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The relation between child feeding problems as measured by parental report and mealtime behavior observation: A pilot study

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ABSTRACT

Because feeding problems have clear negative consequences for both child and caretakers, early diagnosis and intervention are important. Parent-report questionnaires can contribute to early identification, because they are efficient and typically offer a 'holistic' perspective of the child's eating in different contexts. In this pilot study, we aim to explore the concurrent validity of a short screening instrument (the SEP, which is the Dutch MCH-FS) in one of its target populations (a group of premature children) by comparing the total score with the observed behavior of the child and caretaker during a regular home meal. 28 toddlers (aged 9–18 months) and their caretakers participated in the study. Video-observations of the meals were coded for categories of eating behavior and parent–child interaction.

The results show that the total SEP-score correlates with food refusal, feeding efficiency, and self-feeding, but not with negative affect and parental instructions. This confirms that the SEP has a certain degree of concurrent validity in the sense that its total score is associated with specific 'benchmark' feeding behaviors: food refusal, feeding efficiency and autonomy. Future studies with larger samples are needed to generalize the findings from this pilot to a broader context.

1. Introduction

Many parents struggle with the feeding behavior of their young child. Estimations of the prevalence of feeding problems range from around 7%–65%, depending on the definition used (de Moor, Diddens, & Korzilius, 2007). Symptoms in the child include refusing (certain types of) food, acting out during mealtime, and inadequate self-feeding skills (Crist & Napier-Phillips, 2001). Currently, the development of feeding problems is explained by a biopsychosocial model that indicates that these problems stem from the complex interplay between biological, psychological and social factors (Johnson & Harris, 2004; Rommel, De Meyer, Feenstra, & Veereman-Wauters, 2003; Sanders, Patel, Le Grice, & Shepard, 1993). Research has shown that early difficulties, if unaddressed, have a tendency to persist into later childhood and adolescence (Dahl & Sundelin, 1992; Marchi & Cohen, 1990; McDermott et al., 2008). Children with feeding problems often show hampered growth and delayed cognitive development, while their caretakers experience higher levels of stress (Lindberg, Bohlin, Hagekull, & Thunström, 1994; Van den Engel-Hoek, 2006; Garro, Thurman, Kerwin, & Ducette, 2005). For this reason, early diagnosis and intervention are important. There is hardly ever a monocausal explanation for feeding problems, and even in cases with a clear somatic component, the behavioral components and interactions are often also affected. Medical and oral sensory-motor problems can negatively contribute to feeding and often cause more stressful feeding interactions between parent and child. As a result, parents tend to put more pressure on the child, which can cause exacerbation of problems (e.g. Field, Garland, & Williams, 2003; Lindberg, Bohlin, & Hagekull, 1996; Ramsay, Martel, Porporino, & Zygmuntowicz, 2011; Rommel et al. 2003; Tauman et al., 2011). For instance, when a child keeps food in his mouth for too long because of a high oral sensitivity, a caretaker might be tempted to try and speed up the feeding by offering more food. However, in a child that is already over-stimulated, this would lead to increased adverse responses and more food refusal.

Parental feeding style is also relevant. It has been shown that use of a controlling or indulgent feeding style contributes to less optimal self-regulation in children (Birch, Fisher, & Davison, 2003; Frankel et al., 2014). This relation is not unidirectional: feeding style

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contributes to the eating behavior and weight gain of the child, but in turn these influence the concerns and feeding style of the parents (Ventura & Birch, 2008).

Children with medical problems have a higher risk of developing feeding problems (Lukens & Silverman, 2014). One group with an increased prevalence of these problems is the group of premature children (Pridham, Steward, Thoyre, Brown, & Brown, 2006; Samara, Johnson, Lamberts, Marlow, & Wolke, 2009). Due to anatomical, physiological and neurobehavioral immaturity after birth, the achievement of exclusive oral feeding after birth can be challenging (Silberstein et al., 2009). These feeding problems tend to remain later in childhood (Cerro, Zeunert, Simmer, & Daniels, 2002; Gewolb & Vice, 2006). However, the increased risk is largely determined by the medical history of the infants (e.g. neurological impairments (Samara et al., 2009), tube feeding (Jonsson, Van Doorn, & Van Den Berg, 2013)) and not the prematurity itself. In addition, the way caretakers approach such infants may be somewhat more intrusive and less sensitive than it is towards children with a typical development. For instance, mothers of preterm infants are shown to exhibit more gaze aversion and lower adaptability during feeding interactions, as well as less affectionate gaze and touch during other types of interactions (Silberstein et al., 2009). Combined, these vulnerabilities of both preterm children and their caretakers could interact in such a way that they cause a vicious cycle of feeding problems that does not occur as easily in typically developing children. For this reason, premature children have an elevated risk of developing these kinds of problems and therefore pediatricians have to be alert during the regular follow-ups and check-ups in order to ensure early detection.

Because feeding problems are multifactorial and interactive in nature, a diagnosis is required considering many different aspects, such as oral motor skills, feeding history, and behavioral and interactional issues (Sanchez, Spittle, Allinson, & Morgan, 2015). Regular diagnostic procedures therefore often consist of reviewing anamnestic information, a physical examination, and a behavior observation (Arvedson, 2008). It has been argued that questionnaires that ask for parental report are relatively efficient and also provide important information. They typically offer a more 'holistic' perspective, because caretakers observe feeding behaviors across various meals and occasions (Arvedson, 2008). Several parental report instruments are available, such as the Behavioral Pediatrics Feeding Assessment Scale (BPFAS; Crist et al., 1994), the Children's Eating Behavior Questionnaire (CEBQ; Wardle, Guthrie, Sanderson, & Rapoport, 2001), the Children's Feeding Assessment Questionnaire (CFAQ; Harris & Booth, 1992), and the Mealtime Behavior Questionnaire (MBQ; Berlin et al., 2010). However, these instruments consist of between 31 and 40 questions each, and are not suited for a quick identification of problems during a single consultation session. In order to meet this need, a one-page screening list was developed, called the *Montreal Children's Hospital Feeding Scale* (MCH-FS) (Ramsay et al., 2011). The administration and scoring together take only 10 minutes or less in this case. The MCH-FS consists of only 14 items, but still covers most important domains of feeding problems (oral motor dysphagia, selectivity by type and food refusal) (Sanchez et al., 2015). The scale is based on the finding that clinical and non-clinical groups engage in similar behaviors, but that children with feeding difficulties show these behaviors at a higher frequency (Crist & Napier-Phillips, 2001). The questionnaire measures seven main constructs: parental concern, family reactions, compensatory strategies, appetite, mealtime behaviors, oral sensory behavior and oral motor behavior. The MCH-FS has been validated for French, English and Dutch children and has been demonstrated to have a good sensitivity and specificity (Sanchez et al., 2015).

The Dutch version of the MCH-FS is named the 'Screeningslijst Eetgedrag Peuters' (SEP, translated as the 'screening list eating behavior toddlers') and has been administered to a large normative sample (n = 1448) of children under the age of 4 years (see van Dijk, Timmerman, Martel, & Ramsay, 2011). The data indicate a robust internal consistency and meaningful latent variable structure with two factors: 1) Negative mealtime behaviors and 2) Negative causes and consequences. However, there is a high correlation between these two factors, which suggests that a one-factor solution is also sufficient when the primary goal is the rapid identification of feeding problems. In addition, the SEP is able to differentiate between the scores of parents who have sought help for feeding difficulties and the scores of those who have not. Finally, slight but significantly larger scores on the SEP were found for the older children. On the basis of these findings, norms were constructed for four age groups (between 6 months and 1 year, between 1 and 2 years, between 2 and 3 years and between 3 and 4 years) that can also be used to compare the score of an individual child. This leads to a percentile score or a T-score. The aim of the SEP is to screen for significant feeding problems that warrant intervention, which are operationalized in a statistical sense (a T-score above 65 and 70 to indicate moderate and severe problems). However, we first need to know how this score relates to the 'benchmark' of behavior observation in a relevant population.

This current study aims to compare feeding difficulties as reported by parents on this screening instrument (MCH-FS/SEP) with feeding behavior as observed during a regular meal in one of its target groups. We see this pilot study as a first attempt at studying the concurrent validity of the instrument. Previous studies have indicated that parental report scales are related to the observation of feeding behavior, such as meal duration and parental coaxing (Piazza-Waggoner, Driscoll, Gilman, & Powers, 2008; Reau, Senturia, Lebailly, & Christoffel, 1996; Whelan & Cooper, 2000). Children frequently show problematic behaviors such as eating small meals, slow eating, preferring drink to food, and refusing certain types of food (Hofman-van den Hoogen, 1998; de Moor et al., 2007). Young children with feeding problems often display difficult behaviors such as whining, crying, and spitting out food as ways of refusing food. As a response, parents are more likely to use strategies such as coaxing, posing threats, force-feeding, or making multiple meals (Crist & Napier-Phillips, 2001). Pickiness and disturbing behaviors during mealtimes are associated with the use of multiple types of parental management techniques (positive, negative and general management) and the use of many different strategies simultaneously (Hofman-van den Hoogen, 1998; de Moor et al., 2007). We therefore hypothesize that the overall score on the SEP will correspond significantly with observed mealtime behavior.

2. Method

Participants: The study is part of a larger project called *Tailored Care for Preterm Infants* (Luinge, 2011). This project was initiated to gather knowledge on social development and feeding in preterm born children. For the current study, we have focused on a population that has an elevated risk of developing feeding problems and therefore visits the pediatrician at regular intervals. For this reason, preterm born children are one of the target groups for the use of the SEP.

The current study is based on a sample of 30 premature children (aged 9–18 months) and their primary caretakers (biological fathers or mothers). (A-priori power analysis (with a two-tailed alpha of 0.05 and a minimum power of 0.80) indicated that a sample of 29 participants is sufficient to pick up large effect sizes.) The inclusion criterion was that the child was eating solid food. Exclusion criteria were intraventriculair hemorrhage, asphyxia and syndromatic

disorders. Of these 30 participants, 2 cases had to be excluded: one because during the observation the child was fed by his grandmother, and one because the child turned out to have a PEG-feeding tube and received a limited amount of oral feeding. All children in the sample were born preterm (g.a. < 32 weeks), were healthy and had no known developmental problems. All participants were from middle to upper SES families living in the North of the Netherlands. Educational levels of the caregivers varied from lower levels of secondary education, vocational training to university degrees. See Table 1 for some descriptive statistics of the participants.

Material: Caretakers were interviewed about the development and medical history of their child and were given a short questionnaire including the SEP. The SEP consists of 14 items with statements that have to be answered on a 7-point Likert scale. Half of the scores have to be inverted before the total score can be calculated. In a few cases, the SEP was not filled in as intended. In order to preserve as much data as possible, we followed three rules. The first was that when parents had marked two neighboring values (e.g. '1' and '2'), we used the highest value ('2'). This occurred twice. Also, when parents indicated both the highest and lowest value of the scale ('1' and '7'), the middle value ('4') was taken. This also occurred twice. Finally, two parents did not check a value for item 4 ("when does your child start to refuse food") but wrote down "never"/"does not refuse", which we interpreted as the extreme anchor point "at the end of a meal". This way, all 28 questionnaires could be used for further analysis.

All videos were coded from the first feeding action (parent offering a bite or a self-feeding) until the parent indicated that the meal is ended. The coding system consists of the most central feeding behaviors (as also included in other observation systems (e.g. Agras, Berkowitz, Hammer, & Kraemer, 1988; Harris, Thomas, & Booth, 1990; Young & Drewett, 2000). There are codes for giving, accepting and refusing food and self-feeding. We also included two interaction variables: child negative affect and parental instructions (Hughes et al., 2007; Kramer, Barr, Leduc, Boisjoly, & Pless, 1983; Seth et al., 2007; Vereecken, Covents, Haynie, & Maes, 2009). In the first version of the coding scheme, there was a code for Force (indicating negative behaviors of the parent, such as negative comments, forcing food, touching the child in a 'harsh' manner). This behavior hardly occurred in the video-observations and was therefore left out for further analysis.

The inter-observer reliability was computed based on 6 randomly chosen videos that were coded by two independent coders (combinations of first, second and third author). We used a strict definition of reliability, and only included behaviors that were coded as 'present' at a certain point in time. We looked at the overlap of all codes (both coders indicate the presence of the same event within 2 s) and non-overlap (only one coder indicates its presence). This was corrected for the chance overlap (0.50 for give, negative affect, and instruction; 0.33 for accept, self-feeding and refuse). The resulting Cohen's kappas were satisfactory for all categories ($k = 0.86$ for Give, 0.97 for Accept, 0.79 for Self-feeding, 0.69 for Refuse and 0.62 for Instructions), except Negative affect ($k = 0.46$). (When also including agreement on the absence of behaviors for each 2-second time frame, all Cohen's kappas were between 0.99 and 1.00).

Procedure: Ethical approval for the study was given by the Ethical Committee of Psychology at the University of Groningen (after acquiring WMO-exemption by the METC). Parents were informed about the study during a check-up visit at the aftercare clinic of the University Hospital, and were asked if they were willing to be contacted for participation. When parents agreed to this (as roughly 50% did), a research assistant of the project telephoned them a few weeks later to schedule an appointment. The sessions were scheduled right before the time at which the child would typically eat, at a moment of the parents' choice. Most visits occurred between 10:00 a.m. and 03:00 p.m. and concerned a fruit snack or lunch, with the exception of one visit that concerned an evening meal. After the telephone call, the informed consent form was sent by mail.

During the home visit, parents were first interviewed and asked to fill out the questionnaires. After this, they were asked to feed their child as they would normally do. The choice of food was theirs to make, resulting in cases of fruit (puree or pieces), a sandwich or a warm meal. The food was weighed before and after the meal (including the bowl and bib) in order to estimate the amount of food consumed (not including liquid drinks). The feeding sessions were video-recorded using two cameras (a frontal close-up of the child's face, and a frame with child and parent together). In most cases, one researcher was present during the visit, though in two cases a second researcher was there to give assistance. Parents were asked to pretend that the camera and researcher(s) were not there and to follow their own routine as much as possible. During this part of the visit, the researcher(s) would withdraw to a different

Table 1
Background information of the participants.

		n
Child sex	Male	14
	Female	14
Birth composition	Singleton	20
	Twins	8
Caretaker sex	Male	5
	Female	23
Last known weight at check-up (WHO percentiles for (corrected) age)	1th–5th	2
	5th–15th	2
	15th–25th	3
	25th–50th	3
	50th–75th	7
	75th–85th	3
	85th–95th	3
	95th–99th	4
	unknown	1
	Mean	**Std. Deviation**
Child age (months)	12.82	3.49
Gestational age (weeks)	29.21	1.82
Birth weight (grams)	1391.27	423.05
Caretaker age	31.54 yrs	4.14 yrs

corner of the room (or different room altogether) and would not interact with the participants, something that was explained beforehand. After the session, parents were asked (orally) whether the meal was 'representative' for a regular meal (the questions were: "Does this observation give a good picture of how your child usually eats?" and "Was anything different from normal?"). In all cases, it was indicated that the observed meal was indeed illustrative for a normal meal (in just one case, a parent noted that it was only a bit slower than usual). All video material was coded by the first, second and third author of this article, using the coding scheme described in Table 2.

Analyses: Because the meals varied in length (from 6.5 to 32.5 minutes in total), we used relative frequencies of the behaviors described in the coding scheme (frequencies divided by mealtime durations). Aside from providing descriptive statistics, we calculated Pearson correlation coefficients between the questionnaire data and the observation categories. Independent one-sample t-tests were performed to test the average SEP-score against the average of the normative sample in two age groups (0; 6–1 year and 1; 0–2; 0 years) (as reported in van Dijk et al., 2011). We used an alpha of 0.05.

3. Results

Descriptive statistics. A summary of average frequencies and variance is described in Table 3. It is important to note that all SEP-scores fell into the normal range. A one-sample t-test showed that the participants did not score differently than the average score of the 0; 6–1; 0 year olds ($t(33) = -1.05$, $p = 0.30$), but that the scores of the current sample were lower (indicating fewer symptoms) than the average of the 1; 0–2; 0 year olds in the normative sample ($t(35) = -2.72$, $p = .01$). See Table 4 for the descriptive statistics of these samples.

Correlations. The correlation analysis shows that moderate statistical associations exist between the SEP-score and self-feeding ($r = -0.46^{*}$), refusing food ($r = 0.67^{**}$) and feeding efficiency ($r = -0.43^{*}$). This means that in cases where parents indicate more symptoms of feeding problems on the SEP, the feeding behavior is –on average– less independent, less efficient and the child shows more food refusal. No statistical associations were found between the SEP and the interaction variables Instructions and Negative affect, and global variables Mealtime duration and Consumed grams. See Table 5 for all correlation coefficients.

4. Discussion

The results of this pilot study provide preliminary support for the concurrent validity of the SEP. When parents report more symptoms of feeding problems, children are observed to typically refuse more frequently, and to eat less independently and efficiently during a regular meal. No relations were found between the score on the SEP and the interaction behaviors of giving instructions by the parent and negative affect by the child. There was also no significant relation with mealtime duration and consumed grams (though the correlations did have the expected direction). These results suggest that the SEP mainly correlates with the factual eating behavior and feeding skills of the child. Since the strongest correlation is with food refusal, this can be considered the most relevant behavior indicator of feeding problems in terms of the specificity of the SEP for this target group.

The fact that no associations were found with the interaction variables (parental coaxing, giving instructions and negative affect of the child) does not imply that these variables are less relevant, however. Previous research has shown that feeding problems are associated with acting out during mealtimes and the use of many different strategies (simultaneously) to make the child eat more (de Moor et al., 2007; Crist & Napier-Phillips, 2001). The fact that none of the participants in the current study had significant feeding problems may also have contributed to our not being able to reject

Table 3
Descriptives of feeding behavior, SEP and global measures of the feeding session (M and SD).

	Mean	Std. Deviation
Bites (accepts + self feeds) per minute	2.99	1.58
Self-feeding per minute	1.10	1.33
Reject per minute	0.53	0.62
Instruction per minute	0.99	0.88
Negative affect per minute	0.28	0.51
Total SEP	24.39	6.18
Duration of the meal	16.81 min	7.99 min
Consumed grams	86.0 gr	47.5 gr

Table 4
Means and SDs for the SEP scores of the current sample and the age groups from the normative sample (Van Dijk et al., 2011).

	Mean	SD	n
Current study	24.39	6.18	28
Norm sample 0;6 – 1;0	25.69	8.20	408
Norm sample 1;0 – 2;0	27.79	9.21	425

Table 5
Pearson correlations between the SEP-score and the feeding session variables.

	R	p-value
Bites per minute	−0.43	0.021*
Self-feeding per minute	−0.46	0.014*
Reject per minute	0.67	<0.001**
Instruction per minute	0.08	0.681
Negative affect per minute	−0.07	0.707
Duration of the meal	0.28	0.145
Consumed grams	−0.20	0.312

Table 2
Coding scheme used for the quantification of the feeding and interaction behavior.

Eating and feeding

1 . **G**: Give (event): parent brings food to the mouth of the child
'Cleaning' is not seen as a Give, only when the food is consequently taken into the mouth.

2 . **A**: Accept (event): food goes into the mouth
X: Refuse (event): child refuses by not opening the mouth
Note: all gives that are not accepted are refused.

3 . **S**: Self-feeding (event): Each action to bring food/drink into the mouth
When a child is chewing on a larger piece of food, code all action of bringing the food *into* the mount separately.

Interaction behavior

4 . **I**: Instructions (event): all parental verbal interaction that tells the child to eat (e.g. "have a bite"), the tone does not matter (includes coaxing and giving directives)

5 . **N**: negative affect (event): all instances of starting to cry, whine or fuss, choking, rough physical behavior by the infant (also pushing away or pulling spoon)

the null hypothesis for these interaction variables. In this sample all scores were in the range between no and mild problems, which may have reduced effect size and thus made it impossible to detect in a sample of this size.

This study also confirmed that the codes for giving food, food acceptance and refusal, and giving instructions can be easily and reliably coded. For Negative affect, it turned out to be hard to precisely establish the point where a specific vocalization changed into a 'whine' or 'cry', causing the moderate overlap between independent observers for the current definition. Therefore, the findings regarding negative affect should be interpreted with care. What also played a role in the coding of negative affect was the low frequency of the behavior in most of the sessions. Though the coding system was limited, we believe that the codes used in this study capture the essential feeding and interaction behaviors (e.g. food acceptance and refusal, slow eating, autonomy, affect, coaxing). However, more subtle and precise behaviors (e.g. oral sensorimotor skills of the infant, using distraction or motor restriction by the parent, nonverbal interaction behaviors), which were not the main focus of the SEP, can be included in future studies.

An important limitation was that all participating children were born prematurely and were thus at risk for developing feeding problems, and that the participation rate was only 50%. However, the results showed that the scores on the SEP were not higher than the children in the normative sample, but instead seemed to be somewhat lower. This may be related to the fact that none of the children in the sample had health problems, and that they were all very similar to typically developing children of that age. Nevertheless, we cannot be sure that the children's difficult start to life has not altered the perception of parents in one way or the other. In addition, relatively many participants (8/28) were part of a twin, which may have impacted the overall results of the study. On the other hand, twins are often born prematurely and they could therefore be expected to be part of the target group of this pilot study. Future research is needed to generalize these findings to the population. However, it should be noted that the participants are from a population that is actually one of the main target groups of the SEP.

A second limitation of the current study is that the sample turned out only to include children without feeding problems. The findings are thus based on a relatively small distribution of SEP-scores. It may be expected that the associations between the variables would have been stronger if children with feeding problems had been present in this sample. On the other hand, our results do show that the instrument is also able to pick up differences in the normal ('mild') range of the scale, especially with regard to the feeding behaviors of the child.

The main limitation of this pilot study is clearly the small sample size. As a consequence, the power was too low to detect anything other than large effect sizes. In fact, post hoc power analysis showed that only the correlation between the SEP-score and food refusal was above 0.80. In relation to this, we were only able to perform simple correlation analyses, which assume linear relations between the SEP scores and the behavioral variables. However, it is highly likely that, in reality, the relations are non-linear in nature. It may be hypothesized that there is a threshold beyond which the variables show a different (stronger) relation to each other. For instance, it may be the case that the frequency of parental instructions and coaxing matter only in the range of moderate to severe feeding problems, whereas in normal range they are more reflective of the caretakers' feeding style or personality. In this sense, it is relevant to stress that we coded all instructions by the parents and that these were almost all positive in nature (such as "hmm, eat your fruit!" with a big smile). It may be speculated that this is partly caused by the fact that caretakers were aware that they were being recorded (and may have tried to avoid a tantrum). But again, none of these infants showed feeding problems and in all instances parents' indicated that the meal was representative for a normal meal. In a previous study (de Moor et al., 2007) it was demonstrated that during difficult meals, parents use many different strategies simultaneously (positive, negative and general management), whereas in the current study hardly any negative interactions were observed.

In this study, we chose to study children who were at a crucial age in their feeding development. During this time frame, children typically have made the initial transition to solid food, and already get at least part of their daily caloric intake from solid food (Young & Drewett, 2000). They are also eating a variety of food types and are getting more independent and autonomous in feeding behavior. The fact that the children in our sample are going through this 'second transition' in feeding at the moment of the measurements may have led to an increase in the variability between and within participants. The literature shows that eating and feeding behavior are not necessarily stable over consecutive meals and days, but are characterized by meal-to-meal and day-to-day fluctuations (e.g. Young & Drewett, 2000). Children typically show large inter and intra-individual variability (van Dijk, Hunnius, & van Geert, 2009). In this respect, it is surprising that the statistical associations between the more holistic perception of the caretakers and the momentary behavior observation were still relatively large, suggesting a certain sensitivity of the instrument. However, it is important to consider the developmental dimension of feeding as well. In typical development, feeding behavior and food acceptance do not remain stable but are adaptive to context and age, and when there are difficulties the symptoms tend to build up over time (van Dijk et al., 2011; de Moor et al., 2007). Because feeding problems are a developmental phenomenon, future studies with repeated measures are indispensable.

In conclusion, this pilot study has demonstrated that the 14-item SEP (the Dutch version of the MCH-Feeding Scale) has a certain degree of concurrent validity in the sense that its sum score relates to specific benchmark feeding behaviors: food refusal and feeding efficiency and autonomy. This suggests that the SEP can be used to get a valid impression of the eating behavior of a child. However, future studies with larger samples are needed to generalize these findings to a broader context.

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