Yoga Anatomy and Physiology for Kids Aged 8-12yrs

"The soul is healed by being with children."
— **Fyodor Dostoyevsky**

Dedication – This manual is dedicated to the health and well-being of tweens everywhere

CHILD ANATOMY & PHYSIOLOGY 5-8 year olds

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INTRODUCTION

I am so excited to present this manual to you. As a registered physiotherapist, mother and experienced yoga teacher, I am passionate and dedicated towards the well-being of others through the practices of yoga and coaching. My mission is to empower teachers with specific education so that they can enjoy a greater level of depth, understanding and fulfilment in their lives as they branch into the specialty of children's yoga. I am passionate about empowering yoga teachers with the tools they need to effectively teach children and teens life skills, so that they may experience greater levels of health and well-being at school and beyond.

Whether you are just beginning, or have plenty of experience teaching yoga to children, this manual is designed to support you at whatever skill level you are currently at.

INSTRUCTIONS FOR USE:

This Children's Anatomy and Physiology Manual has been created to provide an introduction to children's anatomy and physiology, as it relates the practice of yoga with children aged 8-12 years. This resource provides an overview of child anatomy and physiology, with an emphasis on the development of 8-12 year old children, enabling participants to safely practice yoga with older children based on their unique physical capacities and needs. Even further, participants will learn how yoga supports the growth, strength, and development of children anatomically, in order to maximize potential benefits of yoga techniques in support of children's health, wellness and academic success. A firm understanding of the concepts presented in this manual will allow you to tailor classes to meet children where they are in their physiological development.

Focus: Ages 8 to 12 year olds

LEARNING OBJECTIVES

- Comprehend the physical development of children aged 8-12 years
- To be able to understand the specific gross and fine motor developmental stages of early childhood
- Students will feel confident to be able to tailor yoga techniques of asana, mindfulness, meditation and pranayama as they apply to children aged 8-12 years.
- To be able to understand movement patterns
- To be able to understand the major muscles used in yoga asana practice and yoga techniques
- To be able to understand the nervous system and the effects of yoga on the central and peripheral nervous systems of children
- To be able to understand the general benefits of yoga on childhood digestive, endocrine, skeletal, respiratory, lymphatic and cardiovascular systems.
- The understanding of how to identify and prevent common injuries in children aged 8-12 years
- How to manage physical challenges when teaching yoga classes to children.

Introduction to CHILD DEVELOPMENT in the older child

Understanding Anatomy and Physiology in the 8-12 year old child

- This manual will primarily be an outline of the commonalities seen in the developmental stages of a child between the ages of 8 and 12 (sometimes referred to as upper primary school years or tweenie years)
- Middle childhood brings even greater levels of independence to a child
- Staying healthy and well during this phase of development will set a child up for lifelong habits of wellness
- Developmental milestones are markers at each age group that are considered to be expected by the upper level of the age range
- A child's development can be affected by how they process and use information especially through their sensory system (or nervous system)
- A child's senses are the building blocks for many aspects of development
- There are warning signs that may suggest that a child is not reaching his or her expected milestones
- A yoga teacher is in a good position to monitor a child's developmental milestones and to liaise with other health professionals if there is any cause for concern about a student's development
- Children will always develop at unique rates across each domain and within specific milestones or stages and there are some who will start slow and catch up in time.
- A number of factors come into play that may affect a child and prevent him or her from reaching a milestone – for example, ongoing family stress, the presence of an abnormality such as scoliosis (abnormal spinal curvature) or genetic issues, or bilingualism – which affects language development.
- At this stage a child will become more focussed on friendships and what others think of them.
- Communication becomes more sophisticated and a child becomes more aware of irony and humour. Younger children will be looking up to older children and older children will seek out mentors.
- A yoga teacher can become a very strong and well-loved mentor for a child in this age group
- Yoga for the 8-12 year age group can help to create a bridge between being a child and being an adult.
- Yoga can support a child to become more accepting of the changes in the body that will prepare them for adolescence

and to become more connected to their body so that body self love can be more positive.
- Stories and imagination remain important at this age but children at this age are generally moving more towards an adult style of yoga with engagement on a deeper level with the philosophies behind yoga.

WHY IS ANATOMY and PHYSIOLOGY IMPORTANT for YOGA TEACHERS of 8-12 year olds?

We can use our knowledge of anatomy and physiology as yoga teachers in a myriad of beneficial ways for upper primary-school aged children

- It allows you to become a more precise, confident, skillful, knowledge-able and safe yoga teacher for 8-12 year olds
- It deepens your appreciation of the developmental stages of 8-12 year olds and their unique physical, mental, emotional and spiritual capacity to engage in yoga tools
- It helps you to prevent injury specific to this age group and understand the causes of common injuries and challenges seen in late childhood – the pre-teen years - before the onset of adolescence.
- It supports you to develop and deliver age-appropriate and developmentally-appropriate activities
- To increase your understanding of the health benefits of yoga for older children
- To increase your confidence, awareness and compassion when communicating with 8-12 year olds
- To support you to speak and engage with other health professionals and parents on behalf of your students to ensure their needs are being met. To recognize when a child requires a referral for more specialized intervention. These health professionals may include psychologists, physiotherapists, speech

and language pathologists, occupational therapists, podiatrists, specialists, paediatricians and general practitioners who will support the well-being of a child who is identified to have special requirements

- To support you to teach anatomy and physiology for yoga to your 8-12 year old students to facilitate their learning and awareness about their own bodies
- To understand the anatomical differences that may exist in children of various ages

THE SKELETAL SYSTEM

The child's skeletal system continues to grow consistently throughout the pre-pubescent years. Growth plates, the area of growing tissues at the each ends of the long bones in children and adolescent determine the length and shape of the mature bone. The growth plates contribute new bone to the existing bones to grow.

Since these parts of the bones are soft, they are injury prone. This is a region of bone that is sometimes weaker than the tendons and ligaments that connect bones to other bones and muscles. Due to its soft nature, 30 percent of fractures in children can happen around the growth plates. Body growth is incomplete in the 8-12 year old child and growth plates will not close and stop growing until a couple of years after puberty on average. Different bones close at different times.

Puberty will vary in its onset, sometimes beginning as early as 8. On average, girls stop growing at 12 to 14 years of age, while boys stop growing at around the ages of 14 to 16.

The two most important lifelong bone health habits to encourage now are proper nutrition and plenty of physical activity. Eating for healthy bones means getting plenty of foods that are rich in calcium and vitamin D. Most kids do not get enough calcium in their diets to help ensure optimal peak bone mass.

Growth Plate Injuries
When we think of growing bones, most of us have the idea that they grow out from the middle of the bone. But, it is the growth plates that help the long bones of the legs and arms to grow at either end of these bones. These growth plates produce new bone tissue for the growth of long bones and this is what determines the final length and shape of bones in an adult individual.

An injured growth plate fails to do its job properly, which can result in crooked or misshapen bones, very short limbs, or it can even cause arthritis. But fortunately, these happenings are very rare. Diagnosing this at the right time and proper treatment, growth plate injuries in children can be recovered without any further long-term consequences.

Who Gets Growth Plate Injuries?

- Growing children and adolescents are prone to growth plate injuries. If a child is injured seriously in a joint then most possibly, he can damage his growth plate than the ligaments that alleviate the joint. A shock that would just cause a sprain in an adult might be the cause of a growth plate fracture in a child.
- Boys are more likely to get growth plate fractures as compared to girls, because girls' bodies grow and mature at an earlier age than that of the boys. As a result, the bones in the girls' bodies complete growing earlier, and thus their growth plates are restored by stronger and solid bone.
- People playing competitive sports such as football, basketball, or gymnastics often get growth plate injuries. Recreational activities such as biking, sledding, skiing, or skateboarding may also lead to injuries of the growth plates.
- You may also get growth plate injuries because of a single traumatic event like a sudden fall or road accident, or from constant stress and over physical activities. Generally, the growth plate fractures occur in the fingers' long bone and outer bone of the forearm as well. Fractures in the growth plate are also common in the lower bones of the leg.

What Causes Growth Plate Injuries?

There are a number of factors that cause growth plates injuries. Most of the common causes of these injuries can be an event such as a fall or blow to the limb or injuries can also happen due to overuse. For example, a gymnast practicing on the uneven bars for a longer time, a long-distance runner, and a baseball pitcher practicing his curve ball to make it perfect can suffer from growth plate injuries.

Although many people suffer from growth plate injuries caused by accidents during playing or any athletic activity, growth plates are also vulnerable to other injuries, like bone infection, that can reduce their normal growth and development. Other probable causes of growth plate injuries include the following:

- Child Abuse Fractures in the growth plates are common among physically ill-treated children. And since the growth plate is the weakest part of the bone, these injuries are very common in the children who are abused.
- Injury From Extreme Cold Children who are regularly exposed to extreme cold can damage their growth plate that further can result in short, thick fingers or early degenerative arthritis (failure of the joint cartilage).

- Radiation And Medications Children who are given chemotherapy for cancers can get bone injuries. Long-term use of steroids for seditious conditions such as juvenile idiopathic arthritis can also damage bone growth.
- Neurological Disorders Children suffering from neurological disorders that further results in sensory deficit or muscular disorder are more likely to get growth plate fractures, especially at their ankles and knees. Children who are born with coldness to pain can suffer similar types of injuries.
- Genetics Growth plates are the area where many hereditary disorders affecting the musculoskeletal system appear. Scientists have been making researches to understand the genes and gene mutations that is involved in skeletal formation, growth, and development. This new study and information is creating hopes for developing improved treatments for children who have poorly formed or improperly functioning growth plates in birth.

Metabolic Disease Doctors state that disease such as kidney failure and hormone disorders can affect the growth plates and their function in a person. The bone growth in a child suffering from any of these health issues may be negatively affected.

(source: http://www.findhealthtips.com/growth-plates/)

Back Seat Until 13: Why Your Pre-Teen Should Get the Back Seat
Why is the back seat safer for kids who otherwise are the same size as their older siblings and peers? Let me try to explain.
Most child passenger safety recommendations are based on 2 very simple principles:
1 Vehicle restraint systems are designed for adults.
2 Children are not little adults.
Seat belts are designed to keep an adult person safe during a motor vehicle collision (MVC). The position of the lap belt is specifically designed to ride over the lower part of an adult hip bone. The shoulder belt is designed to securely cover the breast bone. The combination of these 2 belts protects us during a MVC by keeping our bodies in the car (not getting ejected), and by slowing the rate that our bodies come to a complete stop. The belts use two of the strongest areas of our skeleton to do this - the rib cage and hips.
Although some children under the age of 13 may seem as big as an adult *on the outside*, they are not an adult *on the inside*.
The hip bones are not fully developed (all the way to the pointy top part) until 12-13 years of age. It is the pointy, angled area on the front of developed hips that keeps a lap belt low and snug. On a child with rounded, relatively soft hips, the belt will "ride up" onto the abdominal cavity during an MVC - even if the belt starts in the right place! This shift of the lap belt's proper position increases the risk of injury to abdominal organs.

The development of the breast bone (sternum) is even more inconsistent. Mature, stable breast bones can be seen as early as 11 years old. Full development, however, can be seen as late as 17 years old. Without a mature skeleton, a child is at increased risk of injury and death in the event of a MVC.

Until a child has a mature skeleton, the protection provided by seat belt restraint is not as optimal as an adult. Period.

So, how is a seat belt in back, better than a seat belt in front?

The back seat position provides additional protection because it is furthest away from three things responsible for most injuries: the windshield, the dashboard, and the airbag.

The data clearly shows this is a safer way to travel:

- Buckling up in the back seat decreases the risk of death by one-third.
- Passengers in the front seat are at greatest risk of injuries.
- Rear-seated passengers have 60% better protection in side impact collisions.
- Studies repeatedly suggest the risk of injury becomes equal to those of an adult person after the age of 13 years.

When you know the physiology and you see the statistics, the recommendation becomes easier to understand. It is for the greatest safety of our children.

I want all of us, as parents, to be able to use this information to make the best decisions for our own children's car travel. And, hopefully, encourage parents to give the tweens the back seat for awhile longer.

Vehicle Safety for Your Older Child

Did you know that children between the ages of 8 and 15 are injured more in motor vehicle crashes than younger children? Did you know these older children are also more likely to be unrestrained?

Since children in this age group are more at risk for serious injury and death, safety advocates have been trying to figure out the best way to improve how they are protected. The solution is simple and up to you… Take a good look at your children between the ages of 8 and 15. Appearances can be deceiving when it comes to your child's safety. Your child has grown, looks bigger and has gained new skills and abilities. Although your child gives the appearance of being bigger, that doesn't mean he or she is as safe in the vehicle as an adult. Although older children may seem as big as an adult on the outside, they are not an adult on the inside.Your child still needs special consideration when riding in a vehicle. The best things you can do to keep your child safe in the vehicle are:

3 Make sure he or she rides in the back seat until age 13. Your child may look big enough to ride in the front, but they aren't. Even if your car doesn't have an active airbag in front, your child is safer in the back seat.

- Make sure they are buckled up every trip no matter how long the trip. (This goes for all everyone in the vehicle!) Most crashes occur within 6 miles from home.
- Use a booster until the seat belt fits your child properly. He or she may look big enough but may still need that extra boost! The child's height, weight, body proportions, as well as the vehicle configuration can all contribute to proper seatbelt fit.
- To check for proper seat belt seat, make sure your child can sit all the way back on the vehicle seat with his or her knees bent at the end of the seat. The shoulder belt should lie across the middle of the shoulder, not across the neck or face. The lap belt should lay low over the upper thighs, not the abdomen.
- Make sure everyone who drives your child follows these safety rules.

You may be thinking…
Does it really matter if the seat belt fits my child like an adult?

The answer is YES it matters and here's why we say some children 8 years and older may still need to use a booster seat:

- The bones in their hips aren't fully developed until 12 – 13 years of age, which can cause the lap part of the seat belt to ride up on their stomachs instead of staying low on their hips. If the lap belt isn't positioned low on the hips, it can cause injuries to a child's abdominal organs in the event of a crash.
- A child's breast bone (sternum) may not be fully developed putting them at more risk for injury in a crash.
- The ligaments between the bones in a child's neck are not as developed or as strong as an adult's are.
- A child's skeleton needs to be fully developed before a seat belt can provide the same level of protection it does for an adult.

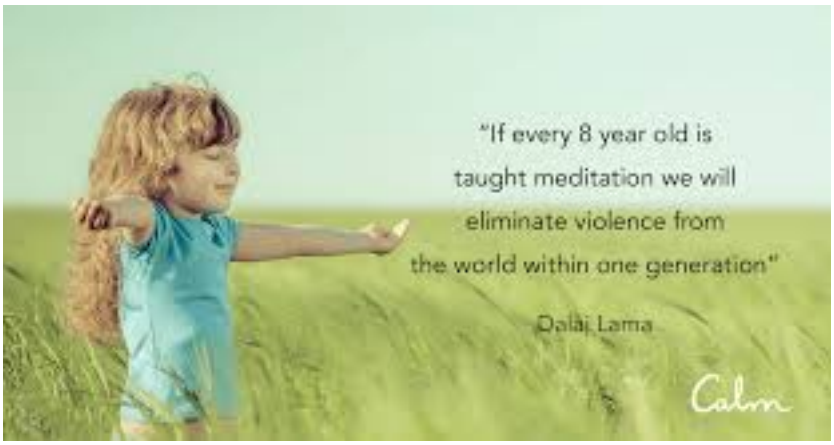
A booster seat helps to properly position the shoulder/lap belt. This allows a child to tolerate the forces in a crash better, reducing the risk of injury.

Yoga safety tip: *protect children's bones by avoiding rowdy play during classes and never allow children to forcibly jump upon one another's body during partner exercises.*

Yoga suggestions for strong bones

Bones continue to strengthen in proportion to the weight bearing and environmental forces placed upon them. Asana that place

THE NERVOUS SYSTEM



The nervous system is becoming increasingly more developed as the child gets older. It maintains its primary function of maintaining balance and supports the integration of more sophisticated movement patterns in the older growing child.

A child aged 8-12 years old will be more capable of following commands to engage in higher-level balance activities in your classes. They will enjoy stories with a narrative as they're attempting asana. Children love to challenge their physical balance and can handle more philosophical discussions about finding balance in their physical and emotional body whilst engaging in asana.

Yoga ideas for finding balance

- Tree Pose – *vrksasana* – send a chord down through the standing leg and lift up through the core and arms at the same time – finding balance between these two opposing forces
- Handstands – *ardho mukha vrksasana* – take care and use the wall if possible. Finding balance through the upper limbs.
- Warrior II – *virabhadrasana II* – finding a balance between front leg and back leg.
- Breath balance – the box breath.

The box breath

This is a technique endorsed by US Navy Seals to remain calm and productive in times of chaos or immediately after a stressful event in order to refocus. The wonderful thing about this breath is that it works on facilitating a balance between the in breath and the out breath whilst it activates the parasympathetic nervous system (*the rest and digest response*).

i. take a comfortable seat
ii. long soft spine – line the crown of the head above the base of the body between the pubic bone at the front and tail bone at the back

iii. relax your shoulders down the back and away from the ears
iv. gently lift your sternum
v. close your eyes
vi. turn your mind's eye towards the nostrils
vii. feel and observe the breath- cool on the inhale and warm on the exhale.
viii. Inhale for 4 seconds
ix. Hold air in your lungs for 4 seconds
x. Exhale for 4 seconds, emptying all of the air in your lungs
xi. Hold your lungs empty for 4 seconds
xii. Continue for five minutes

(quietkit.com has a great circle animation that you can observe to assist you with this exercise if you need visual support).

Childhood stressors

Childhood stress has increased in the past few decades, with around 40 per cent of kids reporting that they worry too much. Jasmina Rowe, Clinical Practice Supervisor at Kids Helpline, looks at the most common stressors faced by today's children, and support strategies for schools and families.

What is stress in the context of childhood?

Stress is considered to be an unavoidable part of life. A certain amount of stress is normal and necessary for survival as it helps children develop the skills they need to cope with new situations and build resilience. Childhood stress can present with a large number of physical and emotional signs and symptoms, and usually occurs when the child is experiencing a situation that requires changing and adapting. Children can experience stress early in their lives, even before they are born, and can cope in different ways. Generally, we can see three types of stress responses in children:

Positive stress response - is considered as a normal part of healthy development, for example, going to school camp or starting at a new school. When experienced in a supportive environment, it can provide important opportunities to learn and practise healthy responses to life changes.

Tolerable stress response - activates the body's alert systems to a greater degree as a result of more severe, longer-lasting stressors, for example, parental divorce, illness or injury, or bullying at school.

Toxic stress response - can occur when a child experiences strong and/or prolonged multiples stressful events without adequate adult support, for example, physical or emotional abuse, chronic neglect, parental mental illness, or exposure to violence. It can disrupt early brain development and lead to many health problems.

The good news is that the damaging effects of toxic stress can be prevented or reversed if the child is placed in a supportive environment

with caring adults as early in life as possible. Children experiencing tolerable (and especially toxic) stress may require the support from a mental health specialist who can provide ongoing therapeutic support and counselling. Telephone and online counselling services like Kids Helpline can also be helpful for children (and parents).

How prevalent is stress in early childhood/primary school?

It seems that everyday life stressors have increased in the last few decades and, certainly, we at Kids Helpline talk to a large number of children and young adults who report feeling significantly stressed and worried. A 2011 survey of 10,000 students across the country (commissioned by the Australian Scholarships Group) found that 40 per cent of students worry too much, and one-in-five have experienced an episode of depression.

What are common stressors for kids these days? Are they very different to 10 or 20 years ago?

Today's children face many pressures from external and internal sources, for example:

- **Stress in schools** - There is a lot of pressure on students today to perform at school, and there seem to be even more pressure within the peer group. The increase in the amount of homework students receive, fear of failure, worrying about fitting in, self-identity, and bullying are some of the more common reasons for stress in schools.
- **Stress in the family** - There are many issues within a family unit that can cause stress in children, for example, parental separation, remarriage (blended family), financial problems, poverty, parental stress, coping with parents who have a mental illness and, commonly, unreasonably high family expectations being placed on children.
- **Media stress and environmental dangers -** Some children can become worried about things they hear and see on the news or by a generalised fear of strangers, burglars and street violence.

Many of the above-mentioned concerns, such as school stress, have been around for a long time. The main difference now, compared to 10 or 20 years ago, is that today's children have increased access to media. Television, internet and cell phones have contributed to the break-down of barriers that protect children from crime, violence and catastrophic events in media coverage. This exposure may contribute to, and have a significant impact on, increasing children's stress levels and their fears around safety. Cyber-bullying is another big stressor, which can be very aggressive and pervasive and often causes serious emotional distress and harm to children.

Are there times in a child's life where they may be more likely to experience stress?

Many internal and external factors can influence a child's susceptibility to stress. Children are more likely to experience stress in the following

situations:

- Multiple stressful situations (particularly those that the young person cannot easily control).
- Transitions (life changes).
- Stress accompanying a serious illness or injury.
- Isolation or loneliness.
- Abuse (past or current).
- Parental stress (especially in mothers).

What behaviours might you see in stressed-out kids?

Youth of all ages, but especially younger children, may find it difficult to recognise and verbalise when they are experiencing stress. For children, stress can manifest itself through changes in behaviour. Some of those behavioural symptoms may include:

- irritability or moodiness
- withdrawing from activities that used to give them pleasure
- clinging; being unwilling to let parents out of sight
- crying
- aggressive behaviour
- regression to earlier behaviours (ie thumb-sucking or bed-wetting)
- school refusal
- unwillingness to participate in family or school activities.

How do you know when stress levels for children are getting too much or are developing into something more concerning (like an anxiety disorder)?

When the strain and pressure becomes too much to handle, a child can develop a range of physical, emotional or behavioural symptoms, and can even be at risk of developing an anxiety disorder or other mental health issue. Some of the following symptoms, particularly if ongoing and severe, may indicate that child could be developing an anxiety disorder:

- Persistent and excessive worry (to the point it is impacting negatively on their day-to-day functioning).
- Ongoing physical symptoms (eg stomach pain, vomiting or headaches).
- Significant sleep disturbances.
- Extreme fearfulness.
- Significant changes in eating habits (poor appetite, overeating or binging).
- Inability to control emotions (eg uncontrollable crying or aggression).
- Withdrawal from friends and family.
- Extreme behaviours or comments (ie self-harm or suicidal ideation).

How can primary schools help student cope with stress

Schools can be really active in supporting students to deal with stress, for example, they can:

- help students learn more about their emotions by incorporating emotional learning into the curriculum at all levels of school
- teach students how to recognise their personal signs and symptoms

of stress and develop positive ways to cope with stress (eg through healthy eating or exercise)
- create supportive, positive and safe classroom environments
- communicate more frequently with student's parents and caregivers (eg information-sharing at parent/teacher evenings)
- ensure that students get the individual support they need with learning and achieving their academic goals
- allow time for students during school hours to receive adequate exercise and have play/relaxation time
- implement anti-bullying practices and policies
- encourage students to be creative and express themselves (eg through art, sport and music)
- provide counselling and actively promote the importance of children speaking up and accessing support when stressed or worried
- develop and implement mentoring support programs in school (eg Peer Skills).

How can parents help their kids cope with stress?

It is important for parents to teach kids to recognise and express their emotions, and to use healthy ways to cope with the stress they experience. Parents can:

- regularly spend calm and relaxing time with their children
- listen to their children and encourage them to talk about their feelings and worries
- provide a safe and nurturing family environment
- encourage physical activity and healthy eating habits
- use positive encouragement and rewards instead of punitive measures
- avoid being critical and negative towards their children
- show active interest in their children's activities and hobbies and participate when possible
- demonstrate active interest in their children's school progress and support them with their learning and homework
- monitor their children's access to media and ensure they are aware of safe online practices
- support their children if they are exposed to bullying
- manage their own stress and be a positive role model
- avoid over-scheduling children and allow them free time to play, read, listen to music or just 'veg–out'
- help build children's sense of self-worth by recognising their achievements and avoid placing unrealistic expectations on them

seek professional help if signs of stress do not decrease.

(source: https://www.kidsmatter.edu.au/health-and-community/enewsletter/how-kids-experience-stress)

Jean Piaget: The Age Period of 7-12 Years Make up the Concrete

Operational Stage

According to Swiss psychologist Jean Piaget, during this period, children develop the ability to think logically and have more "adult like" thought patterns that, among other things, include the ability to:

Look at things in-depth: Realize that things are not always as they seem and that outward appearances are only one aspect to be considered.

View matters from several angles: Approach objects or situations with the question "what if?" and can envision different scenarios that may play out based on specific actions.

Erik Erikson: The Age Period of 7-12 Years Make up the Industry versus Inferiority Stage

According to Erik Erikson, during this time, a child's most significant relationships are those with his friends and peers. Although parents are obviously still very important, they don't have the same influence and authority as in younger years.

Because of this shift, a child's self-esteem and confidence tend to be more susceptible to how he believes those outside his family see him. According to Erikson, this period is characterized by a focus of 'being able'. This ability to accomplish what you set out to do (to realize your own potential), is what he calls industry. Supporting this focus on industry is vital for the existential building of self esteem.

So How Can You Help Your Child Through These Challenging Stages of Child Development?

In my opinion there are two aspects in this:

Supporting your child to meet his *own* agenda, his *own* goals, his *own* personally defined tasks. Helping your child experience the basic existential feeling of, 'Yes, I can do this. I can meet my own goals' is extremely important for building self esteem. This feeling of 'I can' is what will fuel your child to out in the world and experiment, test and try which again will provide him with important life skills.

Installing the basic mindset in your child that he or she is unconditionally loved for who he IS (not for what he DOES). In my experience, the more your child knows that he is unconditionally loved for his person, not his accomplishments, the less susceptible he will be to external evaluations and judgments from the outside. An extra bonus here is also that if he feels unconditionally loved, he will be more prone to following, realizing and reaching his own goals rather than just mindlessly following someone else's ideas of what he should do.

THE ENDOCRINE SYSTEM

Childhood obesity has become a major health concern in recent decades, especially with regard to metabolic abnormalities that impart a high risk for future cardiovascular disease. Recent data suggest that excess adiposity during childhood may influence pubertal development as well. In particular, excess adiposity during childhood may advance puberty in girls and delay puberty in boys. Obesity in peripubertal girls may also be associated with hyperandrogenemia and a high risk of adolescent polycystic ovary syndrome. How obesity may perturb various hormonal aspects of pubertal development remains unclear, but potential mechanisms are discussed herein. Insulin resistance and compensatory hyperinsulinemia may represent a common thread contributing to many of the pubertal changes reported to occur with childhood obesity. Our understanding of obesity's impact on pubertal development is in its infancy, and more research into pathophysiological mechanisms and longer-term sequelae is important.

Go to:

Introduction

Puberty is the complex process by which children develop secondary sexual characteristics and reproductive competence. Normal puberty is initiated centrally, with gonadal function being driven by increased gonadotropin-releasing hormone (GnRH) and gonadotropin secretion. Among other factors, adequate nutritional status appears to be requisite for the central initiation of puberty.

Childhood obesity—a result of relative overnutrition—has become a major health concern in recent decades. A marked increase in the prevalence of childhood and adolescent obesity is well-documented. For example, while an estimated 4.2% of 6–11 year olds and 4.6% of 12–19 year olds in the U.S. were obese in the 1960s (Ogden *et al.* 2002), these estimates had increased to 19.6% and 18.1%, respectively, by the 2007–2008 time period (Ogden *et al.* 2010). An increase in childhood obesity prevalence has been observed worldwide, in both developed and developing countries (Wang & Lobstein 2006).

Childhood and adolescent obesity is associated with a number of medical complications, among the most worrisome being metabolic risk factors for future atherosclerotic vascular disease (e.g., insulin resistance, hyperglycemia, hypertension, and dyslipidemia) (Cali & Caprio 2008). Excess adiposity may also influence various aspects of pubertal development, such as the timing of pubertal initiation and hormonal parameters during puberty. These alterations may not be innocuous. For example, earlier puberty in girls appears to be associated with a higher risk of psychological problems, risk-taking

behavior, and even future breast cancer (Golub *et al.* 2008). Obesity during the pubertal transition may also promote the development of adolescent polycystic ovary syndrome (PCOS) (Franks 2008).
(source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2931339/)

Your child's immune system is comprised of tissues, organs and cells that work to attack invaders and defend him against germs. Much like other body systems that continue to develop after birth, like the nervous system and digestive system, the immune system develops throughout childhood and into adulthood. In the meantime, your child's body will rely on different types of immunity to stay healthy.

Innate Immunity
Your child is born with innate immunity. According to the Kids Health website, innate immunity offers general protection until your child is able to build her immune system further. Her cough reflex, skin and mucus production are all part of her innate immunity that began developing before birth.

Passive Immunity
Passive immunity is temporarily given to your child from another source. For example, breast milk provides immunity from diseases that Mom has been exposed to. Medline Plus indicates that your child has antibodies he received from the placenta during pregnancy as a form of passive immunity. These antibodies disappear between 6 to 12 months of age, when your child's own adaptive immunity is growing stronger.
Adaptive Immunity
The most significant aspect of your child's immunity development is adaptive immunity, which develops throughout her life as she is exposed to illness and germs. Beginning a few months into the first year of life, she is already more prepared to fight infections than she was at birth, according to Kids Health. Vaccinations, which are typically given beginning in infancy, are another way that your child develops immunity to certain diseases. Her immune system will continue to strengthen and develop throughout childhood as she comes into contact with more germs, and the cells in her body learn to fight against different infections.
Recommendations
Although your child will naturally build his immunity through exposure, it is still important to take necessary precautions for his health. Follow his doctor's recommendations for vaccinations, and avoid purposely exposing him to ill individuals. In some cases, certain medications can lower his immunity, and autoimmune disorders and premature birth can reduce the effectiveness of his immune system. In this case, your child's doctor can help you to take extra precautions for his health.

(source: http://oureverydaylife.com/development-immune-system-children-2975.html)

THE MUSCULAR SYSTEM

The differences in human motor development are determined by predispositions and living conditions. The aim of the present study was to examine relationships between motor fitness of children and adolescents aged 8–16 years (277 boys and 247 girls), and their somatic build and quality of life of their families. Body height, body mass and skinfold thickness were measured. On the basis of these measurements body mass index (BMI), Rohrer's index and lean body mass (LBM) were calculated. The subjects' physical fitness was also assessed with motor tests: speed of arm movement (plate tapping), agility (10 x 5 m shuttle run), explosive strength of the legs (standing broad jump), trunk strength (situps), explosive strength of the trunk and shoulder girdle (1-kg medicine ball throw), and flexibility (sit and reach) regarded as a morpho-functional predisposition of motor abilities. The standing broad jump results were then used to calculate maximal anaerobic power (MPA). The examination was completed with a questionnaire survey of the children's parents concerning their families' quality of life. On the basis of the parents' answers to the questionnaire, two quality of life indices were constructed: objective quality of life index and subjective quality of life index. Due to the wide age bracket of subjects the sample was divided into two age groups: 8–12 and 13–16-year-olds. The relationships between subjects' motor development, somatic traits and their families' quality of life were examined with the use of multivariate comparative analysis. The level of motor development of studied children was more strongly determined by their somatic build than the quality of life of their families. The most important somatic determinants of the subjects' motor abilities were body height and subcutaneous adiposity. These determinants primarily affected speed and strength abilities of younger school children. Objective quality of life of children's families determined the development of some strength abilities in children aged 8–12 years. No correlations between the subjects' motor development and subjective quality of life of their families were found.

(source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3592105/)

MOTOR DEVELOPMENT

These are the predictable milestones for development at each age group

8 years

Eight year-old's milestones:

- Print many words
- Write cursive
- Draw detailed pictures
- Manage any task requiring dexterity (play the piano, string small beads, fasten necklaces)
- A period of great agility and energy
- Increasingly sophisticated coordination
- Hopscotch, skipping and more precise activities are more popular
- Emotionally independent of adults largely
- Seeks acceptance from peers
- Satisfied by intellectual games
- Enjoys physical pursuits
- Good control of emotions generally
- Becomes anxious if adults are not effectively supervising
- Can do what's best for a group and submerge individual desire
- Starts to separate between boys and girls in friendship groups but still mixes
- Develops confidence in ability to reason
- Mastering the art of conversation
- Able to add and subtract in head
- The brain starts to prune certain connections to ensure streamlining of activity and focus and speed.
- With this increase in efficiency comes an uptick in self-awareness
- Starting to recognize his/her strengths
- Weight gain speeds up
- Sleeps up to 11 hours a night

- Begin riding a two-wheeler bicycle without training wheels
- Can use a pair of scissors to cut out complex shapes
- Permanent teeth begin to appear
- Improved hand-eye coordination (can bounce and catch a tennis ball)
- **Yoga tip:** At this stage, children are beginning to compare their skills to those of their friends and other kids in the class. Children are aware of false praise at this stage and will respond best if you notice specific strengths. The experts advice is that continued exposure to failure in something a child's just not cut out for can shake confidence long-term. Set up your yoga activities so that they're easy to master with repetition and point out specific capabilities you can see within the class. Be fair and don't leave anyone out with your sprinklings of specific, honest praise. Never shame a child for being unable to complete a task that the rest of the class can do.

(sources : 1. http://www.maternal-and-early-years.org.uk/stages-of-development-5-8-years 2. http://www.parenting.com/article/brain-development-children 3.https://www.babycenter.com/303_milestones-ages-5-to-8_1517873.bc 4. https://www.babycenter.com/0_physical-development-milestones-gross-motor-skills-ages-5-to_3659044.bc)

Social and Emotional Child Development: Age 8

Needing to be 'seen'

Although your child will perhaps be less moody than she was just a few months ago, she will become much more demanding of your time and attention.

While she used to enjoy spending time alone, now she will follow you around and may even 'misbehave' so you will notice her. Even if you spend a lot of time with her, she will still feel like she needs more.

Doing one thing, needing something else

She might be argumentative, and maybe even rude or disrespectful. Even though she will sometimes act as if she does not like her parents and siblings, she will still need a lot of encouragement.

Don't let her attitude fool you – she still needs your unconditional support.

Hard on herself

She will like challenges, but will be very hard on herself when she makes a mistake. And, patience will probably not be her strongest virtue.

Always on to the next exciting project

Her room may be messy, and she will leave a wake of disorder behind her wherever she goes. She will leave her towels on the floor after a shower or her dishes on the counter after a snack.
She is not necessarily sloppy – she is just in a hurry to get to her next activity and too impatient to take the time to tidy up.

Higher awareness on looks

Appearance will become very important to her, and she will begin to judge her relationships based on how she thinks others approve or disapprove of her clothing, hair, or shoes.

More conscious understanding of right and wrong

She will have a better understanding of right and wrong, and this will influence the way she interacts with friends and family.

Cognitive Developmental Milestones: Age 8

Reality will slowly replace the fantasy world

Your child will begin to trade his fantasy world for reality.

Humor is still evolving

He will still enjoy humor and like watching funny shows or reading joke and riddle books.

Language experimentation and playing with words

He may ask for a secret password before you enter his bedroom, or make up nicknames for his friends.
Listening to other languages may interest him and he might create his own funny words for objects then insist that everyone use them in conversation.
Children at this age can be very dramatic which can also be seen in their choice of language: your child may use phrases like, "This is the worst day of my life" or "I'm bleeding to death".

Enjoy activities driven by thinking, categorizing and reasoning

Your child will enjoy activities that involve thinking and reasoning such as board games or card games. He will like looking at and arranging his collections, or impressing the family with magic tricks.

Your 8 year old will love activities that keep her busy. She will be lively and energetic and will talk rapidly. She will flit, and skip, and jump around, and will enjoy physical activities that provide a challenge.

Challenging own physical performance

She will like timing herself to see how quickly she can get dressed, set the table, or complete an obstacle course.
She will believe that she can do anything she sets her mind to, and therefore, will often take risks. For example, she may want to toboggan down the largest hill or climb the highest slide.
The idea of starting small and working up to larger achievements will seem "silly" to her when she can simply save time by beginning with the most difficult task first.

Enjoying rhythmic movements in sports

She may also like dancing and sports that involve rhythmic movement such as ice skating, ballet, or even horseback riding.

Increase in appetite

Her appetite will once again increase because of her high energy level and zest for life.

More detailed art work

Art work will be more detailed and activities involving hand-eye coordination will improve.

Permanent teeth grow in

Your child's permanent teeth will begin to grow in, but they will look overly large at first.

Better peripheral vision

Peripheral vision will also improve so you may notice that she moves her eyes around as she notices objects in her side vision.

(source: http://www.positive-parenting-ally.com/stages-of-child-development.html#Age-10)

Nine year-old's milestones:

Repeating activities to do better each time

As your child's coordination increases, he will become focused on improving physical skills. He will do an activity over and over again, trying to do better each time

Getting involved in many activities all at once

New things will excite him and he will want to get involved in everything that catches his interest. If you let him, he will fill his schedule to overflowing and still want to do more.

Lots of competing

This is the age when the concept of "competition" might be interesting. He may want to join a sports team, become interested in professional sports, or challenge friends to races and contests.

Hands-on activities

He will enjoy hands-on activities and like using Legos or interlocking blocks to build detailed structures.

More intricate artistic activities

He may show an interest in cursive writing or more intricate artistic activities such as painting, carpentry, or designing elaborate roadways and villages for his toy cars.

Potential growth spurts

Your child's body is changing fast, and he may experience sudden growth spurts or growing pains.

Although puberty is likely still a couple of years away, some children will begin showing signs as early as age 9, so be prepared to talk with your child about these changes when they occur.

Applying concepts to real life

At this age, your child will begin applying concepts he has learned at school to real life. You may often hear, "My teacher says" or "Did you know?"

He will start to understand that you use math when you go grocery shopping, or science when you fix a car.

Strong awareness of time

The concept of time will be very important and he will like planning his schedule or organizing his day.

He may even begin giving his exact age, such as "I am 9 and three months".

Planning and playing with the future

He will also become "future" minded and begin saying things like, "When I grow up I am going to be a fireman". He may even tell you about where he will live, how many children he will have, and what kind of car he will drive.

Stronger distinctions between reality and fantasy

Magic and make-believe will continue to give way to reality and he may tell younger siblings that "there is no such thing as Santa Clause" or that "believing in a fairy godmother is silly."

Empathy is growing stronger

He will begin to develop a strong conscience and be very aware of right and wrong.

His apologies and compliments will be genuine. Fairness and justice will be important.

High standards for self and others

He will expect a lot from others, but will have even higher standards for himself.

Higher focus on completion

Once he begins a project, he will insist on finishing it, and will become frustrated if he is unable to complete what he starts.

Social and Emotional Child Development: Age 9

Torn between parental dependence and personal independence

Your child might be moody and sensitive.

He may seem rebellious or aggressive, but this might be due to the reason that he is conflicted between a desire for independence and a continuing need for his parents.

The challenge of managing relationships outside the family

Up until this point, he received most of his feedback about relationships from you, but now he will want to spend more time with his friends.

This can sometimes be volatile since every 9 year old is still learning how to build strong relationships with people other than family members.

Friendships may change daily, and there may be a lot of fights or

disagreements.

Looks are growing more and more important

Appearance will continue to be important, and he may change his style frequently. For example, he may want to grow his hair longer or change from t-shirts to button-up shirts.

Remember, how he judges himself will be based on how he thinks others see him, so he might become frustrated if he isn't able to dress a particular way, participate in certain activities, or achieve specific accomplishments.

(source: http://www.positive-parenting-ally.com/stages-of-child-development.html#Age-10)

Ten year-old's milestones:

Cognitive Developmental Milestones: Age 10

Higher level of conversational contribution

Your child will love to talk and socialize, even to the point of it becoming a distraction when doing other tasks.

She will enjoy being included in adult conversation and will even be able to make logical and intelligent contributions, especially about social issues.

Perhaps engaging in idol mentality

This is the age when your child will begin to admire famous people such as athletes, singers, or actors.

She might hang posters on her walls and school locker, or wear t-shirts of favorite music groups. You may be amazed that she can memorize entire songs by a band she idolizes but is unable to learn her math facts.

Social acceptance becomes more and more important

You will hear the term "that's not fair" over and over, and she will be very aware of social expectations, being especially careful not to do anything that will bring embarrassment or humiliation.

Perhaps more relaxed in being oneself

For some this year might provide a bit of a reprieve from the emotion and insecurity your child has been experiencing.

She might be less concerned about what others think, and happy just to be herself.

You, the parent, is still very important

Although friendships will still matter, her parents will once again be the most important relationships in her life.

She may even try to treat you as a friend by confiding in you and wanting you to participate in her activities. Most of the time, this dynamic will work, but be prepared for explosions of anger when you have to enforce rules or set limits.

Still wants to have a lot on his or her plate

She will want to try new things, and you may have to step in to make sure that she doesn't take on more than she can handle or become too busy.

Perspective is still growing and growing

Socially, she will be able to see situations from others' point of view of will be able to recognize that she is not the only one who has problems. In other words, she will realize that the world does not revolve entirely around her and that sometimes a friend's needs may take precedence over her own.

Physical Child Development: Age 10

Higher level of self knowledge

Your child will still be busy and active, but she may begin to feel more self-conscious about both her body and her abilities.

Natural outbursts of anger

She may have some temper tantrums and exhibit her displeasure by stomping her feet, yelling, or even throwing things.

She will probably use her words more than tears, and she might lash out by saying nasty or cruel things.

Weight gain as early preludes to puberty

Many girls will gain weight around this age, which is the body's way of preparing for all the changes it will experience during puberty.

It is important that you reassure your daughter that this is normal, and that she is not fat.

She may also experience sore or tingling nipples, but may be too worried or embarrassed to say anything. By telling her what to expect, you may be able to prepare her for this uncertain and confusing time.

Eleven year-old's milestones:

Physical Child Development: Age 11

For girls puberty might start here

A lot of physical changes happen during this year, particularly for girls, who may experience growth spurts, breast development, and menstruation.

This is the age when most children need to begin using deodorant.

Since girls usually begin puberty before boys, it may be another couple of years before your son displays moodiness or growth spurts. This is a good time to begin talking to him about what physical changes to expect, as he may be too embarrassed to ask you about what he is feeling and experiencing.

You may also want to assure him that even though he is shorter than most of the girls in his class, he will eventually grow.

Physical self-consciousness

Your child will become more self-conscious about her appearance,

particularly when it comes to clothing and hair, and you may notice significant moodiness, especially in girls.

Basic physical needs shift a bit

Children of this age will eat more, sleep more, and be less interested in physical activities.

Temper tantrums will continue to be a factor, although angry outbursts can quickly turn into tears.

More goal and purpose orientated

Your eleven year old will need new information to be relevant to his life. He may complain that learning history is "useless" or that music class is a "waste of time".

He will love learning, but it must have a purpose.

Higher need for informational precision

He will seem to be very argumentative, but this is his way of challenging his intellect and testing the accuracy of information that he has been given.

Very conscious of moral codes

He will have very high standards for other people, and will demand truth, justice, and fairness from those he trusts.

He is very aware of right and wrong, and he will expect others to do what is right, though he will not always do so himself.

Building on long term perspective

While he will still be very critical of himself, he will also be more aware of his abilities and strengths.

He will "dream big" and will talk about becoming a famous movie star or professional hockey player.

Social and Emotional Child Development: Age 11

Perhaps moodiness

Signs of puberty may or may not be apparent, but even if you cannot see them, these changes are definitely happening.

Your child may swing quickly from laughter, to melancholy, to anger, and then back to contentment.

She may be cruel to her siblings, argue about everything, and constantly test the limits.

Even though you may be the most frequent victim of her outbursts, her family is still very important to her.

And, if you have a girl, stock up on kleenex because she might be prone to crying – a lot!

Old fears may resurface

Don't be alarmed if old fears make a comeback. She may once again need the nightlight to fall asleep, or check all the doors to make sure they are locked before she goes to bed.

Need for appearing independent of parents

Your child will feel grown up, so she will not like being babysat or "rescued" by her parents. So, if she forgets her lunch, don't deliver it to her classroom.

And, try not to assist her with tasks in front of her friends.

Twelve year-old's milestones:

Physical needs are still shifting and going up and down

Since your child's body is going through a lot of changes, he will need to eat a lot.

You may notice that he alternates between periods of high and low energy, and may have difficulty sleeping.

Puberty will likely set in, particularly for girls

Your daughter may begin menstruation, if she hasn't already, and her breasts will begin to fill out. She may even need to begin wearing a bra.

By this age, she will probably be about 90% of her adult height and will be very self-conscious of her body.

She will be emotional, anxious, and irritable because of sudden hormonal changes. This may also be the age when some girls will express a desire to shave their legs and underarms.

Boys will also have mood swings, although this is not usually as prevalent as it is in girls. They may have acne, body odor, and begin noticing some signs of sexual development.

Cognitive Developmental Milestones: Age 12

Continual expansion of consciousness

Your child's "competitive spirit" will not be as prevalent as it has been in previous years. She will concede a loss and celebrate a friend's win.

You may notice that she will become less argumentative and will only argue a point that she feels is important.

Rather than always needing to be right, she will now be more willing to listen to other points of view.

Friends become increasingly more and more important

This is the age when her friends' opinions will be much more important than what her parents say.

Her peers will have the ability to affect her self-esteem or confidence.

Even though she thinks that your opinion does not matter, she will need your support and encouragement when her friends hurt her or let her down.

Mind shift from feeling like a child to feeling more like an adult

Since a lot of physical changes are happening in your child's body, she may feel like she is leaving childhood behind and entering a more

"grown-up" phase.
She may want new clothes, begin giving away younger toys, or want to redecorate her bedroom.

Preparing your child for what lies ahead

Your pre-teen is preparing for a rite of passage. Becoming a teenager is both exciting and scary.
She will experience new emotions, new feelings, and new changes within her body.
It is important that you talk to your child about her sexuality, and let her know that she does not have to be embarrassed or uncomfortable about coming to you when she needs to talk to someone.
If this feels awkward for your child, try to see if you can think of another adult that could function as a confidential guide during these next couple of years. A non-judgmental adult mentor who both you and your child can trust.

Social and Emotional Child Development: Age 12

Sense of identity is relatively strong

By this age, your child has developed a fairly strong sense of identity and security (although, he will struggle with this again in the teenage years).
He is more confident in his individuality, but he may still have difficulty asserting himself in a group setting.

Talking becomes one of the main activities with friends

He will enjoy spending time with people and will often ask if he can "hang out" with friends (which usually means just sitting around and talking).

Interest in the opposite sex

For the first time, he will develop a real interest in the opposite sex, although he will not know how to express these feelings.
More often than not, conversations will take the form of teasing or joking.

Very trend conscious

Appearance and image will still be important, and your child's preferences will be influenced by the latest popular styles.
She will want something simply because everyone else has it.

Enjoying tasks that will increase the sense of being independent

Taking on responsibility will help improve his confidence, and he will take pride in the fact that he can do "grown up" things, especially if he earns some money.
He will work extra hard if given jobs such as mowing the lawn in summer or shoveling the snow in winter.

Correcting social mistakes

Although he will not like to be corrected, he will accept the

responsibility if he does something wrong and will usually try to make amends if he hurts a friend or family member.

(source: http://www.positive-parenting-ally.com/stages-of-child-development.html#Age-10)

THE RESPIRATORY SYSTEM

THE CARDIOVASCULAR SYSTEM

Heart rates at rest and during exercise gradually slow as children grow older. Chronic stress can increase the risk of heart disease. By reducing stress, yoga may improve cardiorespiratory health and wellbeing.

(source: Galantino, M.L., Galbavy, R., & Quinn, L. (2008). erapeutic e ects of yoga for children: A systematic review of the literature. *Pediatric Physical erapy, 20*(1), 66-80. doi:10.1097/PEP.0b013e31815f1208)

Twisting poses promote blood flow to central internal organs when the twist is released. Inverted poses encourage blood flow from the legs and pelvis back to the heart

Benefits of Yoga: The Cardiovascular System

I • Lowers blood pressure • Lowers cholesterol levels • Normalizes blood sugar • Increases heart rate variability • Lowers risk of heart disease