Pediatric Nutrition Assessment and Feeding Practices

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October 30, 2023
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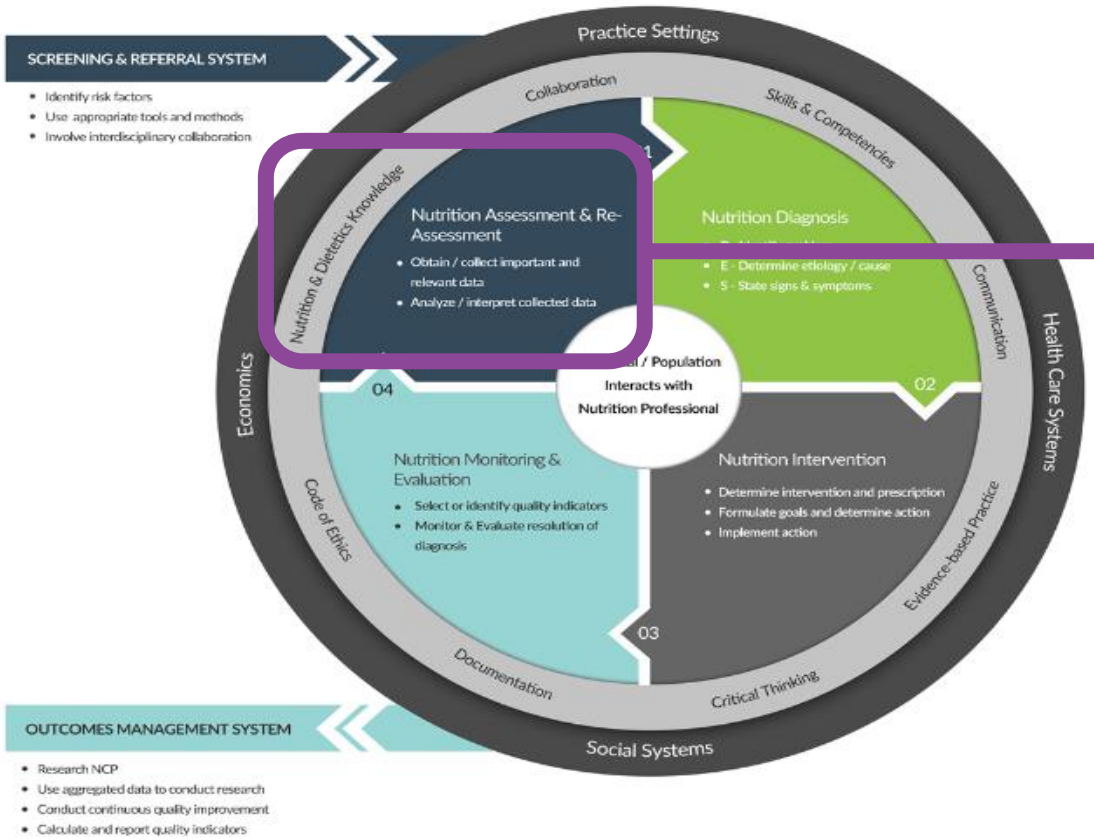
Objectives

- Discuss interpretation of anthropometric measurements and physical assessment
- Review comparative standards for pediatrics
- Discuss parenting/feeding practices

Nutrition Assessment

THE NUTRITION CARE PROCESS MODEL



<u>NUTRITION ASSESSMENT</u>:

- Client History
- **Food/Nutrition Related History**
- Biochemical Data
- **Anthropometrics**
- **Nutrition Focused Physical Findings**

Guide to early screening, detection, treatment for both <u>under</u>- and <u>over</u>-nutrition

Pediatric Considerations
Food/Nutrition related History

- Feeding history
- Textures, aversions
- Formula recipe
- Supplement use
- Introduction schedule

Pediatric Considerations
Food/Nutrition related History

- Feeding dynamics
- Physical activity/milestones
- Cultural considerations
- Red flags

Growth and Anthropometrics

- Comparison with standard references for age and gender

- Assessment of growth requires:
  - Appropriate growth reference
  - Accurate measures & interpretation of the scale used
  - Accurate calculation of age

Growth Charts

WHO:

- "Prescriptive" growth standard
- Representative of healthy, well-nourished breastfed children from around the world

VS

CDC:

- "Descriptive" growth reference
- Representative of how children grow in the U.S.

Growth References

- Weight, Length, and Weight-for-Length/BMI
  - WHO growth standard (0-2 years)
  - CDC growth reference (2-18 years)

- Mid Upper Arm Circumference (MUAC)
  - WHO MUAC growth standard (3 months- 5 years)
  - Mramba MUAC growth reference (5-18 years)

Factors that Influence “Normal” Growth

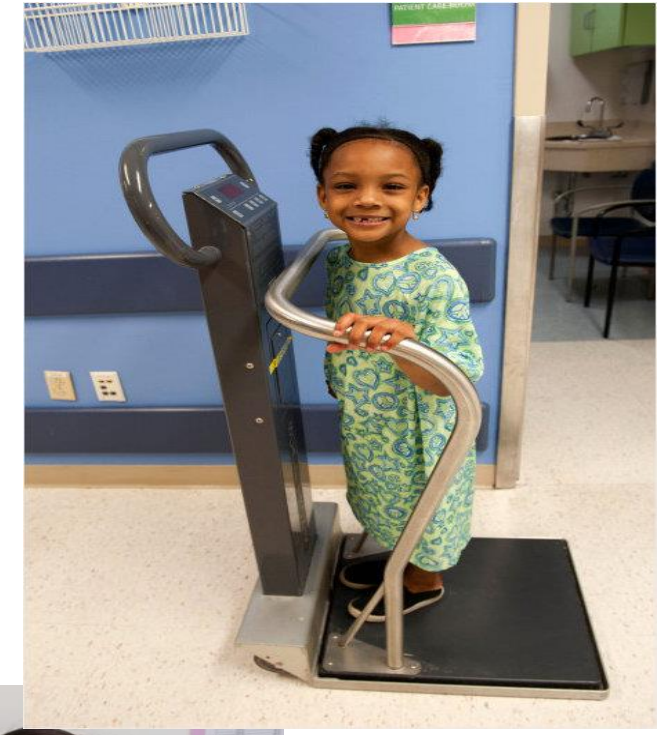
- Hospital course/Length of stay (LOS)
- Medications
- Genetic Potential
- Systemic Inflammation
- Malnutrition
- Endocrine Dysfunction
- Medical Diagnosis

Anthropometrics → assess nutrition status	
Weight (Wt)	Acute or chronic nutritional status
Length/Height (Lt/Ht)	Chronic undernutrition
Head Circumference (HC)	Influenced by nutritional status ≤ 36 months of age, following a faltered weight & length
Weight-for Length & Body Mass Index (BMI)	Distinguish acute vs. chronic malnutrition

Anthropometrics

WEIGHT

- Limit clothing
- Same scale/same time
- Bed-scales, Hoyer-lifts, wheel chair scales if unable to stand



Anthropometrics

LENGTH/HEIGHT

- Supine length using length board < 2 years
- Alternative height measures if unable to stand > 2 years
  - Knee Height
  - Tibial Length
  - Arm span

WHO, Length for Age, 0-24 months, Boys

Date	Age	Corrected Age	Value	Centile	z-score
07/24/2016	12 hours		49.00 cm	--	--
07/31/2016	7 days		52.00 cm	--	--
08/15/2016	3 weeks	4 days	51.60 cm	73.44	0.63
08/22/2016	4 weeks	11 days	48.00 cm	3.45	-1.82
08/29/2016	5 weeks	2 weeks	54.00 cm	70.80	0.55
09/05/2016	6 weeks	3 weeks	54.00 cm	53.63	0.09

WHO, Weight for Length, 0-24 months, Boys

Date	Age	Value		Centile	z-score
07/24/2016	12 hours	3.00 kg	49.00 cm	31.54	-0.48
08/15/2016	3 weeks	3.09 kg	51.60 cm	2.19	-2.02
08/22/2016	4 weeks	3.21 kg	48.00 cm	82.41	0.93
08/29/2016	5 weeks	3.36 kg	54.00 cm	0.19	-2.89
09/05/2016	6 weeks	3.59 kg	54.00 cm	1.94	-2.07

Indicators of Nutritional Status

- Classifications to distinguish *normal* from *abnormal* growth

Percentiles:

- Indicates on the growth charts where the child fits compared to the reference standard

VS.

***Z* scores**:

- Denotes units of standard deviation from the median
- Detects movement toward or away from the median
- More sensitive & precise
- Recommended by the WHO

Z-scores vs. Percentiles

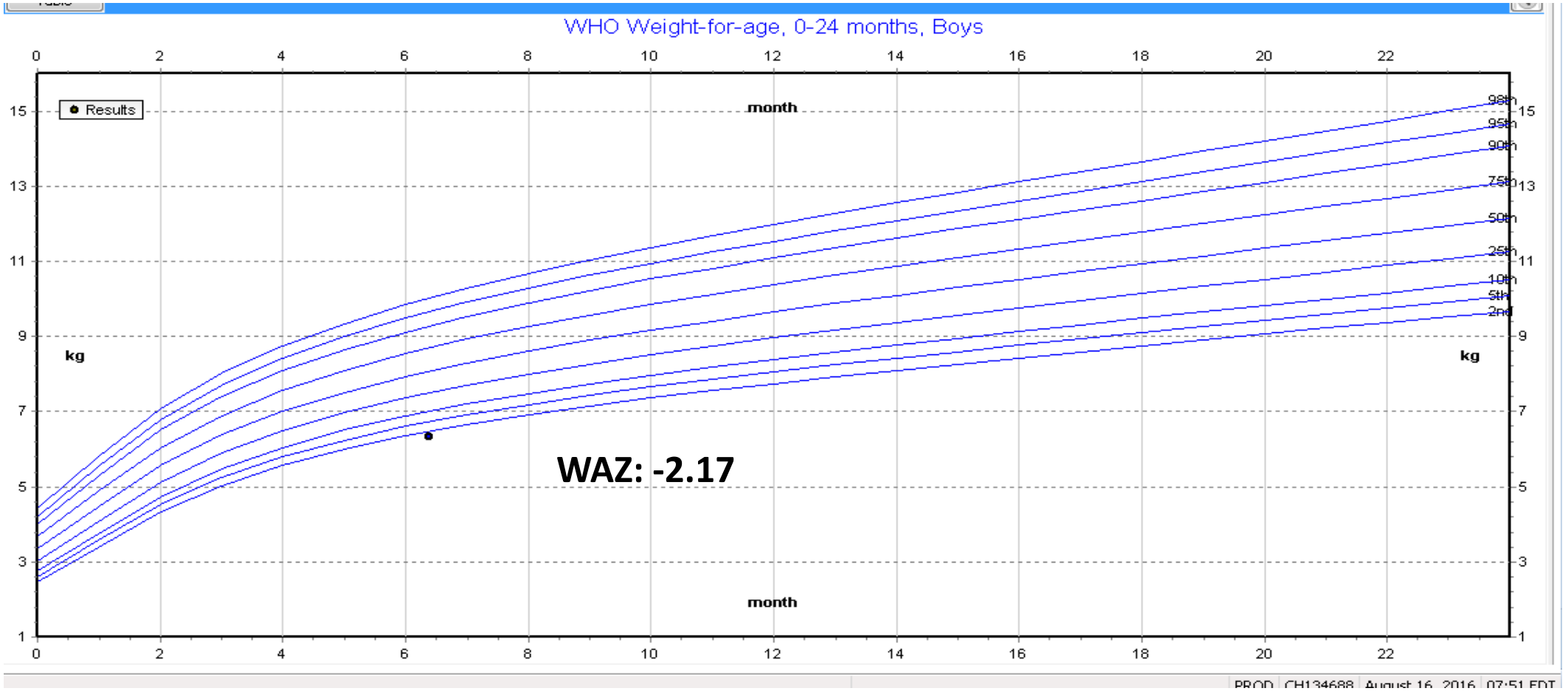
- *Example:* JT: 6 ½ yo F

	1st Visit 12kg 105cm	2nd Visit 14.5kg 106.5cm
Percentiles:		
Weight:	< 3rd%ile	<3rd%ile
Height:	< 3rd %ile	< 3rd%ile
BMI:	<3rd %ile	<3rd%ile
Z scores:		
Weight:	-5.47	-3.5
Height:	-2.43	-2.5
BMI:	-6.19	-2.4

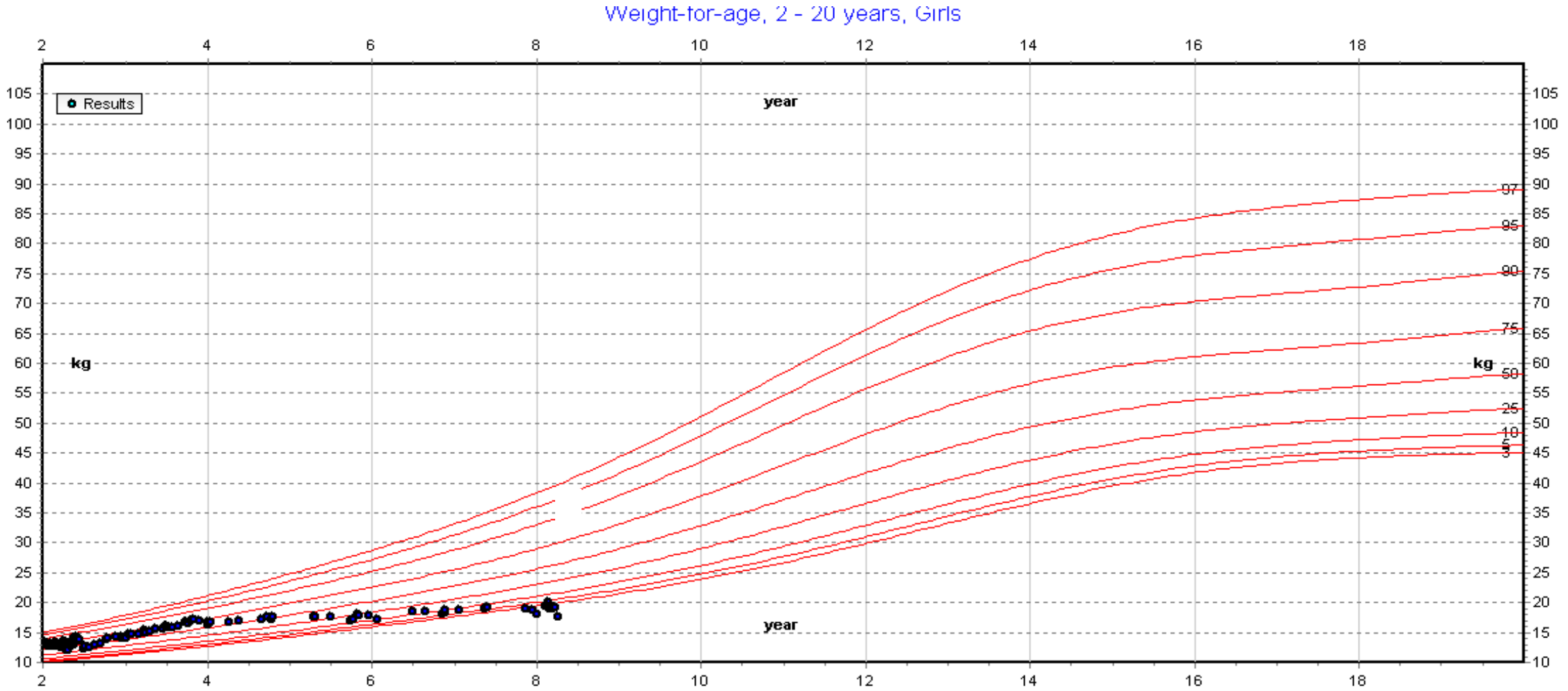
Growth & Anthropometrics

- Single vs. multiple measurements?
  - Multiple measurements → optimal to assess growth over time
    - ***Chronic***
  - Single measurement → screen children who may be at risk
    - ***Acute***

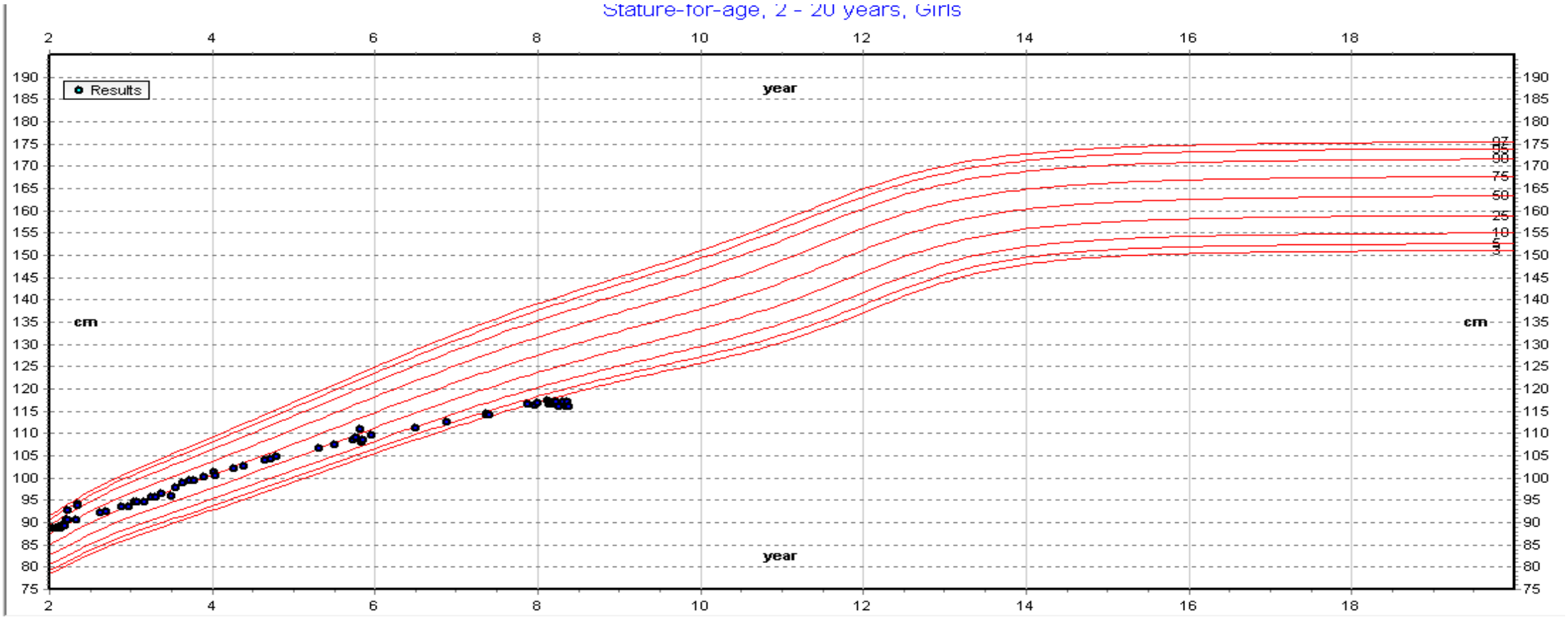
Single Point: *Weight*



Multiple Points: *Weight*



Multiple Points: *Height*



Growth Velocity

- Evaluates change in rate of weight gain over a specific time period
- Identifies growth faltering before growth failure

Example: Baby Boy M	
Admit: 1 month of age	Weight: 4.2kg (4200 gm)
Readmitted: 3 months of age (2 months or 60 days later)	Weight: 4.8kg (4800 gm)
Baby Boy M's weight velocity x 2months = ??	

Growth Velocity

Mean Increments in Weight and Length Gain for Boys and Girls using WHO Growth Charts*							
	Boys			Girls			
Age (months)	g/day	g/month	cm/month	Age (months)	g/day	g/month	cm/month
0-1	37.4	1124	4.8	0-1	31.3	955	4.5
1-2	36.5	1096	3.7	1-2	33.7	940	3.3
2-3	27.1	808	3	2-3	23.9	717	2.7
3-4	20.5	626	2.5	3-4	19.2	577	2.2
4-5	16.9	508	2	4-5	15.8	474	1.9
5-6	14	423	1.7	5-6	13.3	398	1.7
6-7	11.9	363	1.5	6-7	11.5	345	1.5
7-8	10.5	318	1.4	7-8	10.3	306	1.4
8-9	9.5	286	1.3	8-9	9.1	276	1.3
9-10	8.6	263	1.3	9-10	8.4	254	1.3
10-11	8.1	247	1.2	10-11	7.8	239	1.2
11-12	7.8	235	1.2	11-12	7.7	228	1.2
12-24	6-7	208	1.1	12-24	6-7	210	1.0

NOTE: These values above are based on the 50th%ile. Growth velocity should be assessed based on patients own growth curve. More to come in the Growth Chart and Malnutrition session!

Additional anthropometrics

What patient populations??

- Mid-upper arm circumference (MUAC):
  - Immobilized, Chronic Kidney Disease, Liver Disease, Critically Ill, Chronic steroid use, Amputations
- Triceps Skinfold (TSF):
  - Neurologically impaired, Transplant patients, patients with potential for increased adiposity or abnormal lipodistribution (e.g. chronic steroid use)

Determining Energy & Protein Needs

Comparative Standards: Pediatric Predictive Energy Equations

Resting Energy Expenditure (REE)

WHO and Schofield			
Age	**Gender**	**WHO**	**Schofield**
0-3 years	Male	60.9 x Wt - 54	0.17 x Wt + 15.17 x Ht – 617.6
	Female	61 x Wt - 51	16.25 x Wt + 10.232 x Ht – 413.5
3-10 years	Male	22.7 x Wt + 495	19.6 x Wt + 1.303 x Ht + 414.9
	Female	22.5 x Wt + 499	16.97 x W t + 1.618 x Ht + 371.2
10-18 years	Male	17.5 x Wt + 651	16.25 x Wt + 1.372 x Ht + 515.5
	Female	12.2 x Wt + 746	8.365 x Wt + 4.65 x Ht + 200

Comparative Standards: Pediatric Predictive Energy Equations

- ***Use of "stress" factors x REE***

Stress Factors			
****Use as a guide – indirect calorimetry is gold standard when available**			
Multiply REE by Stress Factor according to illness			
Major Surgery	1.05-1.5	Fever	12 % per degree >37° Celcius
Sepsis	1.2-1.6	Starvation	0.7-0.85
Growth Failure	1.5-2	Burns	1.5-2.5
Cardiac Failure	1.15-1.25	Trauma	1.1-1.8
Weight Maintenance*	1.3	Closed Head Injury	1.3
Growth*	1.5		

Comparative Standards: Pediatric Predictive Energy Equations

- ***Total Energy Expenditure***

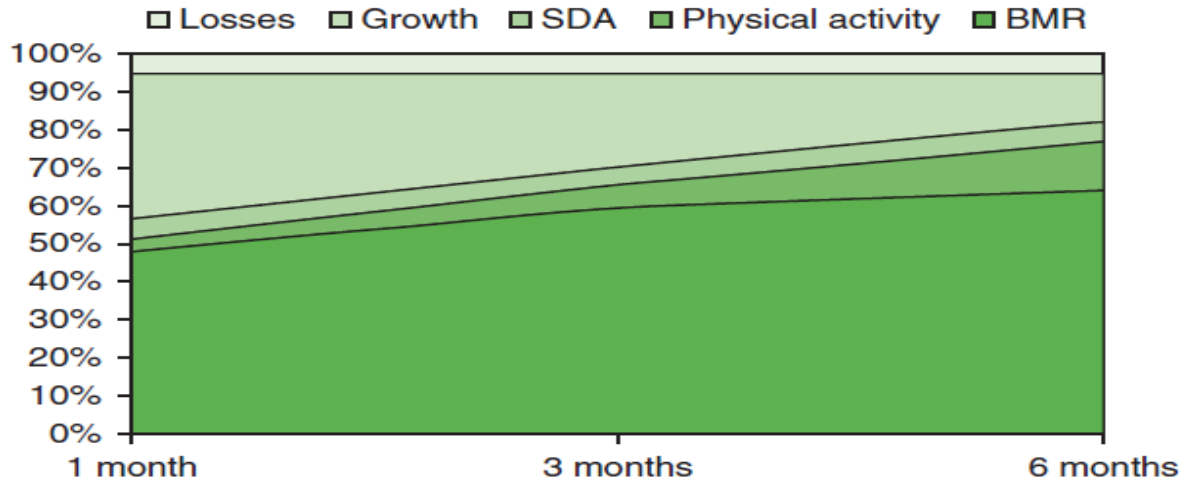
EER (kcals/day) = Total Energy Expenditure + Energy Deposition:

Dietary Reference Intakes (DRI)			
Infants & Young Children (Ages 0-35 months)		**Children and Adolescents (Ages 3-18 years)** wt (kg); ht (cm); age (years)	
Age	**EER**	**Age**	**EER**
0-3 mos	89 x Wt + 75	Boys 3-8 years	108.5 – 61.9 x age + PA x (26.7 x Wt + 9.03 x Ht)
4-6 mos	89 x Wt – 44	9-18 years	113.5 – 61.9 x age + PA (26.7 Wt + 9.03 x Ht)
7-12 mos	89 x Wt – 78	Girls 3-8 years	155.3 – 30.8 x age + PA x (10 x Wt + 9.34 x Ht)
13-35 mos	89 x Wt – 80	9-18 years	160.3 – 30.8 x age + PA (10 x Wt + 9.34 x Ht)

Physical Activity CoEfficients (PA), DRI (Ages 3-18 years)				
Gender	**Sedentary**	**Low Active**	**Active**	**Very Active**
Boys	1.00	1.13	1.26	1.42
Girls	1.00	1.16	1.31	1.56

Total Energy Expenditure (TEE)

- ***TEE*** = *BMR + TEF + $E_{activity}$ + E_{growth} + E_{losses}*
- **$E_{activity}$** = energy required for physical activity
- **E_{growth}** = energy required for somatic growth
- **E_{losses}** = obligatory energy lost in urine/stool



Indirect Calorimetry

- ***Gold standard*** for accurate assessment of energy expenditure
- Leads to decreased risk of significant underfeeding or overfeeding
- Identify patients at greatest risk of metabolic derangements

Hospitalized Child with Obesity

- *A.S.P.E.N Guidelines recommend use of indirect calorimetry vs. pediatric predictive energy equations*

Energy Requirements in Children with Developmental Disabilities:

Condition	Calorie Needs
Cerebral Palsy (age 5-11 years)	13.9 kcal/cm height with mild to moderate activity 11.1 kcal/cm height with severe physical restrictions
Athetoid Cerebral Palsy	Up to 6000 kcals/day (adolescence)
Down Syndrome Boys (age 5-12 years) Girls (age 5-12 years)	16.1 kcal/cm height 14.3 kcal/cm height
Myelomeningocele (Spina Bifida)	9-11 kcal/cm height for maintenance 7 kcal/cm for weight loss Approx 50% RDA for age after infancy
Prader-Willi Syndrome	10-11 kcal/cm height for maintenance 8.5 kcal/cm height for weight loss

Pediatric Protein Requirements

- ***RDA (2005)***

Category	Age	Protein g/kg/day
Infants	0-6 mo	1.52 AI*
	7-12 mo	1.2
Children	1-3 y	1.05
	4-13 y	0.95
Adolescent	14-18 y	0.85
Adult	>18 y	0.8

Fluids Goals

- Infants < ~6 months should not receive free water
  - Inadequate nutrient intake
  - Risk of electrolyte disturbances

Baseline Fluid Requirements:

Holiday-Segar Method	
1-10 kg	100ml/kg
11-20kg	1000ml + 50ml/kg for each kg>10kg
>20kg	1500ml + 20ml/kg for each kg>20kg

Holiday, M. and Segar, W. Pediatrics; 19:823-832, 1957

Nutrition Focused Physical Exam (NFPE)

- Importance of NFPE

NFPE: Before the Exam

- Age/developmental appropriateness
- Pre-natal and birth history (<2 years of age)
- Tanner stages
- Anthropometric measurements & how they plot on age appropriate growth chart
- Surgical history
- Laboratory data
- Medications / Dietary supplements
- Diagnosis

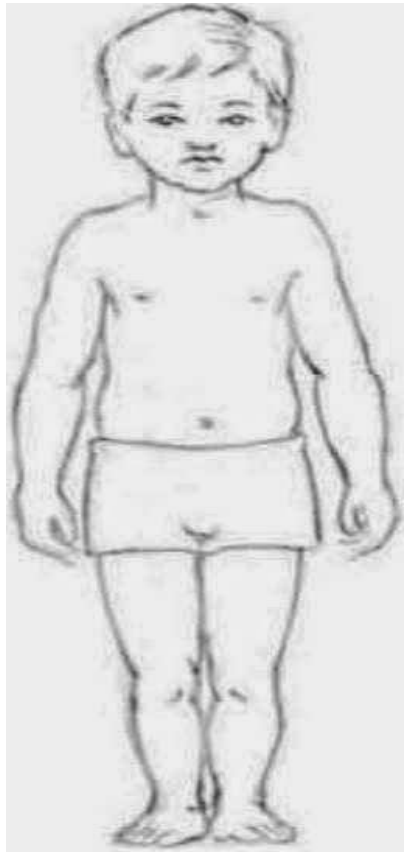
NFPE: Components of Exam

- General inspection then head to toe exam:

Skin and hair

Upper body
- Clavicle, shoulder, scapula, arms, fingernails

Lower Body
- Legs, thigh, knee, calf, ankle



Head
- Face, orbital fat pads, buccal pads, temples, eyes, mouth

Abdomen
- Buttock, stoma sites

Common Pediatric Diagnoses and Possible Nutrient Deficiencies

Diagnosis	Possible Nutrient Deficiencies
Inflammatory bowel disease	Iron, folate, selenium, magnesium, zinc, calcium, vitamin D
Chronic diarrhea	Zinc
Cystic fibrosis	Fat-soluble vitamins (A, D, E, K), protein-calorie malnutrition
Congenital heart defects	Protein-calorie malnutrition
Prematurity	Vitamin D, calcium
Intestinal failure	With fat malabsorption: fat soluble vitamins (A, D, E, K), zinc, calcium, magnesium
	Ileal resection: vitamin B_{12}
	Duodenal involvement: iron, folate
Liver disease	Vitamin K, essential fatty acid deficiency
Chylothorax	Essential fatty acid deficiency, protein deficiency
Burns	Vitamin C, vitamin A, zinc, protein-calorie malnutrition
Cancer	Protein-calorie malnutrition
Poor wound healing	Vitamin C, vitamin A, zinc, protein-calorie malnutrition
Renal	Zinc, copper, iron, magnesium
	With dialysis: water-soluble vitamins

Corkins. Nutr Clin Pract **30**(2): 203-209.

NFPE: Micronutrient Deficiencies

Site	Physical Examination	Potential Nutrition/Metabolic Status
Skin integrity	Pallor	Iron, folate, or vitamin B_{12} deficiency
	Dry, scaly skin	Vitamin A or essential fatty acid deficiency
	Dermatitis	Essential fatty acid deficiency; zinc, niacin, riboflavin, or tryptophan deficiency
Nail	Spoon shape	Iron deficiency
	Lackluster, dull	Protein deficiency
	Mottled, pale, poor blanching	Vitamin A or C deficiency
Face	Moon face	Protein-calorie deficiency
	Bilateral temporal wasting	Protein-calorie deficiency
Neck	Enlarged thyroid	Iodine deficiency
Mouth	Dry, cracked, red lips	Riboflavin, niacin, vitamin B_6 deficiency
	Bleeding gums	Vitamin C deficiency
	Inflamed mucosa	Vitamin B complex, iron, or vitamin C deficiency
Tongue	Magenta color	Riboflavin deficiency
	Beefy red color and diminished taste	Niacin, folate, riboflavin, iron, or vitamin B_{12} deficiency
Eyes	Night blindness; dull dry appearance to sclerae or inner lids; dull milky appearance of the cornea	Vitamin A deficiency
	Cracked, red corners	Riboflavin or niacin deficiency
Hair	Dull, lackluster, thin, sparse	Protein, iron, zinc, or essential fatty acid deficiency
	Easily pluckable	Protein deficiency
Dentition	Excessive dental caries	Excessive simple carbohydrate intake

Adapted with permission from Carney LN, Blair J. Assessment of nutrition status by age and determining nutrient needs. In: Corkins MR, ed. *The A.S.P.E.N. Pediatric Nutrition Support Core Curriculum*. Silver Spring, MD: American Society for Parenteral and Enteral Nutrition; 2014:417.

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What Nutrient Deficiency?

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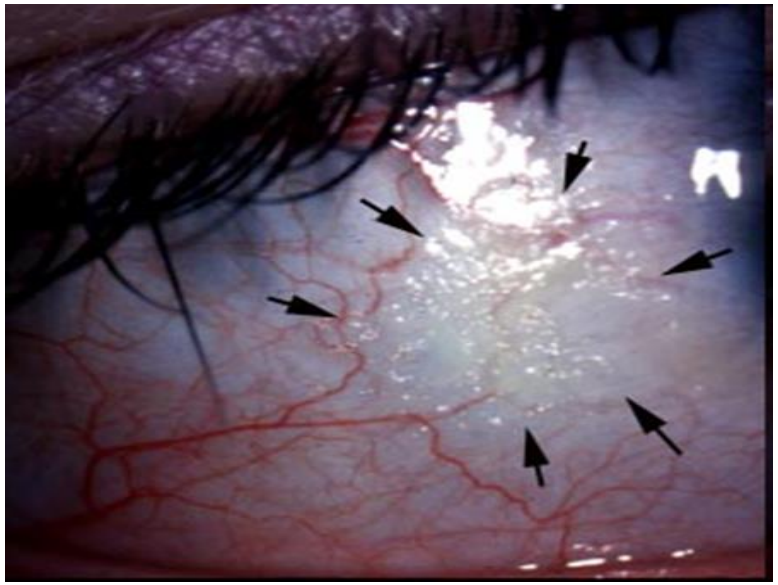


Feeding Practices

What Influences Intake?

Ellyn Satter

Child of Mine: Feeding with Love and Good Sense

Children have natural ability with eating. They eat as much as they need, they grow in the way that is right for them, and they learn to eat the food their parents eat. Step-by-step, throughout their growing-up years, they build on their natural ability and become eating competent. Parents let them learn and grow with eating when they follow the Division of Responsibility in Feeding. (DOR)

Ellyn Satter Model: Division of Responsibility (DOR) in Infants

Parent

- What (breast- or formula-feeding)
- Help the infant be calm and organized
- Pay attention to cues

Infant

- How much
- Everything else! Timing, tempo, frequency and amounts.

Ellyn Satter Model: DOR Toddlers through Adolescents

Parent

- What
- When
- Where

Child

- How much
- Whether

Ellyn Satter Model: DOR Infants Transitioning to Family Food

- Parent will start to become responsible for ***when*** and ***where*** the child is fed
- Child is ***still*** and ***always*** responsible for ***how much*** and ***whether*** to eat the foods offered.

* Solids should be based on what the child can do and not how old they are.

Ellyn Satter Model: Children's Eating Jobs

- Children will eat
- They will eat the amount they need
- They will learn to eat the food their parents eat
- They will grow predictably
- They will learn to behave well at mealtime

Ellyn Satter Model: Parents' Feeding Jobs

- Choose and prepare the food
- Provide regular meals and snacks
- Make eating times pleasant
- Step-by-step, show children by example how to behave at family mealtime

Ellyn Satter Model: Parents' Feeding Jobs

- Be considerate of children's lack of food experiences without catering to likes and dislikes
- No food or beverages (except for water) between meal and snack times
- Let children grow up to get bodies that are right for them

Common Toddler Eating Behaviors

- Picky eating
- Not finishing meals
- Refusal to eat
- Grazing

How do you Support Healthy Eating Beyond the DOR?

Teaching Healthy Eating Concepts

How do you Support Healthy Eating Beyond the DOR?

Phrases that *HELP* and *HINDER*

As the caregiver, you play the biggest role in your child's eating behavior.
What you say has an impact on developing healthy eating habits.
Negative phrases can easily be changed into positive, helpful ones!

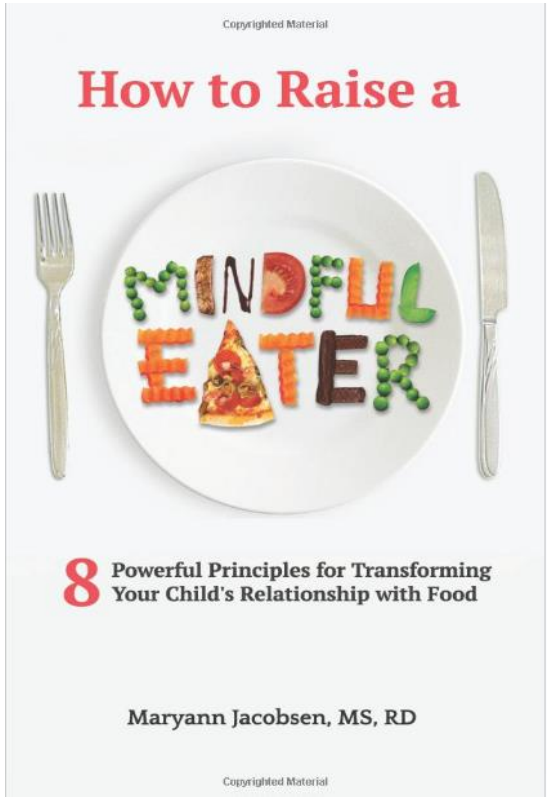
Phrases that *HINDER*	Phrases that *HELP*
INSTEAD OF ...	**TRY ...**
Eat that for me. *If you do not eat one more bite, I will be mad.* Phrases like these teach your child to eat for your approval and love. This can lead your child to have unhealthy behaviors, attitudes, and beliefs about food and about themselves.	***This is kiwi fruit; it's sweet like a strawberry.*** ***These radishes are very crunchy!*** Phrases like these help to point out the sensory qualities of food. They encourage your child to try new foods.
INSTEAD OF ...	**TRY ...**
You're such a big girl; you finished all your peas. ***Jenny, look at your sister. She ate all of her bananas.*** ***You have to take one more bite before you leave the table.*** Phrases like these teach your child to ignore fullness. It is better for kids to stop eating when full or satisfied than when all of the food has been eaten.	***Is your stomach telling you that you're full?*** ***Is your stomach still making its hungry growling noise?*** ***Has your tummy had enough?*** Phrases like these help your child to recognize when he or she is full. This can prevent overeating.
INSTEAD OF ...	**TRY ...**
See, that didn't taste so bad, did it? This implies to your child that he or she was wrong to refuse the food. This can lead to unhealthy attitudes about food or self.	***Do you like that?*** ***Which one is your favorite?*** ***Everybody likes different foods, don't they?*** Phrases like these make your child feel like he or she is making the choices. It also shifts the focus toward the taste of food rather than who was right.
INSTEAD OF ...	**TRY ...**
No dessert until you eat your vegetables. ***Stop crying and I will give you a cookie.*** Offering some foods, like dessert, in reward for finishing others, like vegetables, makes some foods seem better than others. Getting a food treat when upset teaches your child to eat to feel better. This can lead to overeating.	***We can try these vegetables again another time. Next time would you like to try them raw instead of cooked?*** ***I am sorry you are sad. Come here and let me give you a big hug.*** Reward your child with attention and kind words. Comfort him or her with hugs and talks. Show love by spending time and having fun together.

Adapted from "What You Say Really Matters?" in *Feeding Young Children in Group Settings*, Dr. Janice Fletcher and Dr. Laurel Branen, University of Idaho.

Mealtime Tips

- Encourage meals and snacks at table
- Arrange for quiet time before meals
- Offer 2-3 foods/meal and small servings.
  - Rule of thumb is about 1 Tbsp per year of age
- Give a mix of new and familiar foods
- Praise for good eating but don’t make the child the center of attention
- Don’t reward, bribe or punish around eating

Mindful Eating



- Plan, prioritize and structure meals
- Allow hunger and fullness to guide eating
- Neutralize the power of goodies
- Make nutrition a rewarding part of eating
- Put pleasure at the center of your table
- Teach body appreciation
- Deal with stress effectively
- Connect with your kids

- Ellyn Satter -

When the joy goes out of eating, nutrition suffers.

Thank You!

Questions?

References to learn more about NFPE

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