

PHYSICAL THERAPY FOR YOUTH WHO ARE OVERWEIGHT OR OBESE: PROMOTING HEALTH, PHYSICAL ACTIVITY AND PARTICIPATION

Maggie O'Neil, PT, PhD, MPH
APTA Washington Spring Webinar
Saturday, April 9, 2022
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SETTING THE STAGE



OBJECTIVES

- Definition of Terms & Frameworks to Guide PT Practice
- Prevalence of Childhood Overweight & Obesity & Associated Conditions
- Weight Management & PT Management
- PT Interventions
- Outcome Measures
- Health Promotion & Community Resources

SCHEDULE

8:00 – 8:30	Definitions & Frameworks
8:30 – 9:00	Overview: Prevalence of Childhood Overweight & Obesity; Associated Health Conditions & Health Behaviors
9:30 – 10:00	Overview of Weight Management & Physical Therapy Management of Childhood Obesity
10:00 – 10:15	BREAK
10:15 – 12:00	Overview of Interventions: Improving health status and physical activity using Family Centered Care; Fitness & Activity-Based Interventions & Health Promotion
12:00 – 12:30	LUNCH BREAK
12:30 – 1:45	Measuring Effectiveness: Choosing Outcome Measures
1:45 – 2:30	Community & Community Resources: Aquatic exercise, Yoga, Sports, Dance & Movement, Active Video Games, etc
2:30 – 3:00	Wrap Up: Q & A

DEFINITIONS



DEFINING HEALTH

World Health Organization (WHO)

- State of complete physical, mental, social well-being and not merely the absence of disease
- Efforts to improve health should be comprehensive

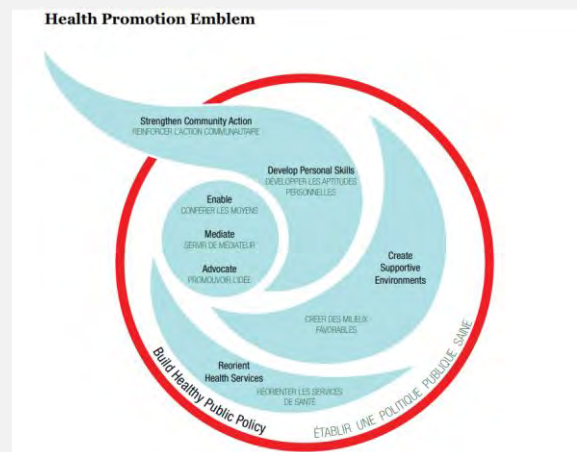


<https://www.who.int/about/governance/constitution>

HEALTH PROMOTION

WHO Ottawa Charter, 1986

- Includes health education, decision making, supportive activities, such as screening and self care for individuals with disabilities and environmental and supportive changes in clinic and community settings
- Improve function, fitness and physical activity (PA)



<https://www.who.int/teams/health-promotion/enhanced-wellbeing/first-global-conference>

HEALTH PROMOTION & FITNESS



Official Document

SPECIAL COMMUNICATION

The Scope of Pediatric Physical Therapy Practice in Health Promotion and Fitness for Youth With Disabilities

Jennifer L. Rowland, PT, PhD, MPH; Maria Fragala-Pinkham, PT, DPT, MS; Cindy Miles, PT, PhD, PCS; Margaret E. O'Neil, PT, PhD, MPH

Department of Physical Therapy (Dr Rowland), University of Texas Medical Branch, Galveston, Texas; Research Center for Children with Special Health Care Needs (Dr Fragala-Pinkham), Franciscan Hospital for Children, Brighton, Massachusetts; Cindy Miles & Associates (Dr Miles), Whitehall, Pennsylvania; Physical Therapy and Rehabilitation Sciences Department (Dr O'Neil), Drexel University, Philadelphia, Pennsylvania.

(Rowland et a, 2015)

TABLE 1

Health Promotion Strategies in Pediatric Physical Therapy*

Step 1	Conduct an interview with youth and/or parents using open-ended questions to identify health behaviors (exercise and physical activity) that the youth and family enjoy and to learn what they know about benefits of active lifestyles. Use this information to help design your health education, health promotion, and fitness intervention program.
Step 2	Provide the youth and family with personalized guidance and information to help reinforce healthy active behaviors and practices. Give ideas on strategies to sustain health behavior change—ie, use a schedule board at home to remind the family to go for walks to the park or to go to the local pool or recreation center.
Step 3	Provide support to families to help them find community resources to adopt and sustain active, healthy lifestyles. Help families and youth find “champions” and develop positive relationships with community professionals.
Step 4	Be sure to come to closure when the PT sessions are over so that youth and family have a good understanding of the health message and strategies to sustain an active, healthy lifestyle. Help the youth and family identify and navigate potential barriers to sustaining an active lifestyle.

*Based on Bernstein.²²

WELLNESS

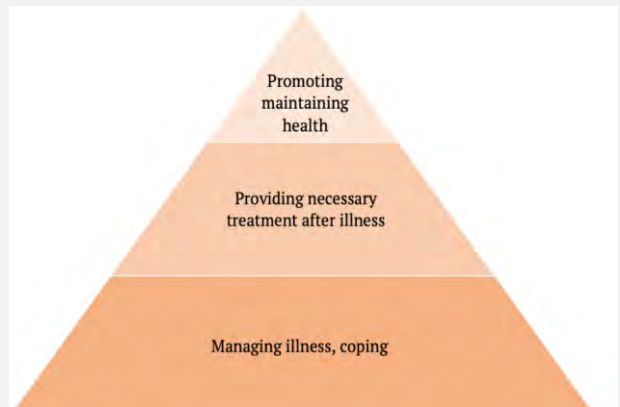
- Sense that one lives in a manner that permits experience of consistent, balanced growth in physical, spiritual, emotional, intellectual, social, psychological dimensions of human existence

(Bezner 2015)



PREVENTION

- **Prevention**
 - Ultimate goal = achieve optimal functional mobility and participation
 - Primary prevention – prevent condition
 - Secondary – necessary treatment to eradicate condition
 - Tertiary – Manage condition to reduce further health problems
- **Rehabilitation**
 - Secondary & tertiary prevention
 - Restore function



<https://press.rebus.community/introductiontocommunitypsychology/chapter/prevention-and-promotion/>

FITNESS, ACTIVITY, EXERCISE

Physical Fitness

A set of attributes a person possesses to perform physical activity (ACSM, 2018)

Physical Activity

Any body movement produced by skeletal muscles that results in energy expenditure (Caspersen, 1985)

Exercise

Physical activity that is planned, structured, repetitive and focused on improving fitness (ACSM, 2018)



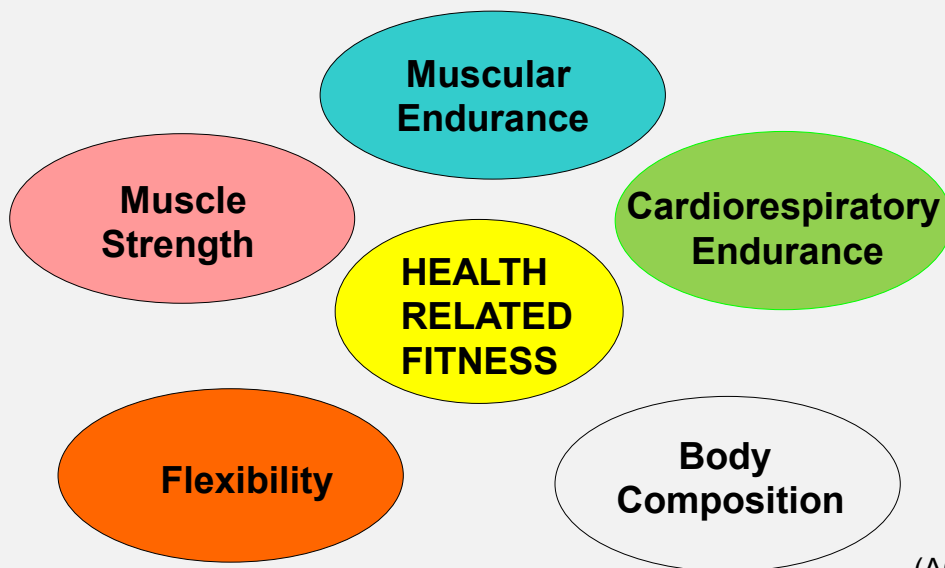
PHYSICAL FITNESS

- “state or a condition that permits the individual to carry out daily activities without undue fatigue & with sufficient reserve to enjoy active leisure”
- A set of attributes a person possesses to perform physical activity.



(Clarke, 1971 - Malina, Bouchard & Bar-Or, 2004; ACSM, 2018)

COMPONENTS OF FITNESS



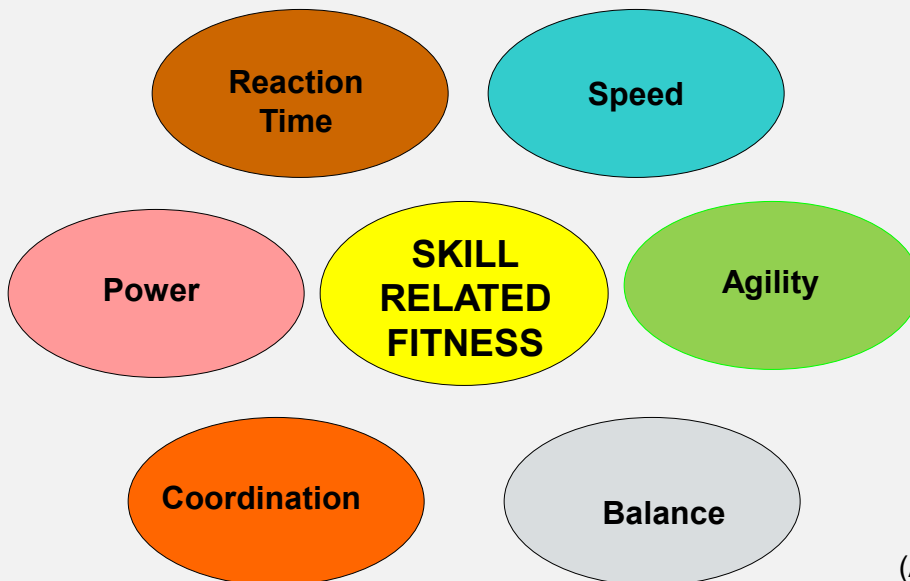
(ACSM, 2018)

HEALTH RELATED FITNESS

- **Muscle Strength**
 - Muscle's ability to exert a maximum force on one occasion (1RM)
- **Muscular Endurance**
 - Muscle's ability to continue to perform successive exertions and repetitions against a submaximal load
- **Cardiorespiratory Endurance**
 - Ability to perform large muscle, dynamic moderate to vigorous intensity exercise for prolonged periods of time
- **Flexibility**
 - Ability to move joint through full ROM
- **Body Composition**
 - Percent of fat mass to fat free mass

(ACSM, 2018)

COMPONENTS OF FITNESS

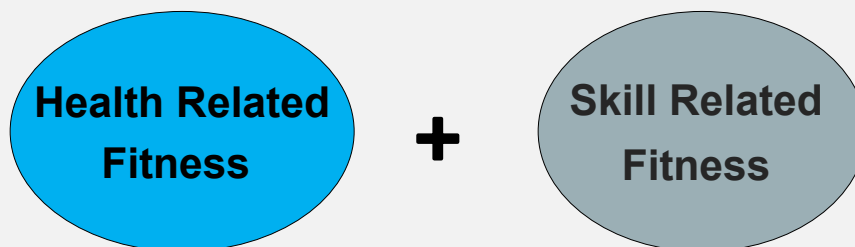


(ACSM, 2018)

SKILL RELATED FITNESS

- **Speed**
 - The rate at which someone is able to move or operate
 - **Agility**
 - Ability to move quickly and easily
 - **Balance**
 - An even distribution of weight enabling someone to remain upright and steady
 - **Coordination**
 - The ability to use different parts of the body together smoothly and efficiently
 - **Reaction Time**
 - The time between a stimulus and a response
 - **Power**
 - Muscle's ability to exert force per unit of time (i.e., rate)
- (ACSM, 2018)

TOTAL FITNESS

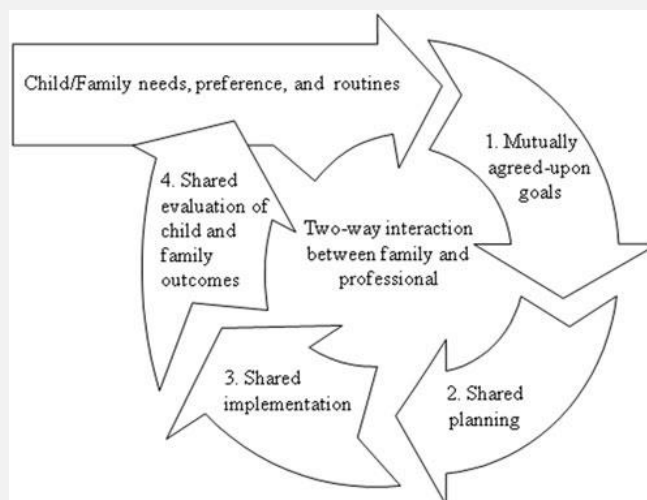


(ACSM, 2018)

PRACTICE FRAMEWORKS



FAMILY-PROFESSIONAL COLLABORATION



(An & Palisano , 2013)

MULTIDIMENSIONAL FACTORS ASSOCIATED WITH CHILDHOOD OBESITY

Kansra et al, 2021

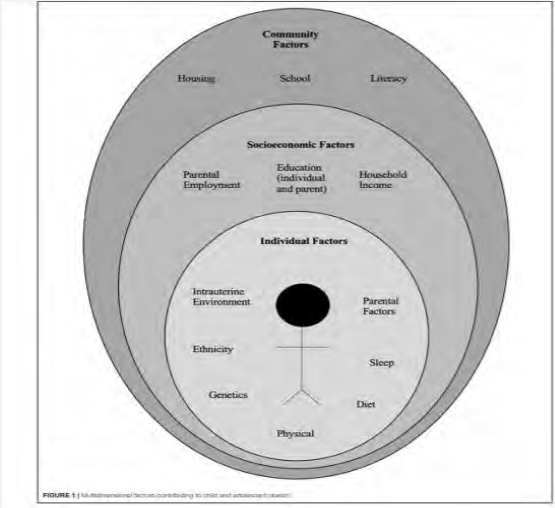


FIGURE 1 | Multidimensional factors contributing to child and adolescent obesity.

ECOLOGICAL MODEL OF CHILDHOOD OBESITY

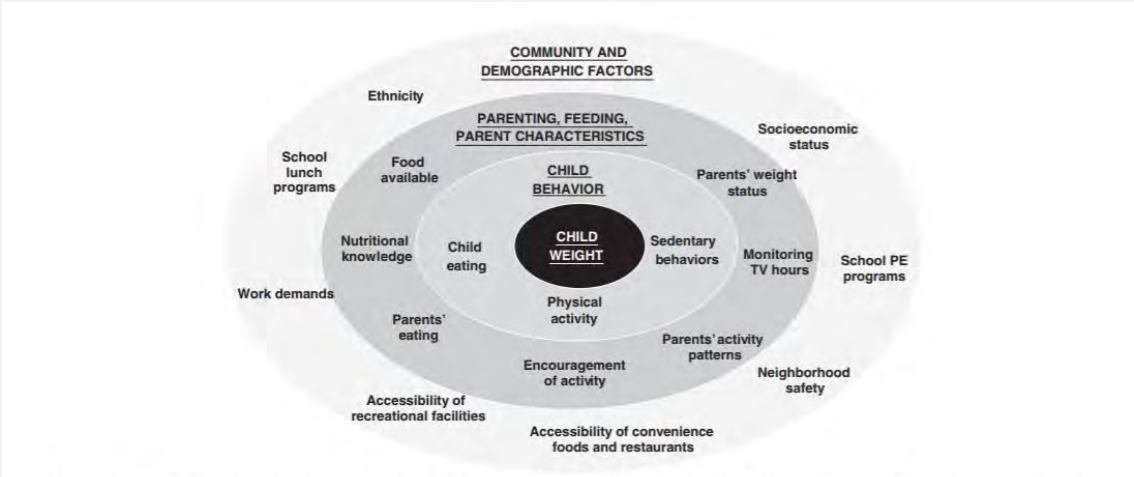


Figure 1 An ecological model for the etiology of childhood overweight. Adapted from Davison and Birch⁸ and reprinted with permission from *Obesity Reviews*.

Birch & Ventura, 2009

ICF MODEL – F-WORDS

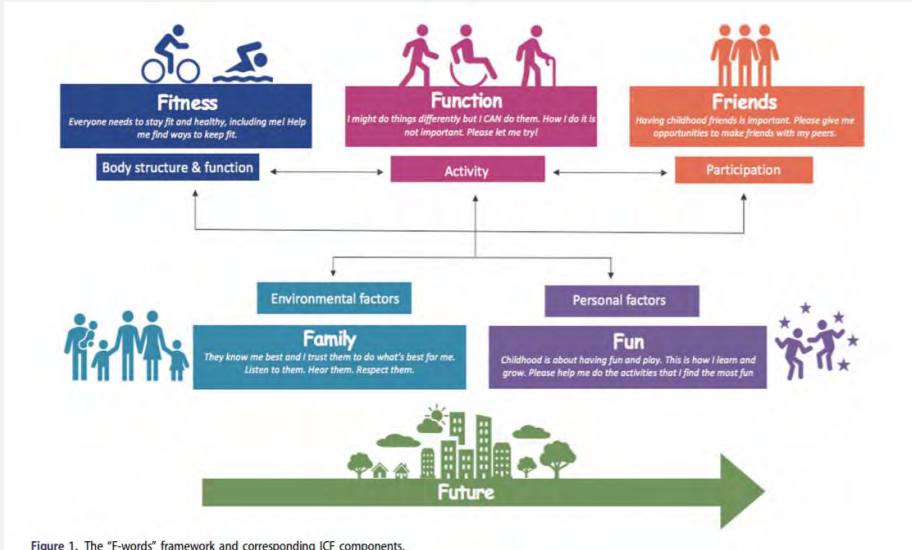


Figure 1. The "F-words" framework and corresponding ICF components.

(Rosenbaum & Gorter, 2012)

FITNESS PRINCIPLES

(ACSM, 2018)

Overload

- Do more to make gains

Progression

- Increase gradually

Specificity

- Goal of workout (therapy)

Regularity

- Work out or practice on a regular basis (use it or lose it!)

Individuality

- Everyone is different!

FITNESS INTERVENTION PHASES

(ACSM, 2018)

Warm-up

- Light PA
- 30-39% max HRR
- 57-67% max HR

Training

- Moderate PA
- 40-59% max HRR
- 64-76% max HR
- Vigorous PA
- 60-89% max HRR
- 77-95% max HR

Cool down

- Light PA
- 30-39% max HRR
- 57-67% max HR

- Training intensity - Depends on fitness level
- Progression of intensity - Depends on fitness/mobility level

FITNESS PRESCRIPTION: FIT FOR STRENGTH TRAINING

Frequency

- How often?
 - 2-4 days /week

Intensity

- How hard?
- Weights/reps/sets
(Volume)

Time (duration)

- How long?
 - min/session
 - # weeks
- (Velocity)*

Type

- What type of resistance training?

(ACSM 2018)

**FITNESS PRESCRIPTION:
FITTE FOR AEROBIC TRAINING**

Frequency
 Aerobic conditioning
 6-7 days /week

Intensity
 Start slow (50-65% MHR)
 Progress (65-93% MHR)
 Moderate to vigorous

Time (duration)
 30- 60 min/session

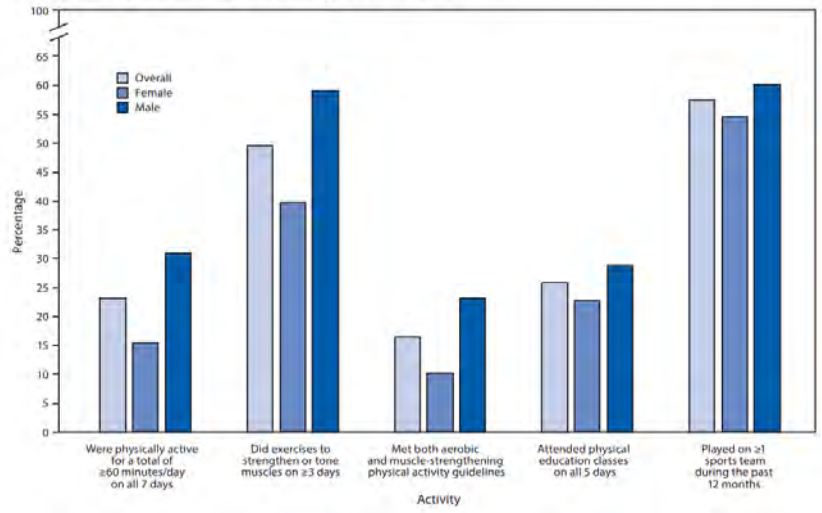
Type
 Aerobic conditioning:
 Large muscles: running,
 walking, wheeling,
 biking, swimming,
 rowing

ENJOYMENT!

(ACSM 2018)

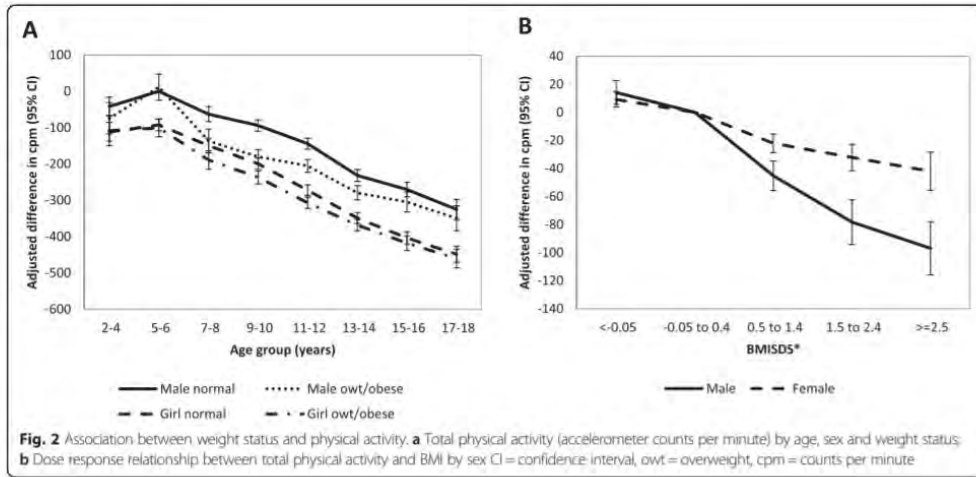
**PHYSICAL
ACTIVITY**

FIGURE 3. Percentage* of high school students who had engaged in physical activity† and physical education during the 7 days before the survey, overall and by sex‡ — Youth Risk Behavior Survey, United States, 2019



<https://www.cdc.gov/mmwr/volumes/69/su/pdfs/su6901a8-H.pdf>

CHILDHOOD OBESITY AND PHYSICAL ACTIVITY



Cooper et al, 2015

PHYSICAL ACTIVITY GUIDELINES FOR AMERICANS



MOVE YOUR WAY. How much physical activity do kids and teens need?

At least 60 minutes every day.
Most of that time can be moderate-intensity aerobic activity — anything that gets their heart beating faster counts.
And at least 3 days a week, encourage them to step it up to vigorous-intensity aerobic activity, so they're breathing fast and their heart is pounding.

60 minutes a day

As part of their daily 60 minutes, kids and teens also need:

- Muscle-strengthening activity** at least 3 days a week
- Bone-strengthening activity** at least 3 days a week

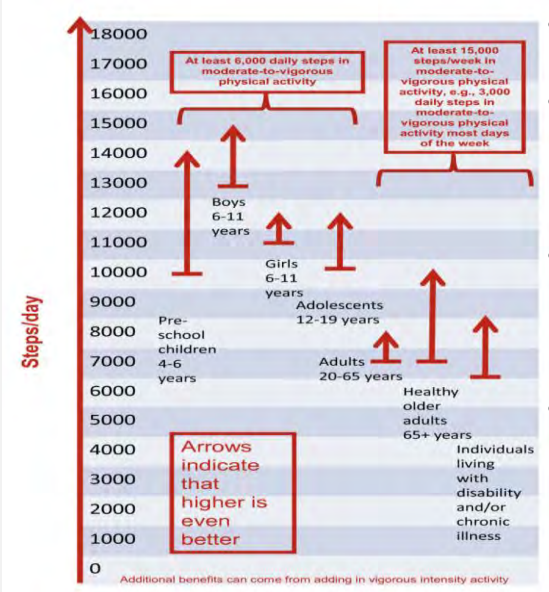
Anything that makes their muscles work harder counts — like climbing or swinging on the monkey bars.

Bones need pressure to get stronger. Running, jumping, and other weight-bearing activities all count.

Walk. Run. Dance. Play. **What's your move?**

https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf

STEP COUNTS (SHULTZ ET AL, 2011; TUDOR-LOCKE, 2011)



- Recommended Step counts by age
- Children
 - Males >13-16,000 steps/day
 - Females 11-13,000 steps/day
- Adolescents
 - Males >11,700 steps/day
 - Females >10,000 steps/day
- Adults
 - Males & Females 7,500-9,999 steps/day (somewhat active)
 - >10,000 steps/day (active)
 - 12,500 (highly active)

PHYSICAL ACTIVITY



**Youth
Compendium
of
Physical
Activities**

www.nccor.org/youthcompendium

PHYSICAL ACTIVITY INTENSITY

- What is a youth MET?
 - A MET, or metabolic equivalent of task, is a unit that represents the metabolic cost of physical activity.
 - MET_y is a MET that has been adjusted to account for the unique physiological characteristics of children and adolescents.
 - A MET_y is the ratio of an activity-specific metabolic rate to the estimated basal metabolic rate (BMR, or the energy the body needs to function while at rest).
 - For example, playing "volleyball" for 6-9 year olds has a MET_y value of 5.0.
 - This means that, for a child this age, playing volleyball has an energy cost about 5 times higher than BMR.

PARTICIPATION



PARTICIPATION

- Involvement in life experiences
- Examples
 - Activities of daily living
 - Daily routines
 - Transfers
 - Driving
 - Toileting
 - Community life
 - Recreation and leisure



Every Body **WALK!**

<http://everybodywalk.wpengine.com/>

<https://nationaltoday.com/national-walk-and-bike-to-school-day/#:~:text=National%20Walk%20and%20Bike%20to%20School%20Day%20on%20October%205,relatives%20living%20longer%20and%20stronger>

Definitions

Fundamental Movement Skills

- **Fundamental Movement Skills**
- **National Coaching Certificate Program (NCCP)**
- Physical literacy = ability to move competently and confidently in all environments
- Physical literacy consists of fundamental movement skills FMS
 - Throwing, catching, jumping, striking, running, kicking, agility, balance, coordination

<http://www.coach.ca/fundamental-movement-skills-s16736>



<http://www.reddeer.ca/recreation-and-culture/active-living-and-sport/physical-literacy-and-fundamental-movement-skills/>

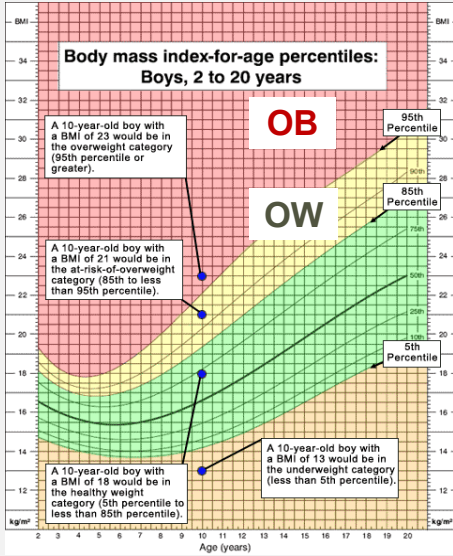
FUNDAMENTAL MOVEMENT SKILLS (FMS): TD (FAIGENBAUM 2013)

- Children with TD may have Exercise-Deficit Disorder
 - Decreased PA levels
 - Decreased fitness
 - Decreased Fundamental Movement Skills (FMS)
- Children may need guided exercise programs & FMS practice to meet daily recommended levels of PA.
- FMS include
 - Locomotor: rolling, balancing, sliding, jogging, running, leaping, jumping, hopping, dodging, galloping, and skipping.
 - Object control: bouncing, throwing, catching, kicking, striking

MOTOR PROFICIENCY & OBESITY (WROTNIAK, 2006)

- Children with TD & obesity have low PA levels (accelerometry) & low motor proficiency (BOT-2)
- Children with TD & obesity demonstrated poor upper limb coordination, bilateral coordination, manual dexterity, and fine motor precision (BOT-2) (Gentier, 2013)
 - Higher PA associated with higher motor skills & aerobic fitness
 - The association between PA & motor proficiency suggests that...
 - Interventions that focus on PA may help increase fitness to then make it easier to improve motor proficiency
 - Interventions that focus on improving motor proficiency may help increase PA

BMI BY AGE & GENDER PERCENTILES



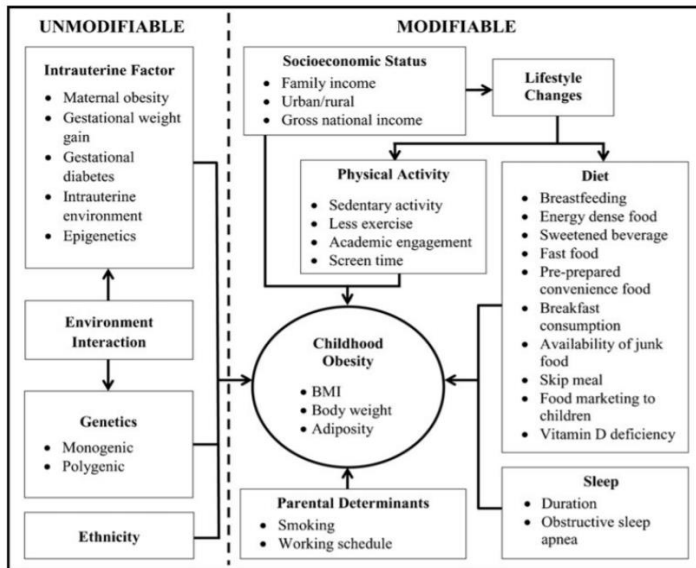
Weight status Age & Gender BMI %iles

Underweight	< the 5th
Healthy weight	5th to < 85th
Overweight (OW)	85th to < 95th
Obese (OB)	≥ 95th

$$BMI = \frac{kg}{m^2}$$

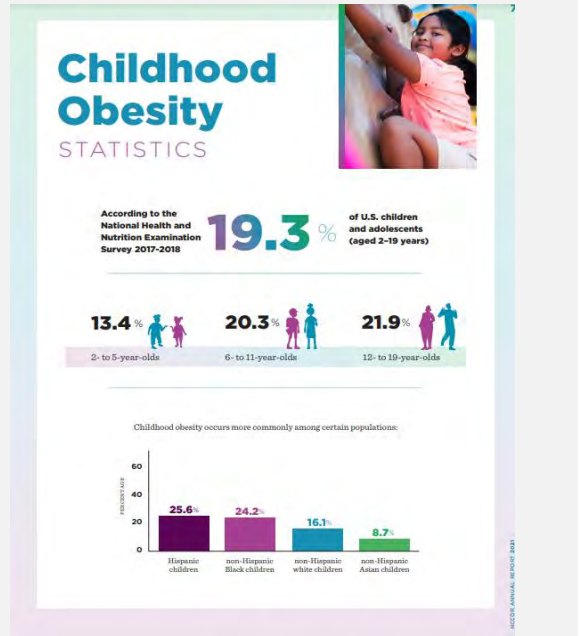
<https://www.cdc.gov/growthcharts/>

FACTORS ASSOCIATED WITH CHILDHOOD OBESITY (ANG ET AL, 2013)



PREVALENCE OF PEDIATRIC OBESITY IN THE US

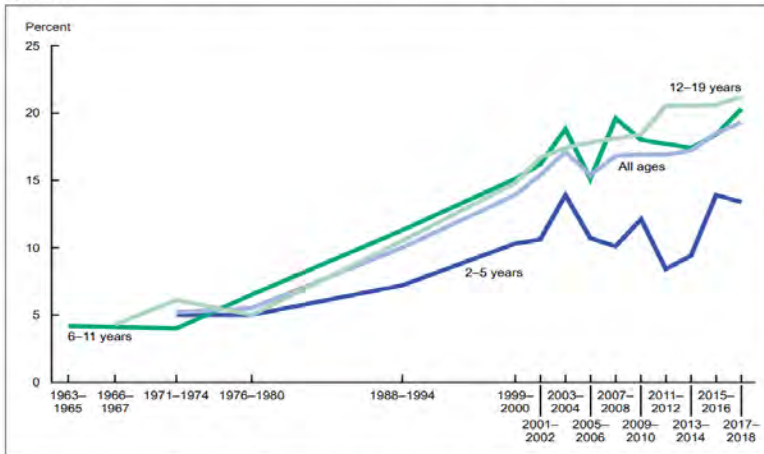
<https://www.cdc.gov/obesity/data/childhood.html>



<https://www.nccor.org/wp-content/uploads/2022/03/NCCOR2021AR-FINAL508.pdf>

PREVALENCE

Figure. Trends in obesity among children and adolescents aged 2–19 years, by age: United States, 1963–1965 through 2017–2018

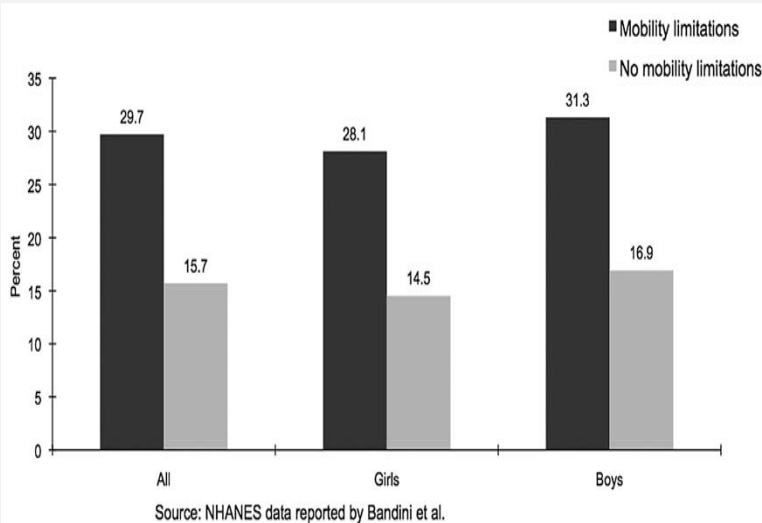


NOTE: Obesity is body mass index (BMI) at or above the 95th percentile from the sex-specific BMI-for-age 2000 CDC Growth Charts.
 SOURCES: National Center for Health Statistics, National Health Examination Surveys II (ages 6–11), III (ages 12–17), and National Health and Nutrition Examination Surveys (NHANES) I–III, and NHANES 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, 2011–2012, 2013–2014, 2015–2016, and 2017–2018.

<https://www.cdc.gov/nc/hs/data/hestat/obesity-child-17-18/overweight-obesity-child-H.pdf>

(Fryer et al, 2020)

OBESITY IN ADOLESCENTS WITH DISABILITIES (RIMMER, 2010)



Children with **functional limitations** are more than twice as likely to be overweight compared to peers with no limitations (Bandini et al, 2005; Minihan, et al, 2007; Rogozinski et al, 2007)

HEALTH CONDITIONS ASSOCIATED WITH CHILDHOOD OBESITY

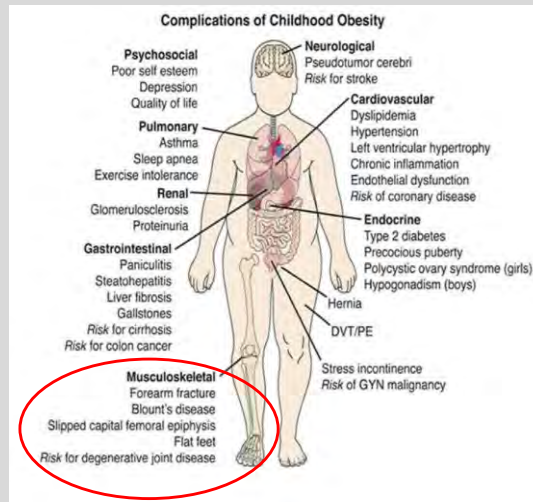


TABLE 1. Secondary Causes of Pediatric Obesity

Monogenic disorders	Endocrine
Melanocortin 4 receptor haploinsufficiency	Hypothyroidism
Leptin deficiency	Glucocorticoid excess (Cushing syndrome)
Leptin receptor deficiency	Growth hormone deficiency
Proopiomelanocortin deficiency	Pseudohypoparathyroidism
Proprotein convertase 1	Psychological
Syndromes	Depression
Prader-Willi	Eating disorders (binge eating disorder and night eating disorder)
Bardet-Biedl	Drug induced
Cohen	Tricyclic antidepressants
Alström	Glucocorticoids
Albright hereditary osteodystrophy	Antipsychotic drugs
Beckwith-Wiedemann	Antiepileptic drugs
Carpenter	Sulfonylureas
Neurologic	Hypothalamic causes
Brain injury	Tumor
Brain tumor	After brain surgery/radiation (craniopharyngioma)
After cranial irradiation	ROHHAD/ROHHADNET syndrome
Hypothalamic obesity	

ROHHAD = rapid-onset obesity with hypothalamic dysfunction, hypoventilation, and autonomic dysregulation; ROHHADNET = rapid-onset obesity with hypothalamic dysfunction, hypoventilation, and autonomic dysregulation with neural crest tumors.

SECONDARY CAUSES OF CHILDHOOD OBESITY

Kumar et al, 2017

HEALTH RISKS & CONDITIONS

<https://www.cdc.gov/obesity/childhood/causes.html>

- Cardiovascular Disease
 - High blood pressure & high cholesterol – CV disease
- Type 2 diabetes
 - Increased risk of impaired glucose tolerance, insulin resistance, Breathing problems, such as asthma and sleep apnea
- Musculoskeletal Conditions
 - Joint problems and musculoskeletal discomfort
- Fatty liver disease
 - Gallstones, and gastro-esophageal reflux (i.e., heartburn)
- Psychological problems like anxiety and depression
 - Low self-esteem and lower self-reported quality of life
- Social problems such and bullying and stigma
 - Increased likelihood of being an adult with obesity

ACANTHOSIS NIGRICANS

- Children with this condition - higher risk of developing type 2 diabetes.
- Rarely – may be a warning sign of a cancerous tumor in an internal organ (stomach or liver)
- Symptoms
 - Skin changes - dark, thickened, velvety skin in body folds and creases — (armpits, groin and back of neck)
 - Skin changes usually appear slowly; skin may also have an odor or itch
- Causes
 - Insulin resistance
 - Hormonal disorders
 - Certain drugs and supplements
 - Cancer
- Risk Factors
 - Obesity
 - Race
 - Family history



<https://www.mayoclinic.org/diseases-conditions/acanthosis-nigricans/symptoms-causes/syc-20368983>;
<https://www.healthline.com/health/acanthosis-nigricans#pictures>

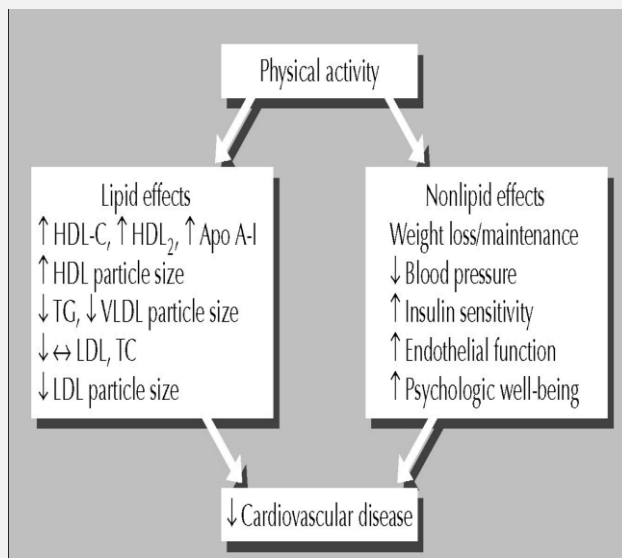
OBESITY & TYPE 2 DIABETES (HANNON 2005; DESHPANDE, 2008)

- Pathophysiology of Type 2 Diabetes (T2DM)
 - Incidence of T2DM parallels the obesity epidemic
 - Twenty yrs ago – childhood DM was T1DM not T2DM
 - Increased adiposity causes insulin resistance and poor glucose regulation
 - Adolescence - vulnerable time as growth hormones mediate relative insulin resistance
- Risk factors for T2DM
 - >85th% BMI for age & gender
 - Family history of T2DM
 - Ethnicity: American Indian, AA, Hispanic, Asian, Pacific Islander
- Earlier age at the onset of DM = earlier complications of DM
 - 30% go undiagnosed

METABOLIC SYNDROME ([WWW.CDC.GOV](http://www.cdc.gov))

- Three of the following conditions are needed for the diagnosis of metabolic syndrome:
 - Fasting glucose: \geq 110 mg/dL
 - Waist circumference: \geq 90th percentile age-and sex specific (NHANES III)
 - Triglycerides: \geq 110 mg/dL (NCEP)
 - HDL-C: $<$ 40 mg/dL (all ages, sexes – NCEP)
 - Resting BP: $>$ 90th percentile (age-sex-height specific – NHLBI)

PA IMPROVES LIPID PROFILES



Type 2 Diabetes

(Schmitz, et al 2002)

- PA improves insulin sensitivity

Hypertension

(Szapary, et al 2003)

- PA improves weight status which is associated with decreased systolic & diastolic blood pressure.

Hypercholesterolemia

PA improves weight status & decreases total cholesterol, low-density lipoprotein cholesterol, triglycerides & inflammatory markers

https://www.nhlbi.nih.gov/sites/default/files/media/docs/pedsguidelines_full.pdf

SLIPPED CAPITAL FEMORAL EPIPHYSIS (SCFE) IN CHILDHOOD OBESITY

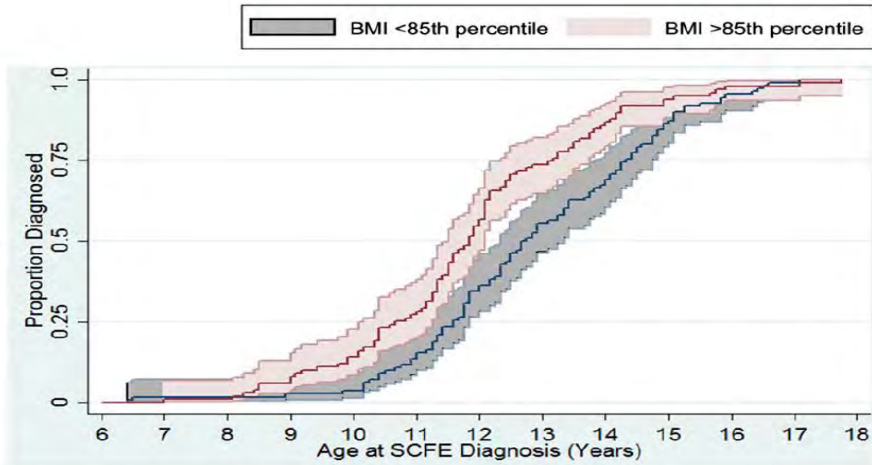


FIGURE 2
Cumulative age to diagnosis curve stratified by BMI z score at 5 to 6 years old (≥ 85 th percentile = children with overweight and obesity; < 85 th percentile = underweight or normal).

Perry, et al, 2018

PAIN ASSESSMENT: (BIERI, 1990; VON BAEYER, 2011)

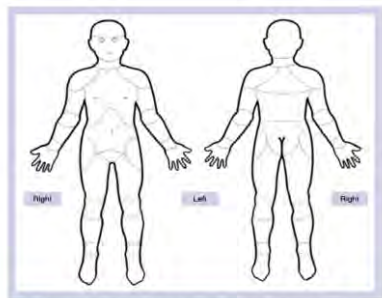
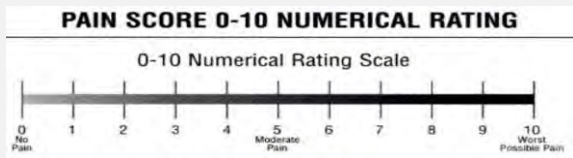


Figure 1. Suggested pain chart for studies of recurrent and chronic pain adopted as part of the SUPER KIDS pain assessment project. The chart is designed for paper or electronic administration. Instructions: "Color in (click) all the parts of your body where you have had pain in the past 2 weeks." Instructions may be varied if necessary to show pain "right now", or pain during a specified activity, or during a different period of time, or to show pain of different quality or intensity using different colors or symbols (areas for scoring are listed in Table 1). Reproduced with permission from (14): © Childhood Arthritis and Rheumatology Research Alliance (CARERA), CA, USA.



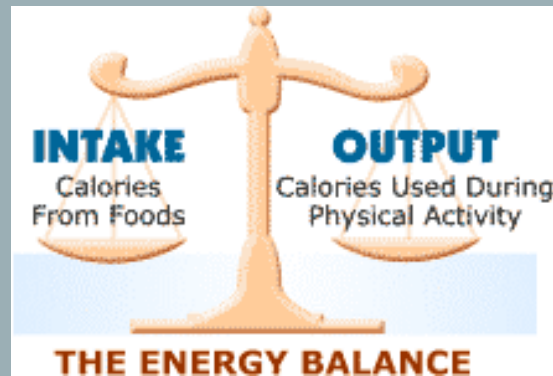
3-7 yo



7+ yo

<https://www.nhpco.org/pediatric-pain-assessment>

OVERVIEW: WEIGHT MANAGEMENT & PT MANAGEMENT



AAP - COMPONENTS OF WEIGHT MANAGEMENT PROGRAMS



Live 5-2-1-
Almost
None
everyday:

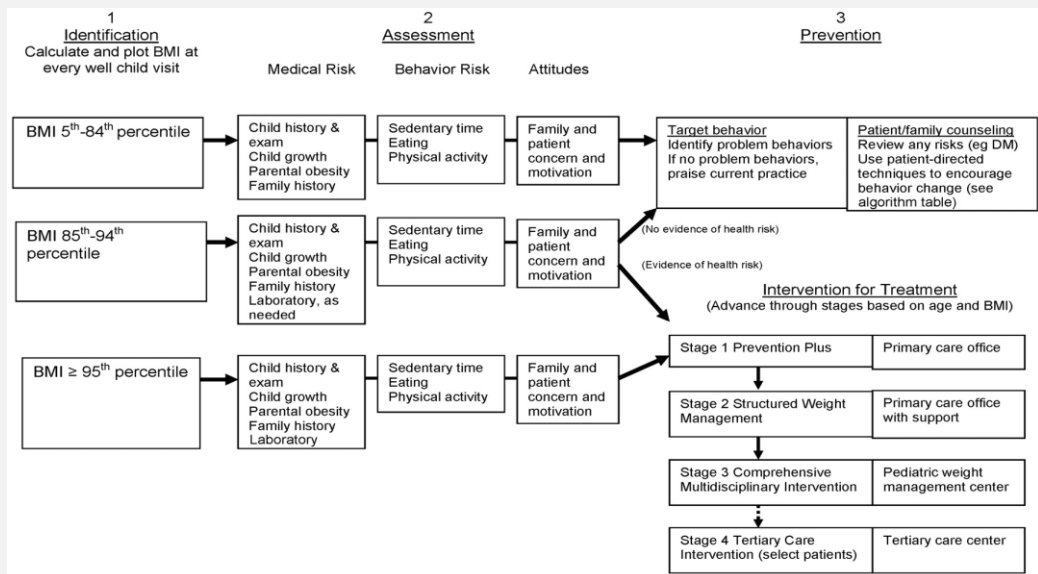
- **Five** or more fruits and vegetables
- **Two** hours or less of screen time
- **One** hour of physical activity
- **Almost none** of items such as soft drinks, sports drinks, and fruit drinks that are not 100% fruit juice

<https://www.nemours.org/services/health/growuphealthy/521almostnone.html>

AAP WEIGHT MANAGEMENT CONSIDERATIONS

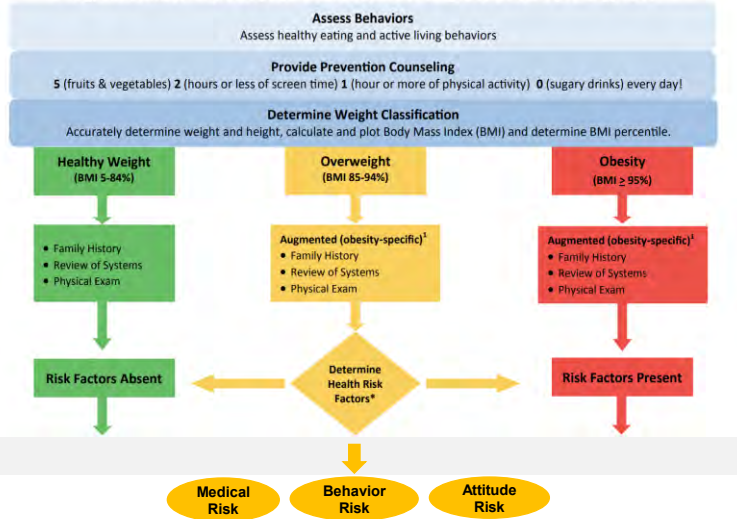
- Not every child/patient is ready
- Fear tactics don't work
- There are no quick fixes
- Frequent visits over time
- Small behavior changes can have profound effects
- Motivational Interviewing works

AAP WEIGHT MANAGEMENT RECOMMENDATIONS (BARLOW, 2007)



CHILDHOOD WEIGHT MANAGEMENT (AAP, 2007)

Algorithm for the Assessment and Management of Childhood Obesity in Patients 2 Years and Older
 This algorithm is based on the 2007 Expert Committee Recommendations,¹ new evidence and promising practices.

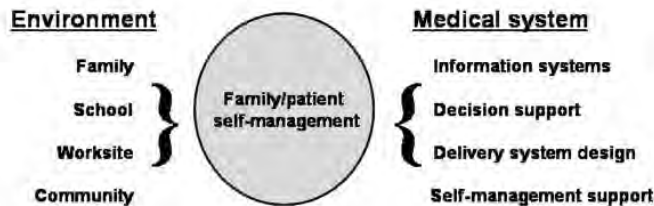


https://ihcw.aap.org/Documents/Assessment%20and%20Management%20of%20Childhood%20Obesity%20Algorithm_FINAL.pdf

AAP WEIGHT MANAGEMENT RECOMMENDATIONS

Obesity care model.

Chronic Care Model



Sarah E. Barlow Pediatrics 2007;120:S164-S192

©2007 by American Academy of Pediatrics

PEDIATRICS

TABLE 2. Suggested Staged Approach to Weight Management in Children and Adolescents

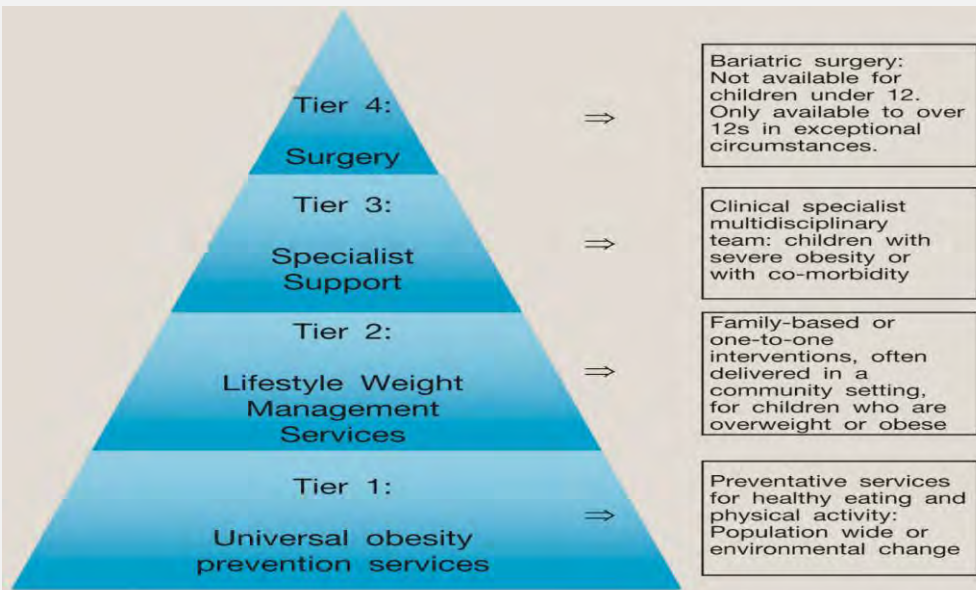
- *Stage 1 (Prevention Plus)* can be implemented in a primary care office setting, 5 or more servings of fruits and vegetables per day, minimize or eliminate consumption of sugar-containing beverages, <2 hours of screen time and >1 hour of physical activity per day
- *Stage 2 (Structured Weight Management)* can be implemented in a primary care office with a dietitian, includes stage 1 guidelines plus increased structure of meals and snacks with attention to energy density of foods
- *Stage 3 (Comprehensive Multidisciplinary Intervention)* can be implemented in a primary care office with a multidisciplinary team and outside facilities for structured physical activity, includes stage 2 guidelines plus increased structured physical activity and dietary program
- *Stage 4 (Tertiary Care Intervention)* can be ideally implemented in a pediatric weight management center with a multidisciplinary team with expertise in pediatric obesity, includes in addition to stage 3 recommendations, medications, extremely structured dietary regimens, or bariatric surgery

STAGES IN WEIGHT MANAGEMENT

Kumar et al, 2017

AAP: STAGES IN WEIGHT MANAGEMENT

(ROBERTSON ET AL, 2016)



STAGE 3 WEIGHT MANAGEMENT (SLUSSER, 2011)

TABLE 2 Proposed Stage 3: Structured Weight Management Care

Services	BMI	
	85th–94th Percentile	≥95th Percentile
Medical: MD/DO/nurse practitioners with a special interest in childhood obesity who works closely with primary care physicians and follow the chronic care model of care delivery	With comorbidities 1/mo for 6 mo, then as needed or minimum 4/y During visits monitor progress to sustain health improvements or to escalate care as needed and to screen for comorbidities	With or without comorbidities 1/mo for 6 mo, then as needed or minimum 4/y
Registered dietician visits	1/wk for 16 wk with follow-up at 3, 6, 9, and 12 mo	1/wk for 16 wk with follow-up at 3, 6, 9, and 12 mo
Mental health services (mental health: PhD, MFT, LCMSW, MA) if indicated during initial assessment	1/wk for 16 wk with follow-up at 3, 6, 9, and 12 mo If indicated on the basis of initial assessment	1/wk for 16 wk with follow-up at 3, 6, 9, and 12 mo If indicated on the basis of initial assessment
Physical activity: physical therapist, exercise physiologist	Initial assessment	Physical activity with incremental increases with the goal of 1 h/d supervised by a professional in physical activity at least 1/wk for 16 wk with follow-up at 3, 6, 9, and 12 mo; other support services as needed
Laboratory tests: screening for comorbidities, continued follow-up of comorbid conditions	If risk factors present in history or physical exam: AST/ALT, fasting glucose and lipid levels, beginning at 2 y of age (every 2 y for screening)	AST/ALT, BUN/Cr, fasting glucose and lipid levels (with or without risk factors); consider insulin levels
Subspecialists involved as needed (eg, endocrinologist, gastroenterologist, orthopedist, cardiologist, pulmonologist)	As needed	As needed
Care coordination: RN, MSW, or health educator	As needed	As needed

AST indicates aspartate aminotransferase; ALT, alanine aminotransferase; SUN, serum urea nitrogen; Cr, creatinine.

PHARMACOLOGICAL INTERVENTIONS (MCGOVERN ET AL, 2008)

- Suppress calorie intake, limit nutrient absorption, regulate insulin production or action
- Evidence suggests this intervention is relatively ineffective in reducing obesity
 - Sibutramine (Meridia 5) – anorexetic agent to increase satiety and decrease calorie intake; approved for ≥ 16 yo
 - Orlistat (Xenical) – limits nutrient absorption by inhibiting pancreatic lipase and increasing fecal loss of triglycerides; approved for ≥ 12 yo
 - Alli – over the counter version of Orlistat for ≥ 18 yo
 - Metformin (Glucophage) – inhibits hepatic glucose production, increases glucose uptake, decreased food intake, fat stores, improves lipid profiles, weight loss; approved for T2D treatment in childhood (not obesity)

SURGICAL INTERVENTIONS

(TREADWELL ET AL, 2008)

Last resort treatment in adolescents with BMI > 40 kg/m² and significant co-morbidities. PT should be member of multidisciplinary team making decisions on surgery.

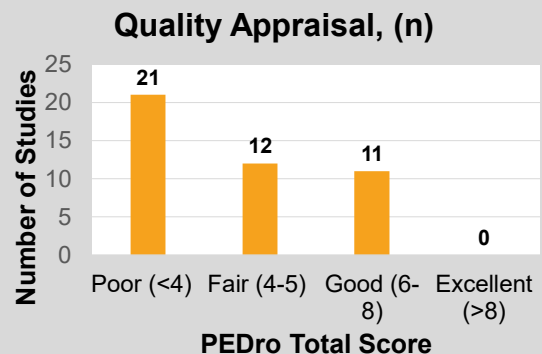
- Laparoscopic gastric banding procedure
 - Restricts contents of stomach by a silicone band around the upper stomach (just distal to the gastroesophageal junction); circumference is adjustable by saline injections percutaneously
- Roux-en-Y (RYGB) bypass
 - Small 10-30 ml gastric pouch (stapling or transecting the stomach); pouch is anastomosed to small intestine; base of the “Roux limb” is connected to lower intestine below stomach – pancreatic enzymes and gall bladder bile do not act on food until it reaches lower connection – create malabsorption & weight loss

EVIDENCE ON USE OF EXERCISE AND PHYSICAL ACTIVITY TO REDUCE CHILDHOOD OVERWEIGHT/OBESITY



SCOPING REVIEW: QUALITY

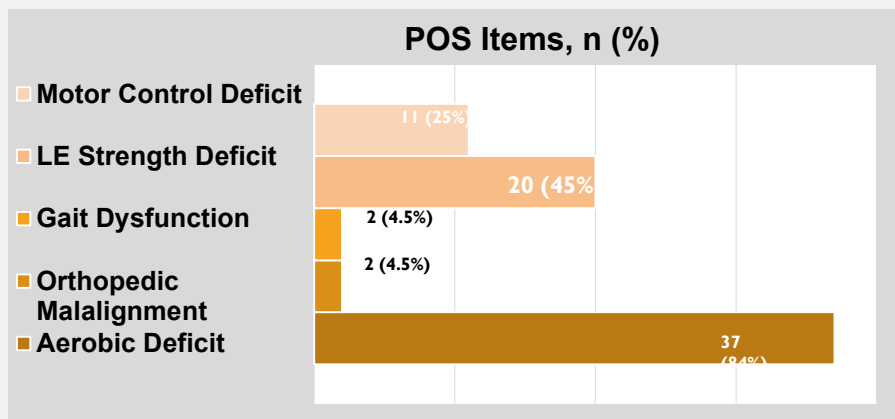
(BRANTON ET AL, 2022)



Scoping Review: Interventions & Outcomes (Branton et al 2022)

POS Item	Interventions	Outcomes	N, (% sig)
Aerobic Conditioning	HIIT/MIIT on treadmill, elliptical, cycle, rower, team sports, outdoor running, aquatic, WiiFit, dance exergames, circuit training	20M SRT, 6MWT distance, VO2max, HR	37 (70.2%)
LE Strength & Endurance	Whole body conc/ecc/iso exercises with free weights, machines, resistance bands, plyometrics, aquatic training, whole body vibration	LSUP, STS, RM (or Submax) Leg Press, Plyometrics (jumping)	20 (35%)
Motor Control	ball games, agility drills, balance, obstacle courses, general exercise activity	10 x 4M Agility, one leg standing balance, MABC-2, postural sway, standardized walking obstacle course (SWOC)	11 (72.7%)
Orthopedic Alignment	Global posture exercises, strengthening, stretching	Visual Posture Assessment: knee valgus/varus, SAPO software: horizontal alignment head/trunk, knee, cervical, thoracic, lumbar angle, trunk inclination	2 (50%)
Gait Dysfunction	Ankle mobility, strengthening of ankle, knee, hip, neuromuscular control training, running drills with forefoot strike emphasis	2D or 3D Gait Analysis temporal spatial outcomes	2 (100%)

Scoping Review: POS (Branton, et al 2021)



SYSTEMATIC REVIEW: EXERCISE & ADIPOSITY (KELLEY ET AL, 2019)

- Studies (n=57) representing 127 groups (73 exercise & 54 controls) and 2792 participants (2-18 yo)
- Frequency: 3.3 +/- 1.1 days
- Duration: 14.1 +/- 6.2 weeks
- Significant Results
 - Decreased BMI & FM and % BF in aerobic vs control comparisons & in combined aerobic & strength vs control comparison
 - Decreased % BF in strength vs control
 - Decreased FM and % BF with combined aerobic and strength training vs control
 - Decreased BMI with aerobic exercise vs control
- Conclusion
 - Aerobic and combined aerobic and strength training are associated with improvements in adiposity outcomes in children and adolescents who are OW or OB

RECOMMENDATIONS PT INTERVENTION STRATEGIES (HANSEN ET AL, 2016)

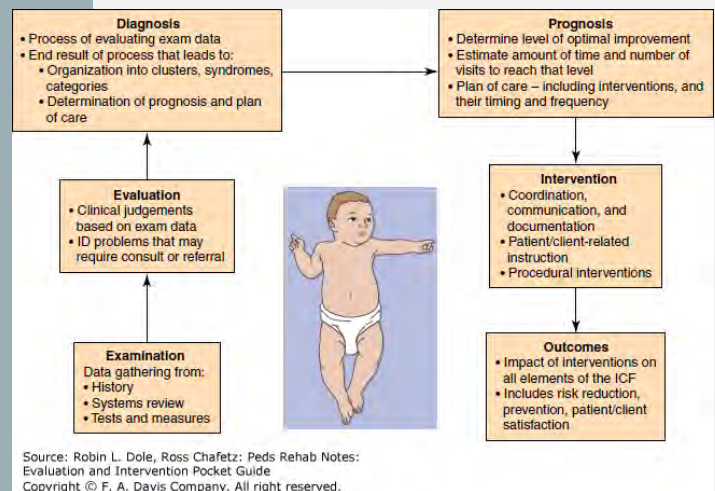
- **Don't rely on BMI.**
Use other tools for measuring whole-body fat mass, such as waist circumference or skin-fold thickness. Ideally, body composition should be analyzed by cross-sectional imaging before beginning treatment.
- **Pay attention to medications.**
Some prescriptions can interfere with exercise. Insulin for type 2 diabetes can lead to hypoglycemia during exercise; this is not true for someone taking metformin for the same condition.
- **Evaluate psychosocial barriers to success.**
Low self-esteem, anxiety, negative body image, and other psychological concerns can influence adherence to the plan of care. This also includes family and peer support.
- **Use accelerometers to monitor physical activity.**
Out of 61 assessment tools the authors reviewed, none were reliable or valid. Pedometers have a high error rate, and heart monitors are expensive and sometimes impractical. Smart watches? No data yet.

RECOMMENDATIONS PT INTERVENTION STRATEGIES (HANSEN ET AL, 2016)

- **Measure exercise endurance capacity and muscle strength.**
The 20-meter shuttle run test - for measuring endurance.
For muscle strength - the handgrip strength test and standing broad jump test.
- **Emphasize endurance in exercise prescription.**
Endurance exercise (organized sports or daily activities) promotes weight loss more than simply increasing physical activity. Whole-body exercises are best. But small changes (less sedentary time) are helpful if maintained long-term
- **Supervise strength training.**
Strength training is recommended if there is muscle weakness and to avoid injury, but only with a PT present to ensure "proper execution" of the exercises – and only for children over age 5.
- **Be your patient's biggest fan.**
Helping build a child's sense of self-efficacy will motivate them to continue exercising. Give praise for achieving incremental goals, and educate parents about the importance of exercise and healthy lifestyles.

The experts assert that "systematic involvement of physical therapists in the treatment of obesity in children and adolescents can result in a more comprehensive evaluation and improved care and treatment of obesity at the community level, especially in children and adolescents with increased health care needs."

APTA ELEMENTS OF PATIENT CARE: PT MANAGEMENT OF CHILDHOOD OVERWEIGHT/OBESITY



(Guide to PT Practice; Dole & Chafetz, 2010)

CONSIDERATIONS: DESIGNING A WEIGHT MANAGEMENT INTERVENTION

Identify child & family goals

- Try not to focus on weight
- Focus on mobility, fitness, physical activity
- Focus on decreasing sedentary behaviors
- Keep goals realistic
 - Weight loss at 8-10% of weight
 - Slow/ incremental

Measures

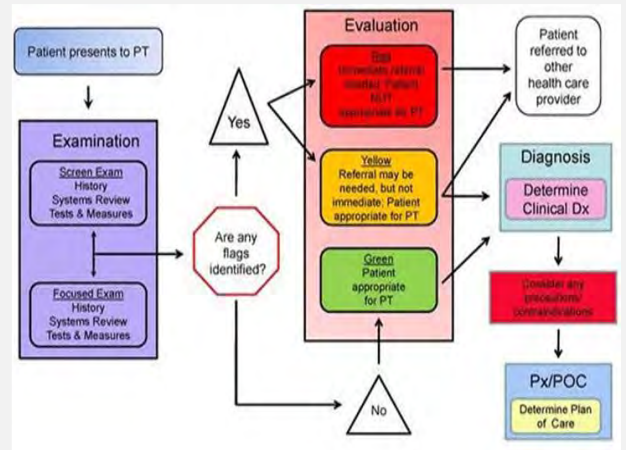
- Dietary Assessment
 - 3 day dietary record
- Physical Activity Assessment
 - Self-report questionnaire,
 - Pedometers/Accelerometer
- Physical Fitness Assessment
 - Body Composition, Strength, Endurance, Flexibility
 - Psychosocial
 - Health Related Quality of Life, Readiness to Change
- Environmental
 - Access & resources to healthy food & places to be physically active

WHAT IS THE HEALTH &/OR FUNCTIONAL MOBILITY GOAL?

- Body Function & Structure
 - Walking speed?
 - Postural control, balance, agility?
 - Endurance?
- Activity
 - High level gross motor skills?
 - Swimming, Running
 - Stair climbing
- Participation
 - Joining a Sports Team
 - Taking a Dance Class
 - Joining a cycling group

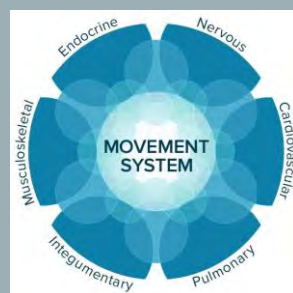


DIFFERENTIAL DIAGNOSIS: PATIENT MANAGEMENT



(Drexel University Model, 2015)

SCREENING



Precautions & Contraindications

- Medical conditions, precautions, or contraindications
 - Ex: Cardiorespiratory conditions
 - May require exercise test
 - May require MD specific guidelines
- Monitor BP, HR, RR, O2 saturation
- Review relevant Movement System components
- Review lab results
- Review health habits & environmental factors

RECOMMENDATIONS: SCREENING & EXAMINATION

Screening	(Hansen & Wrotniak, 2017)
Medications	Weight control or comorbid conditions (antihypertensives, statins, antacids, digestive enzymes, acetaminophen, ibuprofen, corticosteroids, bronchodilators)
Cardiovascular and pulmonary	Lipid profiles (labs), HR, blood pressure, O2 sats, RR, Hgb respiratory exam
Musculoskeletal, neuromuscular, gastrointestinal & integumentary	Fractures, SCFE, Blounts disease, bone density profile, pain, neuropathies, migraines, ulcers, GERD, acanthosis nigricans, skin breakdown,
Psychosocial & Environmental Factors	<ul style="list-style-type: none"> • Low self esteem/self efficacy, physical literacy, exercise limitations • Comorbidities • Environmental – resources, family role
Examination	
Anthropometric measures	BMI (weight category) vs Body composition (bioelectrical impedance, skinfolds) vs visceral adiposity (waist to height or waist to hips ratio)
POS assessment	<ul style="list-style-type: none"> • Strength – standing long jump, hand grip • Aerobic endurance – 20 m shuttle run • Motor control – BOTMP ? (Wrotniak, 2006) • Orthopedic alignment & gait dysfunction – posture and gait assessment
Health behavior assessment	Physical activity – pedometer, accelerometer, heart rate monitor

RESTING BLOOD PRESSURE TABLES (NIH)

Blood Pressure Levels for Boys by Age and Height Percentile (Continued)

Age (Year)	BP Percentile ↓	Systolic BP (mmHg)							Diastolic BP (mmHg)						
		← Percentile of Height →							← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
11	50th	99	100	102	104	105	107	107	59	59	60	61	62	63	63
	90th	113	114	115	117	119	120	121	74	74	75	76	77	78	78
	95th	117	118	119	121	123	124	125	78	78	79	80	81	82	82
	99th	124	125	127	129	130	132	132	86	86	87	88	89	90	90
12	50th	101	102	104	106	108	109	110	59	60	61	62	63	63	64
	90th	115	116	118	120	121	123	123	74	75	75	76	77	78	79
	95th	119	120	122	123	125	127	127	78	79	80	81	82	82	83
	99th	126	127	129	131	133	134	135	86	87	88	89	90	90	91
13	50th	104	105	106	108	110	111	112	60	60	61	62	63	64	64
	90th	117	118	120	122	124	125	126	75	75	76	77	78	79	79
	95th	121	122	124	126	128	129	130	79	79	80	81	82	83	83

<https://www.nhlbi.nih.gov/health-pro/guidelines/current/hypertension-pediatric-jnc-4/blood-pressure-tables>

PEDIATRIC OBESITY SYNDROME (POS)

Pediatric Obesity Syndrome “A human movement system dysfunction associated with excess adiposity that is characterized by aerobic deficit/deconditioning, lower extremity orthopedic malalignment and strength deficit, gait dysfunction, and motor control deficit”



Official Document

SPECIAL COMMUNICATION

Diagnosis Dialog for Pediatric Physical Therapists: Hypotonia, Developmental Coordination Disorder, and Pediatric Obesity as Examples

Kathy S. Martin, PT, DHS; Sarah Westcott, McCoy, PT, PhD; Brian H. Wrotniak, PT, PhD

Krannert School of Physical Therapy (Dr Martin), University of Indianapolis, Indianapolis, Indiana; Department of Rehabilitation Medicine (Dr McCoy), University of Washington, Seattle, Washington; Department of Physical Therapy (Dr Wrotniak), D'Youville College, Buffalo, New York; Center for Clinical Epidemiology & Biostatistics (Dr Wrotniak), University of Pennsylvania, Philadelphia, Pennsylvania; Department of Pediatrics (Dr Wrotniak), Division of Gastroenterology, Hepatology and Nutrition, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania.

Purpose: To clarify what diagnosis means for pediatric physical therapists, to provide several examples of human movement dysfunction syndromes, and to offer guidance for how pediatric physical therapists may continue this work in any clinical setting. **Key points:** The importance of diagnosis in pediatric physical therapy is presented along with examples of 3 different processes used to develop diagnostic labels. These processes included surveys to identify consensus opinion of clinicians, a literature review, and a combination of these 2. Hypotonia, developmental coordination disorder, and pediatric obesity are presented as examples. **Summary:** The 3 diagnoses serve as a basis for ongoing dialogue, discussion, and development of diagnostic labels for human movement syndromes identified by pediatric physical therapists. (Pediatr Phys Ther 2013;25:431-443) **Key words:** adolescence, child, developmental coordination disorder, diagnosis, human, hypotonia, infant, methods, obesity, overweight, physical therapy, psychomotor disorders

(Martin et al, 2013)

BODY FUNCTION AND STRUCTURE (WROTNIAK, 2017)

Clinical Characteristics of Childhood Obesity	Clinical Problems Associated with Each Characteristic
Aerobic fitness deficit/deconditioning	Poorer performance on aerobic fitness measures such as walk/run tests. Increased risk of asthma, sleep apnea
Lower extremity orthopedic malalignment	Slipped capital femoral epiphysis, genu valgus, tibia vara (Blount's disease), and pes planus
Gait dysfunction	<ul style="list-style-type: none"> Slower self-selected speed, wider and shorter steps, increased double-limb support time during walking Joint kinematic changes during walking - collapse of proximal stance limb (hip adduction, knee valgus) with distal compensation (rear foot inversion) Increased absolute peak joint moments at the hip, knee, and ankle
LE functional muscle strength deficit	Decreased for gravity-dependent tasks (vertical leap & standing long jump)
Motor control	Motor control deficit/movement incoordination
Pain	Back, foot & knee
Proprioception deficit	Particularly, poorer kinesthetic proprioception in knee flexion that may be associated with decreased postural control)

POS CLINICAL CHARACTERISTICS

POS item	Clinical Characteristics associated with Childhood Obesity
Aerobic deficit	<ul style="list-style-type: none"> Poorer performance on aerobic fitness measures such as walk/run tests compared to peers with typical weight
Orthopedic malalignment	<ul style="list-style-type: none"> Slipped capital femoral epiphysis, genu valga, tibia vara (Blount's disease), pes planus
Gait dysfunction	<ul style="list-style-type: none"> Slower self-selected speed, wider and shorter steps, increased double-limb support Joint kinematic changes during walking: collapse of proximal stance limb (hip adduction and knee valgus) with distal compensation (rear foot inversion) Increased absolute peak joint movements at hip, knee, ankle
Lower extremity strength	<ul style="list-style-type: none"> Decreased gravity-dependent tasks such as vertical leap, standing long jump
Motor control deficit	<ul style="list-style-type: none"> Associated with higher BMI and increased sedentary activity

(Wrotniak, 2017)

BREAK



PT INTERVENTIONS



BODY STRUCTURE/ FUNCTION INTERVENTIONS

Improve health and/or skill-related fitness

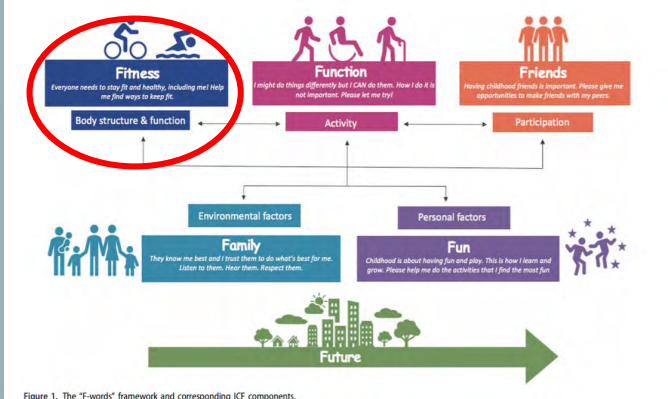
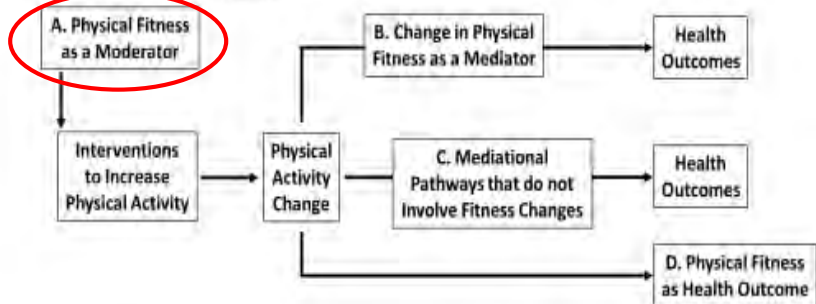


Figure 1. The "F-words" framework and corresponding ICF components.

(Rosenbaum & Gorter, 2012)

PHYSICAL FITNESS & PHYSICAL ACTIVITY TO PROMOTE HEALTH OUTCOMES (PA GUIDELINES 2018, ADVISORY COMMITTEE)

Figure C-9. The Role of Physical Fitness along Various Pathways between Physical Activity and Health Outcomes, Intervention Studies



STRENGTH INTERVENTIONS: EXERCISE TYPES

- Exercises - muscle contractions
 - Concentric/Eccentric
- Formal Exercises
 - Progressive Resistive Exercises (PREs)
 - Isokinetic - (Biodex or Cybex)
 - Plyometrics
- Functional Exercises
 - Sit to stand activities
 - Step ups
 - Stair climbing
 - Isometric



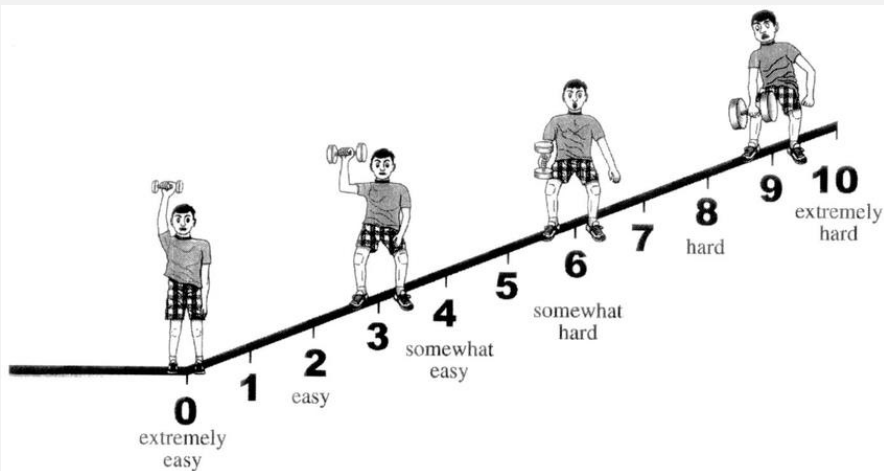
PERCEIVED EXERTION SCALE FOR YOUTH (FAIGENBAUM, MILIKEN, CLOUTIER, PERCEPTUAL AND MOTOR SKILLS, 2004)



Figure 2.2 Perceived exertion scale for youth.
PERCEPTUAL AND MOTOR SKILLS by Faigenbaum, M. A., Miliken, L., Cloutier, S., & Westcott, W. Copyright 2004 by American Scientific, Ltd. Reproduced with permission of American Scientific, Ltd. In the format "Outlook on Copyright Clearance Center."

- Numerical response scale
- Represents child at various levels of exertion while lifting weights

CHILDREN'S OMNI RESISTANCE SCALE OF PERCEIVED EXERTION (ROBERTSON, 2005)



TRAINING INTENSITY

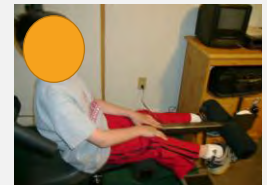
- After completing last rep, children rate exertion
- 6-7 is consistent with training intensity approx 60-70% maximum HR
- Relationship between repetitions and selected percentages of maximum strength vary between muscle groups
- Most children can perform 10 reps at an intensity of 70% maximum

EXERCISE SEQUENCE

- Large muscle groups prior to small muscle groups
- Rotate opposing agonist and antagonist exercises

Quadruped	Glut Max
Sidelying	Glut Medius
Sitting	Quads
Standing	Ankle DF
Standing	Ankle PF
Sitting	Biceps Curl
Supine	Triceps
Supine	Abdominal Crunch
Prone	Superman Back Extensors

PROGRAM VARIATION



- Training program systematically varied over time
 - Will allow children to make even greater gains because body will be challenged to adapt to even greater demands
 - Program changes after first 8-12 weeks of resistance training
 - Program variation – decreases risk of overuse injuries, boredom



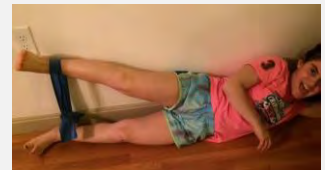
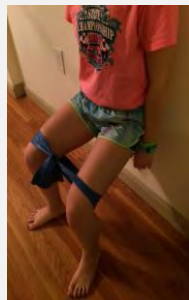
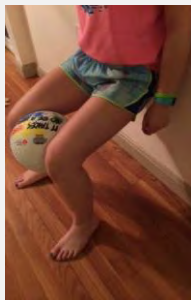
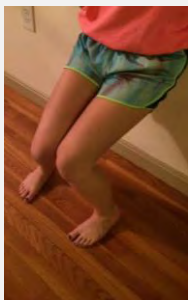
John P. DiFiori et al. Overuse Injuries and Burnout in Youth Sports: A Position Statement from the American Medical Society for Sports Medicine
Clin J Sport Med 2014;24:3–20

RESISTANCE TRAINING DOSE IN CHILDREN

- Depends on goals of sport & training program AND child's resistance training age
- Detraining effects in 8-12 weeks without resistance training


Frequency	2-3 x/wk nonconsecutive days (1x/wk some changes)
Intensity/ volume	Novice: 1-2 sets of 8-12 reps, low resistance $\leq 60\%$ 1RM Increase wt by 5-10% and \downarrow # reps Intermediate: Progress to 2-4 sets of 6 to 10 reps (mod intensity $\leq 80\%$ 1RM) Advanced: < 6 reps at $> 80\%$ 1RM
Time/duration	~ 30 minutes/ > 23 weeks most effective in attaining max strength gains 1 minute rest in between sets novice; 2-3 minutes advanced
Type/velocity	Machines, free weights, plyometrics, weightlifting
Ms Targeted	Core (abd, gutes, low back) for sports participation – postural control & skill acquisition UE & LE muscles
Enjoyment	Incorporate throughout

FUNCTIONAL STRENGTHENING




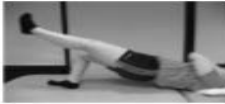

TYPE OF EXERCISE

Table 2
Description of selected exercises targeting the gluteal musculature.

Exercise	Description	
Clam	<p><i>Start:</i> Subject side lying. Knees and ankles together. Knee flexed to 90°. Pelvis perpendicular to surface of bed</p> <p><i>Action:</i> Subject maximally elevate uppermost knee while keep ankles together. External stabilization of pelvis provided if required.</p>	
Lunge	<p><i>Start:</i> Subject in high kneeling (test limb in front). Both knees flexed to 90°. Fixed external support (plinth) provided for stability</p> <p><i>Action:</i> Subject elevates to maximum height while maintaining stance and returns to start position. Instructed to use upper limbs for balance only.</p>	
Squat	<p><i>Start:</i> Subject stands facing bed, feet approximately shoulder width apart.</p> <p><i>Action:</i> Subject lowers buttocks towards floor while maintaining upright trunk and attempting to keep heels on floor. Instructed to use upper limbs in contact with plinth for balance only.</p>	

(Daly et al, 2019)

GLUTEAL MUSCLE EXERCISES

Step-up	<p><i>Start:</i> Foot of test limb place on step/bench set to 50% of the subject knee height from the floor.</p> <p><i>Action:</i> Subject lifts contralateral limb on to bench/step and lowers contralateral limb to floor. Test limb remains on bench throughout. Instructed to use upper limbs in contact with plinth for balance only.</p>	
Single leg bridge	<p><i>Start:</i> Lying in supine with knee of test limb flexed to 90°. Contralateral hip flexed and knee extended so both thighs are parallel but not in contact.</p> <p><i>Action:</i> Subject lifts pelvis to maximum height and returns, with control, to start position. No pelvic rotation permitted. (Note: where subjects were unable to perform this technique they were allowed to lift pelvis with two feet in contact and then extend contralateral knee).</p>	
Prone hip knee extension	<p><i>Start:</i> Subject kneels on bench, trunk fully supported by plinth with hips and knees in 90° flexion.</p> <p><i>Action:</i> Subject fully extends test hip while simultaneously extending the knee and returns to start position. No pelvic/trunk rotation permitted.</p>	

(Daly et al, 2019)

GLUTEAL MUSCLE ACTIVATION

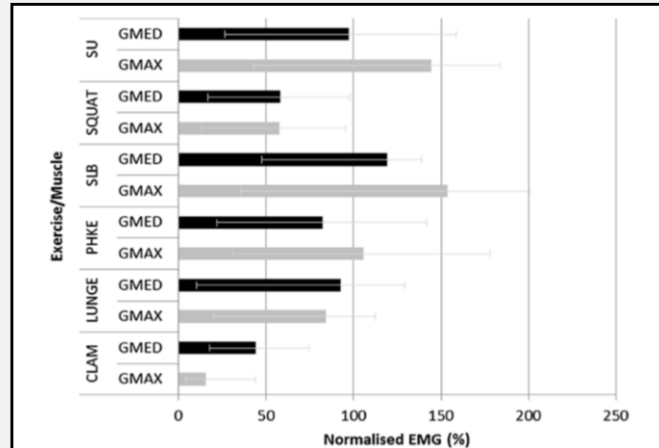


Fig. 1. Median peak and interquartile range EMG levels for the gluteus medius (black) and maximus (grey) normalised EMG across all exercises. SLB = single leg bridge, SU = step up, PHKE = prone hip knee extension, GMED = gluteus medius, GMAX = gluteus maximus.

(Daly et al, 2019)

CP GLUT EXERCISE



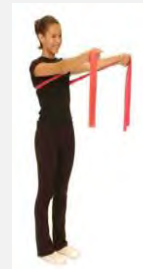
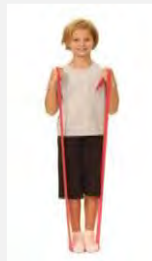
STRENGTH TRAINING ACTIVITIES



- *Using Therapy Balls & Resistance Bands for Specific Exercises*
- *Strengthening muscles with grades of MMT < 3*
- *Strength training for younger children*
- *Using body weight & age-appropriate play activities*
- *Other core and extremity strength training ideas*

THERAPY BALLS & RESISTIVE BANDS

- **Exercise Program Search**
- Over 150 pre-made exercise routines to choose from for a variety of products and body part.



<http://www.thera-bandacademy.com/>

Hip Extension & Abduction



Diagonal Chopping

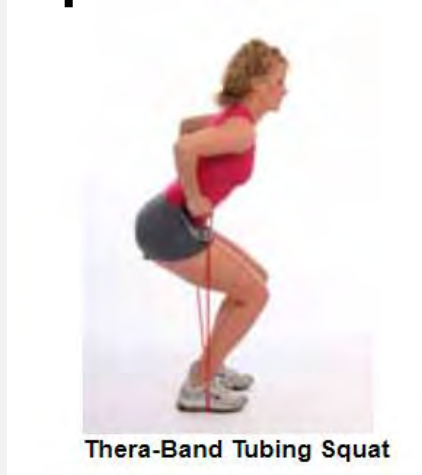


Thera-Band Tubing Diagonal Chopping

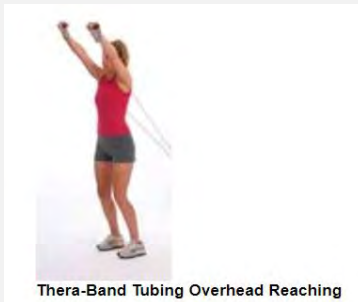
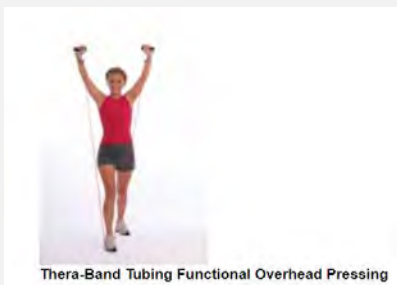


Thera-Band Tubing Diagonal Lifting

Lunge & Squat



Push-Pull



Press-Reach

Monster Walk



Jump



'Russian' Squat



STRENGTHENING WEAK MUSCLES (MMT GRADES <3)

- Consider adding resistance in gravity eliminated positions
- Consider electrical stimulation
- Consider aquatic setting
- Suspended equipment (Zero G)



<https://www.aretchllc.com/products/zerog-gait-and-balance/>



<https://www.theraquatics.com/cepasqflba.html>

STRENGTH TRAINING IN PLAY ACTIVITIES

- Body weight and repetition of activities
- Walking activities with backpack or cuff weights
- Moving up and down ramps or on carpets
- Suspended equipment using theraband
- Lifting weighted balls or toys
 - Organize & sequence activities to emphasize specific muscle groups



FUNCTIONAL STRENGTHENING

- *Wall Squats*
 - Postural control & endurance
 - LE strength training
 - Using a weighted vest
 - With a peanut to help with wall glides
 - On a dynamic surface to increase core muscle activation

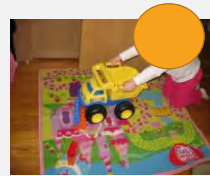


UE/ CORE STRENGTHENING

- Wheelbarrow
- Donkey kicks
- Prone on hands on ball
- Plank
- Wall Push-Ups
- Handle truck
 - Abdominals
- Scooter board
 - Abdominals
 - Back and hip extensors

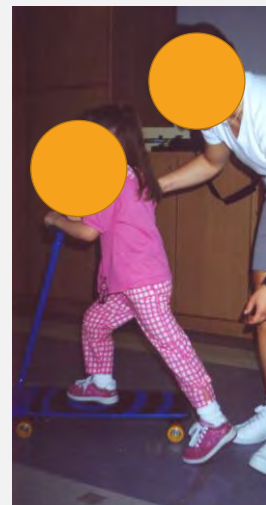


<https://educationtothecore.com/2021/05/30-ways-to-support-sensory-needs/>



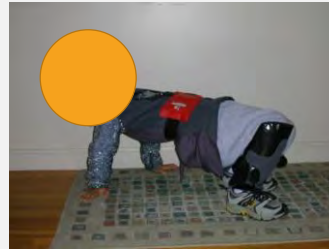
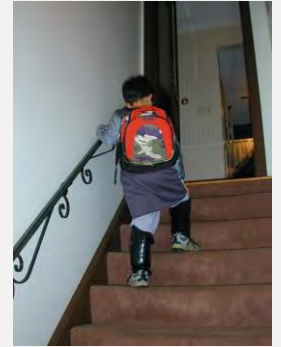
FUNCTIONAL STRENGTHENING

- Right LE – Weight bearing leg – stability in hips & quads especially!
- Left LE – ankle plantarflexion to propel the scooter
- Scooter on tile surface and then add friction using a rug as a harder surface (friction)



WEIGHTED ACTIVITIES

- Ankle weights to increase resistance during play and activities
- Weighted backpack or vest for stair climbing
- UE strengthening – crab walk
- Weight



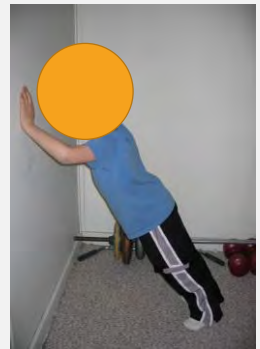
BODY WEIGHT- MUSCULAR ENDURANCE

- Wall squats
- Lunges using wall or ball for balance assistance
- Heel raises
- Toe raises

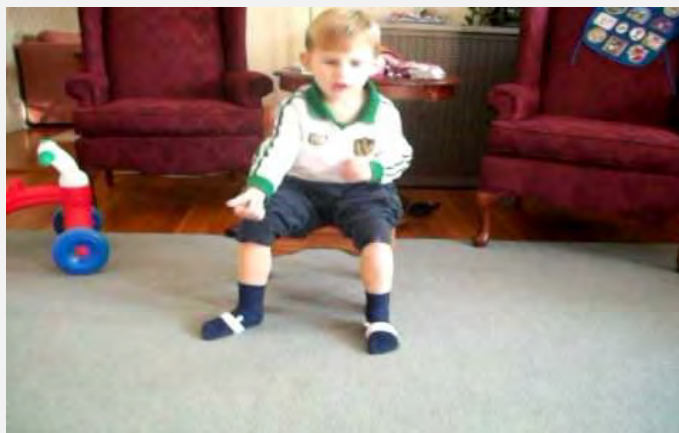


UE STRENGTHENING: WALL PUSHUPS

- To build UE strength & core strength for full body or knee contact push ups
- Hands at shoulder height
- Feet hip width apart under hips to start
- Move feet back as child get stronger and is able to do 2-3 sets of 10-15
- Use tape to mark hand and foot placement
- Use ball under chin for cervical alignment

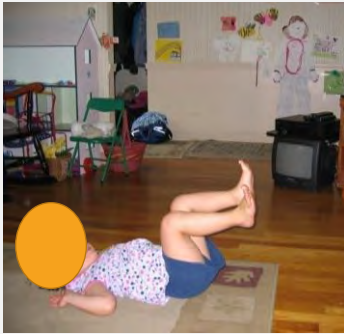


SIMPLE EXERCISE FOR LE STRENGTHENING

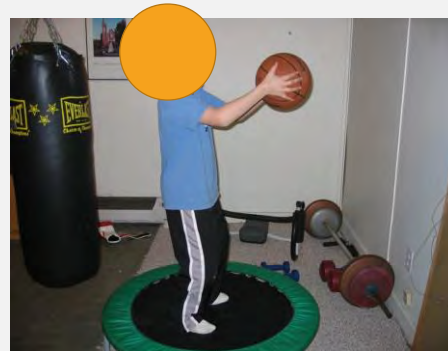


- <http://www.youtube.com/watch?v=3HmHjKpYeHM>

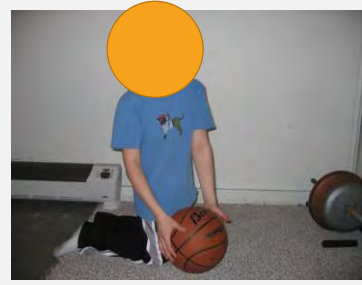
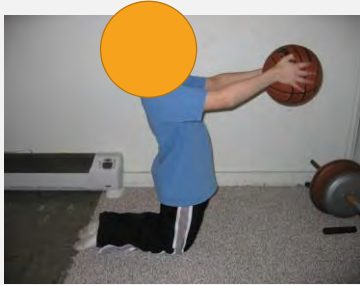
Supine Kicking - Lower Abdominals & LE



CORE STRENGTHENING – WEIGHTED BALL & DYNAMIC SURFACE

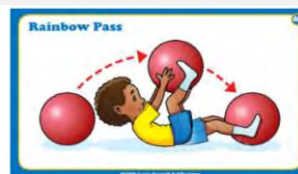


DIAGONAL CHOPS IN KNEELING & HALF KNEEL



OTHER CORE AND EXTREMITY STRENGTHENING

- Kicking ball suspended from ceiling
- Prone over ball – paper on wall for writing/coloring or puzzle on bench and pieces on floor
- Supine – Rainbow Pass
- Sitting – pass ball over head or to side
- In kneeling or sitting - resistance band (or sheet) to provide resistance





FORMAL VS FUNCTIONAL STRENGTH TRAINING: CONSIDERATIONS

MUSCULAR FITNESS

(ACSM, 2018)

Muscle Strength

Muscular Endurance

Power

STRENGTH TRAINING



- **VELOCITY**
 - Cadence at which a strengthening exercise is performed
- **VOLUME**
 - Amount of work performed in a single session (number of sets and reps)
- **PATTERN**
 - Time in training (≥ 10 min) & rest intervals (2-3 min)
- **PROGRESSION**
 - Health status, physical fitness, training responses, exercise program goals

(Faigenbaum et al, 2009; ACSM, 2018; Moreau, 2019)

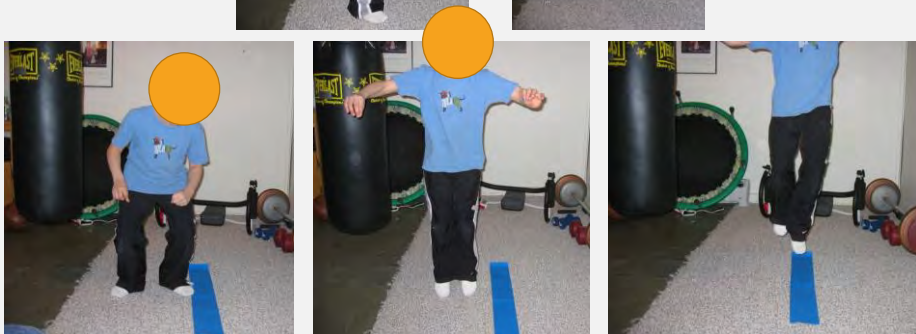
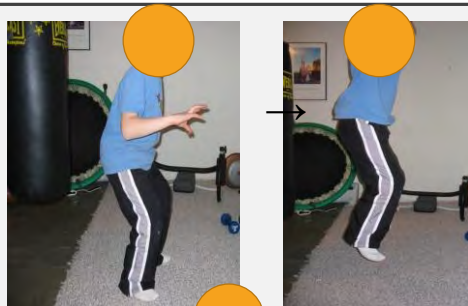
INTERVENTIONS: POWER TRAINING

PLYOMETRICS

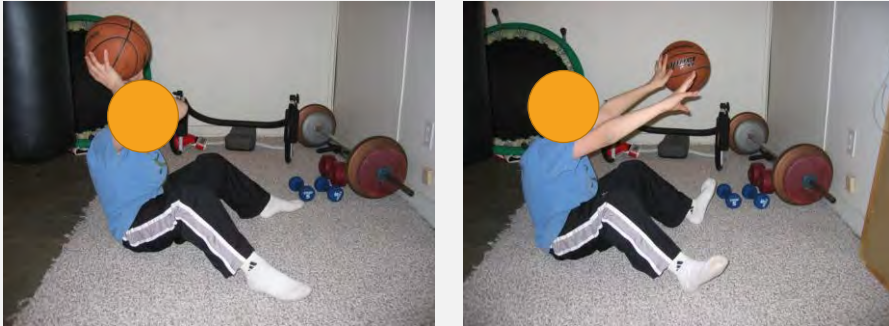
- Muscle lengthening followed by rapid contraction
- Rapid stretch immediately before muscle shortens is pre-stretch phase and elastic energy is stored in muscle
- Increase muscle power, bone strength, increase speed and agility in TD children
 - (Thomas, 2009; Santos, 2008; Johnson, 2011)
- 2x/wk on nonconsecutive days

(Chu, 2006; Faigenbaum , 2000)

PLYOMETRIC EXAMPLES- LOWER BODY



PLYOMETRICS – UPPER BODY



PROGRAM PROGRESSION

- Strength building 1st and then plyometrics
- Time constraints - even exercises on one day and odd exercises next training session
- Decrease time it takes to complete each set by completing each exercise more explosively
- Decrease length of rest interval – as appropriate
- Increase distance between cones or height of cones
- Increase weight
 - medicine balls - start at 1-2 lbs for children and 3-4 lbs for adolescents; increase to 4lbs children and 6 lbs adolescents
 - weighted vest < 10 % of body weight

**FITNESS MEASURES:
RUNNING SPEED,
AGILITY,
& MUSCLE POWER**



**FITNESS MEASURES:
RUNNING SPEED,
AGILITY,
& MUSCLE POWER**



AEROBIC TRAINING



AEROBIC TRAINING

- **Training**
 - Physical Fitness & Physical Activity
 - Increase activity level, aerobic capacity
 - Outcomes
 - Step or Activity Counts
 - Oxygen consumption (VO₂), METS, Heart Rate (HR)
- **VELOCITY**
- **VOLUME**
 - [frequency] x intensity x time (duration)
- **PATTERN**
- **PROGRESSION**

(ACSME, 2018)

FITNESS PRESCRIPTION: FITTE FOR AEROBIC TRAINING

Frequency

Aerobic conditioning
6-7 days /week

Intensity

Start slow (50-65% MHR)
Progress (65-93% MHR)
Moderate to vigorous

Time (duration)

30- 60 min/session

Type

Aerobic conditioning:
Large muscles: running,
walking, wheeling,
biking, swimming,
rowing

ENJOYMENT!

(ACSM 2018)

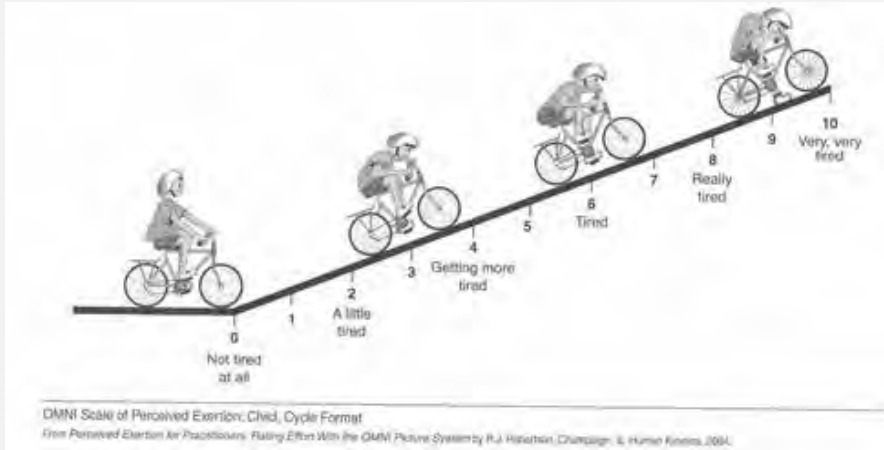
AEROBIC INTERVENTIONS: MAX HR

- **Maximun Heart Rate (MHR)**
- Formal lab testing – stress/exercise EKG
 - Treadmill or cycle ergometer
- Field-based test - Shuttle Run Test (SRT)
- Age
 - (Adults) Age predicted max HR= 220 – age
 - (Children) Age predicted max HR= 208-0.7(age)
 - (Mahon et al, 2010)
- Karvonen formula
 - $HRR = \text{Max HR} - \text{Resting HR}$
 - $HRR \times \text{intensity level} + RHR$



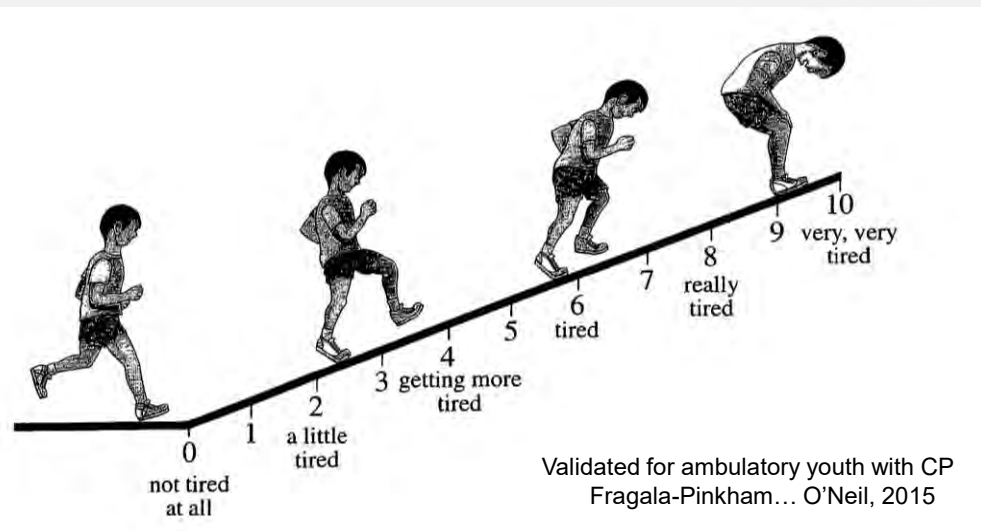
OMNI SCALE OF PERCEIVED EXERTION

ROBERTSON, 2000; ROBERTSON ET AL 2006; PFEIFFER, 2002

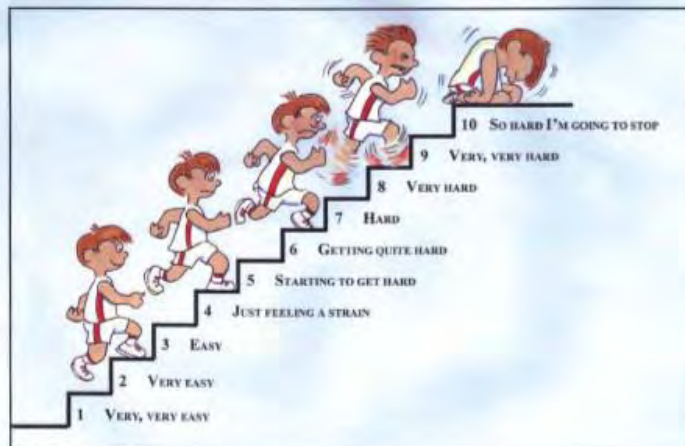


OMNI WALK/RUN SCALE OF PERCEIVED EXERTION

ROBERTSON, 2000; ROBERTSON ET AL 2006; PFEIFFER, 2002



PCERT (PICTORIAL CHILDREN'S EFFORT RATING TABLE) (ROEMMICH J, BARKLEY J, EPSTEIN L, ET AL 2006)



CONSIDERATIONS WHEN CHOOSING AEROBIC ACTIVITY

- Child's abilities; functional limitations; goals
- Child's alignment (UE, LE, trunk)
- High vs low impact
- Size of equipment
- UE vs LE's
- Child's (and family) interest
- Availability of equipment

AEROBIC INTERVENTIONS: ACTIVITIES

• **Activities – Exercise Machines**

- Treadmill (WS treadmill)
- Stepper
- Elliptical
- Bike (stationary, recumbent)
- Rower or UBE (Motormed)

• **Other Activities**

- Walking and wheeling programs
- Aquatic Exercise Programs
- Relay races; Obstacle courses; Sports or Bike Programs
- Treadmill training
- Yoga sequences

TREADMILL TRAINING

- Kinematics are similar to overground walking
- Automaticity of stepping
- Way to increase cadence
- Monitor and record speed and time walked
- Safe environment – body weight support or parent assist



Damiano et al, 2011; Valentin-Gudiol, 2013

STANDARD TREADMILL TESTING PROTOCOLS

- Balke
 - Constant Speed 3.5 mph (5.6km/h)
 - Increase grade
 - 0% grade 1st minute, 2% increase at start of minute 2, elevation increases 1% each minute thereafter
- Modified Balke
 - Speed 3.0 mph
 - 0% grade for 3 minutes, elevation increase 2.5% every 3 minutes thereafter

BRUCE PROTOCOL

- 327 children, 4-14 yrs
- Not holding onto rails

Stage 3 min	Speed (m/h)	Grade
1	1.7	10
2	2.5	12
3	3.4	14
4	4.2	16
5	5.0	18
6	5.5	20
7	6.0	22

Cummings GR, Everatt D, Hastman L, Bruce treadmill test in children: normal values in a clinic population. Am J Cardiology. 1978;41:69-75.

MODIFIED BALKE PROTOCOL

Table 14: Modified Balke-Ware Protocol ⁽⁴⁰⁾

Stage	Speed (mph)	Elevation (%)	Duration (min)
1	2.0	0	3
2	3.3	0	3
3	3.3	5	3
4	3.3	10	3
5	3.3	15	3
6	3.3	20	3
7	3.3	25	3

•K. Buttar, N. Saboo, S. Kacker, 2019
 •International journal of physical education, sports and health

AQUATIC EXERCISE

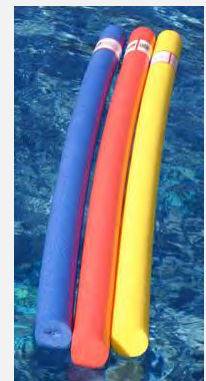
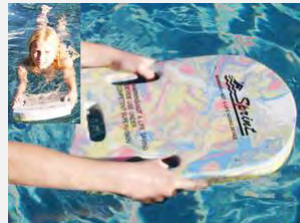
Advantages

- Low impact
- Buoyancy
- Motivating
- Social



AQUATIC EQUIPMENT: BUOYANCY/RESISTANCE

- Pool Noodles
- Kickboards
- Balance board



EQUIPMENT: RESISTANCE

- Webbed gloves
- Fitness paddles
- Bands/tubing
- Hydrotone bells and boots



ACTIVITY INTERVENTIONS

Promote Physical Activity & Functional Mobility

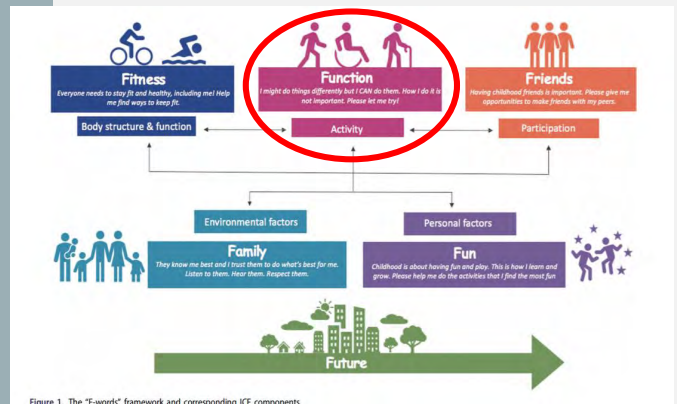
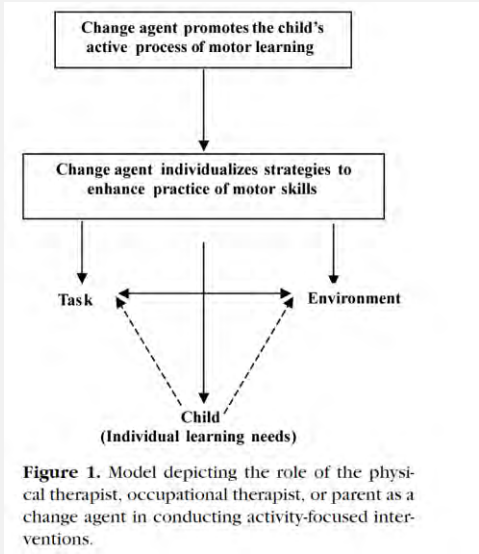


Figure 1. The "F-words" framework and corresponding ICF components.

(Rosenbaum & Gorter, 2012)

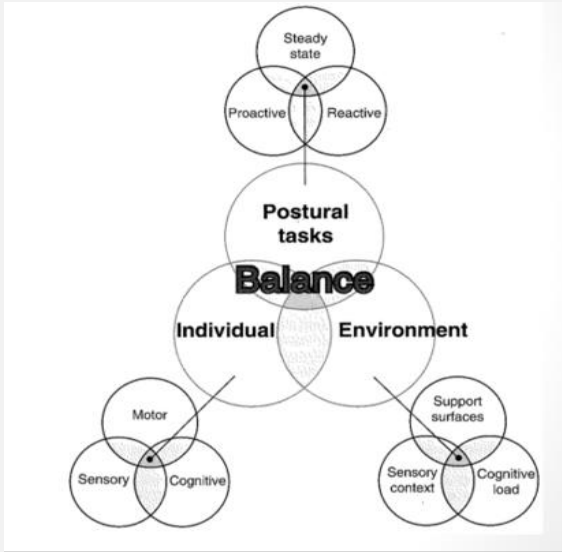
ACTIVITY BASED INTERVENTIONS



(Valvano et al, 2004)

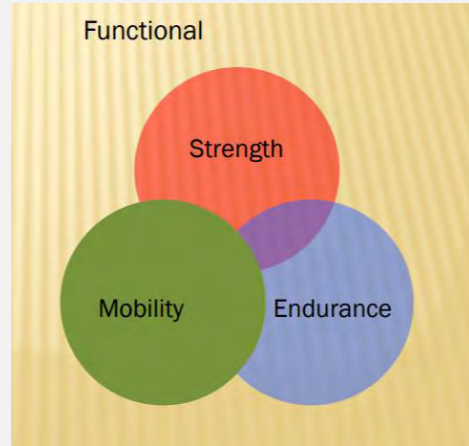
POSTURAL CONTROL & TASK PERFORMANCE

- Functional Task Performance requires postural control & balance



FUNCTIONAL TRAINING

- Exercise that involves training the body for activities performed in daily life



Strength - the ability to overcome resistance
Endurance - the ability to sustain activity
Mobility - the quality of movement

STEP-UPS: FUNCTION, BALANCE, STRENGTH



JUMP AND FREEZE



LADDER EXERCISES



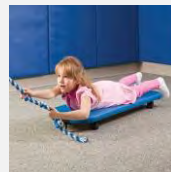
MOVEMENT TO MUSIC & SPORTS

- baseball, soccer, basketball, floor hockey



OBSTACLE COURSES: FOLLOW, LEAD, RELAY RACES

- Relays
 - Ball, bucket, throwing
 - Shuttle run
 - Floor scooter relay
- Obstacle courses
 - tunnel, hoola hoops, balance beams, rope, floor ladders



DESIGNING YOGA INTERVENTIONS



SUMMARY: EVIDENCE TO SUPPORT YOGA FOR CHILDREN

- Overall, evidence indicates that yoga for children facilitates improvements in health & fitness
 - Youth with typical development show trends towards improved health, well-being and fitness
 - Youth at risk for disabilities or with disabilities show trends towards improved motor, social, emotional and behavioral skills
- Body of evidence is increasing across different skills, etc
 - Need more rigorous study and program designs and stronger outcome measures

CHOOSING POSES &/OR SEQUENCES

- What are the child and family goals?
 - Choice of poses/sequences
- What are the child's abilities?
 - Physical – fitness & anatomy
 - Facilitators and Barriers
 - Cognitive
 - Simple vs Complex Sequence Design
 - Behavioral
 - Open/extension poses – to activate and energize
 - Close/flexion poses – to quiet and organize
 - Attention
 - Embed poses/sequences in a story or 'valued' activity



NCHPAD YOGA RESOURCES

- Adaptive Yoga for Kids
 - Video = (11:44 min)
 - Breathing exercises
 - Sitting/floor Poses
 - Cat/Cow
 - Dog - Modified (on knees)
 - Camel - Modified (toes tucked under – reach for heels)
 - Superman (trunk extension in prone)
 - Cobra
 - Bow
 - Plank – Modified (elbows and/or knees)
 - Rabbit
- Dead Bug
- Windshield Wipers
- Bridge
- Half shoulder stand
- Seated stretch – Criss-cross Apple Sauce
- Butterfly
- Turtle
- Flower
- Lion
- Cool Down
 - Knees to Chest
 - Baby
 - Child
 - Corpse (Rag Doll)

<https://www.nchpad.org/1270/5983/Kids~Adaptive~Yoga>

FUNTERVALS (MA, 2015)



- High Intensity interval activities
- 20 seconds of exercise, 10s Rest
- Repeated up to 8X
- Big fast movements
- Engage the students in the story
- Have Fun!

Popcorn

Your school's class has the esteemed duty of making popcorn for the entire school. Aim to make 20 bags of popcorn for your first batch and top that number for the second batch.

- 1 **Reach for popcorn bags from the top shelf and put them in a giant bowl in front of you:** Reach up and squat down
- 2 **Pop the popcorn:** Jumping stars
- 3 **Scoop the popcorn into a giant sack:** Squat down and scoop your arms in front of you and toss beside you
- 4 **Deliver the popcorn:** Run on the spot to deliver the popcorn to the cafeteria while it's still hot!

Repeat

Oh no! The popcorn was burnt!
Repeat steps 1-4 and see if you can top the number of popcorn bags you popped.

<http://130.15.159.10/musclephysio/Activity%20Booklet.pdf>

TAKE 10!

- Classroom based PA program
- Focus: elementary schools
- Goal: get kids to participate in 10 minutes of MVPA during school day
- Lessons integrate PA with academic objectives to reinforce learning
- Developed by the International Life Sciences Institute Center for Health Promotion
- Information



www.take10.net

GAMIFICATION IN PT (JANSSEN ET AL, 2017)

- Gaming mechanics may provide a fun environment to promote motor and cognitive recovery
- Multiple ways to use Games and Gamification
 - Game principles to create engaging and motivating environment
 - Use therapy equipment with commercial games
 - Applied or adjustable exergames that therapists select/adjust to meet goals and/or needs of children



Allied Health (2016)

SPECIFIC TASK MODIFICATIONS

- Teaching new skills
 - Part & Whole Practice to learn task or skill
 - Provide touch cues – manual guidance as needed
 - Combine demonstration with verbal instruction
 - Mirror image demonstration
- Adaptations for walkers or wheelchairs

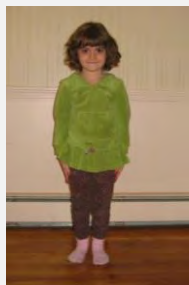
MODIFICATIONS & ADAPTATIONS

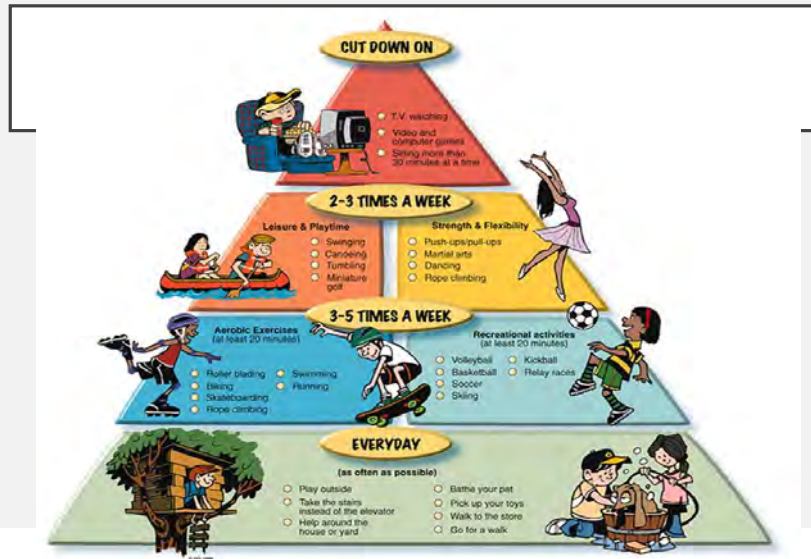
- Assist child
- Adapt task
- Use adaptive equipment



EXAMPLE: ADAPTING AN ACTIVITY

- Activity: Jumping Jacks
 - Alternate just arm or just leg movements
 - Perform leg movements while holding onto wall
 - Place nonskid place markers on the floor to mimic leg movements
 - Verbal commands "pencil" "star"

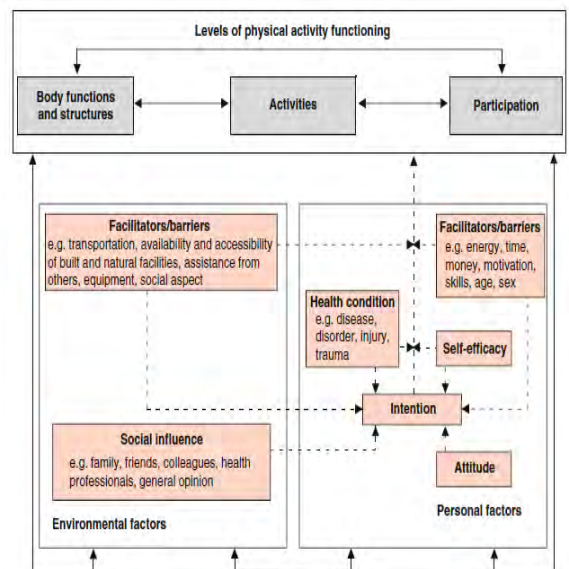




http://www.classbrain.com/artread/publish/article_31.shtml

PHYSICAL ACTIVITY FUNCTIONING

- Physical Function
 - ability to carry out activities from self-care (activities of daily living) to more challenging and vigorous activities that require increased mobility, strength, or endurance
- Pediatric Functional Mobility (PFM)
 - physical function related to mobility includes daily tasks like getting out of bed or a chair to complex activities such as running or active play



(Van de Ploeg et al, 2004;
PROMIS, <http://healthmeasures.net>)

INTERVENTIONS –PROMOTING ACTIVITY THROUGHOUT THE DAY

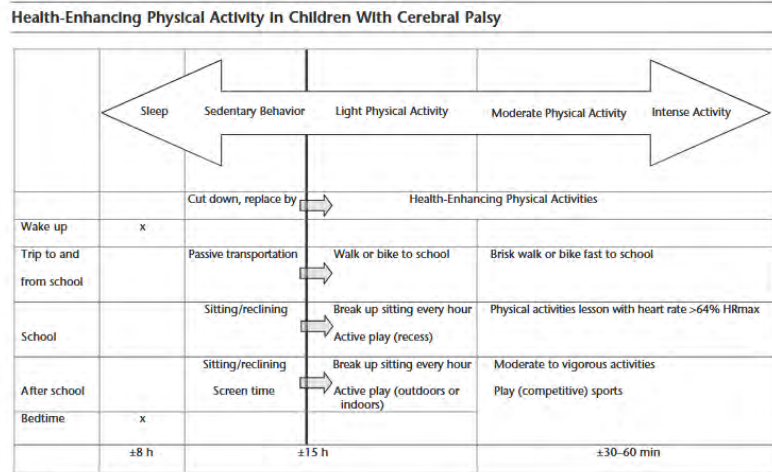


Figure.
Example of a whole-day approach. Activities that constitute sedentary behavior have not yet been verified for children with cerebral palsy. HRmax=maximum heart rate.

(Verschuren et al, 2014)

PHYSICAL ACTIVITY CONSIDERATIONS TUDOR-LOCKE, 2004

- Exercise & PA levels
- Steps per day (pedometers)
 - Active children: 12,000 – 15,000 steps/day
- Programs with frequent, short bouts of activity especially for young children
 - 5-6 yo: 2-4 minute bouts



TYPES OF PHYSICAL ACTIVITY

Type of Physical Activity	Preschool-Aged Children	School-Aged Children	Adolescents
Muscle strengthening	<ul style="list-style-type: none"> Games such as tug of war Climbing on playground equipment Gymnastics 	<ul style="list-style-type: none"> Games such as tug of war Resistance exercises using body weight or resistance bands Rope or tree climbing Climbing on playground equipment Some forms of yoga 	<ul style="list-style-type: none"> Games such as tug of war Resistance exercises using body weight, resistance bands, weight machines, hand-held weights Some forms of yoga
Bone strengthening	<ul style="list-style-type: none"> Hopping, skipping, jumping Jumping rope Running Gymnastics 	<ul style="list-style-type: none"> Hopping, skipping, jumping Jumping rope Running Sports that involve jumping or rapid change in direction 	<ul style="list-style-type: none"> Jumping rope Running Sports that involve jumping or rapid change in direction

Note: Some activities, such as bicycling or swimming, can be moderate or vigorous intensity, depending upon level of effort. For preschool-aged children, aerobic activities listed can be either moderate or vigorous intensity.

TYPES OF PHYSICAL ACTIVITY

Type of Physical Activity	Preschool-Aged Children	School-Aged Children	Adolescents
Moderate-intensity aerobic	<ul style="list-style-type: none"> Games such as tag or follow the leader Playing on a playground Tricycle or bicycle riding Walking, running, skipping, jumping, dancing Swimming Playing games that require catching, throwing, and kicking Gymnastics or tumbling 	<ul style="list-style-type: none"> Brisk walking Bicycle riding Active recreation, such as hiking, riding a scooter without a motor, swimming Playing games that require catching and throwing, such as baseball and softball 	<ul style="list-style-type: none"> Brisk walking Bicycle riding Active recreation, such as kayaking, hiking, swimming Playing games that require catching and throwing, such as baseball and softball House and yard work, such as sweeping or pushing a lawn mower Some video games that include continuous movement
Vigorous-intensity aerobic	<ul style="list-style-type: none"> Games such as tag or follow the leader Playing on a playground Tricycle or bicycle riding Walking, running, skipping, jumping, dancing Swimming Playing games that require catching, throwing, and kicking Gymnastics or tumbling 	<ul style="list-style-type: none"> Running Bicycle riding Active games involving running and chasing, such as tag or flag football Jumping rope Cross-country skiing Sports such as soccer, basketball, swimming, tennis Martial arts Vigorous dancing 	<ul style="list-style-type: none"> Running Bicycle riding Active games involving running and chasing, such as flag football Jumping rope Cross-country skiing Sports such as soccer, basketball, swimming, tennis Martial arts Vigorous dancing

PARTICIPATION INTERVENTIONS

Involvement/Performance in Life Situations

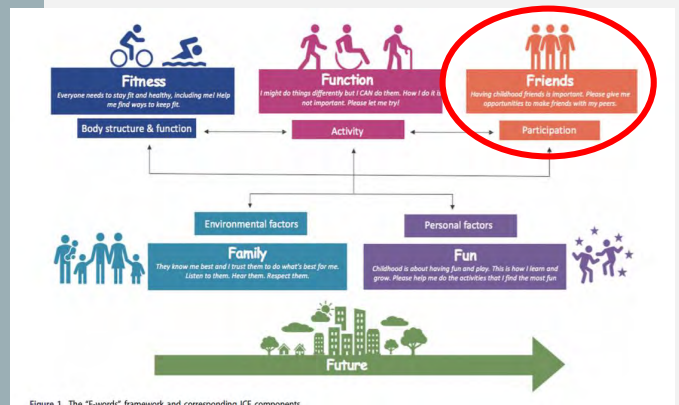


Figure 1. The "F-words" framework and corresponding ICF components.

(Rosenbaum & Gorter, 2012)

PARTICIPATION IN FITNESS INTERVENTIONS

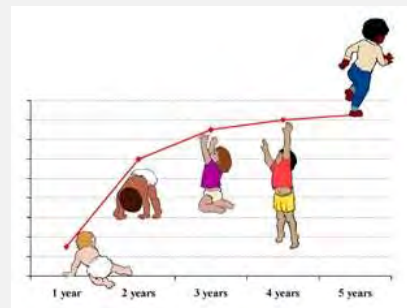
- Limited evidence on participation outcomes after fitness and physical activity interventions
- Characteristics of Participation in Fitness Interventions
 - Family-centered
 - Group &/or social interventions
 - Participation outcomes
 - Environmental Context
 - Imbedded into home, school, community routines

PARTICIPATION RESTRICTIONS

- **Obesity (Pizzi, 2013)**
- Factors limit participation
 - Increased teasing, bullying & social isolation, increased depression symptoms, decreased initiative & motivation
- Preference for more solitary activities or lack of perceived competency in physical activity
 - Low self-esteem specific to sports & athletic competence & appearance

INTERVENTIONS – AGE RELATED CONSIDERATIONS

- **Infant/Toddler**
 - Functional mobility
 - Transitions
 - Play and exploration
- **Preschooler**
 - Social interaction
 - Play
 - Functional Mobility
 - Transitions



INTERVENTIONS – AGE RELATED CONSIDERATIONS

- **School Aged**
 - Social groups & sports
 - Functional mobility
 - Transitions
 - Emerging independence
- **High School and Beyond**
 - Social groups & sports
 - Independence
 - Driving & Working
 - Preparing for College



ROLE OF SCHOOLS TO PROMOTE PHYSICAL ACTIVITY



www.activelivingresearch.org

KIDS WALK-TO-SCHOOL

- Community based program developed by CDC
- National Walk to School Day
 - **October 5, 2021**
- Program for adults supervised walking to school
 - Like a “walking school bus”
- Program advocates:
 - Community partnerships: schools, PTA, local police departments, public works, civic associations, local politicians and businesses
- Information: www.cdc.gov/nccphp/dnpa/kidswalk/index.htm



GETTING BEYOND THE PLATEAU (RIMMER, 2012)

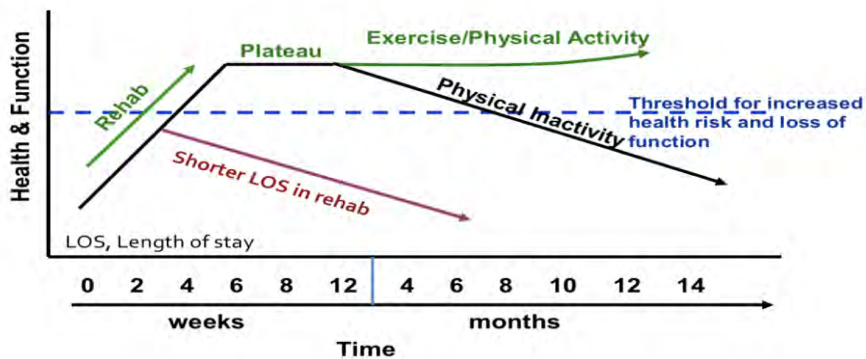


Figure 1. Getting beyond the plateau: projected effect of continued versus stopped exercise/physical activity. LOS = length of stay.

ROLES OF THERAPISTS

(VERHAGEN, 2008; ROWLAND ET AL 2015)

- Promotion of Physical Activity
 - Promote the health and well being of individuals, the general public/society emphasizing the importance of physical activity and exercise
 - Prevent impairments, activity limitations, participatory restrictions, and disabilities
 - Provide interventions/treatment to restore integrity of body systems essential to movement, enhance QOL, independent living
 - Modify environmental, home and work access and barriers to ensure full participation
 - All health professionals must promote physical activity
 - Be knowledgeable about physical activity resources in your area!

WHAT CAN THERAPISTS DO?

- Discuss importance of daily participation in PA/sports
- Discuss ways to decrease sedentary activities
- Discuss barriers and ways to facilitate PA
- Provide resources
- Consult with current programs
- Develop new programs and incorporate exercise principles/dosing

SPARK

Sports, Play and Active Recreation for Kids

- Began as an NIH funded research project:
 - 2 years, 7 elementary schools, 1538 fourth graders
 - Health related PE program
 - Intervention group – improved “in school” PA time in PE
- Commercially available curricular-based school & afterschool PA program



<http://www.sparkpe.org/>

(Sallis, et al, 1997)

CATCH



Coordinated Approaches To Child Health

- Coordinated school health program
- Participants: parents, teachers, school nutrition staff, community partners
- Initially funded as NIH research
- Components: classroom curriculum, physical education program, school nutrition guide, family activities
- Commercially available props and program activity cards from **Flaghouse**
- Focuses on physical activity, nutrition, healthy attitudes and changes in the school, community, and home
- Information:
 - https://www.cdc.gov/prc/resources/pdf/tools/CATCH_508tagged.pdf

PHYSICAL ACTIVITY & FITNESS: SCHOOL & COMMUNITY RESOURCES



<https://www.cdc.gov/physicalactivity/activepeoplehealthynation/index.html>



STRATEGIES TO IMPROVE BEHAVIORS (PHYSICAL ACTIVITY & EATING BEHAVIOR)

MAINTAIN MOTIVATION

- Make It Fun
- Variety of activities
- Ensure child success
- Give children choices
- Child charts progress at each session
- Pre and post-tests to demonstrate progress



AWARDS



DELIVERING A WEIGHT MANAGEMENT PROGRAM (PIGNATARO & HUDDLESTON, 2015)

Overall, many people (patients)

- Know that exercise is good for health but have trouble overcoming ambivalence & perceived barriers to adopt an active lifestyle
- Exercise prescription is effective; other factors are important
 - Readiness to change, interest in improved health & fitness, & a belief in capacity to adopt new health behaviors
- Therapists
 - Need to encourage motivation to establish lifelong health habits & reduce health risks
 - Include assessment of the patient's readiness to change as part of the patient exam/eval to determine best intervention approach – maybe use **Motivational Interviewing**

TABLE 3. Behavioral Treatment Strategies for Obesity During Childhood and Adolescence

Dietary approaches

1. Encourage intake of ≥ 5 servings of fruits and vegetables daily
2. Decrease intake of calorie-dense foods such as saturated fats, salty snacks, and high glycemic foods such as candy
3. Minimize intake of sugar-containing beverages
4. Minimize eating outside home and fast food in particular
5. Eat breakfast daily
6. Avoid skipping meals

Physical activity

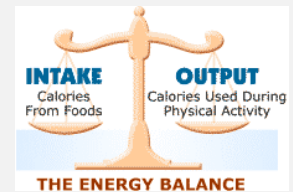
1. Decrease sedentary behavior such as watching television, surfing the Internet, and playing video games to < 2 h/d
2. Engage in fun and age-specific exercise that is appropriate to the individual's abilities
3. Increase intensity, frequency, and duration of exercise gradually as tolerated
4. More than 1 h of physical activity daily

BEHAVIORAL STRATEGIES

Kumar et al, 2017

BEHAVIORAL FACTORS

- Energy Intake & Expenditure
- American Academy of Pediatrics (AAP)
 - 1- 2- 5 Program
 - 1 hour of physical activity a day (minimum)
 - 2 hours of “screen time” a day (maximum)
 - 5 (to 9) fruits and vegetables
 - “0” sugary drinks



STRATEGIES TO DECREASE SEDENTARY BEHAVIORS AT HOME

(BARLOW, 2007; INNES 2013)

- Rules at home
 - Limit TV time – replace with PA time
 - Identify “free” places to eat (NOT in front of the TV)
 - Rules for PA breaks during “computer time”
- Consider parent support
 - Parent/Family Information/tips

www.AmericanHeartAssociation.org

BEHAVIORAL INTERVENTION STRATEGIES

- Increase Healthy Behaviors
 - Ex: Nutrition – Eating Habits
 - Cooking & Food Prep Classes
- Physical Activity (PA)
 - Include PA measures & strategies
 - Individual – Design PA programs & make recommendations for PA home programs
 - Group – Design PA programs – Translation to community programs – Help youth & families find PA resources

DIETARY CONSIDERATIONS

- Dietary interventions are not part of PT strategies
 - Referral to a nutritionist may be an important component to WM interventions
- PT should understand role of nutrition in PA & fitness interventions & be able to answer 'basic' questions & make referrals as needed
 - Encourage children and families to
 - Adopt healthy eating habits
 - Understand strategies to be aware of satiety
 - Learn portion control

ENERGY BALANCE

- To achieve healthy weight
 - Decrease energy intake (Eating habits)
 - Increase energy output (PA)
 - 3500 calories = 1 lb.
 - To lose 10 lbs in one year
 - 100 calorie decrease/day in food intake
 - Walking more to burn an extra 100 calories/day
- Modest weight loss of 5-10% have health benefits

NUTRITION TRAINING TRAFFIC LIGHT CHART (WROTNIAK, 2017)

- Foods are classified as red, yellow or green
- **Red:** Not everyday, **Yellow:** OK watch portion;
- **Green:** Daily
- **Red:** >5grams of fat/serving or >25% sugar
 - e.g. soda, lemonade, fruit juice, muffins, cereal, ice cream, chips, butter, margarine, salad dressing, cookies
- **Yellow:** 2-5 grams of fat/serving or 10-25% sugar
 - Skim milk, 100% fruit juice, white bread, cheese,
- **Green:** 0-1 grams of fat/serving or <10% sugar
 - Water, flavored seltzer, herbs and spices, all non starchy vegetables,

ACADEMY OF NUTRITION & DIETETICS



<https://www.eatright.org/>

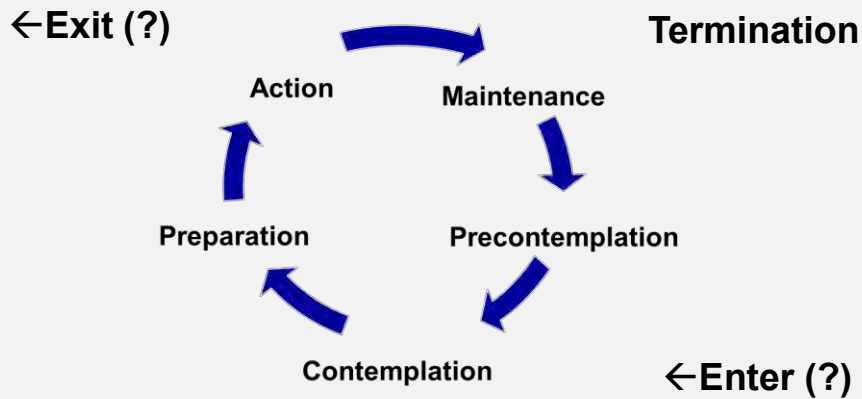
BEHAVIOR MODIFICATION STRATEGIES

- Set Realistic Goals (Epstein, 2007)
 - Establish appropriate treatment plan to achieve healthy weight
 - Make small incremental changes
 - Increase motivation to continue behavior changes and promote healthy lifestyles
- Behavior Change Theories
 - Stage of Change
 - Health Belief Model
 - Social Cognitive Theory

BEHAVIOR MODIFICATION STRATEGIES

- Readiness to Change (Epstein, 2007)
 - Assessing child & family ability or commitment to making healthy changes
- Strategies to promote change
 - Self-monitoring (logs, journals)
 - Social support (praise, positive reinforcement)
 - Stimulus control (identify/eliminate triggers)
 - Parent modeling

STAGES OF CHANGE (SOC)

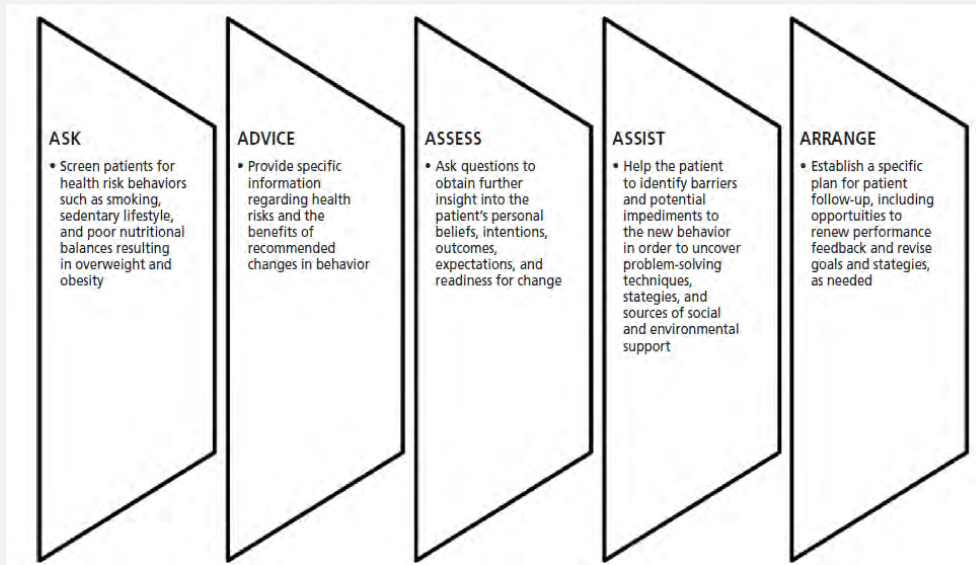


Prochaska & DiClemente, 1982; Prochaska et al, 1994

FAMILY-FOCUSED INTERVENTIONS (EPSTEIN, 2010)

- Family Focused Interventions
 - Important to consider a family approach for a 'supportive' environment and because obesity often 'trends' in families
 - Teach parents behavior-change strategies to promote and support health behavior changes in their children
 - Promote parents as role models
- Important to be aware of the 'human obesity gene map' and to inform parents about this too....

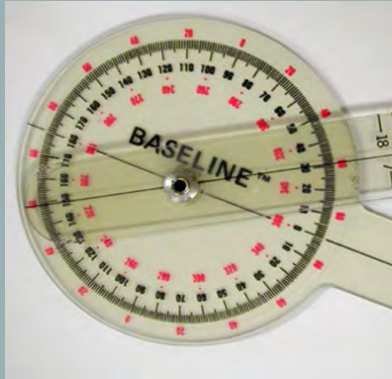
THE 5 A'S OF MOTIVATIONAL INTERVIEWING (PIGNATARO & HUDDLESTON, 2015; WHITLOCK ET AL, 2002)



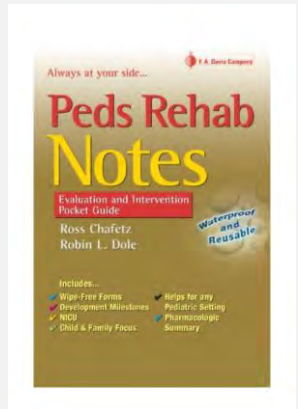
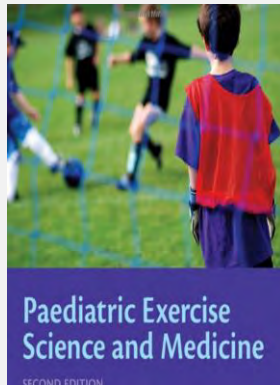
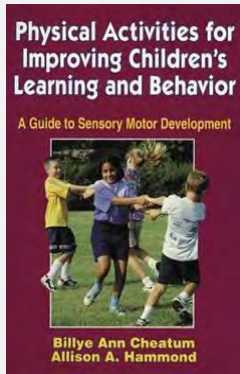
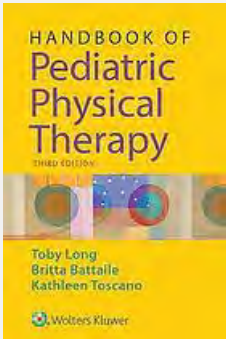
LUNCH



TESTS & MEASURES



RESOURCES

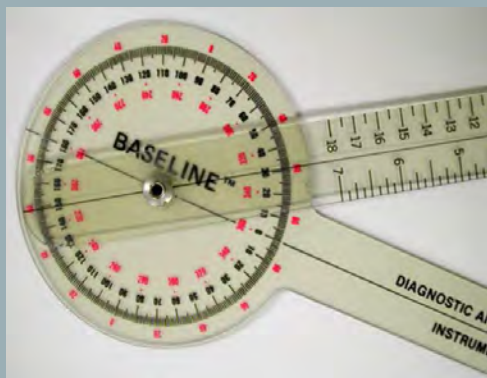


EXAMINATIONS: FOR PATIENTS WITH HEALTHY WEIGHT OR OBESITY (APTA, 2016)

- Strength & Power
 - 20 meter shuttle run test
 - Handgrip strength test
 - Standing broad jump
- Aerobic Endurance
 - Walk (Gait), Run Tests
 - Treadmill
- Musculoskeletal
 - Alignment, Motor Planning
- Posture & Balance



PARTICIPATION MEASURES



GOAL ATTAINMENT SCALING (GAS)

Criteria for goal review process¹⁷

“0” reflects desired level of performance

“-2” reflects current level of performance

“-1” reflects performance between current (-2) and desired (0) performance

+1” reflects a greater performance level than 0

+2” reflects a greater performance level than +1

Each rating is distinct, student’s performance can match only 1 level

Only 1 dimension is changing, or if 2 are changing, it is technically appropriate and not too complex

Intervals between levels represent a relatively equal amount of change

Change between levels are clinically relevant from a measurement standpoint

Statements are written in behavioral terms: can be observed and measured

Criterion is included

Conditions for the goal are provided

(Effgen et al, 2016)

CANADIAN OCCUPATIONAL PERFORMANCE MEASURE (COPM)

- Purpose
 - Client centered tool- individual identifies & prioritizes goals
 - Outcome measure: Rate change in performance & satisfaction
- Child/Parent/Teacher interview to identify goals:
 - Self-care: personal care, functional mobility, community management
 - Productivity: work, household management, play/school
 - Leisure: quiet & active recreation, socialization
- <http://www.thecopm.ca/>



(Law, 2014)

COPM- PARENT GOALS

Canadian Occupational Performance Measure

Initial 2 months/ 8 months

1= Not able to do it 10= Able to do it extremely well



1. My child can use his hands to activate a switch to answer yes/no questions	2/4/9
2. My child can sit comfortably in his wheelchair for 2 hours	1/2/6
3. My child can walk in his gait trainer for 15 minutes every day for exercise	1/6/10
4. My child stands comfortably for 30 minutes twice a day in a stander	1/4/10

(Law, 2005)

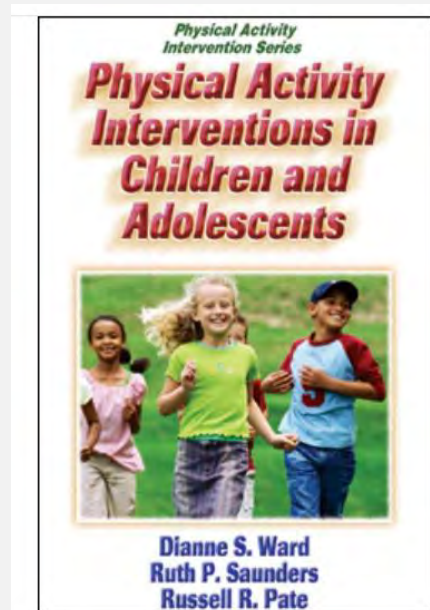
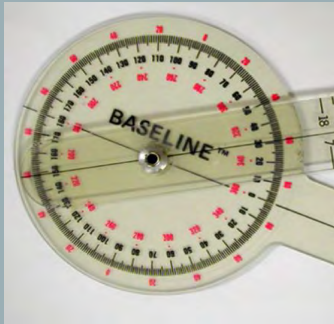
CAPE/PAC

- **Children's Assessment of Participation & Enjoyment (CAPE) & Preferences for Activities for Children (PAC)**
 - For children 6 – 21 yrs.
 - Self-report on recreation & leisure activities outside school
- **CAPE –**
 - 55 item questionnaire to examine child and youth participation in activities outside the school day
 - Measures diversity, intensity, and enjoyment
- **PAC –**
 - 55 items, measures activity preferences
- Activity types addressed in both measures include:
 - Recreational, Physical, Social, Skill-based, & Self-improvement



(King et al, 2004; <http://www.pearsonassess.ca/en/programs/>; www.canchild.ca)

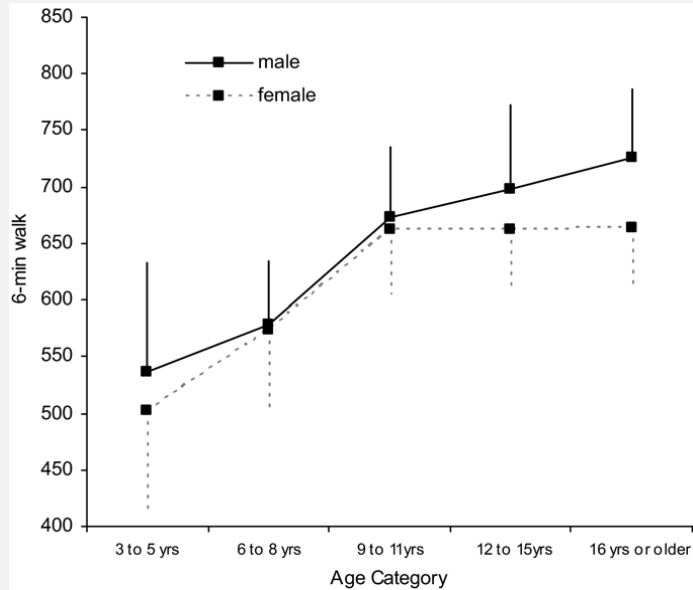
PHYSICAL ACTIVITY & FUNCTIONAL MOBILITY MEASURES



6 MINUTE WALK TEST (6MWT)

- Distance covered in 6 minutes
- Norms for children 3-18 yrs
(Li et al, 2005; Geiger, 2007; Lammers, 2008)
- Minimize turning time (≥ 50 feet)
- Young children – give target, verbal feedback
 - Practice test (2-3 times for baseline)
 - Distance walked correlated to oxygen consumption

6- MINUTE WALK TEST: NORMS (GEIGER ET. AL, 2007)



REFERENCE VALUES: 6MWT FOR CHILDREN IN THE US (KLEPPER & MUIR, 2011)

- Diverse group of children from NYC participated in this study (18% overweight; 28% obese)
- Values lower than those reported for children living in other countries except England
- 25 meter track and 15 meter track

Age	Girls/Boys (n)	Girls/Boys Mean (m) (SD)
7-8	14/14	519.64 (69.31) / 534.54 (60.3)
9	16/11	542.54 (80.25) / 515.83 (81.4)
10	22/13	496.69 (63.98) / 497.94 (74.03)
11	4/4	532.33 (92.25) / 534.93 (88.90)
TOTAL (100)	57/43	518.32 (73.16) / 518.73 (72.61)

TIMED UP AND GO (TUG): NORMATIVE VALUES (ITZKOWITZ ET AL, 2016)

Age (yrs)	Male		Female	
	n	Mean (SD) (sec)	n	Mean (SD) (sec)
5	83	6.98 (1.1)	103	7.17 (1.12)
6	124	6.75 (1.23)	120	6.82 (1.11)
7	92	6.75(1.14)	129	6.79 (1.17)
8	99	6.09 (1.14)	98	6.59 (1.15)
9	73	5.85 (0.88)	130	6.41 (1.01)
10	68	6.09 (0.98)	112	6.34 (0.94)
11	50	6.24 (0.97)	45	6.69 (0.79)
12	36	6.73 (1.09)	74	6.78 (0.83)
13	10	7.24 (0.97)	35	7.09 (1.08)
TOTAL	635	6.46 (1.16)	846	6.68 (1.07)

MODIFIED TUG (OR FLOOR TO STAND – FTS TUG)

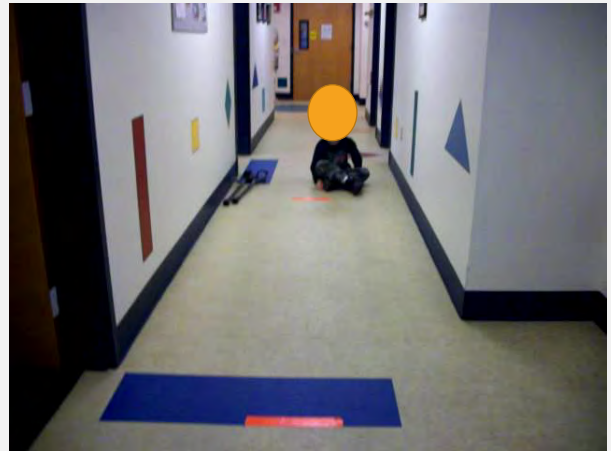
- Starting Position: Sitting on floor in cross-leg position

Floor to stand	Mean (SD)	Range
Haley & Fragala-Pinkham, 2006 - Normative Sample n= 150 (5-21 yo) - Walk @ self-selected quick pace	6.6 (1.1)	4.4 -12.1
Haley & Fragala-Pinkham, 2006 - Clinical Sample (MPS) (n=10) - Walk @ self-selected quick pace	19.8 (21.3)	7.8 - 60
Weingarten et al, 2016 - Normative Sample n=1476 (5-14 yo) - Self selected comfortable pace	8 yo: 7.91 (1.65) 13 yo: 8.98 (1.62)	NA
Weingarten et al, 2015 - Reliability & Validity (n=22) - Good psychometric properties	NA	NA

TFST - MODIFIED TUG

TFST - (MTUG): Floor to Stand

- Sitting on floor in cross-leg position
 - Haley et al, 2006
 - TD: (n=150) – mean = 6.6 sec (1.1)
 - MPS: (n=19) – mean = 19.8 sec (21.3)



(Dhote et al, 2012, Haley et al, 2006; Itzkowitz et al, 2016, Weingarten & Kaplan, 2015)

TIMED UP AND DOWN STAIR TEST (TUDS)

- **Adapted from adult measure**
 - Any method of stair climbing allowed, use 1 hand rail
- **Children: TD: n=27, CP: n=20 (age 8-14 yrs)**
 - Excellent intra-rater, interrater & test-retest reliability
 - Good concurrent validity with other measures (TUG, FRT, TOSL)
 - Construct validity for children who are typically developing and with CP (age and GMFCS levels)
- **Protocol**
 - Participant stands 30 cm from the bottom of a 14-step flight of stairs (19.5-cm step height).
 - Instructed to: “Quickly, but safely go up the stairs, turn around on the top step (landing) and come all the way down until both feet land on the bottom step (landing).”

(Zaino et al, 2004)

ACTIVITY MONITORS

- **Accelerometers**

- Measure “activity counts” or “step counts” during “real time” activities
- Counts transformed to estimates of energy expenditure using specific equations to measure PA INTENSITY
 - Ex: ActiGraph

- **StepWatch Monitors**

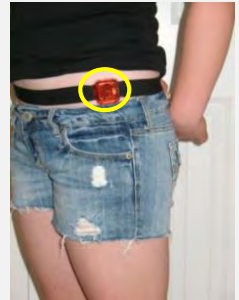
- Step counts reported for youth with CP (worn on ankle)

- **Pedometers**

- Step counts, HR, PA intensity estimates
 - Ex: New Lifestyles

- **Self-Report**

- Physical Activity Records (PAR): Previous Day (PDPAR); Three Day (3DPAR); Seven Day (7DPAR)
- Physical Activity Questionnaires for Children
- Activity Scale for Kids (ASK)
- PROMIS - <http://healthmeasures.net>



(O’Neil et al, 2014 & 2016; Bjornson, 2007; Trost, 2001; Helmerhorst, 2012; Sallis 1993)

ACTIVITY MEASURES

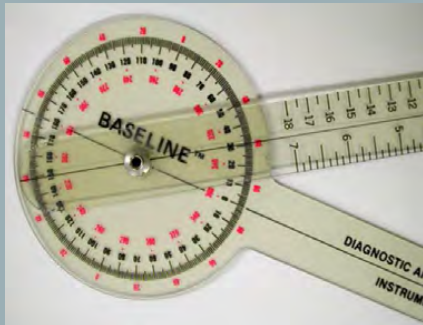
- **Pedometers**

- Piezoelectric vs spring-lever
- Measure “step counts” during “real time” in school, clinic or community activities (Tudor-Locke, 2004)
 - **Boys with TD - 12,000-16,000 steps/day**
 - **Girls with TD – 10,000 – 14,000 steps/day**
- Reliable and valid for children with CP (Maher, 2007)

- **Self-Report**

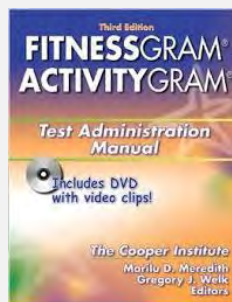
- Physical Activity Records – PDPAR, 3DPAR, 7DPAR (Sallis, 1993)
- Physical Activity Intensity
 - OMNI RPE is valid against HR & VO₂ for youth with CP (Fragala-Pinkham, O’Neil, et al, 2015)

BODY FUNCTION AND STRUCTURE MEASURES



FUNCTIONAL STRENGTH, FITNESS & ENDURANCE

- Fitnessgram
 - Aerobic capacity
 - Muscle strength
 - Muscular endurance
 - Flexibility
 - Body composition
- BOT-2



<https://fitnessgram.net/assessment/>

BOT₂

BOT-2 STRENGTH & AGILITY

Strength Subtest

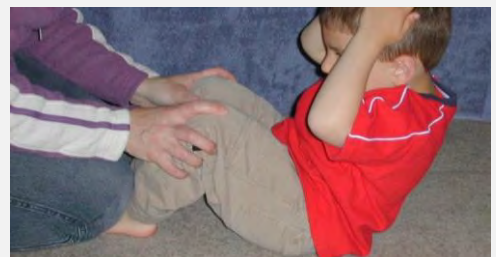
1. Standing Long Jump
2. Knee pushups (30 sec)
3. Sit-ups (30 sec)
4. Wall sit (60 sec)
5. V-up (60 sec) - shoulders and knees raised 2 inches off floor

Running Speed & Agility Subtest

1. One-legged side hop
2. Two-legged side hop
3. One-legged stationary hop
4. Shuttle run
5. Stepping sideways over a balance beam

MUSCLE STRENGTH: DYNAMOMETER & RM

- Hand held dynamometer
- Isokinetic
 - Biodex
 - Cybex
- 6-12 Repetition Maximum
 - Free Weights
 - Cuff Weights
- FitnessGram
 - Functional Strength
 - Endurance



HAND HELD DYNAMOMETERS

- Hand held dynamometry
 - Correlated to GMFM
 - Break test vs Make test
- Test-retest reliability moderate to high
 - (Berry 2004, Crompton 2007, Verschuren, 2008, Wiley 1998)
- Published protocols & user manuals (McFarlane, 2008)

Nichols (Lafayette) (~\$900)



MicroFet (~\$1200)



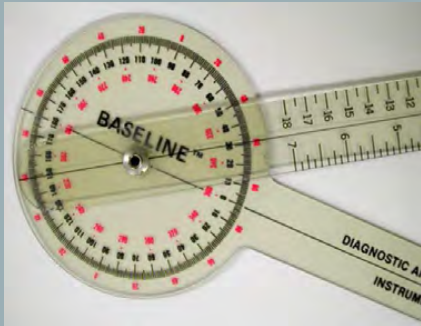
Chatillon (~ \$1200)



MUSCULAR ENDURANCE TESTS

- 3 Single Item Tests -
 - Sit to Stand
 - Lateral Step-ups
 - 1/2 Kneel to Stand

AEROBIC MEASURES



FITNESS MEASURES: RUNNING SPEED, AGILITY, & MUSCLE POWER

Speed & Agility

10 x 5 Meter Sprint Test (10x5 MST)

Anaerobic Capacity

Muscle Power Sprint Test (MPST)



AEROBIC CAPACITY, SPEED & AGILITY & ANAEROBIC CAPACITY

- Max (Peak) Aerobic Capacity – Run Tests
 - Shuttle Run Tests (SRT) -
- Energy expenditure Index (EEI)
 - Physiologic Cost Index (PCI)
- Speed & Agility
 - 10 x 5 Meter Sprint Test (10x5 MST)
 - BOT-2 Running Speed & Agility
- Anaerobic Capacity
 - Muscle Power Sprint Test (MPST)

ENERGY EXPENDITURE INDEX (EEI) (ROSE ET AL 1989, 1990, 1991)

- Walk test
- 3 minute minimum to reach steady state
- $EEI = \frac{\text{Working HR} - \text{Resting HR}}{\text{speed}}$

Fast walking norms

Age (yrs)	Speed(m/min)	EEI(beats/m)
6-8	93 ±13.1	.60 ±.2
9-11	105 ±12.0	.61 ±.18
12-14	106 ±11.6	.58 ±.14
15-18	107 ±11.2	.57 ±.15

MODIFIED EEI (HALEY, 2006)

Table IV: Modified Energy Expenditure Indices (EEIs)

Group	Comfortable walk		Fast walk	
	Modified EEI, mean (SD)	Range	Modified EEI, mean (SD)	Range
Normative				
5-6y (n=23)	1.86 (0.19)	1.56-2.28	1.65 (0.13)	1.41-1.90
7-8y (n=33)	1.73 (0.25)	1.11-2.67	1.56 (0.15)	1.31-1.96
9-10y (n=36)	1.60 (0.23)	0.88-2.11	1.54 (0.18)	1.22-2.06
11-12y (n=16)	1.46 (0.19)	1.23-1.72	1.40 (0.15)	1.16-1.68
13-16y (n=22)	1.52 (0.24)	1.13-2.05	1.35 (0.19)	0.99-1.68
>16y (n=20)	1.56 (0.32)	1.18-2.40	1.40 (0.23)	0.97-1.97
Total normative (n=150)	1.63 (0.27)	0.88-2.67	1.50 (0.20)	0.97-2.06
MPSI Clinical (n=10)	3.30 (2.01)	1.82-8.71	3.55 (3.43)	1.34-10.00

TRAINING INTENSITY

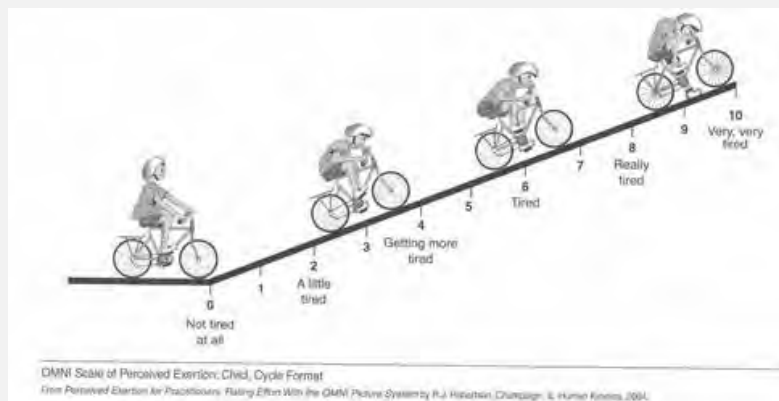
- Pulse Oximeter
- HR monitors
 - Watches and chest transmitters
 - Set high and low parameters
 - Amount of time spent in THR



MAXIMUM HEART RATE

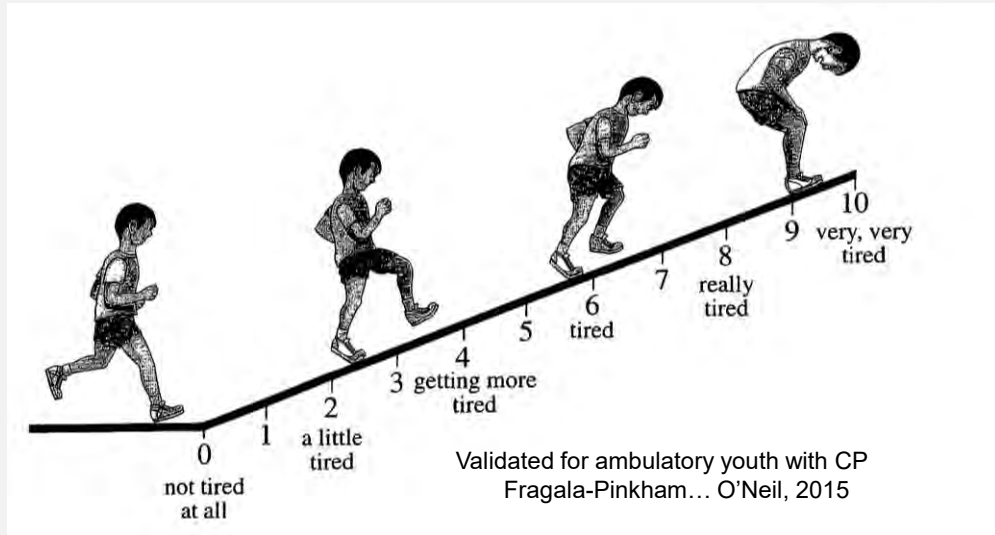
- Formal lab testing – stress/exercise EKG
- Treadmill testing
- Shuttle Run Test
- Maximum Heart rate
 - (Adults) Age predicted max HR= $220 - \text{age}$ (Fox equation)
 - (Children) Age predicted max HR= $208 - (0.7 \times \text{age})$ (Tanaka equation, 2001)
 - Fox equation overestimated MHR by 12.4 bpm, whereas the Tanaka equation ($\text{MHR} = 208 - 0.7 \times \text{age}$) underestimated MHR by 2.7 bpm (Cicone et al, 2019)

OMNI SCALE OF PERCEIVED EXERTION ROBERTSON, 2000; ROBERTSON ET AL 2006; PFEIFFER, 2002



OMNI Walk/Run Scale of Perceived Exertion

Robertson, 2000; Robertson et al 2006; Pfeiffer, 2002



PCERT (PICTORIAL CHILDREN'S EFFORT RATING TABLE) (ROEMMICH J, BARKLEY J, EPSTEIN L, ET AL 2006)



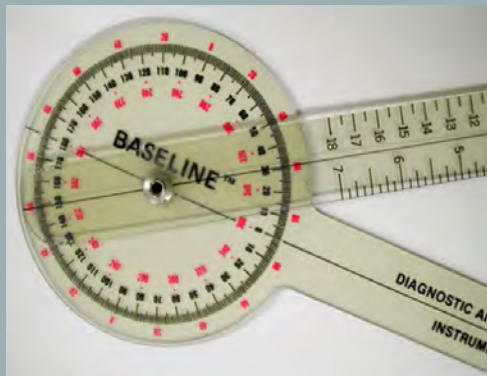
6MWT: NORMS FOR CHILDREN 4-11 YO

- This study was conducted with children in London England; Great Ormond Street Hospital for Children

Age	Boys/Girls(n)	Mean (m) (SD)
4	18/18	383 (41)
5	21/19	420 (39)
6	19/21	463 (40)
7	22/18	488 (35)
8	27/18	483 (40)
9	27/22	496 (53)
10	30/18	506 (45)
11	15/15	512 (41)
TOTAL	178/150	470 (59)

(Lammers et al, 2018)

ANTHROPOMETRIC & HEALTH STATUS MEASURES



THERAPIST EXAMINATION (WROTNIAK, 2017)

- Anthropometric Measures
 - Height
 - Weight
 - BMI z score/BMI percentile - <https://zscore.research.chop.edu/>
 - Waist circumference-%ile, and absolute values
 - Waist to Height (or Hips) Ratio – measure of central adiposity
- Health Status
 - Blood pressure, Heart Rate, Respiratory Rate, SPo2%
 - Bioelectrical impedance analysis-scales, hand held
 - MD reports
 - Lipid profiles from physicians <http://www.apta.org/Innovation2/ChildhoodObesityModel/>
 - Bone density profiles from physicians

HEALTH STATUS & BODY COMPOSITION

- **Resting, Exercise, Recovery HR**
 - Pulse or Heart Rate Monitors
- **Resting, Recovery BP**
 - Syphnomometers – manual or digital
- **Submax/Max O₂ consumption**
 - Estimates or Direct Measures
 - OMNI RPE
- **Body composition**
 - Skinfold calipers, DEXA
- **Body Mass Index**
 - Body Weight (kg)/ Height² (m)
 - Separate BMI Growth curve for CP & DS



BODY COMPOSITION

- Skin Fold Calipers**
 - Slaughter equation using skin fold thickness to estimate % body fat
 - Slaughter et al, 1988

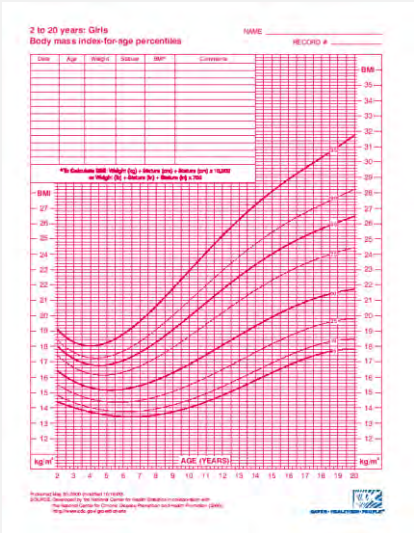
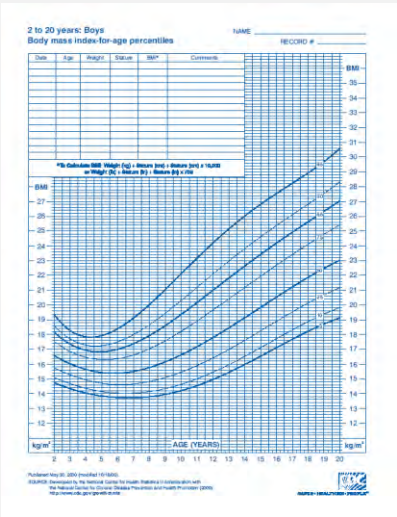
- Bioelectrical Impedance**
 - Handheld device (Omron)
 - Scales (Tanita)
 - Wabitsch et al, 1996

- Waist & Hip Circumference**
 - W/H Ratio for Fat Distribution
 - Daniels et al, 2000



BMI GROWTH CHARTS

([HTTPS://WWW.CDC.GOV/GROWTHCHARTS/INDEX.HTM](https://www.cdc.gov/growthcharts/index.htm))



GROWTH CHARTS FOR YOUTH



https://www.cdc.gov/growthcharts/clinical_charts.htm

VITAL SIGNS: HR AND RR

Heart Rate			Respiratory Rate	
Normal Heart Rate by Age (beats/minute) Reference: PALS Guidelines, 2015			Normal Respiratory Rate by Age (breaths/minute) Reference: PALS Guidelines, 2015	
Age	Awake Rate	Sleeping Rate	Age	Normal Respiratory Rate
Neonate (<28 d)	100-205	90-160	Infants (<1 y)	30-53
Infant (1 mo-1 y)	100-190	90-160	Toddler (1-2 y)	22-37
Toddler (1-2 y)	98-140	80-120	Preschool (3-5 y)	20-28
Preschool (3-5 y)	80-120	65-100	School-age (6-11 y)	18-25
School-age (6-11 y)	75-118	58-90	Adolescent (12-15 y)	12-20
Adolescent (12-15 y)	60-100	50-90		

https://www.pedscases.com/sites/default/files/Vital%20Signs%20Reference%20Chart%201.2_1.pdf

VITAL SIGNS: BLOOD PRESSURE

Blood Pressure

Normal Blood Pressure by Age (mm Hg) Reference: PALS Guidelines, 2015			
Age	Systolic Pressure	Diastolic Pressure	Systolic Hypotension
Birth (12 h, <1000 g)	39-59	16-36	<40-50
Birth (12 h, 3 kg)	60-76	31-45	<50
Neonate (96 h)	67-84	35-53	<60
Infant (1-12 mo)	72-104	37-56	<70
Toddler (1-2 y)	86-106	42-63	<70 + (age in years x 2)
Preschooler (3-5 y)	89-112	46-72	<70 + (age in years x 2)
School-age (6-9 y)	97-115	57-76	<70 + (age in years x 2)
Preadolescent (10-11 y)	102-120	61-80	<90
Adolescent (12-15 y)	110-131	64-83	<90

For diagnosis of hypertension refer to the NHBPEP Reference tables: <http://www.nhlbi.nih.gov/health-pro/guidelines/current/hypertension-pediatric-jnc-4/blood-pressure-tables>.

https://www.pedscases.com/sites/default/files/Vital%20Signs%20Reference%20Chart%201.2_1.pdf

MEASURING ENERGY CONSUMPTION IN CHILDREN

- What is Physical Activity intensity?
 - How 'hard' one works when doing an activity?
 - Accompanied by increased HR, RR, VO₂, hydroskis (sweating)
- What is MVPA? 3-6 METS
- What is VPA? > 6 METS
- What is a MET (Metabolic Equivalent)? (Ridley, 2008)
 - An estimate of energy cost during PA
- What is resting 'relative' MET level?
 - Energy consumption at rest
 - Adults: 3.5 ml/kg/min
 - Children: depends on age: Range: 4.0 – 5.92 ml/kg/min (Harrell, 2005)
- MET compendium for Children
 - Provides estimates of MET levels for different physical activities

https://www.nccor.org/wp-content/uploads/2016/09/NCCOR-Compendium_Factsheet-v10.pdf

NORMAL LIPID PROFILES

Table 9-1. **ACCEPTABLE, BORDERLINE HIGH, AND HIGH PLASMA LIPID, LIPOPROTEIN, AND APOLIPOPROTEIN CONCENTRATIONS (MG/DL) FOR CHILDREN AND ADOLESCENTS***

Note: Values given are in mg/dL. To convert to SI units, divide the results for total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and non-HDL-C by 38.6; for triglycerides (TG), divide by 88.6.

Category	Acceptable	Borderline High	High [†]
TC	< 170	170–199	≥ 200
LDL-C	< 110	110–129	≥ 130
Non-HDL-C	< 120	120–144	≥ 145
Apolipoprotein B (ApoB)	< 90	90–109	≥ 110
TG			
0-9 years	< 75	75–99	≥ 100
10-19 years	< 90	90–129	≥ 130

Category	Acceptable	Borderline Low	Low [†]
HDL-C	> 45	40–45	< 40
Apolipoprotein A-1 (ApoA-1)	> 120	115–120	< 115

* Values for plasma lipid and lipoprotein levels are from the National Cholesterol Education Program (NCEP) Expert Panel on Cholesterol Levels in Children.¹ Non-HDL-C values from the Bogalusa Heart Study are equivalent to the NCEP Pediatric Panel cutpoints for LDL-C.²⁰ Values for plasma apoB and apoA-1 are from the National Health and Nutrition Examination Survey III.

† The cutpoints for high and borderline high represent approximately the 95th and 75th percentiles, respectively.^{1,20,21} Low cutpoints for HDL-C and apoA-1 represent approximately the 10th percentile.²¹

https://www.nhlbi.nih.gov/sites/default/files/media/docs/peds_guidelines_full.pdf

CALORIES FOR AGE & ACTIVITY LEVEL

Estimated amounts of calories needed to maintain caloric balance for various gender and age groups at three different levels of physical activity. The estimates are rounded to the nearest 200 calories. An individual's calorie needs may be higher or lower than these average estimates.

Gender	Age (years)	Calorie Requirements (kcal) by Activity Level**		
		Sedentary	Moderately Active	Active
	2-3	1,000-1,200	1,000-1,400***	1,000-1,400***
Female****	4-8	1,200-1,400	1,400-1,600	1,400-1,800
	9-13	1,400-1,600	1,600-2,000	1,800-2,200
	14-18	1,800	2,000	2,400
	19-30	1,800-2,000	2,000-2,200	2,400
Male	4-8	1,200-1,400	1,400-1,600	1,600-2,000
	9-13	1,600-2,000	1,800-2,200	2,000-2,600
	14-18	2,000-2,400	2,400-2,800	2,800-3,200
	19-30	2,400-2,600	2,600-2,800	3,000

* Based on Estimated Energy Requirements (EER) equations, using reference heights (average) and reference weights (healthy) for each age/gender group. For children and adolescents, reference height and weight vary. For adults, the reference man is 5 feet 10 inches tall and weighs 154 pounds. The reference woman is 5 feet 4 inches tall and weighs 126 pounds. EER equations are from the Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington (DC): The National Academies Press; 2002.

** Sedentary means a lifestyle that includes only the light physical activity associated with typical day-to-day life. Moderately active means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life. Active means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.

*** The calorie ranges shown are to accommodate needs of different ages within the group. For children and adolescents, more calories are needed at older ages. For adults, fewer calories are needed at older ages.

**** Estimates for females do not include women who are pregnant or breastfeeding.

https://www.nhlbi.nih.gov/sites/default/files/media/docs/peds_guidelines_full.pdf

IMPORTANT!!

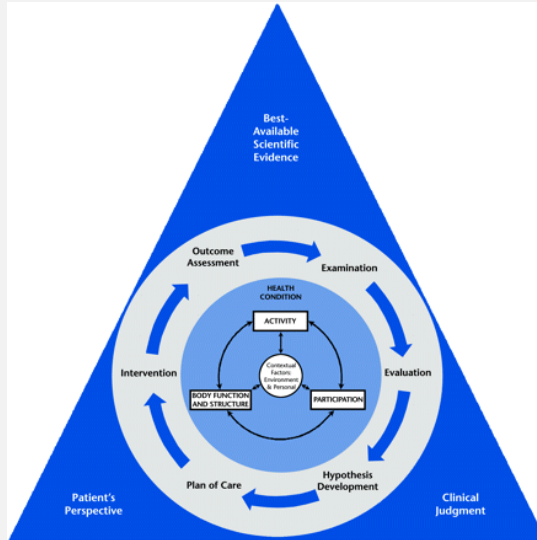
CHILDREN AT RISK FOR OR WITH NEGATIVE HEALTH CONSEQUENCES

- Ex: Family history, blood pressure, total cholesterol, large change in BMI, concern about weight
- **Refer to medical weight management clinic where diet is monitored and restricted by health care team**

INTERVENTION IDEAS & APPROACHES- CASE DISCUSSIONS



CLINICAL REASONING & CLINICAL DECISION MAKING



CASE DISCUSSION FORMAT

	BF/BS Impairment	Activity Limitation	Participation Restriction
A problem			
An intervention			
A measure			

**THANK YOU!
QUESTIONS?**

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**REFERENCES AVAILABLE UPON
REQUEST**