



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

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3 **Do parents recall and understand children's weight status information after BMI**  
4 **screening? A Randomised Controlled Trial.**  
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56 **Key words:** BMI screening; parental recall; memory; health information; overweight  
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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

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3 found the information (0.20; 95% CI 0.05, 0.36) were significant predictors of recall score in  
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5 multivariate analyses.  
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8 **Conclusions:** While parents remember that their child's BMI is higher than recommended, they  
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10 are unable to remember much of the information and advice provided about the result.  
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15 **CLINICAL TRIAL REGISTRATION:** Australian New Zealand Clinical Trials Registry

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## 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,<sup>1</sup> a problem that is poorly recognised, particularly by parents.<sup>2-4</sup> 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.<sup>5</sup>

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.<sup>6</sup> 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.<sup>7,8</sup> In general, recall of medical information is low.<sup>9-12</sup> 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.<sup>13-16</sup> 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).<sup>15,17,18</sup>

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6 In the context of screening for overweight in children, it would appear that parents can recall  
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8 important information, such as their child's weight status following a posted letter.<sup>19</sup> However,  
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10 understanding of the results and BMI charts and/or percentiles is very low.<sup>20</sup> To date, most  
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12 evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a  
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14 few studies<sup>20-22</sup> have assessed whether parents *understand* BMI charts and percentiles, and none  
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16 have done so after receiving BMI results in a face-to-face consultation, as would occur in a  
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18 primary care setting. This is an important distinction as it may be that a letter of results provides  
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20 an enduring memory cue or resource which enables parents to better retain the information and  
21  
22 refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding  
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24 given the opportunity to discuss the results and ask questions, thereby strengthening encoding of  
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26 the information and creating stronger recall.  
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34 Therefore, this study investigated parental recall of information given in a BMI screening and  
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36 face-to-face feedback session. Specifically, we examined how much information parents could  
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38 recall from the BMI screening session, which types of information were more likely to be  
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40 recalled, the accuracy of parental recall and how recall varied according to feedback style.  
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43 Factors that may predict better recall performance were also explored.  
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## 48 **SUBJECTS AND METHODS**

49  
50 This manuscript presents data from a large randomised controlled study (MInT) which has been  
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52 described in detail previously.<sup>23</sup> In brief, MInT was a BMI screening initiative followed by a  
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54 two-year family-based intervention in overweight children. Ethical approval was obtained from  
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3 the Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed  
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5 consent.  
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## 10 **Participants**

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12 1093 children between the ages of 4 and 8 years, recruited from local primary care practices and  
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14 secondary care clinics in Dunedin, New Zealand were screened for overweight at a University  
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16 research clinic. Parents were randomised to receive feedback delivered using a best practice care  
17  
18 (BPC) or motivational interviewing (MI) approach (*screening*).<sup>24</sup> Only those parents with  
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20 overweight children (BMI  $\geq$  85<sup>th</sup> percentile)<sup>25</sup> were eligible for the current study (n = 271). These  
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22 parents were invited to participate in a recall interview at the University approximately two  
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24 weeks later to discuss the feedback they received about their child's growth (*follow-up*). Twenty  
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26 parents declined participation in the recall interview. A further seven participants were excluded  
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28 due to technical difficulties with audio recordings (n = 6) and one had brought the feedback  
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30 booklet with them to the interview making them unsuitable for assessing *recall* of feedback.  
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## 39 **Procedures**

### 40 *Screening*

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

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39 Feedback interview: Researchers explained each measure and then discussed the lifestyle  
40 behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid  
41 labelling the child as "overweight" or "obese". Implications of each colour zone were explained  
42 in terms of how many children were in each zone, possible health consequences and the long-  
43 term risk of carrying excess weight associated with each zone. Researchers delivering the  
44 feedback were from different backgrounds (e.g., dietetics, nutrition, exercise science). Therefore,  
45 researchers delivering BPC feedback (n = 2) received 6 hours of general interviewing skills  
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3 training and 6 hours training on the feedback protocol. Researchers delivering MI feedback (n =  
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6 3) received approximately 40 hours training in MI and the feedback protocol.  
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10 *BPC feedback condition:* Researchers gave generic advice about healthy lifestyles meaning that  
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12 the primary focus of the BPC interview was on anthropometric results and discussion of the  
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14 lifestyle behaviours. Interviews typically lasted 15 minutes.  
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17 *MI feedback condition:* Parents were given information using an Elicit-Provide-Elicit (E-P-E)  
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19 approach<sup>29</sup> that allowed researchers to check in with parents' prior knowledge before giving  
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21 feedback. This approach also allowed parents the opportunity to explore the meaning and  
22  
23 importance of the results. Therefore, in contrast to the BPC interview, the focus of the MI  
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25 interview was on the *implications* of the health check results to the family. Interviews typically  
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27 lasted 30 minutes. All interviews were video-taped and transcribed verbatim so that accuracy of  
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29 recall could be determined.  
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### 36 *Follow-up*

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

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3 The number of pieces of information given at the feedback session were identified and defined  
4 by two authors (AMD, DAB). Lists of acceptable responses were developed and the coding  
5 framework was applied (initially collaboratively, then independently) to transcripts and codes  
6 compared. Discrepancies were resolved through discussion and the coding rules were finalised.  
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8 The pieces of information (n = 16), information categories (n = 6) and definitions are presented  
9 in Table 2. Although 16 is a large number of discrete items of information to receive, the six  
10 categories were the main point of interest and the individual items were included to provide  
11 details on the type of information recalled. Scores were weighted according to their importance  
12 in the feedback interview. Weighting decisions were made through author discussion of the most  
13 important clinical messages delivered to parents. For example, the main result discussed was  
14 BMI, therefore this was allocated the highest weighting of 4 from a maximum of 12.5. Only the  
15 weighted figures were used in analyses presented here but results did not differ whether weighted  
16 or unweighted scores were used (data not shown).  
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36 Coding was completed in two passes. The first pass assessed *how much* information was  
37 recalled. Coders identified relevant statements on the transcript and allocated a score under one  
38 or more categories. One statement could be coded in several categories (e.g., “her BMI was in  
39 the overweight category” would gain a score for indicating that BMI was measured and for  
40 giving the BMI result). If a piece of information was mentioned more than once, only the first  
41 statement was allocated a score. As recall may be prompted by discussion that occurs later in the  
42 interview, recall of the implications associated with carrying excess weight was divided by stage  
43 of interview, into free and prompted recall (Table 1). Recall of the other five information  
44 categories was not divided into free and prompted recall as the majority of relevant information  
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3 was recalled following question 1, and the interview was not set up to prompt exhaustively as  
4 would be expected in a memory interview. Implications recalled in response to the first recall  
5 question and non-specific prompts were considered free recall. Implications recalled following a  
6 specific prompt or additional interview questions were considered prompted recall. The second  
7 coding pass identified whether the information recalled was accurate or not. Each piece of  
8 information identified in the first pass was compared with the transcript of the BMI feedback  
9 interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview  
10 transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD  
11 also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter-  
12 and intra-reliability were moderate to excellent<sup>30</sup> (0.48-0.96).  
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### 29 *Data analysis*

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31 Linear regression was conducted to examine the overall effects of interview condition, recall  
32 interviewer and time between feedback and recall interview. To examine the amount of  
33 information recalled, scores were converted to a proportion of the total number of items in each  
34 category and regression was used to compare the relative frequencies of information category  
35 (within-subjects factor) and the interaction of feedback condition (between-subjects factor).  
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37 Accuracy is presented as the proportion of parents who correctly recalled each type of  
38 information. Accuracy was analysed using a two-group difference in proportion test to detect any  
39 difference between the two feedback conditions. A mixed model was used to compare recall of  
40 the meaning of results by stage of interview (within-subjects factor) and feedback condition  
41 (between-subjects factor). The model included an interaction term. To investigate which factors  
42 are associated with better recall, variables were analysed using multiple linear regression.  
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3 Variables with  $p < 0.2$  in the univariate model were included in the multivariate model. To adjust  
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5 for feedback condition and time between feedback and recall session, these variables were also  
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7 included in the multivariate models.  
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## 10 11 12 13 RESULTS

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15 Parents that did not participate in recall interviews ( $n = 27$ ) had children who did not differ in age  
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17 ( $P = 0.66$ ), sex ( $P = 1.00$ ), maternal education ( $P = 0.57$ ), or BMI z-score ( $P = 0.59$ ) from  
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19 children who did participate ( $n = 244$ ). Table 3 presents the mean number of items recalled and  
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21 weighted score by information category. On average, participants recalled only 6.3 out of the 16  
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23 (39%) pieces of information that they were given at the feedback session. There was no  
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25 difference in total recall score by recall interviewer ( $P = 0.65$ ), but total recall score decreased by  
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27 0.02 (95% CI -0.05 to 0.00) for each extra day between the feedback and recall interview ( $P =$   
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29 0.051). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time  
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31 between interviews (days). There was a significantly higher total recall score for those in the best  
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33 practice care condition ( $M = 6.01$ ,  $SD = 1.42$  from a total possible score of 12.5) compared with  
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35 the MI condition ( $M = 5.55$ ,  $SD = 1.83$ ) (difference 0.47 (95% CI 0.05 to 0.88),  $P = 0.02$ ).  
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44 Table 4 reports the number of people who recalled each category of information. Table 4  
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46 illustrates that while very few parents recalled information about their child's fat distribution  
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48 (28%) or blood pressure findings (21%), virtually every parent recalled that their child had a high  
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50 BMI (97%). However, it is clear that many parents did not know what this actually meant,  
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52 whether in terms of understanding the concept of these measurements (only 26% could say that  
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54 BMI was a measure of weight in relation to height) or, more importantly, the *implications* of a  
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3 high BMI (such as carrying excess weight into adolescence). Fifteen percent of parents had no  
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5 idea of the implications of their child having a high BMI and a further 38% recalled only one of  
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7 four possible implications that they were told when they were given their child's BMI result.  
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10 Logistic regression demonstrated a significant interaction between the type of information  
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12 recalled (e.g., BMI result) and feedback condition (BPC or MI) ( $P < 0.01$ ). Further examination  
13  
14 demonstrated that those in the BPC condition were more likely to report that lifestyle behaviours  
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16 had been discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14  
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18 to 0.40,  $P < 0.01$ ), whereas the *implications* of the BMI results was more likely to be reported by  
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20 those in the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95%  
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22 CI 0.01 to -0.27,  $P = 0.02$ ).  
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29 Table 4 also presents the proportion of parents who correctly recalled each *type* of information.  
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31 As mentioned 97% of parents remembered their child had a high BMI and 97% of these were  
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33 accurate in their recollection. Parents recalled their child's BP and WHtR results less often,  
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35 however when recalled, 86-97% of parents were accurate. Although the number of parents  
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37 recalling what high BMI meant for their child (implications) was considerably lower, those  
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39 parents who did recall implications, were generally very accurate (i.e., child was overweight and  
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41 were more at risk of carrying this weight into adolescence), being correct 83-97% of the time. By  
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43 contrast, the *concept* of BMI or WHtR (i.e., whether the child's weight and height are in  
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45 proportion for their age) was poorly understood with only 11-50% of parents correctly  
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47 remembering this information. Interestingly, feedback condition made no difference to the  
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49 accuracy of parental recall.  
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3 Not surprisingly, there was significantly higher recall of the meaning of results following  
4 prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38),  $P <$   
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6 0.01). This was particularly apparent for those in the MI group who showed a larger increase in  
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8 meaning recall after prompting ( $M = 0.55$ ,  $SD = 0.45$ ) than BPC ( $M = 0.40$ ,  $SD = 0.41$ ,  $P = 0.02$   
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10 for interaction).  
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18 Table 5 presents the models for the association between total recall scores and predictors of  
19 interest. Total recall was higher in more educated mothers ( $P < 0.001$ ) and those who were more  
20 concerned about their child's weight prior to feedback ( $P = 0.01$ ). Lower recall was observed in  
21 parents who were less accurate about their child's true weight status ( $P = 0.01$ ), or if their child's  
22 overweight status had been unexpected ( $P = 0.01$ ). Parents who reported poorer understanding ( $P$   
23 = 0.02) of the feedback process or did not find it as useful ( $P < 0.001$ ) also produced lower recall  
24 scores. However, the only variables which remained statistically significant in the multivariate  
25 model were maternal education and the parental rating of how useful they found the information.  
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## 39 DISCUSSION

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41 Our study demonstrated that although parents were only able to recall 39% of the information  
42 that was given to them at the BMI screening session, virtually all (97%) recalled that their child  
43 was overweight. Our findings are consistent with previous research demonstrating that while  
44 overall recall of medical information is poor,<sup>9</sup> parents are good at recalling important details such  
45 as their child's diagnosis<sup>15</sup> or weight status.<sup>19</sup> In contrast, information from other categories was  
46 not as readily reported and in particular, concepts were poorly understood with less than 50% of  
47 parents able to accurately describe what was done. These findings are consistent with the  
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3 attentional narrowing hypothesis which suggests that the most salient information is attended to  
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5 leaving less attention for peripheral information.<sup>31</sup> Given the poor recognition of overweight in  
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7 children, it is likely that receiving such feedback will elicit distress in some people, which may  
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9 accentuate attentional narrowing.<sup>31,32</sup> However, it is important to note that the child's *actual* BMI  
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11 was supported by a graph that parents were able to take home, and therefore may have aided  
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13 recall of the key results, similar to BMI screening studies which provide results in a letter that  
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15 parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the  
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17 session but was not supported by a take home message. While the provision of take home written  
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19 information to aid recall of medical information has produced inconsistent results,<sup>7</sup> there is some  
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21 evidence to suggest that simple pictorial messages can aid recall.<sup>33</sup> It is also important to note  
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23 that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a  
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25 take home visual and yet were poorly recalled. This may suggest that a take home message may  
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27 not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical  
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29 healthcare appointments, the feedback was given in an environment that minimised distractions  
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31 (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to  
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33 process the information being communicated.  
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43 Findings from the current study suggest that parents have limited capacity for processing a large  
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45 amount of information and although they are able to remember some key pieces of information  
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47 (that their child was overweight), important details were forgotten (such as why being an  
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49 overweight child is a concern). While it could be argued that 6 categories of information is an  
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51 unrealistic target, a considerable amount of time was spent within the interviews on BMI and  
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53 what it means for health; more than would be spent during a typical primary care consultation.  
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3 This has important implications for including BMI screening within routine healthcare,  
4 especially if the information is unexpected. Thus health professionals need to limit the amount of  
5 information given in one session, provide personalised take-home information, or use multiple  
6 sessions to assess gaps in patient recall or understanding and provide clarification, especially if  
7 the information is unexpected or includes unfamiliar concepts.  
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18 Despite our best efforts to present information to promote optimal recall and understanding,<sup>7</sup>  
19 (spending a significant portion of time on the key message (BMI and health), providing pictorial  
20 information and providing simple non-technical explanations),<sup>7</sup> our findings suggest that the  
21 implications were poorly recalled and concepts were poorly understood. While a diagnosis is  
22 important, it is not meaningful without an understanding of the implications and a clear treatment  
23 pathway. This is particularly relevant in primary care, where doctors are often reluctant<sup>34</sup> to  
24 discuss childhood overweight and unsure how to communicate this information to families.<sup>35</sup>  
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27 This may inadvertently lead to ambiguous information or brief communication, making it easy  
28 for parents to become confused about the messages they are being given, particularly if the  
29 information conflicts with parental beliefs. Poor understanding also has implications for the  
30 transfer of this information beyond the direct medical setting and into the child's wider context.  
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32 For example, if parents are unable to understand what their child's results mean, there is the  
33 potential for miscommunication with significant people in the child's life who might need to be  
34 involved in changing lifestyle factors.  
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53 Literature examining parental recall of child weight status information is very limited<sup>19,20,36</sup> and  
54 no studies appear to have assessed recall and understanding of BMI information and related  
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3 concepts following a targeted face-to-face interview. Johnson and colleagues<sup>19</sup> investigated  
4 parent reactions to a screening program and included measures of recall of the information  
5 provided in a BMI results letter. Consistent with the current study, important information was  
6 recalled well (e.g., 94% of the parents recalled their child's weight category), and other details  
7 were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were  
8 lower than that observed in the current study. This may have arisen because of different methods  
9 of informing parents (letter versus face-to-face) or due to the more stringent accuracy  
10 classification used by Johnson et al.<sup>19</sup>  
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24 Although it may seem surprising that parents receiving BPC feedback were able to remember  
25 more than those who received MI, more structured and specific information is more likely to be  
26 remembered.<sup>7,37</sup> The BPC interview was highly structured and the advice given to parents to  
27 achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the  
28 MI session, reflecting the intention of MI,<sup>38</sup> was not structured, with research assistants  
29 intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC  
30 sessions it is also possible that the additional time spent on the exploration of the meaning and  
31 implication of results took focus away from the central details of the message, resulting in lower  
32 recall of the information.  
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48 Higher maternal education was related to improved overall recall, consistent with the literature in  
49 other health contexts.<sup>7,14</sup> While a relationship between recall and child and maternal BMI,<sup>19</sup>  
50 ethnicity<sup>19</sup> and age<sup>39</sup> have previously been suggested, they were unrelated in this study. Here,  
51 beliefs about weight played a more important role: parents who found the information  
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3 unexpected or did not understand the feedback process or find it useful, had lower recall. By  
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5 contrast, those who were already concerned about their child's weight had higher overall recall.  
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7 These findings are consistent with the hypothesis that memory is heightened for information that  
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9 is consistent with one's current beliefs<sup>40</sup> and has implications for health practitioners giving  
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11 parents results that they may not expect. Prior to delivering feedback health practitioners may  
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13 benefit from assessing parents' expectations, concerns and current knowledge, to assist in  
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15 prioritising and explaining results that may not align with these.  
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22 This study examined recall and understanding in a large sample of families with overweight  
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24 children. This study was not originally constructed to assess parental memory, and as such it was  
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26 not set up to exhaustively prompt parents for complete recall. It is possible that had we  
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28 interviewed differently, parents may have recalled more information. However, much of the  
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30 information used in this interview was based on free recall, which is particularly relevant in this  
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32 context as it likely reflects the information that is most salient and easily accessible to parents.  
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39 In summary, our findings appear to be the first to examine parental recall of BMI and growth  
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41 information following a BMI screening and face-to-face feedback session. While our results  
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43 suggest that parents were able to remember their child's overweight diagnosis very well, 61% of  
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45 the information was forgotten. This finding suggests that the inclusion of BMI screening within  
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47 current appointments may negatively impact parental ability to remember and understand this  
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49 information. In addition, the way that the information is given, and parental education, values  
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51 and expectations, were associated with recall of the information and therefore suggest that health  
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53 professionals need to be aware of these factors when discussing results with parents.  
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## 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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5 disclose.  
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12 Committee (LRS/09/09/039).  
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17 **DATA SHARING STATEMENT:** No additional data are available.  
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**Table 1.** Recall interview questions

<b>Free recall question</b>	
1.	What information were you given about your child's growth?
<b>Non-specific prompts</b>	
	Were you given any other information about your child at the initial session? Tell me more about that... What information were you given?
<b>Specific prompt for implications</b>	
2.	What were you told that the information means for him/her?
<b>Additional interview questions – prompted recall</b>	
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.** Mean (SD) number of items recalled and weighted score, reported by information category

Information category	Total sample (n = 244)		MI	BPC
	Number of items m (SD)	Weighted scores m (SD)	(n = 121)	(n = 122)
			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

Information category	Total recall (%)			Correct recall (%)		
	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC
<b>Results</b>						
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)
<b>Meaning of results</b>						
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)	-	-	-
<b>Concepts discussed</b>						
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 <sup>†</sup>	0.78 (0.23 to 1.34)*	0.59 (0.04 to 1.14)*	0.67 (0.13 to 1.22)*
University degree <sup>†</sup>	0.85 (0.37 to 1.33)*	0.71 (0.23 to 1.19)*	0.79 (0.30 to 1.28)*
Ethnicity			
Maori <sup>††</sup>	-0.55 (-1.11 to 0.00)	-0.40 (-0.96 to 0.17)	
Pacific <sup>††</sup>	-0.24 (-1.05 to 0.56)	-0.07 (-0.90 to 0.75)	
Asian <sup>††</sup>	0.73 (-0.38 to 1.84)	0.51 (-0.57 to 1.60)	
Other <sup>††</sup>	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)

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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
<b>Title and abstract</b>			
	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
<b>Introduction</b>			
<b>Background and objectives</b>			
	2a	Scientific background and explanation of rationale	6-7
	2b	Specific objectives or hypotheses	7
<b>Methods</b>			
<b>Trial design</b>			
	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
<b>Participants</b>			
	4a	Eligibility criteria for participants	8
	4b	Settings and locations where the data were collected	8
<b>Interventions</b>			
	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	8-10
<b>Outcomes</b>			
	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
<b>Sample size</b>			
	7a	How sample size was determined	Ref 23
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
<b>Randomisation:</b>			
<b>Sequence generation</b>			
	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
<b>Allocation concealment mechanism</b>			
	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
<b>Implementation</b>			
	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	Ref 24
<b>Blinding</b>			
	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those	Ref 24

1			
2		assessing outcomes) and how	
3			
4		11b If relevant, description of the similarity of interventions	N/A
5	Statistical methods	12a Statistical methods used to compare groups for primary and secondary outcomes	12-13
6		12b Methods for additional analyses, such as subgroup analyses and adjusted analyses	N/A
7			
8	Results		
9	Participant flow (a	13a For each group, the numbers of participants who were randomly assigned, received intended treatment, and	8
10	diagram is strongly	were analysed for the primary outcome	
11	recommended)	13b For each group, losses and exclusions after randomisation, together with reasons	8
12	Recruitment	14a Dates defining the periods of recruitment and follow-up	Ref 24
13		14b Why the trial ended or was stopped	N/A
14			
15	Baseline data	15 A table showing baseline demographic and clinical characteristics for each group	Ref 24 – or could be added as web only
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20	Numbers analysed	16 For each group, number of participants (denominator) included in each analysis and whether the analysis was	Tables 3 & 4
21		by original assigned groups	
22	Outcomes and	17a For each primary and secondary outcome, results for each group, and the estimated effect size and its	Tables
23	estimation	precision (such as 95% confidence interval)	
24		17b For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
25	Ancillary analyses	18 Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing	N/A
26		pre-specified from exploratory	
27			
28	Harms	19 All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
29			
30	Discussion		
31	Limitations	20 Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
32	Generalisability	21 Generalisability (external validity, applicability) of the trial findings	16-17
33	Interpretation	22 Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17-19
34			
35	<b>Other information</b>		
36	Registration	23 Registration number and name of trial registry	4
37	Protocol	24 Where the full trial protocol can be accessed, if available	7
38	Funding	25 Sources of funding and other support (such as supply of drugs), role of funders	20
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44	CONSORT 2010 checklist		
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2 \*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  
3 recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials.  
4 Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see [www.consort-statement.org](http://www.consort-statement.org).  
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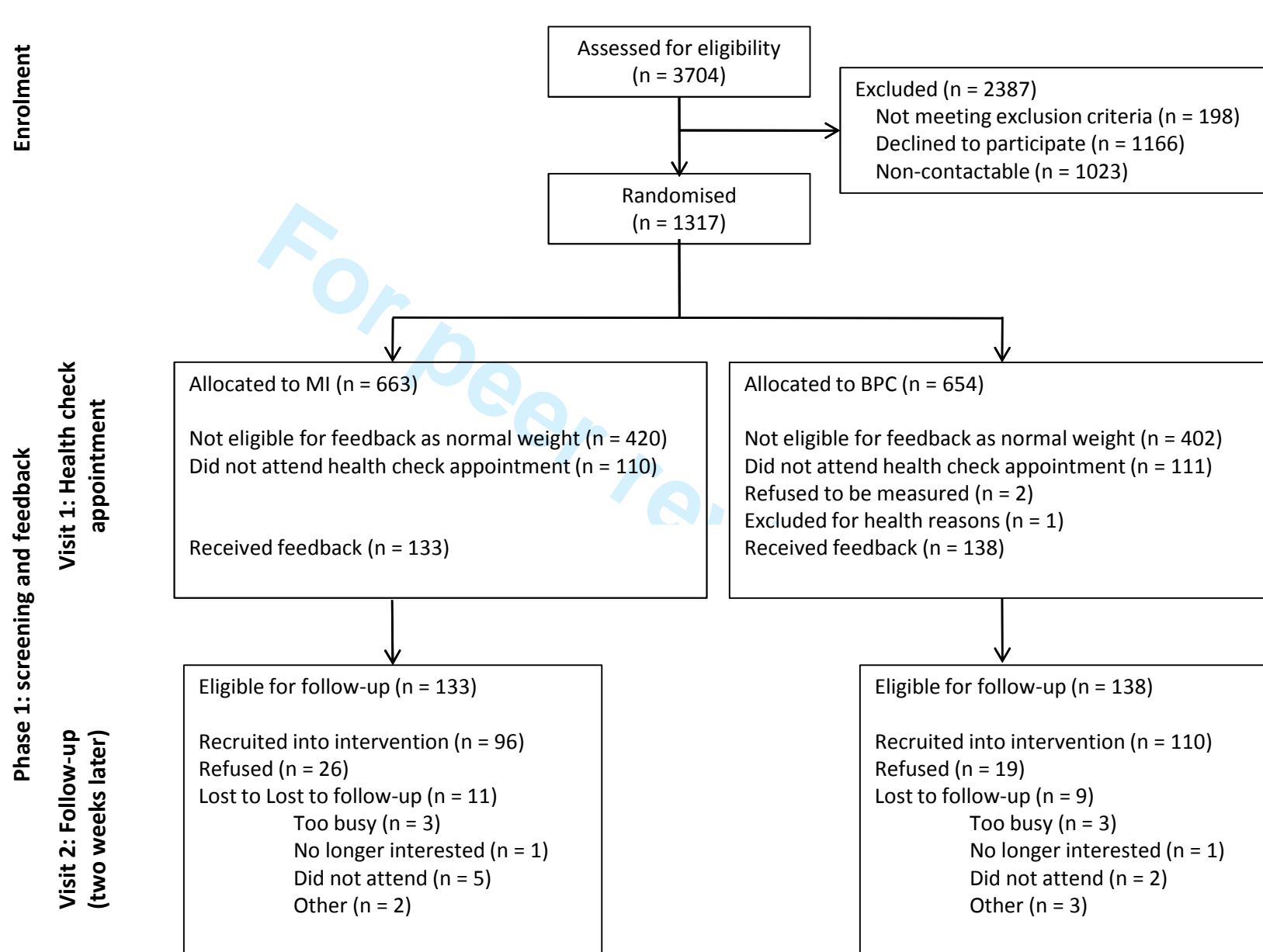


Figure 1. Participant flow through the study

# BMJ Open

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

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2013-004481.R1
Article Type:	Research
Date Submitted by the Author:	03-Jun-2014
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<b>Primary Subject Heading</b>:	Paediatrics
Secondary Subject Heading:	Public health
Keywords:	BMI screening, Parental recall, Memory, Health information, Overweight

SCHOLARONE™  
Manuscripts

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3 **Do parents recall and understand children's weight status information after BMI**  
4 **screening? A Randomised Controlled Trial.**  
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52 **Word count:** 4,037  
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55 **Short title:** Parental recall of weight feedback  
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57 **Key words:** BMI screening; parental recall; memory; health information; overweight  
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## 1 ABSTRACT

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

6 **Design:** Randomised controlled trial of different methods of feedback.

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

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

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

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

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3 1 they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in  
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6 2 multivariate analyses.

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8 3 **Conclusions:** While parents remember that their child's BMI is higher than recommended, they  
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10 4 are unable to remember much of the information and advice provided about the result.  
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15 6 **CLINICAL TRIAL REGISTRATION:** Australian New Zealand Clinical Trials Registry

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3 **1 ARTICLE SUMMARY**  
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6 **2 Strengths and limitations of this study**  
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- 8 • First study to assess what parents remember and understand from a 20-40 minute face-to-  
9 face session dedicated to discussing the weight status of their child  
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11  
12 • Recall and accuracy were studied extensively through the use of transcripts which were  
13 transcribed verbatim and coding according to an extensive coding schedule  
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16 • Large (n = 244), demographically diverse sample of overweight children and their  
17 parents  
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22 • Not originally designed to specifically test parental memory, and thus exhaustively  
23 prompt parents for complete recall  
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## 1 INTRODUCTION

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

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

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

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6 2 In the context of screening for overweight in children, it would appear that parents can recall  
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8 3 important information, such as their child's weight status following a posted letter.<sup>19</sup> However,  
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10 4 understanding of the results and BMI charts and/or percentiles is very low.<sup>20</sup> To date, most  
11  
12 5 evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a  
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14 6 few studies<sup>20-22</sup> have assessed whether parents *understand* BMI charts and percentiles, and none  
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16 7 have done so after receiving BMI results in a face-to-face consultation, as would occur in a  
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18 8 primary care setting. This is an important distinction as it may be that a letter of results provides  
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20 9 an enduring memory cue or resource which enables parents to better retain the information and  
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22 10 refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding  
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24 11 given the opportunity to discuss the results and ask questions, thereby strengthening encoding of  
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26 12 the information and creating stronger recall.  
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34 14 Therefore, this study investigated parental recall of information given in a BMI screening and  
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36 15 face-to-face feedback session. Specifically, we examined how much information parents could  
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38 16 recall from the BMI screening session, which types of information were more likely to be  
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40 17 recalled, the accuracy of parental recall and how recall varied according to feedback style.  
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42 18 Factors that may predict better recall performance were also explored.  
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## 48 **SUBJECTS AND METHODS**

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51 21 This manuscript presents data from a large randomised controlled study (MInT) which has been  
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53 22 described in detail previously.<sup>23</sup> In brief, MInT was a BMI screening initiative (phase 1) to  
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55 23 recruit children into a two-year family-based intervention in overweight children (phase 2).  
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1 Phase 1 entailed a comparison of weight feedback delivered using best practice care or  
2 motivational interviewing whereas phase 2 compared a usual care intervention with a more  
3 intense intervention tailored to the needs of each family. Ethical approval was obtained from the  
4 Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

## 6 **Participants**

7 1093 children between the ages of 4 and 8 years, recruited from local primary care practices and  
8 secondary care clinics in Dunedin, New Zealand were screened for overweight at a University  
9 research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered  
10 using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553)  
11 using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for  
12 practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.<sup>24</sup>  
13 Only those parents with overweight children (BMI  $\geq$  85<sup>th</sup> percentile)<sup>25</sup> were eligible for the  
14 current study (n = 271, Figure 1). These parents were invited to participate in a recall interview  
15 at the University approximately two weeks later to discuss the feedback they received about their  
16 child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview.  
17 A further seven participants were excluded due to technical difficulties with audio recordings (n  
18 = 6) and one had brought the feedback booklet with them to the interview making them  
19 unsuitable for assessing *recall* of feedback.

## 21 **Procedures**

### 22 *Screening*

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

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

20  
21 Feedback interview: Researchers explained each measure and then discussed the lifestyle  
22 behaviours. BMI and WHtR measurements were presented using a traffic light approach to avoid  
23 labelling the child as "overweight" or "obese". Implications of each colour zone were explained

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

7  
8 BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that  
9 the primary focus of the BPC interview was on anthropometric results and discussion of the  
10 lifestyle behaviours. Interviews typically lasted 15 minutes.

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

#### 18 19 *Follow-up*

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

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

#### 4 5 *Coding*

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

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6 2 Coding was completed in two passes. The first pass assessed *how much* information was  
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8 3 recalled. Coders identified relevant statements on the transcript and allocated a score under one  
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10 4 or more categories. One statement could be coded in several categories (e.g., “her BMI was in  
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12 5 the overweight category” would gain a score for indicating that BMI was measured and for  
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14 6 giving the BMI result). If a piece of information was mentioned more than once, only the first  
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16 7 statement was allocated a score. As recall may be prompted by discussion that occurs later in the  
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18 8 interview, recall of the implications associated with carrying excess weight was divided by stage  
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20 9 of interview, into free and prompted recall (Table 1). Recall of the other five information  
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22 10 categories was not divided into free and prompted recall as the majority of relevant information  
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24 11 was recalled following question 1, and the interview was not set up to prompt exhaustively as  
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26 12 would be expected in a memory interview. Implications recalled in response to the first recall  
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28 13 question and non-specific prompts were considered free recall. Implications recalled following a  
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30 14 specific prompt or additional interview questions were considered prompted recall. The second  
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32 15 coding pass identified whether the information recalled was accurate or not. Each piece of  
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34 16 information identified in the first pass was compared with the transcript of the BMI feedback  
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36 17 interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview  
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38 18 transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD  
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40 19 also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter-  
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42 20 and intra-reliability were moderate to excellent<sup>30</sup> (0.48-0.96).  
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53 22 *Data analysis*  
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3 1 Linear regression was conducted to examine the overall effects of interview condition, recall  
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5 2 interviewer and time between feedback and recall interview. To examine the amount of  
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7 3 information recalled, scores were converted to a proportion of the total number of items in each  
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9 4 category and regression was used to compare the relative frequencies of information category  
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11 5 (within-subjects factor) and the interaction of feedback condition (between-subjects factor).  
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13 6 Accuracy was calculated as the number who correctly recalled the information from 1) just those  
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15 7 who actually mentioned each type of information and 2) from all parents. Thus accuracy for the  
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17 8 former calculation reflects errors of commission, whereas using the total number of parents as  
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19 9 the denominator also includes errors of omission. Accuracy was analysed using a two-group  
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21 10 difference in proportion test to detect any difference between the two feedback conditions. A  
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23 11 mixed model was used to compare recall of the meaning of results by stage of interview (within-  
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25 12 subjects factor) and feedback condition (between-subjects factor). The model included an  
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27 13 interaction term to find out whether the type of information (lifestyle changes versus  
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29 14 implications) was different in the MI and BPC groups. To investigate which factors are  
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31 15 associated with better recall, variables were analysed using multiple linear regression. Variables  
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33 16 with  $p < 0.2$  in the univariate model were included in the multivariate models. To adjust for  
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35 17 feedback condition and time between feedback and recall session, these variables were also  
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37 18 included in the multivariate models. Data were also adjusted for clustering within families given  
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39 19 that one family enrolled 3 overweight siblings and 9 families enrolled 2 siblings.  
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50 21 The larger MInT study from which this data are derived is adequately powered as it required a  
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52 22 minimum of 250 participants to detect the main outcomes of interest, with a final sample size of  
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54 23 271.<sup>24</sup> No sample size calculations were performed prior to analysis for this paper as it was a  
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1 secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College  
2 Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have  
3 presented analyses for the available data.

## 4

## 5 RESULTS

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

15  
16 Table 4 presents the mean number of items recalled and weighted score by information category.  
17 On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they  
18 were given at the feedback session. There was no difference in total recall score by recall  
19 interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03  
20 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P =  
21 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time  
22 between interviews (days). There was a significantly higher total recall score for those in the best

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

3  
4 Table 5 reports the number of people who recalled each category of information and illustrates  
5 that while very few parents recalled information about their child's fat distribution (28%) or  
6 blood pressure findings (21%), virtually every parent recalled that their child had a high BMI  
7 (97%). However, it is clear that many parents did not know what this actually meant, whether in  
8 terms of understanding the concept of these measurements (only 26% could say that BMI was a  
9 measure of weight in relation to height) or, more importantly, the *implications* of a high BMI  
10 (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the  
11 implications of their child having a high BMI and a further 38% recalled only one of four  
12 possible implications that they were told when they were given their child's BMI result. Logistic  
13 regression demonstrated a significant interaction between the type of information recalled (e.g.,  
14 BMI result) and feedback condition (BPC or MI) ( $P < 0.01$ ). Further examination demonstrated  
15 that those in the BPC condition were more likely to report that lifestyle behaviours had been  
16 discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40,  $P$   
17  $< 0.01$ ), whereas the *implications* of the BMI results was more likely to be reported by those in  
18 the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01  
19 to 0.27,  $P = 0.02$ ).

20  
21 Table 5 also presents the proportion of parents who correctly recalled each *type* of information.  
22 As mentioned 97% ( $n = 238$ ) of parents remembered their child had a high BMI and 97% ( $n =$   
23 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their

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

12  
13 Not surprisingly, there was significantly higher recall of the meaning of results following  
14 prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38),  $P <$   
15 0.01). This was particularly apparent for those in the MI group who showed a larger increase in  
16 meaning recall after prompting ( $M = 0.55$ ,  $SD = 0.45$ ) than BPC ( $M = 0.40$ ,  $SD = 0.41$ )  
17 (interaction term 0.14, 0.00 to 0.28,  $P = 0.04$ ).

18  
19 Table 6 presents the models for the association between total recall scores and predictors of  
20 interest. As the univariate models demonstrated that both time between feedback and recall  
21 session ( $P = 0.029$ ) and feedback condition ( $P = 0.030$ ) were significantly related to total recall  
22 score, only the multivariate models are discussed here. After adjustment for these two variables,  
23 mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to

1 1.32) than less educated mothers, whereas no differences were observed for child ethnicity or  
2 BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total  
3 recall score appeared to be related to the experience of the feedback process. Having a larger  
4 discrepancy between perceived and actual weight was associated with lower recall scores (-0.44,  
5 -0.76 to -0.14). Conversely, understanding the information presented in the feedback process  
6 (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher  
7 recall scores to a similar degree. Once all significant variables were entered in multivariate  
8 model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information  
9 useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.

10

## 11 **DISCUSSION**

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

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2  
3 1 recall of the key results, similar to BMI screening studies which provide results in a letter that  
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5 2 parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the  
6  
7 3 session but was not supported by a take home message. While the provision of take home written  
8  
9 4 information to aid recall of medical information has produced inconsistent results,<sup>7</sup> there is some  
10  
11 5 evidence to suggest that simple pictorial messages can aid recall.<sup>33</sup> It is also important to note  
12  
13 6 that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a  
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15 7 take home visual and yet were poorly recalled. This may suggest that a take home message may  
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17 8 not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical  
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19 9 healthcare appointments, the feedback was given in an environment that minimised distractions  
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21 10 (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to  
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23 11 process the information being communicated.  
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32 13 Findings from the current study suggest that parents have limited capacity for processing a large  
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34 14 amount of information and although they are able to remember some key pieces of information  
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36 15 (that their child was overweight), important details were forgotten (such as why being an  
37  
38 16 overweight child is a concern). While it could be argued that 6 categories of information is an  
39  
40 17 unrealistic target, a considerable amount of time was spent within the interviews on BMI and  
41  
42 18 what it means for health; more than would be spent during a typical primary care consultation.  
43  
44 19 This has important implications for including BMI screening within routine healthcare,  
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46 20 especially if the information is unexpected. Thus health professionals need to limit the amount of  
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48 21 information given in one session, provide personalised take-home information, or use multiple  
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50 22 sessions to assess gaps in patient recall or understanding and provide clarification, especially if  
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52 23 the information is unexpected or includes unfamiliar concepts.  
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5 2 Despite our best efforts to present information to promote optimal recall and understanding,<sup>7</sup>  
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8 3 (spending a significant portion of time on the key message (BMI and health), providing pictorial  
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10 4 information and providing simple non-technical explanations),<sup>7</sup> our findings suggest that the  
11  
12 5 implications were poorly recalled and concepts were poorly understood. While a diagnosis is  
13  
14 6 important, it is not meaningful without an understanding of the implications and a clear treatment  
15  
16 7 pathway. This is particularly relevant in primary care, where doctors are often reluctant<sup>34</sup> to  
17  
18 8 discuss childhood overweight and unsure how to communicate this information to families.<sup>35</sup>  
19  
20 9 This may inadvertently lead to ambiguous information or brief communication, making it easy  
21  
22 10 for parents to become confused about the messages they are being given, particularly if the  
23  
24 11 information conflicts with parental beliefs. Poor understanding also has implications for the  
25  
26 12 transfer of this information beyond the direct medical setting and into the child's wider context.  
27  
28 13 For example, if parents are unable to understand what their child's results mean, there is the  
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30 14 potential for miscommunication with significant people in the child's life who might need to be  
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32 15 involved in changing lifestyle factors.  
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41 17 Literature examining parental recall of child weight status information is very limited<sup>19,20,36</sup> and  
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43 18 no studies appear to have assessed recall and understanding of BMI information and related  
44  
45 19 concepts following a targeted face-to-face interview. Johnson and colleagues<sup>19</sup> investigated  
46  
47 20 parent reactions to a screening program and included measures of recall of the information  
48  
49 21 provided in a BMI results letter. Consistent with the current study, important information was  
50  
51 22 recalled well (e.g., 94% of the parents recalled their child's weight category), and other details  
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53 23 were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were  
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3 1 lower than that observed in the current study. This may have arisen because of different methods  
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5 2 of informing parents (letter versus face-to-face) or due to the more stringent accuracy  
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8 3 classification used by Johnson et al.<sup>19</sup>  
9

10 4  
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12 5 Although it may seem surprising that parents receiving BPC feedback were able to remember  
13  
14 6 more than those who received MI, more structured and specific information is more likely to be  
15  
16 7 remembered.<sup>7,37</sup> The BPC interview was highly structured and the advice given to parents to  
17  
18 8 achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the  
19  
20 9 MI session, reflecting the intention of MI,<sup>38</sup> was not structured, with research assistants  
21  
22 10 intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC  
23  
24 11 sessions it is also possible that the additional time spent on the exploration of the meaning and  
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26 12 implication of results took focus away from the central details of the message, resulting in lower  
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28 13 recall of the information.  
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36 15 Higher maternal education was related to improved overall recall, consistent with the literature in  
37  
38 16 other health contexts.<sup>7,14</sup> While a relationship between recall and child and maternal BMI,<sup>19</sup>  
39  
40 17 ethnicity<sup>19</sup> and age<sup>39</sup> have previously been suggested, they were unrelated in this study. Here,  
41  
42 18 beliefs about weight played a more important role: parents who found the information  
43  
44 19 unexpected or did not understand the feedback process or find it useful, had lower recall. By  
45  
46 20 contrast, those who were already concerned about their child's weight had higher overall recall.  
47  
48 21 These findings are consistent with the hypothesis that memory is heightened for information that  
49  
50 22 is consistent with one's current beliefs<sup>40</sup> and has implications for health practitioners giving  
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52 23 parents results that they may not expect. Prior to delivering feedback health practitioners may  
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1 benefit from assessing parents' expectations, concerns and current knowledge, to assist in  
2 prioritising and explaining results that may not align with these.

3  
4 This study examined recall and understanding in a large sample of families with overweight  
5 children. This study was not originally constructed to assess parental memory, and as such it was  
6 not set up to exhaustively prompt parents for complete recall. It is possible that had we  
7 interviewed differently, parents may have recalled more information. However, much of the  
8 information used in this interview was based on free recall, which is particularly relevant in this  
9 context as it likely reflects the information that is most salient and easily accessible to parents.

10  
11 In summary, our findings appear to be the first to examine parental recall of BMI and growth  
12 information following a BMI screening and face-to-face feedback session. While our results  
13 suggest that parents were able to remember their child's overweight diagnosis very well, 61% of  
14 the information was forgotten. This finding suggests that the inclusion of BMI screening within  
15 current appointments may negatively impact parental ability to remember and understand this  
16 information. In addition, the way that the information is given, and parental education, values  
17 and expectations, were associated with recall of the information and therefore suggest that health  
18 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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14  
15 disclose.  
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21  
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**Table 1.** Recall interview questions

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**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) <sup>†</sup>
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity <sup>a</sup> 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) <sup>†</sup>
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19) <sup>†</sup>
Household deprivation <sup>b</sup>		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years) <sup>c</sup>		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education <sup>d</sup>	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) <sup>†</sup>
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64) <sup>†</sup>
Maternal BMI <sup>e</sup> (kg/m <sup>2</sup> )		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<sup>a</sup>, 9<sup>b</sup>, 9<sup>c</sup>, 3<sup>d</sup> and 13<sup>e</sup> participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as \*difference or <sup>†</sup>odds ratios as shown.

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

Information category	Total sample (n = 244)		MI	BPC
	Number of items m (SD)	Weighted scores m (SD)	(n = 121)	(n = 122)
			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

Information category	Total recall (%)			<sup>1</sup> Correct recall (%)			<sup>2</sup> Correct recall (%)		
	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
<b>Results</b>									
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)
<b>Meaning of results</b>									
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)	-	-	-	-	-	-
<b>Concepts discussed</b>									
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)

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3 Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition.

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5 For correct recall, percentages are calculated from <sup>1</sup>only from those who recalled the information (errors of commission) and <sup>2</sup>the total  
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8 sample (errors of omission).  
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10 Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio  
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**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 <sup>†</sup>	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree <sup>†</sup>	0.82 (0.27 to 1.38)*	0.76 (0.20 to 1.32)*	0.81 (0.25 to 1.37)*
Ethnicity			
Maori <sup>††</sup>	-0.61 (-1.17 to -0.05)*	-0.52 (-1.09 to 0.04)	
Pacific <sup>††</sup>	-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)

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

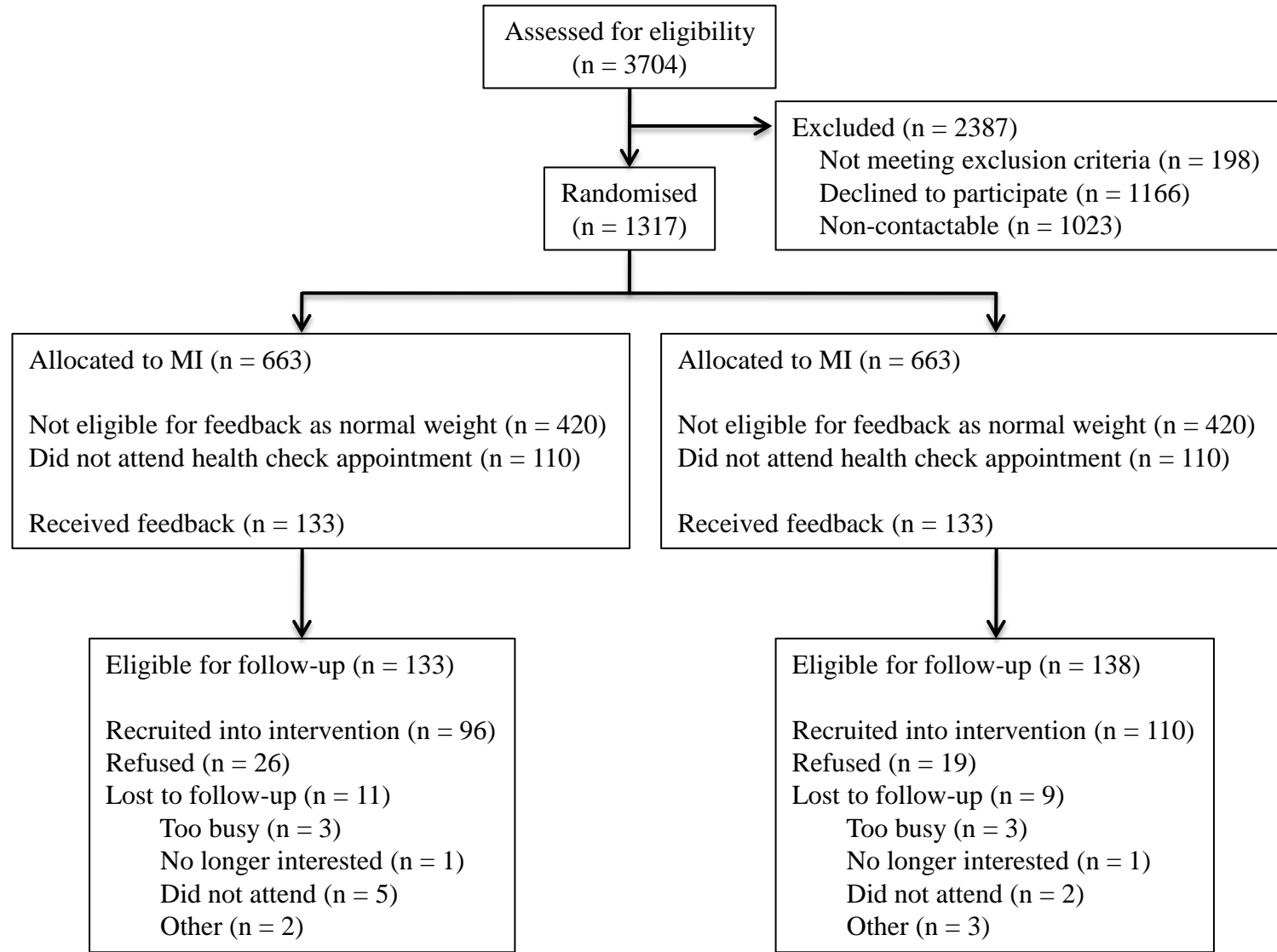
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Enrolment

Visit 1: Health check appointment

Visit 2: Follow-up (two weeks later)

Phase 1: Screening and feedback





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	<p><i>“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”</i> P125</p>	<p>Good Easy to understand Clear visual message Meaningful metaphor Didn’t give enough information Other</p>
2. Evaluation of the overall process	<p><i>“It was really good to see where she fitted”</i> P123]</p> <p><i>“I went away thinking gosh we need to do something about this”</i> P249</p> <p>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.</p>	<p>Good Good that child was entertained Good child was in different room for feedback Impetus for change Other</p>
3. Spontaneously reported behaviour change	<p><i>“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”</i> P125</p>	<p>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)</p>
4. Spontaneously reported discussion with other	<p><i>“It was very useful. To be honest I needed a second opinion it shocked me so much I went to the doctor”</i> P38</p>	
5. Discussion with child		
6. Parental feelings about the way feedback was given	<p>Too clinical presentation, very professional but maybe too much so, responses too scripted (e.g., P37)</p> <p><i>“I don’t know it could have been given in a better way. I mean its hard to hear, regardless”</i> P125</p> <p>Researchers maybe a bit nervous to be giving this information - <i>“felt like you are reassuring the researcher...I’m fine”</i> P260</p> <p>Repeated questioning of what information means to parents coming up as making them uncomfortable.</p> <p><i>“calm, matter of fact, how I’d want it to be presented”</i> P164</p> <p><i>“the fact that a practitioner takes time to recognise concerns and validate..I found it was very supportive”</i> P139</p> <p><i>“It was confirming how I felt..I was quite relieved to get it”</i> P108</p>	<p>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</p>

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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 be 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.
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3 **Do parents recall and understand children's weight status information after BMI**  
4 **screening? A Randomised Controlled Trial.**  
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51 **Word count:** 4,037  
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54 **Short title:** Parental recall of weight feedback  
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57 **Key words:** BMI screening; parental recall; memory; health information; overweight  
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3 **1 ABSTRACT**  
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5 **2 Objectives:** As parents of young children are often unaware their child is overweight, screening  
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8 provides the opportunity to inform parents and provide the impetus for behaviour change. We  
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10 aimed to determine if parents could recall and understand the information they received about  
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12 their overweight child after weight screening.  
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15 **6 Design:** Randomised controlled trial of different methods of feedback.  
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18 **7 Setting:** Participants were recruited through primary and secondary care but appointments took  
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20 place at a University research clinic.  
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23 **9 Participants and intervention:** 1093 children aged 4-8 years were screened. Only overweight  
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25 children (n = 271, 24.7%) are included in this study. Parents of overweight children were  
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27 randomised to receive feedback regarding their child's weight using best practice care (BPC) or  
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29 motivational interviewing (MI) as face-to-face interviews typically lasting 20-40 minutes. Two  
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31 hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to  
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33 assess recall and understanding of information from the feedback session.  
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37 **15 Primary and secondary outcome measures:** Interviews were audio-taped and transcribed  
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39 verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall  
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41 and sub-categories of interest.  
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44 **18 Results:** Overall, 39% of the information was recalled (mean score 6.3 from possible score of  
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46 16). Parents given feedback via BPC recalled more than those in the MI group (difference in  
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48 total score 0.48; 95% CI 0.05 to 0.92). Although 94% of parents were able to correctly recall  
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50 their child's weight status, fewer than 10 parents could accurately describe what the  
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52 measurements meant. Maternal education (0.81; 0.25 to 1.37) and parental ratings of how useful  
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1 they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in  
2 multivariate analyses.

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

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6 **CLINICAL TRIAL REGISTRATION:** Australian New Zealand Clinical Trials Registry  
7 ACTRN12609000749202

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3 1 **ARTICLE SUMMARY**  
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6 2 **Strengths and limitations of this study**  
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- 8 3 • First study to assess what parents remember and understand from a 20-40 minute face-to-  
9 face session dedicated to discussing the weight status of their child  
10 4  
11  
12 5 • Recall and accuracy were studied extensively through the use of transcripts which were  
13 transcribed verbatim and coding according to an extensive coding schedule  
14 6  
15 7 • Large (n = 244), demographically diverse sample of overweight children and their  
16 parents  
17 8  
18 9 • Not originally designed to specifically test parental memory, and thus exhaustively  
19 prompt parents for complete recall  
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## 1 INTRODUCTION

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

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

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

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6 2 In the context of screening for overweight in children, it would appear that parents can recall  
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8 3 important information, such as their child's weight status following a posted letter.<sup>19</sup> However,  
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10 4 understanding of the results and BMI charts and/or percentiles is very low.<sup>20</sup> To date, most  
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12 5 evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a  
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14 6 few studies<sup>20-22</sup> have assessed whether parents *understand* BMI charts and percentiles, and none  
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16 7 have done so after receiving BMI results in a face-to-face consultation, as would occur in a  
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18 8 primary care setting. This is an important distinction as it may be that a letter of results provides  
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20 9 an enduring memory cue or resource which enables parents to better retain the information and  
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22 10 refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding  
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24 11 given the opportunity to discuss the results and ask questions, thereby strengthening encoding of  
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26 12 the information and creating stronger recall.  
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34 14 Therefore, this study investigated parental recall of information given in a BMI screening and  
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36 15 face-to-face feedback session. Specifically, we examined how much information parents could  
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38 16 recall from the BMI screening session, which types of information were more likely to be  
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40 17 recalled, the accuracy of parental recall and how recall varied according to feedback style.  
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42 18 Factors that may predict better recall performance were also explored.  
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## 49 **SUBJECTS AND METHODS**

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51 21 This manuscript presents data from a large randomised controlled study (MInT) which has been  
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53 22 described in detail previously.<sup>23</sup> In brief, MInT was a BMI screening initiative (phase 1) to  
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55 23 recruit children into a two-year family-based intervention in overweight children (phase 2).  
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1 Phase 1 entailed a comparison of weight feedback delivered using best practice care or  
2 motivational interviewing whereas phase 2 compared a usual care intervention with a more  
3 intense intervention tailored to the needs of each family. Ethical approval was obtained from the  
4 Lower Regional South Ethics Committee (LRS/09/09/039) and parents gave informed consent.

## 6 **Participants**

7 1093 children between the ages of 4 and 8 years, recruited from local primary care practices and  
8 secondary care clinics in Dunedin, New Zealand were screened for overweight at a University  
9 research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered  
10 using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553)  
11 using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for  
12 practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.<sup>24</sup>  
13 Only those parents with overweight children (BMI  $\geq$  85<sup>th</sup> percentile)<sup>25</sup> were eligible for the  
14 current study (n = 271, Figure 1). These parents were invited to participate in a recall interview  
15 at the University approximately two weeks later to discuss the feedback they received about their  
16 child's growth (phase 1, follow-up). Twenty parents declined participation in the recall interview.  
17 A further seven participants were excluded due to technical difficulties with audio recordings (n  
18 = 6) and one had brought the feedback booklet with them to the interview making them  
19 unsuitable for assessing recall of feedback.

## 21 **Procedures**

### 22 *Screening*

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

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

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

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

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

#### 18 19 *Follow-up*

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

1 assessed recall and usefulness of the information, and parental experience of the feedback.

2 Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for  
3 coding by a professional transcriber blinded to feedback group.

#### 4 5 *Coding*

6 The number of pieces of information given at the feedback session were identified and defined  
7 by two authors (AMD, DAB). The first phase of the coding was developed a priori from the  
8 interview schedule, which was designed and developed prior to the study, based on the  
9 information we expected to elicit. The second phase of the coding, involving the development of  
10 specific codes and weightings, were developed after the data had been collected and researchers  
11 became familiar with the categories of responses that parents gave (Supplementary Table 1).

12 Lists of acceptable responses were developed and the coding framework was applied (initially  
13 collaboratively, then independently) to transcripts and codes compared. Discrepancies were  
14 resolved through discussion and the coding rules were finalised. The pieces of information (n =  
15 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a  
16 large number of discrete items of information to receive, the six categories were the main point  
17 of interest and the individual items were included to provide details on the type of information  
18 recalled. Scores were weighted according to their importance in the feedback interview.

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

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5 2 Coding was completed in two passes. The first pass assessed *how much* information was  
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8 3 recalled. Coders identified relevant statements on the transcript and allocated a score under one  
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10 4 or more categories. One statement could be coded in several categories (e.g., “her BMI was in  
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12 5 the overweight category” would gain a score for indicating that BMI was measured and for  
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14 6 giving the BMI result). If a piece of information was mentioned more than once, only the first  
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16 7 statement was allocated a score. As recall may be prompted by discussion that occurs later in the  
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18 8 interview, recall of the implications associated with carrying excess weight was divided by stage  
19  
20 9 of interview, into free and prompted recall (Table 1). Recall of the other five information  
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22 10 categories was not divided into free and prompted recall as the majority of relevant information  
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24 11 was recalled following question 1, and the interview was not set up to prompt exhaustively as  
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26 12 would be expected in a memory interview. Implications recalled in response to the first recall  
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28 13 question and non-specific prompts were considered free recall. Implications recalled following a  
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30 14 specific prompt or additional interview questions were considered prompted recall. The second  
31  
32 15 coding pass identified whether the information recalled was accurate or not. Each piece of  
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34 16 information identified in the first pass was compared with the transcript of the BMI feedback  
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36 17 interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview  
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38 18 transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD  
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40 19 also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter-  
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42 20 and intra-reliability were moderate to excellent<sup>30</sup> (0.48-0.96).  
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53 22 *Data analysis*  
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3 1 Linear regression was conducted to examine the overall effects of interview condition, recall  
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5 2 interviewer and time between feedback and recall interview. To examine the amount of  
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7 3 information recalled, scores were converted to a proportion of the total number of items in each  
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9 4 category and regression was used to compare the relative frequencies of information category  
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11 5 (within-subjects factor) and the interaction of feedback condition (between-subjects factor).  
12  
13 6 Accuracy was calculated as the number who correctly recalled the information from 1) just those  
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15 7 who actually mentioned each type of information and 2) from all parents. Thus accuracy for the  
16  
17 8 former calculation reflects errors of commission, whereas using the total number of parents as  
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19 9 the denominator also includes errors of omission. Accuracy was analysed using a two-group  
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21 10 difference in proportion test to detect any difference between the two feedback conditions. A  
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23 11 mixed model was used to compare recall of the meaning of results by stage of interview (within-  
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25 12 subjects factor) and feedback condition (between-subjects factor). The model included an  
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27 13 interaction term to find out whether the type of information (lifestyle changes versus  
28  
29 14 implications) was different in the MI and BPC groups. To investigate which factors are  
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31 15 associated with better recall, variables were analysed using multiple linear regression. Variables  
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33 16 with  $p < 0.2$  in the univariate model were included in the multivariate models. To adjust for  
34  
35 17 feedback condition and time between feedback and recall session, these variables were also  
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37 18 included in the multivariate models. Data were also adjusted for clustering within families given  
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39 19 that one family enrolled 3 overweight siblings and 9 families enrolled 2 siblings.  
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51 21 The larger MInT study from which this data are derived is adequately powered as it required a  
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53 22 minimum of 250 participants to detect the main outcomes of interest, with a final sample size of  
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55 23 271.<sup>24</sup> No sample size calculations were performed prior to analysis for this paper as it was a  
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1 secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College  
2 Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have  
3 presented analyses for the available data.

## 5 RESULTS

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

16 Table 4 presents the mean number of items recalled and weighted score by information category.  
17 On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they  
18 were given at the feedback session. There was no difference in total recall score by recall  
19 interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03  
20 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P =  
21 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time  
22 between interviews (days). There was a significantly higher total recall score for those in the best

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3 1 practice care condition ( $M = 6.01$ ,  $SD = 1.42$  from a total possible score of 12.5) compared with  
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5 2 the MI condition ( $M = 5.55$ ,  $SD = 1.83$ ) (difference 0.48 (95% CI 0.05 to 0.92),  $P = 0.030$ ).  
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10 4 Table 5 reports the number of people who recalled each category of information and illustrates  
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12 5 that while very few parents recalled information about their child's fat distribution (28%) or  
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14 6 blood pressure findings (21%), virtually every parent recalled that their child had a high BMI  
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16 7 (97%). However, it is clear that many parents did not know what this actually meant, whether in  
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18 8 terms of understanding the concept of these measurements (only 26% could say that BMI was a  
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20 9 measure of weight in relation to height) or, more importantly, the *implications* of a high BMI  
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22 10 (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the  
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24 11 implications of their child having a high BMI and a further 38% recalled only one of four  
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26 12 possible implications that they were told when they were given their child's BMI result. Logistic  
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28 13 regression demonstrated a significant interaction between the type of information recalled (e.g.,  
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30 14 BMI result) and feedback condition (BPC or MI) ( $P < 0.01$ ). Further examination demonstrated  
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32 15 that those in the BPC condition were more likely to report that lifestyle behaviours had been  
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34 16 discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40,  $P$   
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36 17  $< 0.01$ ), whereas the *implications* of the BMI results was more likely to be reported by those in  
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38 18 the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01  
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40 19 to 0.27,  $P = 0.02$ ).  
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51 21 Table 5 also presents the proportion of parents who correctly recalled each *type* of information.  
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53 22 As mentioned 97% ( $n = 238$ ) of parents remembered their child had a high BMI and 97% ( $n =$   
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55 23 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their  
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1 child's BP and WHtR results less often ( $n = 51 - 68$  parents). Estimates of accuracy were based  
2 on errors of commission (i.e. parents who reported the information but did so incorrectly) of  
3 which 86-97% accurately recalled the information. When we included errors of omission (i.e.,  
4 parents who left the information out of their account) then accuracy was substantially lower (19-  
5 25%). Although the number of parents recalling what high BMI meant for their child  
6 (implications) was considerably lower, those parents who did recall implications, were generally  
7 very accurate (i.e., child was overweight and were more at risk of carrying this weight into  
8 adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e.,  
9 whether the child's weight and height are in proportion for their age) was poorly understood with  
10 only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR.  
11 Interestingly, feedback condition made no difference to the accuracy of parental recall.

12  
13 Not surprisingly, there was significantly higher recall of the meaning of results following  
14 prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38),  $P <$   
15 0.01). This was particularly apparent for those in the MI group who showed a larger increase in  
16 meaning recall after prompting ( $M = 0.55$ ,  $SD = 0.45$ ) than BPC ( $M = 0.40$ ,  $SD = 0.41$ )  
17 (interaction term 0.14, 0.00 to 0.28,  $P = 0.04$ ).

18  
19 Table 6 presents the models for the association between total recall scores and predictors of  
20 interest. As the univariate models demonstrated that both time between feedback and recall  
21 session ( $P = 0.029$ ) and feedback condition ( $P = 0.030$ ) were significantly related to total recall  
22 score, only the multivariate models are discussed here. After adjustment for these two variables,  
23 mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to

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3 1 1.32) than less educated mothers, whereas no differences were observed for child ethnicity or  
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5 2 BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total  
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7 3 recall score appeared to be related to the experience of the feedback process. Having a larger  
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9 4 discrepancy between perceived and actual weight was associated with lower recall scores (-0.44,  
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11 5 -0.76 to -0.14). Conversely, understanding the information presented in the feedback process  
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13 6 (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher  
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15 7 recall scores to a similar degree. Once all significant variables were entered in multivariate  
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17 8 model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information  
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19 9 useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.  
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## 27 11 **DISCUSSION**

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29 12 Our study demonstrated that although parents were only able to recall 39% of the information  
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31 13 that was given to them at the BMI screening session, virtually all (97%) recalled that their child  
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33 14 was overweight. Our findings are consistent with previous research demonstrating that while  
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35 15 overall recall of medical information is poor,<sup>9</sup> parents are good at recalling important details such  
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37 16 as their child's diagnosis<sup>15</sup> or weight status.<sup>19</sup> In contrast, information from other categories was  
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39 17 not as readily reported and in particular, concepts were poorly understood with less than 50% of  
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41 18 parents able to accurately describe what was done. These findings are consistent with the  
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43 19 attentional narrowing hypothesis which suggests that the most salient information is attended to  
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45 20 leaving less attention for peripheral information.<sup>31</sup> Given the poor recognition of overweight in  
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47 21 children, it is likely that receiving such feedback will elicit distress in some people, which may  
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49 22 accentuate attentional narrowing.<sup>31,32</sup> However, it is important to note that the child's *actual* BMI  
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51 23 was supported by a graph that parents were able to take home, and therefore may have aided  
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3 1 recall of the key results, similar to BMI screening studies which provide results in a letter that  
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5 2 parents are able to refer back to. In contrast, the *meaning* of the BMI result was discussed in the  
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7 3 session but was not supported by a take home message. While the provision of take home written  
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9 4 information to aid recall of medical information has produced inconsistent results,<sup>7</sup> there is some  
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11 5 evidence to suggest that simple pictorial messages can aid recall.<sup>33</sup> It is also important to note  
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13 6 that unfamiliar concepts (such as the waist to height ratio measurement) were also supported by a  
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15 7 take home visual and yet were poorly recalled. This may suggest that a take home message may  
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17 8 not be sufficient to promote recall of unfamiliar concepts. Furthermore, in contrast to typical  
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19 9 healthcare appointments, the feedback was given in an environment that minimised distractions  
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21 10 (e.g., the presence of the child or other siblings), potentially optimising the ability of parents to  
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23 11 process the information being communicated.  
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32 13 Findings from the current study suggest that parents have limited capacity for processing a large  
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34 14 amount of information and although they are able to remember some key pieces of information  
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36 15 (that their child was overweight), important details were forgotten (such as why being an  
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38 16 overweight child is a concern). While it could be argued that 6 categories of information is an  
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40 17 unrealistic target, a considerable amount of time was spent within the interviews on BMI and  
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42 18 what it means for health; more than would be spent during a typical primary care consultation.  
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44 19 This has important implications for including BMI screening within routine healthcare,  
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46 20 especially if the information is unexpected. Thus health professionals need to limit the amount of  
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48 21 information given in one session, provide personalised take-home information, or use multiple  
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50 22 sessions to assess gaps in patient recall or understanding and provide clarification, especially if  
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52 23 the information is unexpected or includes unfamiliar concepts.  
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5 2 Despite our best efforts to present information to promote optimal recall and understanding,<sup>7</sup>  
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8 3 (spending a significant portion of time on the key message (BMI and health), providing pictorial  
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10 4 information and providing simple non-technical explanations),<sup>7</sup> our findings suggest that the  
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12 5 implications were poorly recalled and concepts were poorly understood. While a diagnosis is  
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14 6 important, it is not meaningful without an understanding of the implications and a clear treatment  
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16 7 pathway. This is particularly relevant in primary care, where doctors are often reluctant<sup>34</sup> to  
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18 8 discuss childhood overweight and unsure how to communicate this information to families.<sup>35</sup>  
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20 9 This may inadvertently lead to ambiguous information or brief communication, making it easy  
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22 10 for parents to become confused about the messages they are being given, particularly if the  
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24 11 information conflicts with parental beliefs. Poor understanding also has implications for the  
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26 12 transfer of this information beyond the direct medical setting and into the child's wider context.  
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28 13 For example, if parents are unable to understand what their child's results mean, there is the  
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30 14 potential for miscommunication with significant people in the child's life who might need to be  
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32 15 involved in changing lifestyle factors.  
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41 17 Literature examining parental recall of child weight status information is very limited<sup>19,20,36</sup> and  
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43 18 no studies appear to have assessed recall and understanding of BMI information and related  
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45 19 concepts following a targeted face-to-face interview. Johnson and colleagues<sup>19</sup> investigated  
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47 20 parent reactions to a screening program and included measures of recall of the information  
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49 21 provided in a BMI results letter. Consistent with the current study, important information was  
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51 22 recalled well (e.g., 94% of the parents recalled their child's weight category), and other details  
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53 23 were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were  
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1 lower than that observed in the current study. This may have arisen because of different methods  
2 of informing parents (letter versus face-to-face) or due to the more stringent accuracy  
3 classification used by Johnson et al.<sup>19</sup>

4  
5 Although it may seem surprising that parents receiving BPC feedback were able to remember  
6 more than those who received MI, more structured and specific information is more likely to be  
7 remembered.<sup>7,37</sup> The BPC interview was highly structured and the advice given to parents to  
8 achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the  
9 MI session, reflecting the intention of MI,<sup>38</sup> was not structured, with research assistants  
10 intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC  
11 sessions it is also possible that the additional time spent on the exploration of the meaning and  
12 implication of results took focus away from the central details of the message, resulting in lower  
13 recall of the information.

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

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3 1 benefit from assessing parents' expectations, concerns and current knowledge, to assist in  
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6 2 prioritising and explaining results that may not align with these.  
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10 4 This study examined recall and understanding in a large sample of families with overweight  
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13 5 children. This study was not originally constructed to assess parental memory, and as such it was  
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15 6 not set up to exhaustively prompt parents for complete recall. It is possible that had we  
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17 7 interviewed differently, parents may have recalled more information. However, much of the  
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20 8 information used in this interview was based on free recall, which is particularly relevant in this  
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22 9 context as it likely reflects the information that is most salient and easily accessible to parents.  
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27 11 In summary, our findings appear to be the first to examine parental recall of BMI and growth  
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29 12 information following a BMI screening and face-to-face feedback session. While our results  
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31 13 suggest that parents were able to remember their child's overweight diagnosis very well, 61% of  
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34 14 the information was forgotten. This finding suggests that the inclusion of BMI screening within  
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36 15 current appointments may negatively impact parental ability to remember and understand this  
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39 16 information. In addition, the way that the information is given, and parental education, values  
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41 17 and expectations, were associated with recall of the information and therefore suggest that health  
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44 18 professionals need to be aware of these factors when discussing results with parents.  
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## 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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6  
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12 **COMPETING INTERESTS:** The authors have no conflicts of interest relevant to this article to  
13  
14 disclose.  
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19 **ETHICAL APPROVAL:** Ethical approval was obtained from the Lower Regional South Ethics  
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21 Committee (LRS/09/09/039).  
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27 **DATA SHARING STATEMENT:** No additional data are available.  
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**Table 1.** Recall interview questions

<b>Free recall question</b>	
1.	What information were you given about your child's growth?
<b>Non-specific prompts</b>	
	Were you given any other information about your child at the initial session? Tell me more about that... What information were you given?
<b>Specific prompt for implications</b>	
2.	What were you told that the information means for him/her?
<b>Additional interview questions – prompted recall</b>	
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) <sup>†</sup>
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity <sup>a</sup> 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) <sup>†</sup>
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19) <sup>†</sup>
Household deprivation <sup>b</sup>		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years) <sup>c</sup>		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education <sup>d</sup>	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) <sup>†</sup>
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64) <sup>†</sup>
Maternal BMI <sup>e</sup> (kg/m <sup>2</sup> )		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<sup>a</sup>, 9<sup>b</sup>, 9<sup>c</sup>, 3<sup>d</sup> and 13<sup>e</sup> participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as \*difference or <sup>†</sup>odds ratios as shown.

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

Information category	Total sample (n = 244)		MI	BPC
	Number of items m (SD)	Weighted scores m (SD)	(n = 121)	(n = 122)
			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

Information category	Total recall (%)			<sup>1</sup> Correct recall (%)			<sup>2</sup> Correct recall (%)		
	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
<b>Results</b>									
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)
<b>Meaning of results</b>									
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)	-	-	-	-	-	-
<b>Concepts discussed</b>									
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)

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3 Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition.

4  
5 For correct recall, percentages are calculated from <sup>1</sup>only from those who recalled the information (errors of comission) and <sup>2</sup>the total  
6  
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8 sample (errors of omission).  
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10 Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio  
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**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 <sup>†</sup>	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree <sup>†</sup>	0.82 (0.27 to 1.38)*	0.76 (0.20 to 1.32)*	0.81 (0.25 to 1.37)*
Ethnicity			
Maori <sup>††</sup>	-0.61 (-1.17 to -0.05)*	-0.52 (-1.09 to 0.04)	
Pacific <sup>††</sup>	-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)

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Feedback condition	0.48 (0.05 to 0.92)*	0.28 (-0.18 to 0.73)
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$\beta$  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
<b>Title and abstract</b>			
	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
<b>Introduction</b>			
<b>Background and objectives</b>			
	2a	Scientific background and explanation of rationale	6-7
	2b	Specific objectives or hypotheses	7
<b>Methods</b>			
<b>Trial design</b>			
	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
<b>Participants</b>			
	4a	Eligibility criteria for participants	8
	4b	Settings and locations where the data were collected	8
<b>Interventions</b>			
	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	8-10
<b>Outcomes</b>			
	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
<b>Sample size</b>			
	7a	How sample size was determined	Ref 23
	7b	When applicable, explanation of any interim analyses and stopping guidelines	N/A
<b>Randomisation:</b>			
<b>Sequence generation</b>			
	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
<b>Allocation concealment mechanism</b>			
	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
<b>Implementation</b>			
	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	Ref 24
<b>Blinding</b>			
	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those	Ref 24

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2		assessing outcomes) and how	
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4		11b If relevant, description of the similarity of interventions	N/A
5	Statistical methods	12a Statistical methods used to compare groups for primary and secondary outcomes	12-13
6		12b Methods for additional analyses, such as subgroup analyses and adjusted analyses	N/A
7			
8	Results		
9	Participant flow (a	13a For each group, the numbers of participants who were randomly assigned, received intended treatment, and	8
10	diagram is strongly	were analysed for the primary outcome	
11	recommended)	13b For each group, losses and exclusions after randomisation, together with reasons	8
12	Recruitment	14a Dates defining the periods of recruitment and follow-up	Ref 24
13		14b Why the trial ended or was stopped	N/A
14			
15	Baseline data	15 A table showing baseline demographic and clinical characteristics for each group	Ref 24 – or could be added as web only
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20	Numbers analysed	16 For each group, number of participants (denominator) included in each analysis and whether the analysis was	Tables 3 & 4
21		by original assigned groups	
22	Outcomes and	17a For each primary and secondary outcome, results for each group, and the estimated effect size and its	Tables
23	estimation	precision (such as 95% confidence interval)	
24		17b For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
25	Ancillary analyses	18 Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing	N/A
26		pre-specified from exploratory	
27			
28	Harms	19 All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
29			
30	Discussion		
31	Limitations	20 Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
32	Generalisability	21 Generalisability (external validity, applicability) of the trial findings	16-17
33	Interpretation	22 Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17-19
34			
35	<b>Other information</b>		
36	Registration	23 Registration number and name of trial registry	4
37	Protocol	24 Where the full trial protocol can be accessed, if available	7
38	Funding	25 Sources of funding and other support (such as supply of drugs), role of funders	20
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44	CONSORT 2010 checklist		
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2 \*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  
3 recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials.  
4 Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see [www.consort-statement.org](http://www.consort-statement.org).  
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For peer review only

# BMJ Open

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

Journal:	<i>BMJ Open</i>
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<b>Primary Subject Heading</b>:	Paediatrics
Secondary Subject Heading:	Public health
Keywords:	BMI screening, Parental recall, Memory, Health information, Overweight

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3 **Do parents recall and understand children's weight status information after BMI**  
4 **screening? A Randomised Controlled Trial.**  
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52 **Word count:** 4,037  
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54 **Short title:** Parental recall of weight feedback  
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56 **Key words:** BMI screening; parental recall; memory; health information; overweight  
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1

2 **ABSTRACT**

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

7 **Design:** Randomised controlled trial of different methods of feedback.

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

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

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

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

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3 1 they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in  
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6 2 multivariate analyses.

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8 3 **Conclusions:** While parents remember that their child's BMI is higher than recommended, they  
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10 4 are unable to remember much of the information and advice provided about the result.  
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15 6 **CLINICAL TRIAL REGISTRATION:** Australian New Zealand Clinical Trials Registry  
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3 **1 ARTICLE SUMMARY**  
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6 **2 Strengths and limitations of this study**  
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- 8 • First study to assess what parents remember and understand from a 20-40 minute face-to-  
9 face session dedicated to discussing the weight status of their child  
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13 • Recall and accuracy were studied extensively through the use of transcripts which were  
14 transcribed verbatim and coding according to an extensive coding schedule  
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17 • Large (n = 244), demographically diverse sample of overweight children and their  
18 parents  
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22 • Not originally designed to specifically test parental memory, and thus exhaustively  
23 prompt parents for complete recall  
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## 1 INTRODUCTION

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

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

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

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6 2 In the context of screening for overweight in children, it would appear that parents can recall  
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8 3 important information, such as their child's weight status following a posted letter.<sup>19</sup> However,  
9  
10 4 understanding of the results and BMI charts and/or percentiles is very low.<sup>20</sup> To date, most  
11  
12 5 evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a  
13  
14 6 few studies<sup>20-22</sup> have assessed whether parents *understand* BMI charts and percentiles, and none  
15  
16 7 have done so after receiving BMI results in a face-to-face consultation, as would occur in a  
17  
18 8 primary care setting. This is an important distinction as it may be that a letter of results provides  
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20 9 an enduring memory cue or resource which enables parents to better retain the information and  
21  
22 10 refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding  
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24 11 given the opportunity to discuss the results and ask questions, thereby strengthening encoding of  
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26 12 the information and creating stronger recall.  
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34 14 We recently examined whether motivational interviewing was an appropriate way of informing  
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36 15 parents that their young child was overweight following BMI screening.<sup>23, 24</sup> Parents attended a  
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38 16 second session two weeks later providing the opportunity for us to examine how well they  
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40 17 recalled the information given in this face-to-face feedback session. Specifically, we examined  
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42 18 how much information parents could recall from the BMI screening session, which types of  
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44 19 information were more likely to be recalled, the accuracy of parental recall and how recall varied  
45  
46 20 according to feedback style. Factors that may predict better recall performance were also  
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48 21 explored. This manuscript represents a secondary data analysis from our main trial.<sup>24</sup> While  
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50 22 recall was not specified *a priori* as a variable of interest, it was considered a component of how  
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52 23 well parents understood the feedback process.<sup>23</sup>  
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## SUBJECTS AND METHODS

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

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11

### Participants

12 1093 children between the ages of 4 and 8 years, recruited from local primary care practices and  
13 secondary care clinics in Dunedin, New Zealand were screened for overweight at a University  
14 research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered  
15 using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553)  
16 using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for  
17 practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.<sup>24</sup>  
18 Only those parents with overweight children (BMI  $\geq$  85<sup>th</sup> percentile)<sup>25</sup> were eligible for the  
19 current study (n = 271, Figure 1). These parents were invited to participate in a recall interview  
20 at the University approximately two weeks later to discuss the feedback they received about their  
21 child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview.  
22 A further seven participants were excluded due to technical difficulties with audio recordings (n

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

## 4 **Procedures**

### 5 *Screening*

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



1 physical activity, fruit and vegetable intake) as reported by parents, as well as current New  
2 Zealand guidelines for these behaviours.<sup>28</sup>

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

13  
14 BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that  
15 the primary focus of the BPC interview was on anthropometric results and discussion of the  
16 lifestyle behaviours. Interviews typically lasted 15 minutes.

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

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2 *Follow-up*

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

10

11 *Coding*

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

1 recalled. Scores were weighted according to their importance in the feedback interview.

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

7  
8 Coding was completed in two passes. The first pass assessed *how much* information was  
9 recalled. Coders identified relevant statements on the transcript and allocated a score under one  
10 or more categories. One statement could be coded in several categories (e.g., “her BMI was in  
11 the overweight category” would gain a score for indicating that BMI was measured and for  
12 giving the BMI result). If a piece of information was mentioned more than once, only the first  
13 statement was allocated a score. As recall may be prompted by discussion that occurs later in the  
14 interview, recall of the implications associated with carrying excess weight was divided by stage  
15 of interview, into free and prompted recall (Table 1). Recall of the other five information  
16 categories was not divided into free and prompted recall as the majority of relevant information  
17 was recalled following question 1, and the interview was not set up to prompt exhaustively as  
18 would be expected in a memory interview. Implications recalled in response to the first recall  
19 question and non-specific prompts were considered free recall. Implications recalled following a  
20 specific prompt or additional interview questions were considered prompted recall. The second  
21 coding pass identified whether the information recalled was accurate or not. Each piece of  
22 information identified in the first pass was compared with the transcript of the BMI feedback  
23 interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview

1 transcript was coded by coder 1 (AMD) and 25% (n = 60) were coded by coder 2 (DAB). AMD  
2 also recoded a subset of the interviews (12%, n = 30) to check for drift. Kappa values for inter-  
3 and intra-reliability were moderate to excellent<sup>30</sup> (0.48-0.96).  
4

#### 5 *Data analysis*

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

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

3  
4 The larger MInT study from which this data are derived is adequately powered as it required a  
5 minimum of 250 participants to detect the main outcomes of interest, with a final sample size of  
6 271.<sup>24</sup> No sample size calculations were performed prior to analysis for this paper as it was a  
7 secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College  
8 Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have  
9 presented analyses for the available data.

## 11 RESULTS

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

1 Table 4 presents the mean number of items recalled and weighted score by information category.  
2 On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they  
3 were given at the feedback session. There was no difference in total recall score by recall  
4 interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03  
5 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview ( $P =$   
6 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time  
7 between interviews (days). There was a significantly higher total recall score for those in the best  
8 practice care condition ( $M = 6.01$ ,  $SD = 1.42$  from a total possible score of 12.5) compared with  
9 the MI condition ( $M = 5.55$ ,  $SD = 1.83$ ) (difference 0.48 (95% CI 0.05 to 0.92),  $P = 0.030$ ).

11 Table 5 reports the number of people who recalled each category of information and illustrates  
12 that while very few parents recalled information about their child's fat distribution (28%) or  
13 blood pressure findings (21%), virtually every parent recalled that their child had a high BMI  
14 (97%). However, it is clear that many parents did not know what this actually meant, whether in  
15 terms of understanding the concept of these measurements (only 26% could say that BMI was a  
16 measure of weight in relation to height) or, more importantly, the *implications* of a high BMI  
17 (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the  
18 implications of their child having a high BMI and a further 38% recalled only one of four  
19 possible implications that they were told when they were given their child's BMI result. Logistic  
20 regression demonstrated a significant interaction between the type of information recalled (e.g.,  
21 BMI result) and feedback condition (BPC or MI) ( $P < 0.01$ ). Further examination demonstrated  
22 that those in the BPC condition were more likely to report that lifestyle behaviours had been  
23 discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40,  $P$

1 < 0.01), whereas the *implications* of the BMI results was more likely to be reported by those in  
2 the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01  
3 to 0.27, P = 0.02).

4  
5 Table 5 also presents the proportion of parents who correctly recalled each *type* of information.  
6 As mentioned 97% (n = 238) of parents remembered their child had a high BMI and 97% (n =  
7 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their  
8 child's BP and WHtR results less often (n = 51 - 68 parents). Estimates of accuracy were based  
9 on errors of commission (i.e. parents who reported the information but did so incorrectly) of  
10 which 86-97% accurately recalled the information. When we included errors of omission (i.e.,  
11 parents who left the information out of their account) then accuracy was substantially lower (19-  
12 25%). Although the number of parents recalling what high BMI meant for their child  
13 (implications) was considerably lower, those parents who did recall implications, were generally  
14 very accurate (i.e., child was overweight and were more at risk of carrying this weight into  
15 adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e.,  
16 whether the child's weight and height are in proportion for their age) was poorly understood with  
17 only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR.  
18 Interestingly, feedback condition made no difference to the accuracy of parental recall.  
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20 Not surprisingly, there was significantly higher recall of the meaning of results following  
21 prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P <  
22 0.01). This was particularly apparent for those in the MI group who showed a larger increase in

1 meaning recall after prompting ( $M = 0.55$ ,  $SD = 0.45$ ) than BPC ( $M = 0.40$ ,  $SD = 0.41$ )  
2 (interaction term 0.14, 0.00 to 0.28,  $P = 0.04$ ).  
3

4 Table 6 presents the models for the association between total recall scores and predictors of  
5 interest. As the univariate models demonstrated that both time between feedback and recall  
6 session ( $P = 0.029$ ) and feedback condition ( $P = 0.030$ ) were significantly related to total recall  
7 score, only the multivariate models are discussed here. After adjustment for these two variables,  
8 mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to  
9 1.32) than less educated mothers, whereas no differences were observed for child ethnicity or  
10 BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total  
11 recall score appeared to be related to the experience of the feedback process. Having a larger  
12 discrepancy between perceived and actual weight was associated with lower recall scores (-0.44,  
13 -0.76 to -0.14). Conversely, understanding the information presented in the feedback process  
14 (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher  
15 recall scores to a similar degree. Once all significant variables were entered in multivariate  
16 model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information  
17 useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.  
18

## 19 DISCUSSION

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



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

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

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3 1 overweight child is a concern). While it could be argued that 6 categories of information is an  
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5 2 unrealistic target, a considerable amount of time was spent within the interviews on BMI and  
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7 3 what it means for health; more than would be spent during a typical primary care consultation.  
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10 4 This has important implications for including BMI screening within routine healthcare,  
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12 5 especially if the information is unexpected. Thus health professionals need to limit the amount of  
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14 6 information given in one session, provide personalised take-home information, or use multiple  
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16 7 sessions to assess gaps in patient recall or understanding and provide clarification, especially if  
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18 8 the information is unexpected or includes unfamiliar concepts.  
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24 10 Despite our best efforts to present information to promote optimal recall and understanding,<sup>7</sup>  
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26 11 (spending a significant portion of time on the key message (BMI and health), providing pictorial  
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28 12 information and providing simple non-technical explanations),<sup>7</sup> our findings suggest that the  
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30 13 implications were poorly recalled and concepts were poorly understood. While a diagnosis is  
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32 14 important, it is not meaningful without an understanding of the implications and a clear treatment  
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34 15 pathway. This is particularly relevant in primary care, where doctors are often reluctant<sup>34</sup> to  
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36 16 discuss childhood overweight and unsure how to communicate this information to families.<sup>35</sup>  
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38 17 This may inadvertently lead to ambiguous information or brief communication, making it easy  
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40 18 for parents to become confused about the messages they are being given, particularly if the  
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42 19 information conflicts with parental beliefs. Poor understanding also has implications for the  
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44 20 transfer of this information beyond the direct medical setting and into the child's wider context.  
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46 21 For example, if parents are unable to understand what their child's results mean, there is the  
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48 22 potential for miscommunication with significant people in the child's life who might need to be  
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50 23 involved in changing lifestyle factors.  
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5 2 Literature examining parental recall of child weight status information is very limited<sup>19,20,36</sup> and  
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8 3 no studies appear to have assessed recall and understanding of BMI information and related  
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10 4 concepts following a targeted face-to-face interview. Johnson and colleagues<sup>19</sup> investigated  
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12 5 parent reactions to a screening program and included measures of recall of the information  
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14 6 provided in a BMI results letter. Consistent with the current study, important information was  
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16 7 recalled well (e.g., 94% of the parents recalled their child's weight category), and other details  
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18 8 were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were  
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20 9 lower than that observed in the current study. This may have arisen because of different methods  
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22 10 of informing parents (letter versus face-to-face) or due to the more stringent accuracy  
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24 11 classification used by Johnson et al.<sup>19</sup>  
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13 Although it may seem surprising that parents receiving BPC feedback were able to remember  
14 more than those who received MI, more structured and specific information is more likely to be  
15 remembered.<sup>7,37</sup> The BPC interview was highly structured and the advice given to parents to  
16 achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the  
17 MI session, reflecting the intention of MI,<sup>38</sup> was not structured, with research assistants  
18 intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC  
19 sessions it is also possible that the additional time spent on the exploration of the meaning and  
20 implication of results took focus away from the central details of the message, resulting in lower  
21 recall of the information.

22

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

12  
13 This study examined recall and understanding in a large sample of families with overweight  
14 children. This study was not originally constructed to assess parental memory, and as such it was  
15 not set up to exhaustively prompt parents for complete recall. It is possible that had we  
16 interviewed differently, parents may have recalled more information. However, much of the  
17 information used in this interview was based on free recall, which is particularly relevant in this  
18 context as it likely reflects the information that is most salient and easily accessible to parents.

19  
20 In summary, our findings appear to be the first to examine parental recall of BMI and growth  
21 information following a BMI screening and face-to-face feedback session. While our results  
22 suggest that parents were able to remember their child's overweight diagnosis very well, 61% of  
23 the information was forgotten. This finding suggests that the inclusion of BMI screening within

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3 1 current appointments may negatively impact parental ability to remember and understand this  
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6 2 information. In addition, the way that the information is given, and parental education, values  
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8 3 and expectations, were associated with recall of the information and therefore suggest that health  
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10 4 professionals need to be aware of these factors when discussing results with parents  
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## 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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12 Committee (LRS/09/09/039).  
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17 **DATA SHARING STATEMENT:** No additional data are available.  
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**Table 1.** Recall interview questions

<b>Free recall question</b>	
1.	What information were you given about your child's growth?
<b>Non-specific prompts</b>	
	Were you given any other information about your child at the initial session? Tell me more about that... What information were you given?
<b>Specific prompt for implications</b>	
2.	What were you told that the information means for him/her?
<b>Additional interview questions – prompted recall</b>	
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) <sup>†</sup>
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity <sup>a</sup> 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) <sup>†</sup>
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19) <sup>†</sup>
Household deprivation <sup>b</sup>		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years) <sup>c</sup>		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education <sup>d</sup>	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) <sup>†</sup>
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64) <sup>†</sup>
Maternal BMI <sup>e</sup> (kg/m <sup>2</sup> )		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<sup>a</sup>, 9<sup>b</sup>, 9<sup>c</sup>, 3<sup>d</sup> and 13<sup>e</sup> participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as \*difference or <sup>†</sup>odds ratios as shown.

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

Information category	Total sample (n = 244)		MI	BPC
	Number of items m (SD)	Weighted scores m (SD)	(n = 121)	(n = 122)
			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

Information category	Total recall (%)			<sup>1</sup> Correct recall (%)			<sup>2</sup> Correct recall (%)		
	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
<b>Results</b>									
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)
<b>Meaning of results</b>									
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)	-	-	-	-	-	-
<b>Concepts discussed</b>									
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)



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3 Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition.  
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5 For correct recall, percentages are calculated from <sup>1</sup>only from those who recalled the information (errors of commission) and <sup>2</sup>the total  
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7 sample (errors of omission).  
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10 Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio  
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**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 <sup>†</sup>	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree <sup>†</sup>	0.82 (0.27 to 1.38)*	0.76 (0.20 to 1.32)*	0.81 (0.25 to 1.37)*
Ethnicity			
Maori <sup>††</sup>	-0.61 (-1.17 to -0.05)*	-0.52 (-1.09 to 0.04)	
Pacific <sup>††</sup>	-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)

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

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4 **screening? A Randomised Controlled Trial.**  
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57 **Key words:** BMI screening; parental recall; memory; health information; overweight  
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3 **1 ABSTRACT**  
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5 **2 Objectives:** As parents of young children are often unaware their child is overweight, screening  
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7 provides the opportunity to inform parents and provide the impetus for behaviour change. We  
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9 aimed to determine if parents could recall and understand the information they received about  
10  
11 their overweight child after weight screening.  
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14 **6 Design:** Randomised controlled trial of different methods of feedback.  
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17 **7 Setting:** Participants were recruited through primary and secondary care but appointments took  
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19 place at a University research clinic.  
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22 **9 Participants and intervention:** 1093 children aged 4-8 years were screened. Only overweight  
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24 children (n = 271, 24.7%) are included in this study. Parents of overweight children were  
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26 randomised to receive feedback regarding their child's weight using best practice care (BPC) or  
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28 motivational interviewing (MI) as face-to-face interviews typically lasting 20-40 minutes. Two  
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30 hundred and forty-four (90%) parents participated in a follow-up interview two weeks later to  
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32 assess recall and understanding of information from the feedback session.  
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36 **15 Primary and secondary outcome measures:** Interviews were audio-taped and transcribed  
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38 verbatim before coding for amount and accuracy of recall. Scores were calculated for total recall  
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40 and sub-categories of interest.  
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43 **18 Results:** Overall, 39% of the information was recalled (mean score 6.3 from possible score of  
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45 16). Parents given feedback via BPC recalled more than those in the MI group (difference in  
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47 total score 0.48; 95% CI 0.05 to 0.92). Although 94% of parents were able to correctly recall  
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49 their child's weight status, fewer than 10 parents could accurately describe what the  
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51 measurements meant. Maternal education (0.81; 0.25 to 1.37) and parental ratings of how useful  
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1 they found the information (0.19; 0.04 to 0.35) were significant predictors of recall score in  
2 multivariate analyses.

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

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6 **CLINICAL TRIAL REGISTRATION:** Australian New Zealand Clinical Trials Registry  
7 ACTRN12609000749202

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3 1 **ARTICLE SUMMARY**  
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6 2 **Strengths and limitations of this study**  
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- 8 3 • First study to assess what parents remember and understand from a 20-40 minute face-to-  
9 face session dedicated to discussing the weight status of their child  
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11  
12 5 • Recall and accuracy were studied extensively through the use of transcripts which were  
13 transcribed verbatim and coding according to an extensive coding schedule  
14 6  
15 7 • Large (n = 244), demographically diverse sample of overweight children and their  
16 parents  
17 8  
18 9 • Not originally designed to specifically test parental memory, and thus exhaustively  
19 prompt parents for complete recall  
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## 1 INTRODUCTION

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

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

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



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5 2 In the context of screening for overweight in children, it would appear that parents can recall  
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7 3 important information, such as their child's weight status following a posted letter.<sup>19</sup> However,  
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9 4 understanding of the results and BMI charts and/or percentiles is very low.<sup>20</sup> To date, most  
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11 5 evaluations of BMI screening simply measure whether parents recall receiving the letter. Only a  
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13 6 few studies<sup>20-22</sup> have assessed whether parents *understand* BMI charts and percentiles, and none  
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15 7 have done so after receiving BMI results in a face-to-face consultation, as would occur in a  
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17 8 primary care setting. This is an important distinction as it may be that a letter of results provides  
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19 9 an enduring memory cue or resource which enables parents to better retain the information and  
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21 10 refer to it if need be. Alternatively, a face-to-face session may enhance recall and understanding  
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23 11 given the opportunity to discuss the results and ask questions, thereby strengthening encoding of  
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25 12 the information and creating stronger recall.  
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34 14 We recently examined whether motivational interviewing was an appropriate way of informing  
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36 15 parents that their young child was overweight following BMI screening.<sup>23, 24</sup> Parents attended a  
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38 16 second session two weeks later providing the opportunity for us to examine how well they  
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40 17 recalled the information given in this face-to-face feedback session. Specifically, we examined  
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42 18 how much information parents could recall from the BMI screening session, which types of  
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44 19 information were more likely to be recalled, the accuracy of parental recall and how recall varied  
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46 20 according to feedback style. Factors that may predict better recall performance were also  
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48 21 explored. This manuscript represents a secondary data analysis from our main trial.<sup>24</sup> While  
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50 22 recall was not specified *a priori* as a variable of interest, it was considered a component of how  
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52 23 well parents understood the feedback process.<sup>23</sup>  
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## 2 SUBJECTS AND METHODS

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

10

### 11 Participants

12 1093 children between the ages of 4 and 8 years, recruited from local primary care practices and  
13 secondary care clinics in Dunedin, New Zealand were screened for overweight at a University  
14 research clinic. Parents were randomised to receive feedback (phase 1, screening) delivered  
15 using a best practice care (BPC) (n = 540) or motivational interviewing (MI) approach (n = 553)  
16 using random block lengths (STATA 12.0, StataCorp, College Station, TX) after stratifying for  
17 practice, with sealed, opaque envelopes. Participants were blinded to randomisation condition.<sup>24</sup>  
18 Only those parents with overweight children (BMI  $\geq$  85<sup>th</sup> percentile)<sup>25</sup> were eligible for the  
19 current study (n = 271, Figure 1). These parents were invited to participate in a recall interview  
20 at the University approximately two weeks later to discuss the feedback they received about their  
21 child's growth (phase 1, *follow-up*). Twenty parents declined participation in the recall interview.  
22 A further seven participants were excluded due to technical difficulties with audio recordings (n

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

## 4 **Procedures**

### 5 *Screening*

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

1 physical activity, fruit and vegetable intake) as reported by parents, as well as current New  
2 Zealand guidelines for these behaviours.<sup>28</sup>

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

13  
14 BPC feedback condition: Researchers gave generic advice about healthy lifestyles meaning that  
15 the primary focus of the BPC interview was on anthropometric results and discussion of the  
16 lifestyle behaviours. Interviews typically lasted 15 minutes.

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

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6 2 *Follow-up*  
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8 3 The recall interview took place approximately two weeks after the screening and feedback  
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10 4 session and an independent interviewer (n = 3), not involved in the feedback process,  
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12 5 interviewed the parents. Parents repeated aspects of the BMI screening questionnaire and  
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14 6 completed a semi-structured interview (questions are presented in Table 1). In summary, these  
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16 7 assessed recall and usefulness of the information, and parental experience of the feedback.  
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18 8 Interviews lasted approximately 10-15 minutes and were audio recorded and later transcribed for  
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20 9 coding by a professional transcriber blinded to feedback group.  
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### 27 11 *Coding*

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29 12 The number of pieces of information given at the feedback session were identified and defined  
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31 13 by two authors (AMD, DAB). The first phase of the coding was developed a priori from the  
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33 14 interview schedule, which was designed and developed prior to the study, based on the  
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35 15 information we expected to elicit. The second phase of the coding, involving the development of  
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37 16 specific codes and weightings, were developed after the data had been collected and researchers  
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39 17 became familiar with the categories of responses that parents gave (Supplementary Table 1).  
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41 18 Lists of acceptable responses were developed and the coding framework was applied (initially  
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43 19 collaboratively, then independently) to transcripts and codes compared. Discrepancies were  
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45 20 resolved through discussion and the coding rules were finalised. The pieces of information (n =  
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47 21 16), information categories (n = 6) and definitions are presented in Table 2. Although 16 is a  
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49 22 large number of discrete items of information to receive, the six categories were the main point  
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51 23 of interest and the individual items were included to provide details on the type of information  
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1 recalled. Scores were weighted according to their importance in the feedback interview.  
2 Weighting decisions were made through author discussion of the most important clinical  
3 messages delivered to parents. For example, the main result discussed was BMI, therefore this  
4 was allocated the highest weighting of 4 from a maximum of 12.5. Only the weighted figures  
5 were used in analyses presented here but results did not differ whether weighted or unweighted  
6 scores were used (data not shown).

7  
8 Coding was completed in two passes. The first pass assessed *how much* information was  
9 recalled. Coders identified relevant statements on the transcript and allocated a score under one  
10 or more categories. One statement could be coded in several categories (e.g., “her BMI was in  
11 the overweight category” would gain a score for indicating that BMI was measured and for  
12 giving the BMI result). If a piece of information was mentioned more than once, only the first  
13 statement was allocated a score. As recall may be prompted by discussion that occurs later in the  
14 interview, recall of the implications associated with carrying excess weight was divided by stage  
15 of interview, into free and prompted recall (Table 1). Recall of the other five information  
16 categories was not divided into free and prompted recall as the majority of relevant information  
17 was recalled following question 1, and the interview was not set up to prompt exhaustively as  
18 would be expected in a memory interview. Implications recalled in response to the first recall  
19 question and non-specific prompts were considered free recall. Implications recalled following a  
20 specific prompt or additional interview questions were considered prompted recall. The second  
21 coding pass identified whether the information recalled was accurate or not. Each piece of  
22 information identified in the first pass was compared with the transcript of the BMI feedback  
23 interview (ie. what was really discussed) and coded as correct or incorrect. Each recall interview

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

#### 4 5 *Data analysis*

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

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

3  
4 The larger MInT study from which this data are derived is adequately powered as it required a  
5 minimum of 250 participants to detect the main outcomes of interest, with a final sample size of  
6 271.<sup>24</sup> No sample size calculations were performed prior to analysis for this paper as it was a  
7 secondary data analysis. All data were analysed using Stata 13.1 [43] (StataCorp, College  
8 Station, TX, USA). As missing data were less than 1.5% (43 of 2928 data points) we have  
9 presented analyses for the available data.

## 11 RESULTS

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



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3 1 Table 4 presents the mean number of items recalled and weighted score by information category.  
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5 2 On average, participants recalled only 6.3 out of the 16 (39%) pieces of information that they  
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7 3 were given at the feedback session. There was no difference in total recall score by recall  
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9 4 interviewer (difference, 95% CI: 0.37, -0.16 to 0.44), but total recall score decreased by 0.03  
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11 5 (95% CI -0.05 to -0.004) for each extra day between the feedback and recall interview (P =  
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13 6 0.029). Therefore, analyses have been adjusted for feedback condition (MI or BPC) and time  
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15 7 between interviews (days). There was a significantly higher total recall score for those in the best  
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17 8 practice care condition ( $M = 6.01$ ,  $SD = 1.42$  from a total possible score of 12.5) compared with  
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19 9 the MI condition ( $M = 5.55$ ,  $SD = 1.83$ ) (difference 0.48 (95% CI 0.05 to 0.92),  $P = 0.030$ ).  
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27 11 Table 5 reports the number of people who recalled each category of information and illustrates  
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29 12 that while very few parents recalled information about their child's fat distribution (28%) or  
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31 13 blood pressure findings (21%), virtually every parent recalled that their child had a high BMI  
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33 14 (97%). However, it is clear that many parents did not know what this actually meant, whether in  
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35 15 terms of understanding the concept of these measurements (only 26% could say that BMI was a  
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37 16 measure of weight in relation to height) or, more importantly, the *implications* of a high BMI  
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39 17 (such as carrying excess weight into adolescence). Fifteen percent of parents had no idea of the  
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41 18 implications of their child having a high BMI and a further 38% recalled only one of four  
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43 19 possible implications that they were told when they were given their child's BMI result. Logistic  
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45 20 regression demonstrated a significant interaction between the type of information recalled (e.g.,  
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47 21 BMI result) and feedback condition (BPC or MI) ( $P < 0.01$ ). Further examination demonstrated  
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49 22 that those in the BPC condition were more likely to report that lifestyle behaviours had been  
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51 23 discussed (mean difference in score 0.27 from total possible score of 1.0, 95% CI 0.14 to 0.40,  $P$   
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1 < 0.01), whereas the *implications* of the BMI results was more likely to be reported by those in  
2 the MI condition (mean difference in score 0.14 from a total possible score of 2.0, 95% CI 0.01  
3 to 0.27, P = 0.02).

4  
5 Table 5 also presents the proportion of parents who correctly recalled each *type* of information.  
6 As mentioned 97% (n = 238) of parents remembered their child had a high BMI and 97% (n =  
7 230) of these or 94% of parents overall were accurate in their recollection. Parents recalled their  
8 child's BP and WHtR results less often (n = 51 - 68 parents). Estimates of accuracy were based  
9 on errors of commission (i.e. parents who reported the information but did so incorrectly) of  
10 which 86-97% accurately recalled the information. When we included errors of omission (i.e.,  
11 parents who left the information out of their account) then accuracy was substantially lower (19-  
12 25%). Although the number of parents recalling what high BMI meant for their child  
13 (implications) was considerably lower, those parents who did recall implications, were generally  
14 very accurate (i.e., child was overweight and were more at risk of carrying this weight into  
15 adolescence), being correct 83-97% of the time. By contrast, the *concept* of BMI or WHtR (i.e.,  
16 whether the child's weight and height are in proportion for their age) was poorly understood with  
17 only 7 parents correctly recalling the concept of BMI and 3 parents correctly recalling WHtR.  
18 Interestingly, feedback condition made no difference to the accuracy of parental recall.  
19  
20 Not surprisingly, there was significantly higher recall of the meaning of results following  
21 prompting (mean difference 0.28 from a total possible score of 2, 95% CI 0.18 to 0.38), P <  
22 0.01). This was particularly apparent for those in the MI group who showed a larger increase in

1 meaning recall after prompting ( $M = 0.55$ ,  $SD = 0.45$ ) than BPC ( $M = 0.40$ ,  $SD = 0.41$ )  
2 (interaction term 0.14, 0.00 to 0.28,  $P = 0.04$ ).  
3

4 Table 6 presents the models for the association between total recall scores and predictors of  
5 interest. As the univariate models demonstrated that both time between feedback and recall  
6 session ( $P = 0.029$ ) and feedback condition ( $P = 0.030$ ) were significantly related to total recall  
7 score, only the multivariate models are discussed here. After adjustment for these two variables,  
8 mothers with a university education had higher recall scores (difference, 95% CI: 0.76, 0.20 to  
9 1.32) than less educated mothers, whereas no differences were observed for child ethnicity or  
10 BMI z-score, maternal age or maternal BMI. Most variables of interest associated with the total  
11 recall score appeared to be related to the experience of the feedback process. Having a larger  
12 discrepancy between perceived and actual weight was associated with lower recall scores (-0.44,  
13 -0.76 to -0.14). Conversely, understanding the information presented in the feedback process  
14 (0.29, 0.07 to 0.50) or finding it useful (0.20, 0.04 to 0.35) were both associated with higher  
15 recall scores to a similar degree. Once all significant variables were entered in multivariate  
16 model 2, only university maternal education (0.81, 0.25 to 1.37) and finding the information  
17 useful (0.19, 0.04 to 0.35) remained independent predictors of total recall score.  
18

## 19 DISCUSSION

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

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

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

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3 1 overweight child is a concern). While it could be argued that 6 categories of information is an  
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5 2 unrealistic target, a considerable amount of time was spent within the interviews on BMI and  
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7 3 what it means for health; more than would be spent during a typical primary care consultation.  
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10 4 This has important implications for including BMI screening within routine healthcare,  
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12 5 especially if the information is unexpected. Thus health professionals need to limit the amount of  
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14 6 information given in one session, provide personalised take-home information, or use multiple  
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16 7 sessions to assess gaps in patient recall or understanding and provide clarification, especially if  
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18 8 the information is unexpected or includes unfamiliar concepts.  
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24 10 Despite our best efforts to present information to promote optimal recall and understanding,<sup>7</sup>  
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26 11 (spending a significant portion of time on the key message (BMI and health), providing pictorial  
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28 12 information and providing simple non-technical explanations),<sup>7</sup> our findings suggest that the  
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30 13 implications were poorly recalled and concepts were poorly understood. While a diagnosis is  
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32 14 important, it is not meaningful without an understanding of the implications and a clear treatment  
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34 15 pathway. This is particularly relevant in primary care, where doctors are often reluctant<sup>34</sup> to  
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36 16 discuss childhood overweight and unsure how to communicate this information to families.<sup>35</sup>  
37  
38 17 This may inadvertently lead to ambiguous information or brief communication, making it easy  
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40 18 for parents to become confused about the messages they are being given, particularly if the  
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42 19 information conflicts with parental beliefs. Poor understanding also has implications for the  
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44 20 transfer of this information beyond the direct medical setting and into the child's wider context.  
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46 21 For example, if parents are unable to understand what their child's results mean, there is the  
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48 22 potential for miscommunication with significant people in the child's life who might need to be  
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50 23 involved in changing lifestyle factors.  
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5 2 Literature examining parental recall of child weight status information is very limited<sup>19,20,36</sup> and  
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8 3 no studies appear to have assessed recall and understanding of BMI information and related  
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10 4 concepts following a targeted face-to-face interview. Johnson and colleagues<sup>19</sup> investigated  
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12 5 parent reactions to a screening program and included measures of recall of the information  
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14 6 provided in a BMI results letter. Consistent with the current study, important information was  
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16 7 recalled well (e.g., 94% of the parents recalled their child's weight category), and other details  
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18 8 were less likely to be recalled (e.g., measurements). However, reports of parental accuracy were  
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20 9 lower than that observed in the current study. This may have arisen because of different methods  
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22 10 of informing parents (letter versus face-to-face) or due to the more stringent accuracy  
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24 11 classification used by Johnson et al.<sup>19</sup>  
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32 13 Although it may seem surprising that parents receiving BPC feedback were able to remember  
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34 14 more than those who received MI, more structured and specific information is more likely to be  
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36 15 remembered.<sup>7,37</sup> The BPC interview was highly structured and the advice given to parents to  
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38 16 achieve lifestyle guidelines was very specific (e.g., change high fat to low fat milk) whereas the  
39  
40 17 MI session, reflecting the intention of MI,<sup>38</sup> was not structured, with research assistants  
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42 18 intentionally avoiding giving specific advice. As the MI sessions were twice as long as the BPC  
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44 19 sessions it is also possible that the additional time spent on the exploration of the meaning and  
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46 20 implication of results took focus away from the central details of the message, resulting in lower  
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48 21 recall of the information.  
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3 1 Higher maternal education was related to improved overall recall, consistent with the literature in  
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5 2 other health contexts.<sup>7,14</sup> While a relationship between recall and child and maternal BMI,<sup>19</sup>  
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7 3 ethnicity<sup>19</sup> and age<sup>39</sup> have previously been suggested, they were unrelated in this study. Here,  
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9 4 beliefs about weight played a more important role: parents who found the information  
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11 5 unexpected or did not understand the feedback process or find it useful, had lower recall. By  
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13 6 contrast, those who were already concerned about their child's weight had higher overall recall.  
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15 7 These findings are consistent with the hypothesis that memory is heightened for information that  
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17 8 is consistent with one's current beliefs<sup>40</sup> and has implications for health practitioners giving  
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19 9 parents results that they may not expect. Prior to delivering feedback health practitioners may  
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21 10 benefit from assessing parents' expectations, concerns and current knowledge, to assist in  
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23 11 prioritising and explaining results that may not align with these.  
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32 13 This study examined recall and understanding in a large sample of families with overweight  
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34 14 children. This study was not originally constructed to assess parental memory, and as such it was  
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36 15 not set up to exhaustively prompt parents for complete recall. It is possible that had we  
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38 16 interviewed differently, parents may have recalled more information. However, much of the  
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40 17 information used in this interview was based on free recall, which is particularly relevant in this  
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42 18 context as it likely reflects the information that is most salient and easily accessible to parents.  
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48 20 In summary, our findings appear to be the first to examine parental recall of BMI and growth  
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50 21 information following a BMI screening and face-to-face feedback session. While our results  
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52 22 suggest that parents were able to remember their child's overweight diagnosis very well, 61% of  
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54 23 the information was forgotten. This finding suggests that the inclusion of BMI screening within  
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3 1 current appointments may negatively impact parental ability to remember and understand this  
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6 2 information. In addition, the way that the information is given, and parental education, values  
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8 3 and expectations, were associated with recall of the information and therefore suggest that health  
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10 4 professionals need to be aware of these factors when discussing results with parents.  
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## 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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14 disclose.  
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21 Committee (LRS/09/09/039).  
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27 **DATA SHARING STATEMENT:** No additional data are available.  
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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) <sup>†</sup>
Age (years)		6.4 (1.4)	6.4 (1.4)	6.3 (1.7)	0.12 (-0.52 to 0.08)*
Ethnicity <sup>a</sup> 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) <sup>†</sup>
	Pacific	20 (7)	18 (7)	2 (7)	0.89 (0.18 to 4.19) <sup>†</sup>
Household deprivation <sup>b</sup>		5.1 (2.9)	5.1 (2.6)	5.0 (2.6)	0.06 (-1.12 to 0.99)*
Maternal age (years) <sup>c</sup>		37.0 (5.8)	37.0 (5.7)	36.7 (7.1)	0.00 (-0.01 to 0.01)*
Maternal education <sup>d</sup>	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) <sup>†</sup>
	University degree	91 (34)	83 (34)	8 (30)	0.92 (0.32 to 2.64) <sup>†</sup>
Maternal BMI <sup>e</sup> (kg/m <sup>2</sup> )		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<sup>a</sup>, 9<sup>b</sup>, 9<sup>c</sup>, 3<sup>d</sup> and 13<sup>e</sup> participants from the total n = 271. Data are all expressed as mean (SD) except where indicated as n (%). Presented as \*difference or <sup>†</sup>odds ratios as shown.

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

Information category	Total sample (n = 244)		MI	BPC
	Number of items m (SD)	Weighted scores m (SD)	(n = 121)	(n = 122)
			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

Information category	Total recall (%)			<sup>1</sup> Correct recall (%)			<sup>2</sup> Correct recall (%)		
	Total sample n = 244	MI n = 121	BPC n = 123	Total sample	MI	BPC	Total sample	MI	BPC
<b>Results</b>									
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)
<b>Meaning of results</b>									
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)	-	-	-	-	-	-
<b>Concepts discussed</b>									
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)

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3 Figures shown are the frequency and percentages of parents who recalled each type of information overall and by feedback condition.

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5 For correct recall, percentages are calculated from <sup>1</sup>only from those who recalled the information (errors of commission) and <sup>2</sup>the total  
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8 sample (errors of omission).  
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10 Abbreviations: BMI – body mass index; BPC – best practice care; MI – motivational interviewing; WhtR – waist to height ratio  
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**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 <sup>†</sup>	0.30 (-0.25 to 0.86)	0.30 (-0.25 to 0.84)	0.30 (-0.30 to 0.85)
University degree <sup>†</sup>	0.82 (0.27 to 1.38)*	0.76 (0.20 to 1.32)*	0.81 (0.25 to 1.37)*
Ethnicity			
Maori <sup>††</sup>	-0.61 (-1.17 to -0.05)*	-0.52 (-1.09 to 0.04)	
Pacific <sup>††</sup>	-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)

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Feedback condition	0.48 (0.05 to 0.92)*	0.28 (-0.18 to 0.73)
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$\beta$  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.

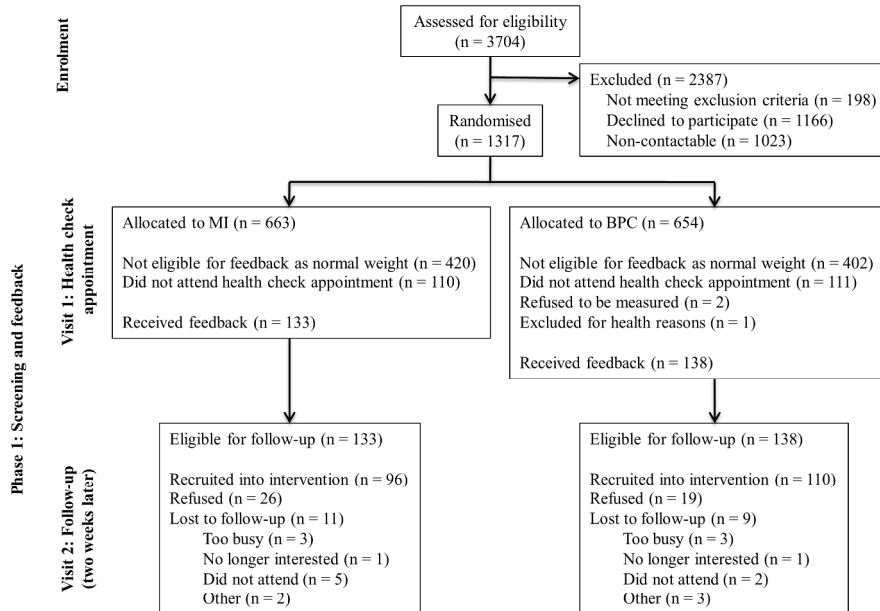
Multivariate model 2 estimates are adjusted for all other variables in the model.

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	<p><i>“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”</i> P125</p>	<p>Good Easy to understand Clear visual message Meaningful metaphor Didn’t give enough information Other</p>
2. Evaluation of the overall process	<p><i>“It was really good to see where she fitted”</i> P123]</p> <p><i>“I went away thinking gosh we need to do something about this”</i> P249</p> <p>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.</p>	<p>Good Good that child was entertained Good child was in different room for feedback Impetus for change Other</p>
3. Spontaneously reported behaviour change	<p><i>“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”</i> P125</p>	<p>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)</p>
4. Spontaneously reported discussion with other	<p><i>“It was very useful. To be honest I needed a second opinion it shocked me so much I went to the doctor”</i> P38</p>	
5. Discussion with child		
6. Parental feelings about the way feedback was given	<p>Too clinical presentation, very professional but maybe too much so, responses too scripted (e.g., P37)</p> <p><i>“I don’t know it could have been given in a better way. I mean its hard to hear, regardless”</i> P125</p> <p>Researchers maybe a bit nervous to be giving this information - <i>“felt like you are reassuring the researcher...I’m fine”</i> P260</p> <p>Repeated questioning of what information means to parents coming up as making them uncomfortable.</p> <p><i>“calm, matter of fact, how I’d want it to be presented”</i> P164</p> <p><i>“the fact that a practitioner takes time to recognise concerns and validate..I found it was very supportive”</i> P139</p> <p><i>“It was confirming how I felt..I was quite relieved to get it”</i> P108</p>	<p>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</p>



## 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 be 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.

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

Section/Topic	Item No	Checklist item	Reported on page No
<b>Title and abstract</b>			
	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
<b>Introduction</b>			
Background and objectives	2a	Scientific background and explanation of rationale	6-7
	2b	Specific objectives or hypotheses	7
<b>Methods</b>			
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
<b>Randomisation:</b>			
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

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2		assessing outcomes) and how	
3			
4		11b If relevant, description of the similarity of interventions	N/A
5	Statistical methods	12a Statistical methods used to compare groups for primary and secondary outcomes	12-13
6		12b Methods for additional analyses, such as subgroup analyses and adjusted analyses	N/A
7			
8	Results		
9	Participant flow (a	13a For each group, the numbers of participants who were randomly assigned, received intended treatment, and	8
10	diagram is strongly	were analysed for the primary outcome	
11	recommended)	13b For each group, losses and exclusions after randomisation, together with reasons	8
12	Recruitment	14a Dates defining the periods of recruitment and follow-up	Ref 24
13		14b Why the trial ended or was stopped	N/A
14			
15	Baseline data	15 A table showing baseline demographic and clinical characteristics for each group	Ref 24 – or
16			could be
17			added as web
18			only
19			
20	Numbers analysed	16 For each group, number of participants (denominator) included in each analysis and whether the analysis was	Tables 3 & 4
21		by original assigned groups	
22	Outcomes and	17a For each primary and secondary outcome, results for each group, and the estimated effect size and its	Tables
23	estimation	precision (such as 95% confidence interval)	
24		17b For binary outcomes, presentation of both absolute and relative effect sizes is recommended	N/A
25	Ancillary analyses	18 Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing	N/A
26		pre-specified from exploratory	
27			
28	Harms	19 All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	N/A
29			
30	Discussion		
31	Limitations	20 Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	19
32	Generalisability	21 Generalisability (external validity, applicability) of the trial findings	16-17
33	Interpretation	22 Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	17-19
34			
35	<b>Other information</b>		
36	Registration	23 Registration number and name of trial registry	4
37	Protocol	24 Where the full trial protocol can be accessed, if available	7
38	Funding	25 Sources of funding and other support (such as supply of drugs), role of funders	20
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44	CONSORT 2010 checklist		
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2 \*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  
3 recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials.  
4 Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see [www.consort-statement.org](http://www.consort-statement.org).  
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