" P164 "*the fact that a practitioner takes time to recognise concerns and validate..I found it was very supportive*" P139 "*It was confirming how I felt..I was quite relieved to get it*" P108	Non-judgmental Couldn't have been done another way/no easy way Fine/good Makes you think about change Lack of empathy/too clinical Uncomfortable Judgmental Concern about labeling child

7.	Parental acceptance of the information	Parents indicating that they are unsure about how we got this information, unsure where the charts were from and if they were relevant (e.g., P264) "*I suppose if your child is overweight then it (traffic light system) would be useful*" P22 Could be included as evaluation of traffic light but also included in acceptance as the person does not believe their child is overweight.	Acceptance – no challenging of the message, no querying the accuracy of the results. May by upset by result but accepts that their child is overweight and that it is a problem for their child. Ambivalence – Moves between accepting and rejecting result, provide lots of minimizations, reasons that it is not a problem. Inconsistent in their response. Uncertainty about whether the results are accurate. Rejection – Does not believe that their child is overweight. Indicates that it is not a problem, very similar to other children, and may also state that the results are inaccurate.

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	3-4
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	6-7
	2b	Specific objectives or hypotheses	7
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	7-8
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	N/A
Participants	4a	Eligibility criteria for participants	8
	4b	Settings and locations where the data were collected	8
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	8-10
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	10-12
	6b	Any changes to trial outcomes after the trial commenced, with reasons	N/A
Sample size	7a	How sample size was determined	Ref 23
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	Ref 24
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	Ref 24
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	Ref 24
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	Ref 24
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those	Ref 24

		assessing outcomes) and how	
	11b	If relevant, description of the similarity of interventions	N/A
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	12-13
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	N/A
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	8
	13b	For each group, losses and exclusions after randomisation, together with reasons	8
Recruitment	14a	Dates defining the periods of recruitment and follow-up	Ref 24
	14b	Why the trial ended or was stopped	N/A
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	Ref 24 – or could be added as web only
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	Tables 3 & 4
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	Tables
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	N/A
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	16-17
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17-19
Other information			
Registration	23	Registration number and name of trial registry	4
Protocol	24	Where the full trial protocol can be accessed, if available	7
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	20

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.