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Mealtime duration in problem and non-problem eaters

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Running head: Children's mealtime duration

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## Abstract

Young children commonly encounter difficulties at mealtimes, which are important to address early to avoid the maintenance of problematic eating behaviour. Among these are drawn-out meals, which some research has associated with more mealtime problems. However, research on meal duration, and therefore guidelines for appropriate meal length, is lacking. This research aimed to compare the meal duration of problem-eaters and controls, and to examine changes to meal length among problem-eaters following a parenting intervention. The mealtimes of 96 problem-eaters and 105 controls were examined via parent-report and in-home observations; meal length was also compared amongst problem-eaters who had received intervention and a waitlist control. Meal duration was similar across groups, though problem-eaters engaged in more aversive behaviour and less eating than controls. Observed eating and mealtime behaviour altered following intervention but not duration. Parents who reported meal length as a specific concern had longer meals and reported less successful feeding than those that did not. These results suggest that what is happening during the meal may better distinguish problem-eaters than duration alone.

**Keywords:** feeding, mealtimes, duration

37           Mealtime difficulties are among the most common behavioural disturbances in  
38 toddlers (Sanders, Patel, Le Grice, & Shepherd, 1993). Up to 45% of parents face difficulties  
39 with young children at mealtimes (Blissett, Meyer, Farrow, Bryant-Waugh, & Nicholls, 2005;  
40 Kerwin, 1999; Lewinsohn et al., 2005), which, beyond physical risks, may have significant  
41 psychosocial consequences such as parent-child (Forsyth, Leventhal, & McCarthy, 1985) and  
42 marital conflict (Archer, Rosenbaum, & Streiner, 1991), and parental stress and anxiety  
43 (Greer, Gulotta, Masler, & Laud, 2008). Problem eating is also not necessarily transient  
44 (Parkinson & Drewett, 2001; Wright, Callum, Birks, & Jarvis, 1998), making research in this  
45 area vital in ensuring healthy food choices and eating behaviour are developed early in life.

46           Normally developing young children have been noted to demonstrate such feeding  
47 problems as limited appetite or interest in food (Douglas, 1995), food refusal (Lewinsohn et  
48 al., 2005), selective food preferences (Girolami, Kahng, Hilker, & Girolami, 2009; Martin,  
49 Southall, Shea, & Marr, 2008; Nicholls, Christie, Randall, & Lask, 2001), disruptive  
50 mealtime behaviour (Sanders, Patel, et al., 1993), and refusal to self-feed (Kerwin, 1999).  
51 Drawn-out meals in particular are a common concern for parents (Centre for Community  
52 Child Health, 2006; Douglas, 1995). Some research has found a positive correlation between  
53 meal duration and problem eating including food refusal (Uribe & Senturia, 1994), mealtime  
54 misbehaviour (de Moor, Didden, & Korzilius, 2007), delaying eating by talking, and refusing  
55 to swallow food (Crist & Napier-Phillips, 2001). A study of 12-14 month-old children found  
56 longer meals to be associated with reduced intake once adjusted for the number of bites taken  
57 (Parkinson & Drewett, 2001). Meals longer than 30 minutes have also been associated with  
58 picky eating (Reau, Senturia, Lebailly, & Christoffel, 1996). Longer meals have been  
59 reported by parents of children in populations with higher rates of feeding difficulties (e.g.,  
60 diabetes; Powers et al., 2002). Other research investigating the rate and pace of eating has

61 highlighted increasingly problematic interactions over the length of the meal (Stark et al.,  
62 2000).

63 Duration may thus represent an important clinical indicator of feeding difficulties  
64 (Reau et al., 1996) and one that could be easily assessed to identify families requiring more  
65 intensive assistance with feeding (de Moor et al., 2007). A focus on duration is consistent  
66 with models emphasising the ecological characteristics of mealtimes (Li, 1993), and  
67 treatment approaches that aim to regulate the structure of meals, maximise time between  
68 meals (Kedesdy & Budd, 1998), and maintain positive mealtime interactions (Satter, 1995).

69 Surprisingly few studies have investigated the duration of mealtimes however (Crist  
70 & Napier-Phillips, 2001). Much of the literature available has relied upon parental report of  
71 duration, the reliability of which has been questioned due to discrepancies between parent-  
72 reported and observed meal length (Reilly, Skuse, & Poblete, 1996). Research that has  
73 employed observations has limited meal length for practical reasons (Sanders, Patel, et al.,  
74 1993) or to control the impact of duration on frequency counts (e.g., Stark et al., 2000), which  
75 precludes naturalistic collection of data on meal length. Other research has observed family  
76 mealtimes at home among pre-schoolers (Kong et al., 2013), and children with asthma (Fiese,  
77 Hammons, & Grigsby-Toussaint, 2012), though a gap exists regarding duration as it relates to  
78 problem eating, and among typically developing toddlers (de Moor et al., 2007). As a result,  
79 little is currently known about appropriate meal length (Uribe & Senturia, 1994).

80 Consequently, recommendations made to parents about meal length are diverse (Li, 1993)  
81 and are largely provided without reference to empirical data.

82 The current research thus aimed to examine meal duration and mealtime behaviour  
83 among normally developing toddlers using observational data. The focus on young, typically  
84 developing children with moderate mealtime difficulties was also thought to facilitate a  
85 preventive approach. The study compared mealtimes in problem-eaters to a control group,

86 both in terms of observed child mealtime behaviour and meal length. Both were also  
87 examined in response to intervention, based on the premise that if each differed among  
88 problem-eaters they may change as a result of intervention. Duration has also seldom been  
89 used as a measure of outcome. Problem-eaters were divided into an intervention or waitlist  
90 control condition and assessed at multiple time points. It was hypothesised that problem-  
91 eaters would have significantly longer meals than controls (H1a), and that within the  
92 mealtime problem-eaters would display fewer appropriate behaviours (H1b) and more  
93 problematic mealtime behaviours than controls (H1c). A second set of hypotheses related to  
94 changes as a result of intervention: families in the intervention group were predicted to  
95 demonstrate greater change to meal duration than waitlist controls (H2a). It was also expected  
96 that positive behaviour would increase (H2b) and negative child behaviour decrease (H2c) as  
97 a result of intervention.

## 98 **Method**

99 This study was part of broader research undertaken to examine the psychosocial  
100 characteristics of young children with and without problematic mealtime behaviour, and to  
101 test the effectiveness of a mealtime parenting intervention (see Adamson, Morawska, &  
102 Sanders, 2013 for full report on intervention). This paper focuses on meal duration as the  
103 primary variable of interest.

## 104 **Participants**

105 Parents were recruited via advertisement at child care centres, playgroups, primary  
106 schools, general practitioner clinics and community health centres in regional and  
107 metropolitan Queensland, and on a number of Australian parenting websites. Parents were  
108 eligible if they had a child aged approximately 2 to 5 years, without medical or  
109 developmental conditions, and were not already accessing professional assistance for their  
110 child's behaviour or feeding. A total of 201 parents participated including 96 parents who

111 reported they were concerned about and wanting assistance for their child's feeding and  
112 living in the geographical areas where the intervention was offered (problem-eaters group),  
113 and 105 control parents. Problem-eaters had a range of mealtime difficulties including refusal  
114 to eat an adequate amount or range of food, refusal to come to or stay at the table, playing  
115 with food, and tantrums.

116         Demographic information is presented in Table 1. Respondents were mostly mothers  
117 (98.5%) within original two-parent families who were well educated and had been able to  
118 meet household expenses in the past year. The target children were aged 15 to 72 months  
119 ( $M=33.75$  months,  $SD=12.07$ ) with male and female children approximately equally  
120 represented. Problem-eaters were older ( $M=37.64$ ,  $SD=13.21$ ) than controls ( $M=30.19$ ,  
121  $SD=9.70$ ),  $t(173.33)=-4.52$ ,  $p<.001$ ; demographic variables were otherwise similar between  
122 the groups.

123         Families in the problem-eaters group were further divided into an intervention ( $n=49$ )  
124 or waitlist control condition ( $n=47$ ). As shown in Table 2, demographic variables were  
125 similar across the groups. Children in the intervention group were younger ( $M=33.33$  months,  
126  $SD=12.13$ ) than those in the waitlist condition ( $M=42.13$  months,  $SD=12.90$ ),  $t(94)=-3.45$ ,  
127  $p=.001$ . More mothers in the waitlist condition were married (95.7%) than in the intervention  
128 group (75.5%) though the rates of mothers within intact relationships were similar if co-  
129 habiting relationships were taken into account.

### 130 **Measures**

131 Parents completed a number of measures electronically as part of the wider research project;  
132 only measures relevant to the current paper are reported here. This included an adapted  
133 version of the Family Background Questionnaire (FBQ; Sanders, Markie-Dadds, & Turner,  
134 2001) to gather demographic information (e.g., target child's age and sex, family  
135 composition, parental education and employment).

Variable	Problem-eaters <i>N</i> (%)	Controls <i>N</i> (%)	$\chi^2(df)$	<i>p</i>
Child ethnicity	94	105	3.03 (3)	.388
White	91 (96.8)	100 (95.2)		
Asian	0	2 (1.9)		
Aboriginal/Torres Strait Islander	1 (1.0)	0		
Other	2 (2.1)	3 (2.9)		
Marital status	96	105	5.04 (4)	.283
Single	3 (3.1)	1 (0.9)		
De-facto	7 (7.3)	15 (14.3)		
Married	82 (85.4)	84 (80.0)		
Separated	3 (3.1)	5 (4.8)		
Divorced	1 (1.0)	0		
Household	94	105	3.60 (3)	.308
Original family	87 (90.6)	100 (95.2)		
Sole parent family	6 (6.3)	5 (4.8)		
Step family	1 (1.0)	0		
Other	0	0		
Mother's education	93	102	4.41 (4)	.353
Year 10/11	7 (7.5)	5 (4.9)		
Year 12	9 (9.7)	8 (7.8)		
TAFE/college certificate	15 (16.1)	18 (17.7)		
Trade/apprenticeship	3 (3.2)	0		
University degree	59 (63.4)	71 (69.6)		
Mother's hours of employment	94	102	7.16 (5)	.209
None	33 (35.1)	33 (32.4)		
Less than 10 hours	9 (9.6)	12 (11.8)		
10 – 20 hours	22 (23.4)	17 (16.7)		
20 – 30 hours	10 (10.6)	23 (22.6)		
30 – 40 hours	14 (14.9)	15 (14.7)		
More than 40 hours	6 (6.4)	2 (2.0)		
Household income	103	94	0.01 (1)	.975
Not able to meet expenses	9 (9.4)	10 (9.5)		
Able to meet expenses	85 (88.5)	93 (88.6)		
Concerned status	96	105	157.88 (3)	<.001
No, not concerned	2 (2.1)	94 (89.5)		
Yes, a bit concerned	44 (45.8)	11 (10.5)		
Yes, quite concerned	35 (36.5)	0		
Yes, very concerned	15 (15.6)	0		

138 *Note.* *t* = Independent samples *t*-test;  $\chi^2$  = Pearson's chi-square. Numbers included in each  
139 analysis vary due to missing data. Concerned status refers to the question "Are you concerned  
140 about your child's eating?"

Variable	Intervention N (%)	Waitlist N (%)	$\chi^2(df)$	<i>p</i>
Child ethnicity	47	47	3.01 (2)	.222
White	46 (97.9)	45 (95.7)		
Aboriginal/Torres Strait Islander	1 (2.1)	0		
Other	0	2 (4.3)		
Marital status	49	47	12.08 (4)	.017
Single	2 (4.1)	1 (2.1)		
De-facto	7 (14.3)	0		
Married	37 (75.5)	45 (95.7)		
Separated	3 (6.1)	0		
Divorced	0	1 (2.1)		
Household	49	47	3.73 (3)	.292
Original family	43 (87.8)	45 (95.7)		
Sole parent family	5 (10.2)	1 (2.1)		
Step family	1 (2.0)	0		
Other	0	1 (2.1)		
Mother's education	46	47	9.41 (4)	.052
Year 10/11	6 (13.0)	1 (2.1)		
Year 12	7 (15.2)	2 (4.3)		
TAFE/college certificate	9 (19.6)	7 (14.9)		
Trade/apprenticeship	1 (2.2)	2 (4.3)		
University degree	23 (50.0)	35 (74.5)		
Mother's hours of employment	47	47	7.14 (5)	.210
None	14 (29.8)	20 (42.6)		
Less than 10 hours	4 (8.5)	5 (10.6)		
10 – 20 hours	11 (23.4)	11 (23.4)		
20 – 30 hours	7 (14.9)	3 (6.4)		
30 – 40 hours	10 (21.3)	4 (8.5)		
More than 40 hours	1 (2.1)	4 (8.5)		
Household income	47	47	1.11 (1)	.293
Unable to meet expenses	6 (12.8)	3 (6.4)		
Able to meet expenses	41 (87.2)	44 (93.6)		
Concerned status	49	47	2.42 (3)	.490
No, not concerned	0	2 (4.3)		
Yes, a bit concerned	24 (49.0)	20 (42.6)		
Yes, quite concerned	17 (34.7)	18 (38.3)		
Yes, very concerned	8 (16.3)	7 (14.9)		



144 Parents also completed the Parent and Toddler Feeding Assessment (PATFA;  
145 Adamson & Morawska, 2008), a 90-item measure of child feeding behaviour, parenting  
146 strategies and parental cognitions about mealtimes. Parents first rated the frequency of 21  
147 common mealtime problems (e.g., spitting food out) on a 5-point scale from 1 (*never*) to 5  
148 (*almost always*) and whether each behaviour was problematic (*yes/no*), followed by their  
149 confidence in successfully managing each on a 10-point scale (higher scores indicating  
150 greater confidence). Parents then rated how frequently they used 30 strategies at mealtimes  
151 on a 5-point scale from 1 (*never*) to 5 (*almost always*). Finally, parents rated their agreement  
152 with 39 statements about feeding on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly*  
153 *agree*). Of primary interest in the current study was the total frequency of problematic child  
154 feeding behaviours, calculated by summing parent frequency ratings on the child feeding  
155 items. This scale has good internal consistency ( $\alpha=.93$ ) and test-retest reliability ( $r=.89$ ;  
156 Adamson & Morawska, 2008). Of particular interest was an item on the PATFA which asked  
157 parents about meals longer than 30 minutes.

158 Families were also observed at home during an evening meal. To maximise the  
159 representativeness of the observation, meals were filmed at the time nominated by the parent,  
160 without research assistants present, parents were asked to provide a typical meal to their child  
161 and to act as they usually would, and afterward rated whether the mealtime was typical.  
162 Thirty-three control families lived locally and volunteered for the filming, representing  
163 31.34% of the total control group. These families did not differ from those not observed on  
164 sociodemographic and clinical variables thus observations were considered representative of  
165 the group. Families in the problem-eaters group were filmed as part of the intervention study,  
166 resulting in 74 coded observations at time 1 and 72 at time 2, representing 77.08% and 75%  
167 of the problem-eaters group at each time point respectively. The remaining parents in this  
168 group either declined observation or withdrew from the research after time 1 and were not

169 coded. A second observation was attempted for a small number of tapes in the problem-eaters  
170 group reported as atypical; of these, a small number remained atypical at the second attempt  
171 but were retained as there was an approximately equal number per time point, each was more  
172 representative on the second occasion, and additional attempts were not feasible.

173 Video footage was analysed by a coder blind to study hypotheses and the group  
174 membership and time point of each family using the Mealtime Observation Schedule (MOS;  
175 Sanders, Le Grice, & Turner, 1993). The MOS employs a partial interval time sampling  
176 procedure to record the presence of 16 child behaviours and 14 parent behaviours, as listed in  
177 Table 3. Coding began when the child was called to or approached the table or the food  
178 presented, and continued until food was removed by the parent or the child left the table for  
179 the final time, thereby facilitating information on meal length. Dessert was not included in  
180 coding or meal duration calculations. The percentage of intervals in which the child  
181 demonstrated appropriate (e.g., *eating; Child positive*) or inappropriate behaviour (e.g.,  
182 *noncompliance; Child negative*) was computed.

183 The MOS is an established method of coding that has been shown to reliably  
184 differentiate children with and without feeding difficulties (Sanders, Patel, et al., 1993) and to  
185 capture post-intervention change (Turner, Sanders, & Wall, 1994). The MOS has good inter-  
186 rater reliability (mean k: parent codes=.83, child codes=.80; Sanders, Patel, et al., 1993).

187 Twenty per cent of tapes were randomly allocated to a second coder and inter-rater  
188 reliability values calculated based on correlations between raters in terms of the presence or  
189 absence of each code in each interval. Average inter-rater correlations for the child summary  
190 codes (*Child positive* and *Child negative*) were moderate ( $r=.47$ ).

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193 Table 3

194 *Observational Codes for Mealtime Observation Schedule* (Sanders et al., 1993a)

Child Codes	Parent Codes
Positive codes	Praise
Appropriate Verbal Interaction	Positive Contact
Engaged Activity	Aversive Contact
Affection	Positive Specific Instruction
Appropriate Eating	Aversive Specific Instruction
Request for Food	Positive Vague Instruction
Negative codes	Aversive Vague Instruction
Non-compliance	Positive Social Attention
Complaint	Aversive Social Attention
Aversive Demand	Affection
Physical Negative	Presentation of Food
Oppositional	Removal of Food
Interrupt	Non-interaction
Food Refusal	Blank Parent
Vomit	
Playing with Food	
Leaving the Table	
Blank Child	

195

## 196 **Procedure**

197 Following telephone screening, a dinner observation was scheduled and parents were  
198 directed to the on-line suite of measures. After indicating consent and completing the  
199 assessment, families in the control group were thanked for their participation and provided  
200 with general feedback. Families in the problem-eaters group continued on to the mealtime  
201 intervention study, and were randomly assigned to either receive the intervention  
202 immediately (intervention) or after a short delay (waitlist control). The research was  
203 conducted with the approval of The University of Queensland ethics officers.

204 The intervention was an 8-session variant of the Triple P - Positive Parenting  
205 Program, a behavioural family intervention (Morawska & Sanders, 2009). Parents attended  
206 four 2-hour group sessions which covered factors involved in the maintenance of mealtime  
207 difficulties, strategies for promoting positive behaviour and eating at mealtimes (e.g., ground

208 rules, praise, behaviour charts), dealing with difficult feeding (e.g., instructions, planned  
209 ignoring, consequences) and coping skills training. A range of strategies were presented and  
210 parents instructed in combining these towards a mealtime parenting routine, in order to  
211 address their child's particular feeding difficulty. Three individual telephone sessions  
212 followed to assist parents in implementing the routines at home, and a final group session to  
213 close the program and plan ahead. Results of the intervention study are reported elsewhere  
214 (Adamson et al., 2013). Parents in the intervention group completed the measures again  
215 immediately following and 6-months after the program. Parents in the waitlist control  
216 condition completed the measures again before receiving the program.

### 217 **Statistical Analyses**

218         Given group differences on child age, a series of ANCOVA compared problem-eaters  
219 to controls on meal duration (H1a), and the incidence of positive (H1b) and negative child  
220 behaviour (H1c). The PATFA item related to meal length was also analysed via ANCOVA.  
221 Mixed analyses of variance (ANOVA) were conducted to assess changes over time for meal  
222 duration (H2a), and the incidence of positive (H2b), and negative mealtime behaviour (H2c).  
223 Across all analyses meal length is presented in minutes for ease of interpretation.

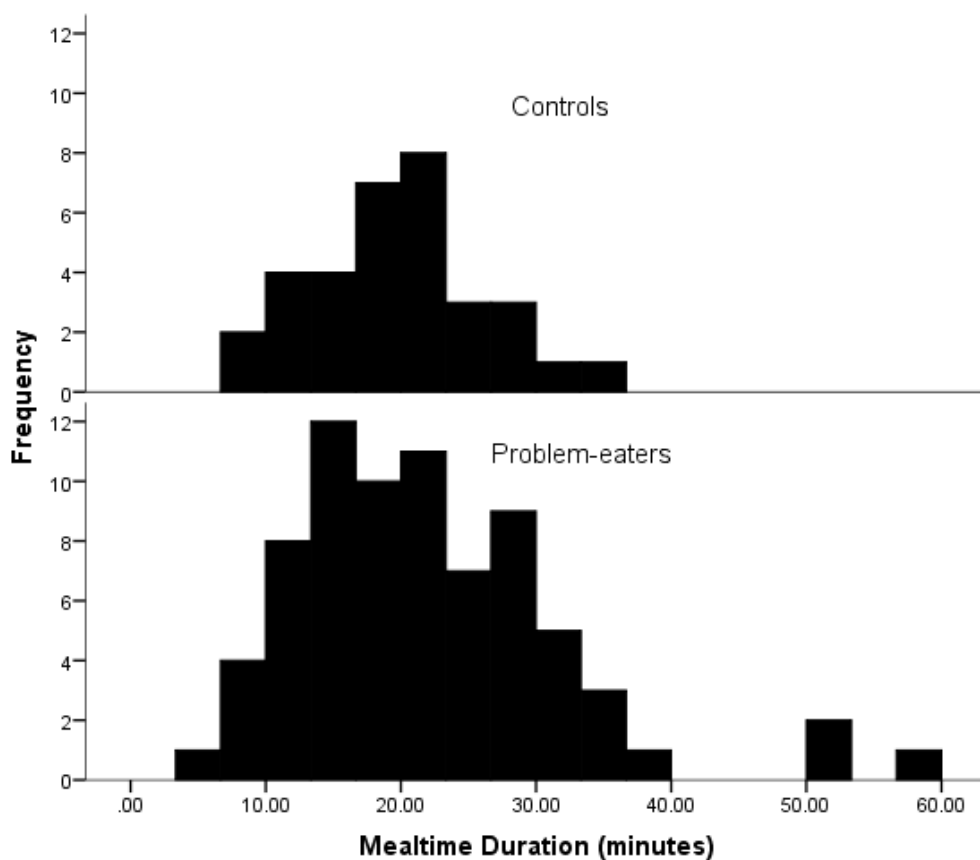
### 224 **Results**

225 Missing data checks revealed some missing data across variables, however these were  
226 minimal and appeared randomly distributed; as a result no data was excluded.

#### 227 **Problem-eaters Versus Controls**

228         **Meal duration.** The observed length of meals varied widely. Families with problem-  
229 eaters occupied the outer limits from 5.75–59.47 minutes ( $M=21.81$ ,  $SD=10.05$ ) compared to  
230 7.80–35.53 minutes for control families ( $M=19.85$ ,  $SD=6.31$ ) though a Kolmogorov-Smirnov  
231 test found meal duration was normally distributed in each group,  $Z=.89$ ,  $p=.407$ . These  
232 distributions are illustrated in Figure 1. Given differences in child age between the groups,

233 and a small correlation between age and meal length,  $r=.28$ ,  $p<.001$ , an ANCOVA was used  
 234 to compare problem-eaters and controls on meal duration, treating child age as a covariate.  
 235 Results indicated a main effect for age,  $F(1,104)=7.67$ ,  $p=.007$ ,  $d=0.22$ , but not group,  
 236  $F(1,104)=.01$ ,  $p=.938$ . Chi square analysis categorising meal length as either less than or  
 237 greater than/equal to 30 minutes found no difference by group,  $\chi^2(1)=2.07$ ,  $p=.218$ , with  
 238 16.20% of meals among problem-eaters exceeding 30 minutes compared with 6.10% of  
 239 controls.



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Figure 1. Distributions of mealtime duration between problem-eaters and controls

244 The PATFA item which asked parents whether meals longer than half an hour were a  
 245 problem was endorsed significantly more by parents of problem-eaters (54.44%) than  
 246 controls (7.29%),  $\chi^2(1)=49.08$ ,  $p<.001$ . A series of ANCOVA compared parents who reported  
 247 meal length as a problem to those who did not on observed meal duration, reported and

248 observed child behaviour. Age was included as a covariate given parents reporting meal  
 249 length as a problem had significantly older children ( $M=39.79$  months,  $SD=13.91$ ) than those  
 250 who did not ( $M=31.38$ ,  $SD=10.62$ ),  $t(184)=-4.49$ ,  $p<.001$ . Results are displayed in Table 4.  
 251 Parents who reported meal length as a problem had longer observed meals than those who did  
 252 not and reported significantly more frequent child feeding difficulties on the PATFA, though  
 253 no differences were found on observed positive or negative child mealtime behaviour.

254

255 Table 4

256 *Comparison of Mealtime Variables by Report of Meal Duration as a Problem*

Measure	Taking more than half an hour to finish the meal is a problem		$F(df)$	$p$	$d$
	Yes $M (SD)$	No $M (SD)$			
Observed meal duration (mins)	25.21 (11.15)	19.15 (5.91)	4.13 (1,97)	.019	0.74
PATFA Child Frequency score	63.44 (12.50)	44.87 (11.25)	26.81 (1, 185)	< .001	1.64
Observed positive behaviour (% of intervals)	63.78 (21.82)	72.24 (22.03)	2.91 (1, 96)	.091	0.39
Observed negative behaviour (% of intervals)	33.62 (21.64)	27.24 (22.13)	1.67 (1, 96)	.200	0.29

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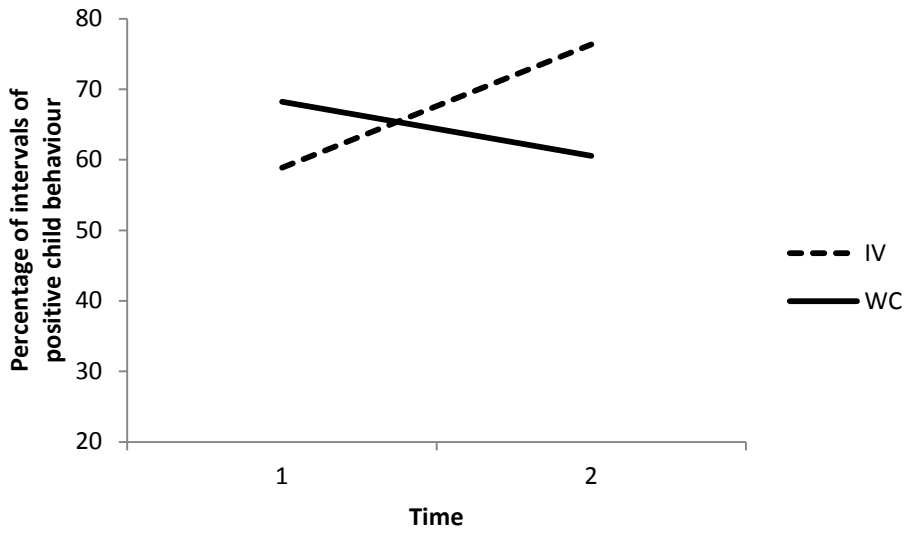
258 **Mealtime behaviour.** Observational and parent-report data regarding child behaviour  
 259 at mealtimes were also compared by group, using a series of ANCOVA with child age as a  
 260 covariate. Parents of problem-eaters reported more aversive mealtime behaviour on the  
 261 PATFA ( $M=62.26$ ,  $SD=10.28$ ) than controls ( $M=39.71$ ,  $SD=7.52$ ),  $F(1,197)=267.79$ ,  $p<.001$ ,  
 262  $d=2.58$ . Observational data showed a similar pattern whereby children in the problem-eaters  
 263 group demonstrated a significantly higher incidence of problem behaviour at mealtimes  
 264 ( $M=33.90$ ,  $SD=22.63$ ) than controls ( $M=18.33$ ,  $SD=13.87$ ),  $F(1,104)=12.80$ ,  $p=.001$ ,  $d=0.77$ ;

265 and less positive behaviour ( $M=64.19$ ,  $SD=22.54$ ) than controls ( $M=81.72$ ,  $SD=13.62$ ),  
266  $F(1,104)=15.93$ ,  $p<.001$ ,  $d=0.87$ . Neither positive,  $F(1,104)=0.11$ ,  $p=.746$ , nor problematic  
267 mealtime behaviour showed age effects,  $F(1,104)=0.20$ ,  $p=.660$ .

## 268 **Intervention Outcomes**

269 A 2 (Time: time 1 and time 2) x 2 (Condition: IV and WC) mixed ANCOVA, with  
270 child age as a covariate, examined whether meal duration changed as a result of intervention  
271 (H2a). No main effect was found for time,  $F(1,68)=0.62$ ,  $p=.435$ , or condition,  $F(1,68)=0.01$ ,  
272  $p=.916$ , nor any significant interaction found between time and condition,  $F(1,68)=0.03$ ,  
273  $p=.870$ .

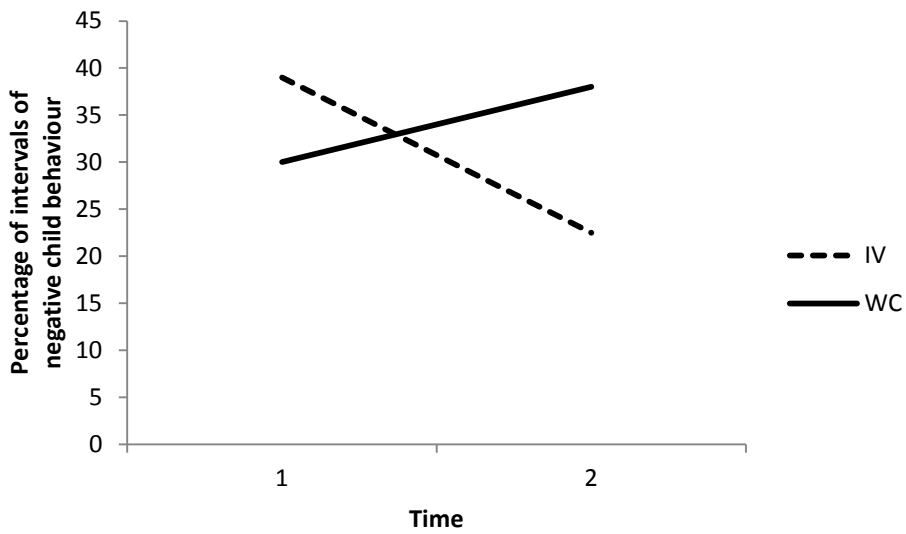
274 A 2 (Time: time 1 and time 2) x 2 (Condition: IV and WC) mixed ANOVA examined  
275 whether observed positive mealtime behaviour changed as a result of intervention (H2b).  
276 Results indicated no significant main effect for time,  $F(1,69)=1.92$ ,  $p=.170$ , or condition,  
277  $F(1,69)=0.70$ ,  $p=.407$ . However, a significant interaction between time and condition was  
278 found,  $F(1,69)=12.58$ ,  $p=.001$ . Similar results were found for observed negative behaviour –  
279 while there was no main effect for time,  $F(1,69)=1.46$ ,  $p=.231$ , or condition,  $F(1,69)=0.73$ ,  
280  $p=.395$ , a significant interaction existed between time and condition,  $F(1,69)=12.10$ ,  $p=.001$ ,  
281 indicating that the intervention was effective in changing mealtime behaviour. An inspection  
282 of means in Figures 2 and 3 shows rates of positive behaviour increased in the intervention  
283 group from time 1 ( $M=58.86$ ,  $SD=23.04$ ) to time 2 ( $M=76.34$ ,  $SD=18.25$ ), compared to  
284 waitlist controls (time 1:  $M=68.22$ ,  $SD=21.59$ ; time 2:  $M=60.57$ ,  $SD=24.40$ ). Negative  
285 behaviour decreased after intervention from time 1 ( $M=38.98$ ,  $SD=23.37$ ) to time 2  
286 ( $M=22.49$ ,  $SD=17.06$ ), while waitlist controls increased from time 1 ( $M=30.01$ ,  $SD=21.60$ ) to  
287 time 2 ( $M=38.00$ ,  $SD=24.47$ ).



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289 *Figure 2.* Mean rate of positive mealtime behaviour by group at time 1 and 2.

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292 *Figure 3.* Mean rate of negative mealtime behaviour by group at time 1 and 2.

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## Discussion

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The main aims of this research were to compare meal duration between children identified as problem-eaters and controls, and to assess changes to meal length as a result of intervention. The duration of an observed evening meal did not significantly differ by group (H1a). Duration did vary widely from 5 to almost 60 minutes, with problem-eaters occupying the outer limits. Recorded meal durations of problem-eaters did not alter significantly after intervention compared to waitlist controls (H2a).

Problem-eaters did demonstrate more negative and less positive mealtime behaviour than controls, which was in line with predictions (H1b and H1c). Support was also found for the hypotheses that positive behaviour would increase and negative mealtime behaviour decrease after intervention relative to a waitlist control (H2b and H2c). These findings validate the mealtime difficulties reported by parents, and to an extent the intervention methods tested (see Adamson et al., 2013), yet taken together with the above findings on duration suggest that what is happening during the meal may better distinguish problem-eaters than duration alone. This is in contrast to previous studies that have found longer meals in groups of children with higher incidences of feeding problems (e.g., Powers et al., 2002), though this is to our knowledge the first study to compare normally developing, healthy young children with and without feeding difficulties on meal duration. Significantly more parents in the problem-eaters group did report meals longer than 30 minutes to be a problem, and this was associated with more frequent feeding difficulties on the PATFA. However, only half of parents in the problem-eaters group reported meal length as problematic, suggesting individual differences in problem-eating or issues of salience, where parents may consider other behaviours problematic without realising the influence of these on meal length (Reau et al., 1996). Another possibility might be that particular types of feeding problems affect duration differently - further research is currently underway investigating the correlates

319 of different types of feeding issues and how these respond to intervention. Use of parent-  
320 rather than clinician-report or other means of classifying problem-eaters and controls also  
321 deserves mention, though parents' perceptions of problem eating are central.

322         The association between age and meal length has been unclear within the literature.  
323 While some studies have made clear links between age and meal length (Turner et al., 1994;  
324 van Dijk, Hunnius, & van Geert, 2009; Young & Drewett, 2000), others have found no  
325 differences in meal length across different ages (Crist & Napier-Phillips, 2001; Reau et al.,  
326 1996). The current study found age to influence both observed and parent-reported meal  
327 duration, thus further research should be directed towards clarifying this complex relationship  
328 between the developmental stage of the child and meal length.

329         In the current study, the majority of control children (68%) and those whose parents  
330 were not concerned about meal length (68%) took between 13 and 26 minutes for the evening  
331 meal. This is consistent with previous research that has noted 20 to 30 minutes as an  
332 appropriate meal length (Crist & Napier-Phillips, 2001; Powers et al., 2002; Reau et al.,  
333 1996), and other research finding 19 minutes to be average among children without feeding  
334 problems (Fiese et al., 2012; Kong et al., 2013). This provides to our knowledge the first step  
335 towards empirically-based guidelines for meal length. Further validation with a larger and  
336 more diverse sample may be useful, particularly as this may also facilitate examination of the  
337 cultural aspects of meal length. The current sample represented a reasonably homogenous  
338 group of well-educated Australian mothers from intact families. Kong et al. (2013) noted  
339 some differences in the mealtime interactions of children from various ethnic groups in the  
340 United States, though no significant differences in meal length.

341         A significant strength of the current study was measurement of meal length via  
342 naturalistic observation in the home. This is in contrast to most other research which has  
343 relied on parental report of duration or limited the duration as part of the study methodology.

344 While observed meals were longer for families reporting meals more than 30 minutes as  
345 problematic in the current study, which provides some support for parental report of duration,  
346 observational methods are generally considered a more objective means of recording meal  
347 length (Reilly et al., 1996). Observational methods are not without their challenges however.  
348 While a strict protocol was used to designate the start and end of meals, this is often difficult  
349 with young children (Parkinson & Drewett, 2001). Some parents placed the food at the table  
350 before the child arrived there or vice versa; in other cases, the end of the meal was less clear  
351 due to multiple departures of the parent and child. Parents' reactions to being observed may  
352 also influence meal duration - indeed there were few short meals in this sample, which may  
353 reflect social desirability related to filming – for example, a parent may not want to appear to  
354 let their child go hungry, or for problem-eaters parents may be keen to capture problematic  
355 behaviours on tape.

356 While the MOS is an established coding system with strong psychometric properties  
357 (Sanders, Le Grice, et al., 1993), in the current research it demonstrated more limited  
358 reliability. This may reflect the reality that mealtimes are complicated: multiple children and  
359 parents may be present, in addition to other distractions such as television. The use of a  
360 micro-analytic coding method more generally may not capture the richness of the mealtime  
361 context by coding only the frequency of behaviours (Alexander, Newell, Robbins, & Turner,  
362 1995). Future research might thus apply a coding system which explores the interaction  
363 between parent and child behaviour (e.g., ABC Mealtime Coding System; Fiese, Foley, &  
364 Smyth, 2007, as cited in Kong et al., 2013). The current study also focused only on observed  
365 child mealtime behaviour: an examination of parent behaviour during the meal and in relation  
366 to duration would also be a significant addition to the literature.

367 Meal duration appears to be a complicated aspect of mealtimes, which is influenced  
368 by particular behaviours (Reau et al., 1996), developmental capabilities of the child (Crist &

369 Napier-Phillips, 2001; van Dijk et al., 2009), child age (Turner et al., 1994; Young &  
370 Drewett, 2000), and potentially issues of salience. While this study represented one of the  
371 first to directly explore meal length in a population of typically developing young children,  
372 further research is required to determine the extent to which meal length may differentiate  
373 problem-eaters and controls.

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