Journal of Parenteral and Enteral Nutrition
Volume 0 Number 0
xxx 2018 1–7

DOI: 10.1002/jpen.1433
wileyonlinelibrary.com
WILEY

Messy Play Therapy in the Treatment of Food Aversion in a Patient With Intestinal Failure: Our Experience

Fabrizia Chiatto, MD[1]; Riccardo Coletta, MD, PhD[2,3]; Andrea Aversano, MD[4]; Tracy Warburton, HPSET[5]; Lynette Forsythe, RD, BSc[6]; and Antonino Morabito, MD[7]

Abstract

Background: Food aversion (FA) is an eating behavior where children refuse solid or fluid intake. FA can compromise the weaning off parenteral nutrition (PN) in children with intestinal failure (IF), reducing their quality of life (QoL). Around 25% of children with IF experience FA, but few data are available on interventions to get over FA. Messy play therapy (MPT) uses sensory activities to provide another meaningful avenue for learning in children by creating a fun way to experience new textures. This study aims to assess the efficacy of MPT in FA. *Methods:* Demographic data and MPT intervention were retrospectively recorded between 2004 and 2017. Food was categorized by tastes and textures. Data are expressed as median and interquartile range (25%–75%). *Results:* Twelve children were identified. MPT was started at 9 (6–16) months with an enrolling time within the program of 10.11 (7.75–12.5) months. MPT was ended after 19.5 (16.75–28.5) months, and all patients achieved tolerance to oral diet. Significant improvement in savory ($P = .001$), sweet ($P = .002$), and mixed texture ($P = .001$) of food intake was reported. Better QoL and mealtimes with family were reported at median follow-up of 39 (24–56) months. *Conclusions:* MPT seems to be a positive intervention to overcome FA. In our experience, the children have gone from not tolerating any intake to tolerating an oral diet, which means enjoying their mealtimes. Further studies are needed to evaluate the effectiveness of MPT in a larger scale of patients. (*JPEN J Parenter Enteral Nutr.* 2018;0:1–7)

Keywords

children; enteral nutrition; feeding and eating disorders; messy play; oral aversion; parenteral nutrition; short gut syndrome

Clinical Relevancy Statement

Feeding problems are common in childhood, in particular food aversion is common in children with chronic illness. A child with intestinal failure usually is hospitalized for a long time. Parenteral nutrition/nasal gastric feeds represent the methods used to provide the nutrition requirements these children need, before the gradual introduction of what may be a limited/restricted diet. The transition to oral food may be difficult for these children. There is evidence that children with conditions leading to intestinal failure often experience food aversion and feeding difficulties. In the general assessment of a child with intestinal failure, it is important to also consider the emotional area to overcome

From the [1]Department of Translational Medical Sciences, Section of Paediatrics, University Federico II, Naples, Italy; [2]Department of Paediatric Surgery, Royal Manchester Children's Hospital, Manchester, United Kingdom; [3]Paediatric Autologous Bowel Reconstruction and Rehabilitation Unit, Royal Manchester Children's Hospital, Manchester, United Kingdom; [4]School of Medicine, University of Cagliari, Cagliari, Italy; [5]Department of Therapeutic and Specialised Play, Royal Manchester Children's Hospital, Manchester, United Kingdom; [6]Department of Dietetics and Nutrition, Royal Manchester Children's Hospital, Manchester, United Kingdom; and [7]Department of Pediatric Surgery, Meyer Children's Hospital, University of Florence, Florence, Italy.

Financial disclosure: None declared.

Conflicts of interest: None declared.

Received for publication May 16, 2018; accepted for publication July 11, 2018.

This article originally appeared online on xxxx 0, 2018.

Corresponding Author:
Coletta Riccardo, MD, PhD, Department of Paediatric Surgery, Royal Manchester Children's Hospital, Oxford Road, Manchester M13 9WL, UK.
Email: coletta.riccardo@gmail.com

food aversion. The first year of life can be physically and emotionally challenging. Messy play helps children get used to new textures, smells, and so on, in a relaxed, funny way without the pressure to eat or taste. This is the first study to review the outcome of messy play therapy, and little evidence is available.

Introduction

Food aversion (FA) is described as an excessive or extreme and consistently negative reaction to oral fluids or diet, which interferes with nutrition requirements. The aversion may be partial or selective, with a limited repertoire of intake of tastes and/or textures.[1] In patients suffering from intestinal problems leading to intestinal failure (IF), such as short bowel syndrome, FA is reported in 25% of this population.[2,3] The reasons are complex, and weaning onto oral food seems to benefit from a multidisciplinary team approach.[4,5]

Children with IF require nutrition support via parenteral nutrition (PN) and/or enteral feeding tubes. In these children, developing and preserving oral skills is always a priority, like in our program, because they often can develop FA[2,6] due to delayed introduction of oral feeds as a result of prematurity, prolonged intubation, and cardiovascular instability. In fact, that is the reason why, in our rehabilitation program, oral feeding is generally started as soon as possible with normal breast milk or formula, and patients are weaned at the appropriate time.[7]

There is a critical period for the development of oral feeding skills in the first year of life, and this opportunity to learn needs to be preserved. If this period is missed, children may display oral-motor, sensory, and developmental feeding problems when they are weaned off of PN and/or enteral tube feeding.[8] Unfortunately, few reports have investigated what is the best time to move from tube feeding to oral feeding,[4,9] and no consistent guidelines for this transition have been issued so far. When weaning is attempted, the children unaccustomed to having food in their mouth cannot handle the presence of food in their mouth, and they do not know what to do with it. This leads to gagging, choking, and vomiting, making feeding a negative experience.[10]

Limited research and information are present in the literature regarding which could be the best intervention to overcome oral aversion, eat orally, and increase participation and satisfaction in mealtimes. The exact cause of FA seems to result from a combination of factors including psychological aspects. From a recent review, 3 underlying themes emerged, such as physical, developmental, and social aspects of eating.[11]

Multiple strategies have demonstrated effectiveness when used in a multidisciplinary team program. Some different treatments, such as sensorimotor skill building behavioral modification, hunger provocation, and sensory integration therapy, are used because they seem to help children suffering from FA.[12] It appears difficult to find a unique accepted treatment because there are few rigorous scientific studies evaluating treatment for this population. The major part of the available studies is retrospective, and this limits their generalizability.[13]

Previous studies highlighted how to develop a child's interest in food, advocating activities such as cooking, messy play, and playing touching food.[14-17]

Messy play therapy (MPT) uses the senses to gradually desensitize children to different smells and textures within play, without the pressure to taste or eat.[18] Although it may be commenced within the hospital, it is continued within the home environment under the supervision of the play therapist.

The aim of this study was to assess the efficacy of a play therapist–led interaction, or "messy play," in this cohort of children with FA.

Methods

Retrospective analyses of all children referred to the pediatric autologous bowel reconstructive unit at the Royal Manchester Children's Hospital were performed. The period of investigation was 2004–2017. Inclusion criteria were patient suffering from FA and managed with MPT. Patients affected by gastrointestinal disorders without intestinal resection who experienced FA were excluded. FA was classified through symptoms such as gagging, retching, vomiting, and refusal of oral feeds/fluids.

Demographic data were collected for diagnosis, age, weight, height, methods of enteral feeds, duration of inpatient stay, duration of messy play, and the proportion of inpatient and outpatient messy play. Dietary intake was identified from food diaries, which consisted of a blank form with sections for mealtimes that families completed at home on their own. Weight-for-age and height-for-age were expressed using a z-scores chart and tables from the Global Database on Child Growth and Malnutrition database. Outcomes measured were tolerance of oral feeds before and after therapy (as described in food diaries) and changing of weight. Food was categorized by taste and texture as shown in Table 1.

MPT

The aim of MPT is to allow children to become familiar with a range of textures and smells without pressure to taste or eat. Informed consent has been obtained by all caregivers enrolled in the study. After clinical assessment with a speech and language therapist to ensure that the child has no swallowing difficulties, MPT was started according to the pathway listed in Table 2.

Children begin a program of 30-minute sessions, 2–3 times a week as per children acceptance and enjoyment.

Table 1. Categories of Food Considered Within the Process of Messy Play Therapy.

Tastes of food	
Bland (eg, formula milk, breast milk, or baby rice)	A
Savory (eg, pasta, vegetables, toast, and fish stick)	B
Sweet (eg, fruit, yogurt, biscuits, cereal, and raisins)	C
Spicy	D
Bitter	E
Textures of food	
Liquid (eg, breast milk, fortified milks such as Cow & Gate, juice, formula milk)	1
Puree (eg, pureed fruit, baby food, or milk with thickener)	2
Mashed (eg, mashed potatoes and mashed bananas)	3
Roughly mashed	4
Mixed texture (eg, porridge, lasagna and pasta in sauce, soups, and baked beans)	5
Soft separate lumps (eg, banana pieces, scrambled eggs, and cooked vegetables)	6
Hard separate lumps (eg, meat, raw vegetables and fruit, raisins, crisps, and fish stick)	7

Table 2. Phases of Assessment in the Messy Play Program Used in Royal Manchester Children's Hospital.

Messy Play Therapy: Initial Assessment	
Parental/Carer engagement	Ensure parents and carers of child are fully aware of the aims of the interventions to be offered and their role within this
Prefeeding intervention	Textured toys/materials, food-related jigsaw puzzles, books, and games
Introduction to Messy Food Play Program (alongside Oral Skills program as required)	Tolerance to food textures follows the pattern: Dry coarse (eg, dry pasta, rice, lentils) Dry fine: flour Wet firm: bread dough Wet tacky: wetter dough, cooked pasta plus rice Wet semisolid consistencies: yogurt/thick custard Wet liquid: puree Wet mixed: baked beans

As inpatients, the sessions are held in the department of therapeutic and specialized play or in the ward area. Once discharged, the play specialist visits children in their home environment. The play specialist coordinates with dietitians, physiotherapists, speech and language therapists, and surgeons regarding patient progression.

The program begins with desensitization to touch by handling and playing games with fabrics and materials such as fur, cotton wool, and sponge, and gradually dry course foods such as pasta, rice, and cereals are then introduced and used in fun activities such as collage making.

A progression from dry course to dry fine such as flour follows on to wet sticky and wet runny consistency (thin, watery) before finishing with mixed textures encouraging the child to "get messy" and gain confidence with textures and smells. Eventually the child experiences different tastes as he or she touches his or her lips with food on his or her fingers.

Play intervention around the awareness of the oral structure itself is often carried out alongside the MPT to maximize readiness for effective oral eating. It is important that the parent/carer is actively involved in the session.

Growth and Height

z-Scores were calculated to evaluate the impact of MPT on the children's growth. *z*-Scores show the number of SDs that the weight and height are above or below the mean weight and height for children of the same age. They are used to analyze before and after weights and heights using the Mann-Whitney *U* test for any statistically significant change.

Data Analysis

StatsDirect software (2008; StatsDirect, London, UK) version 2.7.9 was used for statistical analysis completed using McNemar's test for the comparison of tolerance to oral feeds.

z-Scores were produced using the World Health Organization's (WHO's) Anthro software.[19] This software uses the 2011 WHO growth standards for children from 0 to 5 years of age. Current UK growth charts use the WHO standards between 2 weeks and 4 years of age, after which UK 1990 data are used.[20] All of the children were between 4 months and 4 years of age when they underwent MPT. Therefore, accepting the limitation that analyzing follow-up data after 60 months of age will use UK 1990 data, the WHO growth standards were chosen for this population. Mann-Whitney *U* test was used to analyze weights and heights before and after MPT.

Results

Twelve patients were identified (8 girls, 4 boys). Demographic information and diagnosis are presented in Table 3. The majority of cases were diagnosed at birth, with 1 patient being diagnosed at 1 month of age.

Seventy-five percent of patients were premature, with gestational age ranging from 26/40 to 39/40 weeks. Only 1 child has developmental delay. Length of stay in the hospital was 8 months (6.75–10.25). All patients had safe oral motor

Table 3. Demographic Data of 12 Children With Food Aversion Who Underwent Messy Play Therapy Between 2004 and 2017.

Sex, n (M/F)	8/4
Median gestational age (IQR), weeks	34 (32.75–37.25)
Median birth weight (IQR), kg	1.9 (1.72–2.26)
Causative factors, n (%)	
Gastroschisis	6 (50)
Malrotation/Volvulus	2 (17)
Small-bowel atresia	1 (8)
Necrotizing enterocolitis	2 (17)
Hirschsprung's disease	1 (8)
EN by NG, n (%)	7 (58)
EN by gastrostomy, n (%)	3 (25)
EN by gastrostomy and NG, n (%)	2 (17)
Median duration of inpatient stay (IQR), mo	8 (6.75–10.25)
Patients off PN, n (%)	7 (58)
Median of nights receiving PN, n (IQR), d	4 (2–5)

EN, enteral nutrition; IQR, interquartile range; NG, nasogastric tube; PN, parenteral nutrition.

skills, all children had been exposed to some oral feeds before commencing messy play, and all had been receiving PN from birth.

MPT enrolled patients with a median age of 9 (6 –16) months with an average duration of therapy of 10.11 (7.75–12.5) months. Four patients of the cohort had been fed from birth to aid gut absorption and adaptation. Fifty-eight percent of patients were reported to have enteral nutrition through nasogastric tube (NG), whereas gastrostomy was used in 25% of the patients. Interestingly, 17% of patients with FA had NG and gastrostomy at different times.

Ninety-two percent of patients completed the MPT as a combination of inpatient and outpatient management. One patient remained an inpatient throughout because of medical issues. All patients (100%) were tolerating liquids (category 1) before MPT. About 41.7% of children did not tolerate pureed food (category 2) before MPT, with all children tolerating purees after. This difference was not statistically significant ($P = .06$). There was a 100% increase in tolerance to mashed, roughly mashed, and food with soft or hard separate lumps (categories 3,4, 6, and 7) after therapy, and 91.7% ($P = .001$) increased their intake of mixed textured foods (category 5).

Tolerance to taste was also affected and improved after therapy. All patients tolerated bland taste (category A) before therapy. There was a statistically significant increase in tolerance to savory food ($P = .001$) and sweet food ($P = .002$) after therapy (categories B and C). MPT did not appear to affect tolerance to spicy or savory foods (categories D and E). A statistically significant increase was observed in children tolerating savory ($P = .001$) and sweet foods ($P = .002$), along with an increase in those tolerating mixed texture foods ($P = .001$). Tolerance to oral diet after MPT treatment was recorded in all children after a follow-up of 39 (24–56) months.

Mann-Whitney U test showed that there were no significant changes in the children's z-scores for height or weight pretherapy and posttherapy (median difference 0.335, 96% CI: −1.07 to 1.56, $P = .3207$; median difference −0.78, 95.5% CI: −2.01 to 0.3, $P = .1782$, respectively) (Table 4).

Discussion

FA can occur in patients where extensive bowel resection led to a prolonged period of nil by mouth because of ileus. Unfortunately, FA is more frequent in surgical patients where the dietary restrictions, the use of feeding devices, and prolonged hospital stays[21-23] can interfere with normal eating behavior.

The prolonged use of NG seems to promote hypersensitivity in response to different tastes and textures[6,24]; furthermore, this device, if present for a prolonged time in patients <6 months old, can delay adequate reflexes such as suction and swallow.[12,25,26] Moreover, in severe scenarios when PN is required to support growth, the patient can potentially suppress normal appetite,[27] and subsequent prolonged hospitalization can reduce the eating behavior and pattern.

Enteral feeds are an important element in the management of children with FA and gastrointestinal diseases.[28,29] Enteral feeding plays an important role in intestinal adaptation and growth. In fact, enteral feeding reduces biliary cholestasis,[30] encourages intestinal adaptation through the stimulatory effects on epithelial cells and the production of trophic hormones,[31,32] and reduces bacterial overgrowth and potential translocation with sepsis.[33]

MPT is designed to overcome FA and to encourage an oral diet. Success can be measured by an increase in food tolerance and oral intake; this will help in the overall management of patients and PN weaning.

Although there is agreement that a multidisciplinary approach is needed for children with FA,[34,35] there are few described plans to address the long-term issues of FA, and no unique therapeutic plan has been put in place so far. Previous studies reported different pathways in behavioral programs including parental engagement,[36,37] rapid weaning with hunger phase lasting 5 days, followed by intensive psychology support during mealtimes for 4–10 days.[38] Behavioral manipulation is also important as demonstrated in the case study by Gutentag and Hammer,[39] where training consisted of teaching the parents how to attend to and reinforce appropriate behaviors, ignore minor inappropriate behaviors, administer appropriate commands, and implement effective timeout for noncompliance. Children are sensitive to the reactions of those around them, especially their parents/carers.[40,41] Interaction between the child and the

Table 4. *z*-Scores for Heights and Weights of the Patients Before and After (Between 5 and 16 Months After Therapy Ended) MPT.

Personal Identification No.	Height (*z*-Score)		Weight (*z*-Score)		Length of MPT (mo)
	Before MPT	After MPT	Before MPT	After MPT	
1	−2.37	−2.27	−1.23	−1.54	12
2	n/a	n/a	−4.89	−4.79	6
3	n/a	−2.31	−5.69	−0.99	6
4	−1.27	−2.24	−1.74	−2.04	12
5	n/a	n/a	−0.92	−1.34	10
6	n/a	n/a	−3.45	−0.29	15
7	−2.24	−3.32	−2.07	−1.94	9
8	−1.06	−1.6	−0.04	0.09	7
9	n/a	n/a	−2.85	−2.13	4
10	−4.11	−2.45	−3.68	−3.1	17
11	−0.89	−1.17	−2.53	−1.67	14
12	−0.27	−0.33	−1.85	−1.01	9

MPT, messy play therapy; n/a, height and weight were not recorded.

caregiver promotes bonding and communication, leading to a more enjoyable experience.[42]

All children belonging to the study cohort had experienced FA after long hospitalization due to conditions that required abdominal surgery, but interestingly all were tolerating a bland liquid diet.

In our experience, a significant success was reported in increasing the children's tolerance to mashed foods, roughly mashed foods, mixed texture, soft and hard separate lumps (textures 3–7), and tolerance to savory and sweet foods, respectively. The increased tolerance to oral diet allowed the children of our study to experience a positive relationship with food. In our population, we observed a relatively wide range of MPT length (4–17 months) as demonstration of a different need and efficacy of treatment for each enrolled child. This variation in treatment length is related to a single medical and nutrition feature, as well as to the child's ability to acquire developmental milestones during the treatment period. In addition, the MPT approach is tailored on child age and periodically modified over time in accordance with medical and nutrition improvement, and the acquisition of developmental skills that may impact on the interaction with the play specialist.

In agreement with Douglas,[43] we are of the opinion that the sensory environment in which the sessions were carried out could play a role for the outcome of the treatment, including the room (inpatients or outpatients) in which the child was fed, the reactions of the people around (parental involvement and anxiety of caregivers), and the taste, texture, and temperature of the food. We believe that a child who is comfortable with handling foods with different skin/surface texture will often become more daring in trying new foods and tastes, and to build up confidence around food. For those following restricted diets, the messy play program was adapted using foods that are in line with the dietary advice. The ability of the child to overcome his or her aversion to food is also important as demonstrated from previous studies where reduction of stress and anxiety improved the family unity.[44,45]

Parental anxiety seems to play an important factor delaying the cessation of tube feeds or the PN especially around the expected growth velocity.[46] With rapid weaning of PN and hunger provocation programs, weight loss can be variable between 3.7% and 15.6%,[47] but increase in weight appears to happen once oral diet is tolerated. We wanted to analyze whether there was a change in the growth with the MPT. This could suggest that the therapy had a positive or negative effect on the child's growth. Analyzing our study group, no negative impact on the growth velocity was reported for height or weight, respectively. In fact, our results showed that there were no significant changes in the children's *z*-scores for height or weight pretherapy and posttherapy. This suggests that MPT is not designed to improve growth velocity, but rather the children's ability to eat.

Successful MPT used in this study embraces the concepts of learning through play. The MPT embraced parental involvement, and it was mainly home based. Further studies should incorporate a comparison between the various methods with a strict definition for "success," along with an assessment of anxiety in both the child and the parent. Finally, Davis et al[13] also concluded that because children who present with feeding difficulties are so heterogeneous, it is possible that a variety of treatments will need to be developed or tailored to the unique needs of these subgroups of children.

The limits of our study are that we analyzed a small number of patients, also because of the rarity of the underlying

disease. Furthermore, we did not use a scale for measuring quality of life, mealtime stress, or enjoyment, so this type of evaluation should be considered in futures studies. Our MPT was limited to a single medical center, so research studies should be coordinated across multiple centers to enroll a sufficient number of children to standardize this type of treatment.

Statement of Authorship

F. Chiatto, R. Coletta, and A. Morabito equally contributed to the conception and design of the research; L. Forsythe contributed to the design of the research; F. Chiatto and A. Aversano contributed to the acquisition and analysis of the data; T. Warburton and R. Coletta contributed to the interpretation of the data; F. Chiatto, R. Coletta, and A. Morabito drafted the manuscript; and all authors critically revised the manuscript, agree to be fully accountable for ensuring the integrity and accuracy of the work, and read and approved the final manuscript.

References

1. McCurtin A. Eating & Drinking & Swallowing (EDS) aversion. In the fun with food programme: therapeutic intervention for children with aversion to oral feeding. *Speechmark*; 2007:11–20.
2. Gutierrez I, Kang K, Jaksic T. Neonatal short bowel syndrome. *Semin Fetal Neonatal Med*. 2011;16(3):157-163.
3. Olieman JF, Penning C, Ijsselstijn H, et al. Enteral nutrition in children with short-bowel syndrome: current evidence and recommendations for the clinician. *J Am Diet Assoc*. 2010;110(3):420-426.
4. Davis AM, Bruce AS, Mangiaracina C, Schulz T, Hyman P. Moving from tube to oral feeding in medically fragile nonverbal toddlers. *J Pediatr Gastroenterol Nutr*. 2009;49(2):233-236.
5. Ayoob KT, Barresi I. Feeding disorders in children: taking an interdisciplinary approach. *Pediatr Ann*. 2007;36:478-483.
6. Goulet O, Olieman J, Ksiazyk J, et al. Neonatal short bowel syndrome as a model of intestinal failure: physiological background for enteral feeding. *Clin Nutr*. 2013;32(2):162-171.
7. Khalil BA, Ba'ath ME, Aziz A, et al. Intestinal rehabilitation and bowel reconstructive surgery: improved outcomes in children with short bowel syndrome. *J Pediatr Gastroenterol Nutr*. 2012;54(4):505-509.
8. Moreno Villares J, Galiano Segovia MJ, Marín Ferrer M. Changes in feeding behavior of patients who had received enteral nutrition during the 1st year of life. *Nutr Hosp*. 1998;13:90.e4.
9. Senez C, Guys JM, Mancini J, Paz Paredes A, Lena G, Choux M. Weaning children from tube to oral feeding. *Childs Nerv Syst*. 1996;12(10):590-594.
10. Mason SJ, Harris G, Blissett J. Tube feeding in infancy: implications for the development of normal eating and drinking skills. *Dysphagia*. 2005;20(1):46-61.
11. Hopkins J, Cermak SA, Merritt RJ. Oral feeding difficulties in children with short bowel syndrome: a narrative review. *Nutr Clin Pract*. 2017;33(1):99-106.
12. Edwards S, Davis AM, Ernst L, et al. Interdisciplinary strategies for treating oral aversions in children. *JPEN J Parenter Enteral Nutr*. 2015;39(8):899-909.
13. Davis AM, Bruce A, Cocjin J, Mousa H, Hyman P. Empirically supported treatments for feeding difficulties in young children. *Curr Gastroenterol Rep*. 2010;12(3):189-194.
14. Harding C, Faiman A, Wright J. Evaluation of an intensive desensitisation, oral tolerance therapy and hunger provocation program for children who have had prolonged periods of tube feeds. *Int J Evid Based Healthc*. 2010;8(4):268-276.
15. Dunitz-Scheer M, Marinschek S, Beckenbach H, et al. Tube dependence: a reactive eating behavior disorder. *Infant Child Adolesc Nutr*. 2011;3:209-215.
16. Dunitz-Scheer M, Levine A, Roth Y. Prevention and treatment of tube dependency in infancy and early childhood. *Infant Child Adolesc Nutr*. 2009;1:73-82.
17. Ishizaki A, Hironaka S, Tatsuno M, Mukai Y. Characteristics of and weaning strategies in tube-dependent children. *Pediatr Int*. 2013;55(2):208-213.
18. Warburton T. The importance of messy play. Short Bowel Survivor & Friends. http://www.shortbowelsurvivor.co.uk/#/messy-play/4552261320.
19. WHO Anthro (version 3.2.2, January 2011) and macros. Software for assessing growth and development of the world's children. Geneva: World Health Organization; 2010. http://www.who.int/childgrowth/software/en/.
20. Royal College of Paediatrics and Child Health. UK-WHO growth charts, 0–18 years. https://www.rcpch.ac.uk/growthcharts.
21. Case-Smith J. Systematic reviews of the effectiveness of interventions used in occupational therapy early childhood services. *Am J Occup Ther*. 2013;67(4):379-382.
22. Manikam R. Current literature: pediatric feeding disorders. *Nutr Clin Pract*. 2000;15(6):312-314.
23. Brown L, Pickler R, Wetzel P. Maternal attention and preterm infant feeding. *J Spec Pediatr Nurs*. 2014;19(3):257-265.
24. Crapnell TL, Rogers CE, Neil JJ, Inder TE, Woodward LJ, Pineda RG. Factors associated with feeding difficulties in the very preterm infant. *Acta Paediatr*. 2013;102(12):e539-e545.
25. Illingworth RS, Lister J. The critical or sensitive period, with special reference to certain feeding problems in infants and children. *J Pediatr*. 1964;65:839-848.
26. Barlow SM, Finan DS, Lee J, Chu S. Synthetic orocutaneous stimulation entrains preterm infants with feeding difficulties to suck. *J Perinatol*. 2008;28(8):541-548.
27. Eneli IU, Tylka TL, Watowicz RP, Hummel J, Ritter J, Lumeng JC. Targeting feeding and eating behaviors: development of the feeding dynamic intervention for caregivers of 2- to 5-year-old children. *J Obes*. 2015;2015:964249.
28. Kocoshis S. Medical management of pediatric intestinal failure. *Semin Pediatr Surg*. 2010;19:20-26.
29. Jones KD, Howarth LJ. Intestinal failure following necrotizing enterocolitis: a clinical approach. *Early Hum Dev*. 2016;97:29-32.
30. Kelly DA. Preventing parenteral nutrition liver disease. *Early Hum Dev*. 2010;86(11):683-687.
31. DiBaise JK, Young RJ, Vanderhoof JA. Intestinal rehabilitation and the short bowel syndrome: part 1. *Am J Gastroenterol*. 2004;99(7):1386-1395.
32. Yi DY. Enteral nutrition in pediatric patients. *Pediatr Gastroenterol Hepatol Nutr*. 2018;21(1):12-19.
33. Parm Ü, Metsvaht T, Ilmoja ML, Lutsar I. Gut colonization by aerobic microorganisms is associated with route and type of nutrition in premature neonates. *Nutr Res*. 2015;35(6):496-503.
34. Olieman JF, Penning C, Poley MJ, Utens EM, Hop WC, Tibboel D. Impact of infantile short bowel syndrome on long-term health-related quality of life: a cross-sectional study. *J Pediatr Surg*. 2012;47(7):1309-1316.
35. Nucci A, Burns RC, Armah T, et al. Interdisciplinary management of pediatric intestinal failure: a 10-year review of rehabilitation and transplantation. *J Gastrointest Surg*. 2008;12(3):429-436.

36. Williams KE, Riegel K, Gibbons B, Field DG. Intensive behavioral treatment for severe feeding problems: a cost effective alternative to tube feeding? *J Dev Phys Disabil.* 2007;19:227-235.
37. Byars KC, Burklow KA, Ferguson K, O'Flaherty T, Santoro K, Kaul A. A multicomponent behavioural program for oral aversion in children dependent on gastrostomy feedings. *J Pediatr Gastroenterol Nutr.* 2003;37(4):473-480.
38. Wilken M, Cremer V, Berry J, Bartmann P. Rapide home-based weaning of small children with feeding tube dependency: positive effects on feeding behaviour without deceleration of growth. *Arch Dis Child.* 2013;98(11):865-861.
39. Gutentag S, Hammer D. Shaping oral feeding in a gastrostomy tube-dependent child in natural settings. *Behav Modif.* 2000;24(3): 395-410.
40. Stipek D, Recchia S, McClintic S. Self-evaluation in young children. *Monogr Soc Res Child Dev.* 1992;57(1):1-98.
41. Institute of Medicine (IOM) and National Research Council (NRC). *Transforming the workforce for children birth through age 8: a unifying foundation.* Washington, DC: The National Academies Press; 2015.
42. World Health Organization. Programme on Mental Health & International Child Development Programmes (Oslo). *Improving mother/child interaction to promote better psychosocial development in children.* Geneva: World Health Organization; 1997. http://www.who.int/iris/handle/10665/63999.
43. Douglas J. Psychological treatment of food refusal in young children. *Child Adolesc Ment Health.* 2002;7(4):173-180.
44. Resnick MD, Bearman PS, Blum RW, et al. Protecting adolescents from harm: findings from the National Longitudinal Study on Adolescent Health. *JAMA.* 1997;278(10):823-832.
45. Larson RW, Branscomb KR, Wiley AR. Forms and functions of family mealtimes: multidisciplinary perspectives. *New Dir Child Adolesc Dev.* 2006;2006(111):1-5.
46. Wright CM, Smith KH, Morrison J. Withdrawing feeds from children on long-term enteral feeding: factors associated with success and failure. *Arch Dis Child.* 2011;96(5):433-439.
47. Kindermann A, Kneepkens CM, Stok A, van Dijk EM, Engels M, Douwes AC. Discontinuation of tube feeding in young children by hunger provocation. *J Pediatr Gastroenterol Nutr.* 2008;47(1):87-91.