



*Yoga Anatomy and Physiology for Kids
Aged 12-18yrs*

" Look deep down and you will find out that you are the change, you are the hope, you are the miracle. You are all the strength you need in times unbearable. You can make a reformation in your generation."

- *Siyanbade J.T. Age 15 – Nigeria*

Dedication – This manual is dedicated to the health, longevity and well-being of teens and their caregivers everywhere

CHILD ANATOMY & PHYSIOLOGY 12-18 year olds

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INTRODUCTION

It is exciting to present this manual to you. As a registered physiotherapist, mother and experienced yoga teacher, I am passionate and dedicated towards the wellbeing of others through the practices of yoga and coaching. My intention for this manual is to empower yoga teachers with specific education to enjoy a greater level of depth, understanding and fulfilment in their lives as they branch into the specialty of teaching yoga to teenagers. To support teenagers to experience a greater level of wellbeing at school and beyond whether you are just beginning, or have plenty of experience teaching yoga to teenagers. This manual is designed to support you to deepen, reinforce and strengthen your understanding of the miracles of teenage anatomy and physiology.

INSTRUCTIONS FOR USE:

This Children's Anatomy and Physiology Manual has been created to provide a basic introduction to children's anatomy and physiology, as it relates the practice of yoga with children aged 12-18 years. This resource provides an overview of child anatomy and physiology, with an emphasis on the development of 12-18 year olds, enabling participants to safely practice yoga based on their unique physical capacities and needs. Even further, participants will learn how yoga supports the growth, strength, and development of the physical body, in order to maximize the potential benefits of yoga techniques. 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 to support their holistic health and wellbeing.

Focus: Ages 12 to 18 year olds

LEARNING OBJECTIVES

- Competently understand the basic physical development of children aged 12-18 years
- To be able to understand skeletal, nervous, muscular, cardiovascular and respiratory development in teens
- To be able to understand specific benefits of yoga to the skeletal, nervous, muscular, cardiovascular and respiratory systems and specific safety aspects to ensure proper care is given.
- To be able to tailor yoga techniques of asana, mindfulness, meditation and pranayama as they apply to children aged 12-18 years.
- How to manage specific physical challenges and understand how to identify certain common conditions when teaching yoga classes to teenagers.

THE NERVOUS SYSTEM

Summary of safety considerations of the n system when teaching __year olds

Benefits of yoga for the n. system

Yoga asana to support the n system

THE MUSCULAR SYSTEM & MOTOR DEVELOPMENT

Developmental milestones –for each age group

The Urinary system

Summary of safety considerations of the n system when teaching __year olds

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Introduction to DEVELOPMENT of TEENAGERS

Understanding Anatomy and Physiology in the 12-18 year old

- The teenage years can be a challenging see-saw between the teen's increasing need for independence juxtaposed against his or her dependency upon significant adults and caregivers
- Understanding that rebelliousness at this stage is a natural manifestation of self-growth will help to reduce the tendency to be judgemental of a teen's decisions
- Adolescent development is filled with the most physical, cognitive, emotional, and social changes since infancy
- You are able to have a profound influence as a teacher, upon a teen's perceptions of themselves, their body awareness and their ability to self-determine their own unique life path.
- However some teens will find yoga practice a little daunting initially and they may feel self-conscious about being flexible enough to manage poses and about how they might look in certain poses too.
- Understanding their developmental need for specific and genuine positive reinforcement towards a healthy self esteem will motivate teenagers to actively participate in your classes
- Explaining the relevance of yoga to support teens with their special sports interests is a great way to build rapport and support their enthusiasm.
- For example, demonstrating and explaining how Warrior II is similar to a surfer's stance (aside from the front foot position) is a wonderful way to captivate surf enthusiasts. Explaining how down dog will help to improve some dance moves and soccer kick will ignite the imagination of dance-lovers and soccer fans.
- Teenagers will always develop at unique rates and the onset of puberty may be delayed in some teens. If you are concerned about their development you are in a unique position to become a referral partner to health practitioners and to work collaboratively to support their development in specialised ways.
- A number of factors come into play that may affect teens from reaching their full potential, especially stress.
- These factors include psycho-social, cultural, emotional, mental and spiritual.
- Yoga offers a holistic model of well-being that potentially encompasses all aspects of a teen's world that may be supported by the practices.
- Understanding the warning signs that suggest a teen is at high risk of mental health issues can be helpful to ensure intervention is initiated and appropriate. Teenagers are one of the highest risk groups for suicide.

- Yoga for the 12-18 year age group can help to build emotional resilience, reduce the negative impacts of stress upon mental health and increase self-esteem.
- Teenagers become increasingly focussed on friendships and what others think of them. Ensure they have an opportunity in your classes to debrief and work together and capitalise on their social connections.
- Yoga can support teenagers to become more accepting of the changes in their bodies that occur in adolescence and to become more connected to their body so that body self image can be more positive.
- Psychologist Daniel Levinson believed that adolescents must form an identity separate from their family in order to experience what he calls "positive adult development".
- For positive adult development to happen, a person must establish relationships with people outside of the family, and these relationships must be strong enough to provide emotional support, and be intimate enough that both parties feel that they are playing an equally important role.
- A yoga teacher can play a significant role in being a mentor to a teen. Teens generally need significant adults that they admire and emulate who are not their parents.
- Learning how to be an individual while still building connections with people can be a difficult task for teenagers and must be respected rather than judged. In their push towards independence, teenagers may overstep boundaries by being rude and defiant. This often indicates they are pushing for personal growth, which needs to be carefully addressed without losing their trust
- Being critical or condemning will only re-enforce a teen's belief that you do not understand her/him and will reduce the likelihood that they will come to you with future concerns or issues.
- What adults may view as rebellion against authority, teens view as an effort to be separate from dependency upon parents and caregivers to gain independence
- Supporting teenagers to build a strong sense of self-worth and identity is important because they are now equipped with the ability to "redefine" their own identity within a broader social environment that has expanded beyond their family unit into the wider world.
- If they are showing signs of anti-social behavior or anger, you can play a role in addressing this directly by naming the behavior and working out a more constructive response to manage a situation or challenge.
- Using yoga asana and yoga tools, you can weave the themes of strength, flexibility, centredness, calm, kindness and care into

your classes and demonstrate an inspiring and resourceful model of coping with life to teenagers.

The Skeletal System

As teenagers go through puberty, the increased sex hormones lead to an increase in size and bone mass of the skeleton. Bone growth during this period is crucial as peak bone mass will be achieved during the 20's. So the teenage years form a foundation for lifelong bone health. If teenagers are deficient in specific hormones, it will affect bone mass overall.

The end of puberty marks the end of most bone growth. The growth plates (epiphyseal plates) close so the length of bone stabilizes. Up until the time the growth plates close, more bone is produced than broken down. However after the growth plates close, more bone is broken down than produced.

Bone health at this age is affected by many factors. These include genetics, calcium and vitamin D intake, general nutrition, hormonal status, exercise levels, plus body weight and any medications that affect bone density.

To achieve optimum bone mass, it is important for teenagers to engage in regular weight-bearing activity on most days of the week (a minimum of four days out of seven). Osteoporosis is loss of bone strength, making bones more fragile and more prone to fracture. Osteoporosis prevention begins in childhood and adolescence. Yoga asana is the perfect tool for care and prevention of issues with bone. Just 12 minutes of yoga at least four times per week improves bone strength and can reduce the risk of fractures, according to a Columbia University study. It may even reverse osteoporosis. "The force and pressure of each pose make bones grow stronger," explains Loren Fishman, MD.

Adequate calcium levels are necessary for mineralization of the bone and cartilage. Teenagers between the ages of 12 and 18 should aim for 1300 mg of calcium per day. This equates to approximately 4 servings of high calcium food. For example an 8-ounce glass of milk has 300mg of calcium and a cup of yoghurt has 300mg of calcium.

By the end of adolescence about 90% of an adult's bone mineral content is deposited. Bone mass peaks at age twenty, says Kathy M. Shipp, an adjunct associate professor of physical therapy at Duke University School of Medicine.

(sources: i. <http://youngwomenshealth.org/2013/10/17/calcium/>

- ii. <http://www.bonehealthforlife.org.au/life-stages/teen-years>
- iii. <https://jeanhailes.org.au/health-a-z/bone-health>
- iv. <https://www.yogajournal.com/poses/standing-strong>
- v. <http://www.familycircle.com/health/concerns/bone-health/yoga-poses-for-better-bone-health/>).

Top eight asana for bone strengthening in teens

1. Tree pose (vrksasana)
2. Triangle (trikonasana)
3. Triangle with a twist (parvritta trikonasana)
4. Side angle pose (Parsvakanasana)
5. Side angle pose with a twist (parvritta parsvakanasana)
6. Warrior II (Virabhadrasana II)
7. Locust pose (Salabhasana) – so great for reversing the poor posture that teenagers experience from so much sitting at a desk!
8. Bridge (Setu Bhandha)

The Nervous system

The nervous system is still developing in the adolescent body. Yoga supports self-regulation for a healthy body and mind. It helps to build the brain's higher functions like executive decision-making and reasoning skills. This in turn could help a teenager to regulate their tendency to be impulsive and to support them to respond to stress and challenging emotions and social situations.

Meditation has been proven to help to calm the limbic system, a part of the brain and nervous system, which is helpful for reducing risk taking and primitive behavior. Meditation can also support the pre-frontal cortex, that part of the brain that regulates emotion and makes higher-level decisions.

Teenagers spend so much more time engaging in technology and intellectual activities and less time in nature than ever before. A yoga practice will help reconnect their mind-body-breath. This has been shown to reduce the negative effects of chronic stress and disembodiment upon the nervous system.

A healthy and strong mind-body connection is important for long term wellbeing as it creates the ability to tune in to the body's wants and needs in order to maintain *homeostasis* – which is nervous system balance. The harmony between breath and movement that occurs during an asana practice helps to bridge the mind-body connection and fosters a deep awareness of the internal state of well-being (or not).

Self care practices that include yoga asana, pranayama and meditation are vital for a healthy life and preventative towards long term issues related to stress such as mental illness and substance abuse.

Studies have shown that students who regularly do yoga report significantly reduced anger, depression and fatigue. These symptoms are thought to lead teens towards substance and alcohol use to self-medicate. Physically active teens have been shown to report greater feelings of enthusiasm and excitement towards life.

According to psychologist Jean Piaget, as they enter adolescence teens develop the ability to think logically and abstractly. They start considering the outcomes of multiple scenarios, and to look at situations in the light of possibility rather than only concrete reality. Teens will be able to ask "what if?" and answer with various options and consequences.

Abstract ideas around concepts like morality, philosophy, trust and faith are more readily embraced as the brain becomes more and more capable of sophisticated thoughts. Many teenagers will express a desire to explore different belief systems and to better understand a sense of belonging in the world.

Teenagers also develop meta-cognition, which is 'knowing about knowing.' This will open up the discussion about how to think about and analyse feelings and to look logically at how they are seen by other people.

Yoga Tip

Never underestimate a teen's capacity for drawing upon abstract themes and for grasping the deeper philosophical insights of yoga. This age group represents an opportunity for you as a teacher to introduce themes in your classes such as 'staying centred', 'being in balance on the mat and in life' and the moral guidelines of the Patanjali's Yamas and Niyamas as ethical codes of behavior in life.

Higher thinking also allows teens to devise learning and memory strategies. However, they will often believe that they are immune from consequences and engage in unprotected sex, drinking and driving because they genuinely believe it won't happen to them. Although teenagers may understand that consequences are real, they think it won't happen to them. Using story-telling and metaphor and drawing upon the stories of the deities, you can illuminate greater levels of understanding consequence.

Sleep

A teenager's body has an increased need for sleep. This is due to the rapid changes in their bodies. Approximately 10 hours of sleep is recommended. Teenagers are often wired for a late morning start and a late evening bedtime.

Summary of safety considerations of the nervous system when teaching

12-18 year olds

Benefits of yoga to the teens nervous system

Yoga asana and tools to support the nervous system

(Sources:

<https://www.newportacademy.com/resources/empowering-teens/yoga-teen-mental-health/>

The Muscular system and developmental milestones

Teens will gain approximately 50 percent of their ideal adult weight during puberty, including an increase in lean muscle mass. Skeletal muscle continues to increase well into adulthood for males. Lean muscle mass will decrease for females after puberty, giving way to increased body fat.

Milestones

12 - 14 year olds

- hormones change as puberty begins, usually in girls first.
- A time of rapid physical, mental, emotional and social changes
- Boys grow facial hair and voices deepen
- Girls grow breasts and pubic hair and begin menstruating
- Increasing self-consciousness about what other's think, especially peers
- May begin to feel greater levels of depression and stress as the physical changes occur, greater levels of moodiness and mood swings
- May face peer group pressure, to use substances like alcohol and tobacco and to become sexually active
- Become more independent with personality and interests
- Often there's an internal roller-coaster between high confidence and low self-esteem
- Teens at this age can come across as being rude and short-tempered
- Girls may develop eating disorders like bulimia and anorexia
- Ability for complex thought is increasing rapidly so yoga classes can be taught to them in a more adult-like way
- Self-expression is strong and they are better able to express themselves through talking through their issues – this can open up great opportunities in a yoga class to have a sharing session about feelings and current issues
- A sense of right and wrong is surfacing strongly
- The best approach is to be honest and direct with teens when speaking about sensitive topics like sexual activity and drug use

- Respect a teenager's opinions and understand that listening without judgment is important to teens.
- Be clear about the goals and aims in a class so that the teen is well guided and sign-posted.
- make sure teens know about the importance of wearing seatbelts as motor vehicle crashes are the leading cause of death amongst 12-14 year olds.
- Encourage your teen to wear a helmet for cycling, skateboarding and contact sports when appropriate.
- Teens need to be supported to avoid peers who make unhealthy choices and for someone to point out what these unhealthy choices look like ie excessive drug or alcohol use and unprotected sex
- Set clear rules so that teens feel supported by rules
- Limit screen time to 1-2hrs per day maximum

15-18 year olds

- most girls are more physically mature than boys and many will be at the end of puberty
- boys are still maturing physically
- increasing self-consciousness about body size and weight will be continuing especially for girls.
- Teens are developing their personality and their unique view points on life
- A part-time job may give a teen independence and pocket money
- Teens show more interest in the opposite sex at this age and may be in relationship
- conflict with parents will start settling at this stage
- many teens will show more interest in their future
- however, some teens will experience suicidal thoughts along with depression and need to be closely monitored by caregivers
- teens need a lot of respect and listening without judgment
- a teens accomplishments should be celebrated as they secretly do enjoy being acknowledged for their efforts
- create a solution-oriented approach to challenges with teens
- create opportunities for teens to make their own decisions
- always respect a teen's need for privacy
- plan ahead and role play scenarios that might be happening in a teenager's world
- encourage teens to get enough sleep and exercise and to eat healthy, balanced meals
- Talk with your teen about the dangers of driving and how to be safe on the road. You can steer your teen in the right direction.

"Parents Are the Key" has steps that can help. Motor vehicle crashes are the leading cause of death from unintentional injury among teens, yet few teens take measures to reduce their risk of injury.

- Remind your teen to wear a helmet when riding a bike, motorcycle, or all-terrain vehicle. Unintentional injuries resulting from participation in sports and other activities are common.
- Talk with teens about suicide and pay attention to warning signs. Suicide is the third leading cause of death among youth 15 through 24 years of age.
- Talk with your teen about the dangers of drugs, drinking, smoking, and risky sexual activity. Ask him what he knows and thinks about these issues, and share your feelings with him. Listen to what he says and answer his questions honestly and directly.
- Discuss with your teen the importance of choosing friends who do not act in dangerous or unhealthy ways.
- Know where your teen is and whether a responsible adult is present. Make plans with her for when she will call you, where you can find her, and what time you expect her home
- 1 hr of physical activity per day is recommended
- a teen who eats meals with the family is more likely to get better grades and less likely to smoke, drink, or use drugs, and also less likely to get into fights, think about suicide, or engage in sexual activity.
- **Yoga Safety Tips for Teens**

(sources:1.<https://www.cdc.gov/ncbddd/childdevelopment/positiveparenting/adolescence.html>

2.<https://www.cdc.gov/ncbddd/childdevelopment/positiveparenting/adolescence2.html>

3. <http://www.livestrong.com/article/301122-muscle-growth-in-teenagers/>)

Summary of safety considerations of the muscular system

Benefits of yoga to the teen's muscular system

Yoga asana to support the teen's muscular system

Awkwardness and Clumsiness

Physical development is not always a smooth, gradual process. In fact, much change comes in sudden spurts, often leaving your teen awkward, clumsy, and uncoordinated.

Sometimes your child's body will change faster than he can keep up with and he may be uncomfortable about his awkwardness, acne, or excessive sweating.

By giving him unconditional love and helping him find solutions when he asks, you will be equipping him with helpful tools to pass through this challenging teen development phase.

Self-Consciousness

Your teen may often overreact or feel as if her every move is being watched and judged. Drama can be expected, and don't be surprised to hear, "You will never understand" or "I wish you would just trust me."

She believes her feelings are unique and she is the only one who has ever experienced such misery.

Commitments are intense but often don't last very long

Your teen may also take a sudden interest in being involved with multiple groups or activities.

However, her interests may change regularly. Today, she may love being in the school play, but next week she may say that she can't wait until she is finished with acting so she can take karate classes.

While you may interpret this as a lack of commitment or "flighty", it is actually her way of discovering her skills and figuring out what she is good at.

You may want to encourage her to stick with something long enough to get an accurate idea of what she likes - or doesn't like - but don't force long term commitments, as this may discourage her from branching out and trying new things.

An important part of teen development and adolescence is exploring career options as your teen begins think about his goals and future.

Encourage him to consider all possibilities, and provide him with opportunities to talk with people in various occupations.

Independence and Autonomy

Growing towards being autonomous

Again, your teen is not always being rebellious, but simply trying to figure out what contribution he makes within a relationship.

To engage in healthy relationships, an individual must be able to function as an independent and separate person. That means that he can make his own decisions without the emotional dependence on others, and knows who he is despite changing circumstances and situations.

Identity formation leads to autonomy, and autonomy is necessary for mutually rewarding relationships.

The need for privacy

And, as every parent of a teen knows - privacy is important!

Your adolescent might enjoy journaling because this helps her think about her feelings and evaluate her social relationships, but she will hide her diary in a secret location and will be mortified if you discover it.

She may lock herself in her room and be evasive about her activities. For example, if you ask her where she is going, she may respond with a simple, "Out".

If you ask her with whom, she may say "no one" or "just some friends".

Unless you notice depression, erratic behavior, or a sudden drop in grades, this is probably nothing to worry about. Just because she doesn't want to tell you where she is going, doesn't mean that she is planning on doing something dangerous.

She will be more forthcoming as she realizes that you are willing to let her have some control over her choices.

Regarding emotional development, Jonathan Bradley and Helene Dubinsky of the Tavistock Clinic state:

- "Teenagers may feel that they have to break away from their family. Fierce battles develop as they complain that all that has been received to date is inadequate and needs to be rejected. This is a time of conflicts, grievances, and the settling of scores. They often complain bitterly that parents, teachers, and all other

authority figures are stopping them from growing up, from asserting their individuality or newly acquired power and still trying to dominate their lives. As when they were children, teenagers feel a deep suspicion that adults not only have the monopoly of power and sexuality, but conspire to keep teenagers out of it" (*Understanding Your 15-17 Year-Old*, page 12).

According to Bradley and Dubinski, your adolescent might become argumentative, hostile, and even withdrawn. He may want to spend a lot of time alone in his room, and will often use phrases such as "Get off my back" or "It's *my* life." Friends will be more important, and as a parent, you may find it difficult when your teen listens to the advice of peers while disregarding your own. However, it is important that your teen develop friendships outside the family because it is these relationships that help him form a sense of identity in an adult world.

But, don't worry, he hasn't forgotten your input and influence. In fact, even though he seems to prefer his friends, he will often defer to your values and still depend on your encouragement and support.

Bradley and Dubinski go on to say that as parents, you:

"[Will] be faced with the difficult and often painful task of having to relinquish a degree of control to allow adolescents this new freedom. It may feel painful to let go at this age for various reasons. Parents may rightly feel that because of immaturity, their teenager is not ready to take on greater freedom and make good use of it. It can also be very painful to be faced with an adolescent for whom you are no longer the center of the world, and for whom friends and their particular way of life are becoming increasingly influential. In such circumstances, when experiencing teenagers' tendency to turn away and throw themselves into their new world, many parents find it difficult to remember how much their children still need their concern and understanding" (*Understanding Your 15-17 Year-Old*, page 38).

Intimacy

Close friendships are typically the first opportunity your teen will have to learn how to build open, honest relationships outside the security and acceptance of family.

A child raised in a healthy home will have received unconditional love and acceptance, but it doesn't take very many social interactions for him to learn that not everyone in his life will be so accepting.

Teens struggle with appearance and body image because they

believe that this is a condition for acceptance within a group. They may equate sex with intimacy because they think that physical actions will lead to an emotional connection. Throughout the teen development years, your child will learn how to function within a relationship and how to develop intimacy on a friendship level. If this is achieved successfully, he will then know how to translate these skills into a romantic relationship.

Parenting Tips Regarding Teens

The teenage development stage is the last phase before adulthood and it is filled with many changes that prepare your adolescent for self-sufficiency and independent functioning within the world outside the family.

As he learns to step away from the security and safety of the home, he will begin to build relationships, discover his identity, and find his place within society. This is a big task for anyone, but when physical changes and emerging sexuality are added to new expectations of maturity and higher thinking, it can be very overwhelming to a young teen. Yes, he needs freedom and the opportunities to develop autonomy, but he will also need you - his parents. Despite what he says, no one ever outgrows the need for unconditional love and acceptance. However, with the teen years comes a re-evaluation of these ideas. Your child will now question what he believes and want to know "why" he holds these ideologies, rather than simply accepting them. He may diverge, even if only temporarily, from accepted family principles and experiment with different spiritual or social ideas.

Be on the Lookout for a Good Adult Mentor for Your Teen

As your teen moves through all the teen development changes, be prepared for her to seek the advice of others rather than your own. Remember, she might not think you can ever understand, and she can't imagine that you were once her age, so your experiences might be considered relevant.

So if you can think someone that has a good connection with your ten and is someone you trust, see if you can't get the two of them together somehow.

Try to not Appear Better Knowing (Even Though You May Be)
 Instead of saying, "You need to do this" or "This is best for you", try something like, "This is what your sister found worked for her" or "Why don't you talk to your older brother and ask his opinion?"

Making decisions and understanding the consequences of choices is an important step in the mental development of hypothetical deductive reasoning.

To help your teen, allow him to be part of the process. You have raised him to be responsible, so let him have some say, listen to him.

If he makes a logical argument with realistic expectations, why not let him have a say?

Be Emotionally Available for Your Teen

Finally, be available for your teen.

Much of the time he may push you away, disregard your opinion, or prefer the advice of friends; but don't let the apparent "I don't care about you" attitude fool you.

When it comes to important matters, he will likely seek you out for clarity and balance. Be honest with him, even if you don't want to be.

For example, it is not necessarily a bad thing to admit that you experimented with drugs as a teen. It doesn't mean that he is going to take this as permission. In fact, by sharing your experiences, he may actually decide against giving into peer pressure.

The Respiratory System

Issues affecting teens involving the respiratory system may include

Asthma

Asthma is a long-term, inflammatory lung disease that causes airways to tighten and narrow when a person with the condition comes into contact with irritants such as cigarette smoke, dust, or pet dander. It is one of the number one reasons for teen absences from school and will cause an audible wheeze.

Bronchitis

Most teens have grown out of suffering from bouts of bronchitis but they may still experience this if they smoke. In bronchitis, the bronchial tubes are inflamed creating a productive cough, which serves as a mechanism for clearing the phlegm from the lungs. If a student is suffering from a persistent, moist sounding cough in your class, be wary of the possibility of it being infective and ensure you have cleaned their mat and any equipment used. Encourage students to place their hands over their mouth when coughing and to wash their hands before and after class (if feasible).

Common cold

Colds are caused by a myriad of different viruses that cause

inflammation in the upper respiratory tract. The common cold is the most common issue that will affect the teen's respiratory system. Symptoms may include a mild fever, cough, headache, runny nose, sneezing, and sore throat.

A teen suffering from a high level of symptoms from a common cold should be instructed to stay away from class as they are most likely contagious.

Cough

A cough suggests that an illness is present and is not an illness in and of itself. It is a symptom of an illness, not an illness itself. The most common causes of cough affecting kids and teens are the common cold, asthma, sinusitis, seasonal allergies, and pneumonia.

Occasionally a cough will be a symptom of a more serious illness.

Cystic fibrosis (CF)

CF causes mucus in the body to be abnormally thick and sticky. The mucus can clog the airways in the lungs and regular chest physiotherapy is required to clear the lungs. Cystic fibrosis is non-contagious and is diagnosed in early childhood. It is a genetic condition.

Pneumonia

Pneumonia is an inflammation of the lungs due to bacteria or virus. It causes fever and inflammation of lung tissue, which makes breathing difficult. It requires investigation by a GP and may also require antibiotics. A teen suffering from pneumonia will need to take time off school and bed rest is recommended.

Yoga safety tips

Be careful when using essential oils and/or incense. Not all students will be able to tolerate these substances through their lungs and may even be allergic to them. If you are choosing to burn aromatherapy oils, make sure you invest in a good quality diffuser and high quality oils.

Although some respiratory diseases like asthma or cystic fibrosis can't be prevented, teens can prevent many chronic lung and respiratory illnesses by avoiding smoking, staying away from pollutants and irritants, washing hands and yoga mats to avoid cross infection, and getting regular medical checkups.

Keep an eye out for signs and symptoms of respiratory distress, which include shortness of breath and wheezing. Always allow students to rest when needed.

Keep the air warm when conducting a yoga class. Be aware of the

effects of dust, mites and cold air, which may trigger an adverse respiratory response.

Benefits of yoga for the respiratory system

Yoga pranayama to support the respiratory system

The Cardiovascular System

For children ages 6 to 15, the normal resting heart rate is between 70 and 100 bpm, according to the AHA (American Heart Association). For adults 18 and older, a normal resting heart rate is between 60 and **100 beats per minute** (bpm), depending on the person's physical condition and age.

The heart is a muscle. Just like strengthening other muscles by doing exercise, it is possible to strengthen the heart with movement and exercise such as asana.

Heart rate, also known as pulse, is the number of times a person's heart beats per minute. A normal heart rate depends on the individual, age, body size, pre-existing heart conditions, whether the person is sitting or moving and even whether there is high pressure conditions in the weather. Emotions can effect heart rate, especially if high excitement or anxiety places the nervous system in the fight or flight response. Getting fitter lowers the heart rate overall, by strengthening heart muscles and supporting them to work more efficiently. Athletes and people who are very fit can have resting heat rate as low as 40 bpm.

Fun Yoga Activity: 1. Measure resting heart rate before asana

A fun way to get teens to work at their optimum pace in a yoga class (especially when you're offering vinyasa based practices) is to get the students to measure their resting heart rate and to calculate their optimum exercise capacity. Resting heart rate is the pulse rate in relaxed sitting or lying. Optimum exercise capacity is the more desirable target heart rate to work at to optimize well-being.

While still at rest, before the asana component of your class starts, measure the heart rate on the wrists or one side of the neck. For an accurate reading, put two fingers over one of these areas and count the number of beats in 60 seconds.

You can also do this for 15 seconds and multiply the number by 4 to get bpm (beats per minute).



image: checking the carotid artery for heart rate: place a very light pressure on the side of the neck just under the jaw



image: checking the heart rate at the wrist. Use your index finger and middle finger to gently check at the proximal wrist crease on the thumb side of the wrist.

2. calculate maximum and target heart rate

Most commonly, maximum heart rate is calculate by subtracting a teen's age from 220:

- $220 - \text{Age}$. For a 15-year-old, for example: $220 - 15 = 205$.

The target zone for a 15-year-old person would be between 50 and 85 percent of his or her maximum heart rate:

- 50 percent level: $205 \times 0.50 = 102$ bpm
- 85 percent level: $205 \times 0.85 = 174$ bpm

Ask teens to take their heart rate following a vinyasa work-out to see if they are working at their optimal heart rate.

Many yoga classes will work the cardiovascular system below optimal heart rate, which is totally fine as there are many other health benefits being gained from yoga. However, experts agree that aiming to work out for 30 minutes several times per week at the optimal heart rate can be beneficial to the heart. You can instruct students so that they are aware – and this prescription supports management of depression, anxiety and weight loss so it's a good one to instruct for students who may need more specified prescription.

Blood pressure

Summary of safety considerations of the cardiovascular system

A consistent heart rate in the upper levels (90-100+ bpm) can put too much stress on the heart and other organs over time. If a teen has a high heart rate at rest and is experiencing other symptoms like shortness of breath or chest pain, it is worth sending them to see their GP.

Keeping an eye on heart rate during classes, especially if you are teaching vinyasa or higher-paced asana, can help know whether you are pushing too much (or not enough).

Research has shown that when people exercise at their target heart rate, they gain the most benefits and improve their heart's health, strength and well-being of the cardiovascular system.

Benefits of yoga for the cardiovascular system

Research published in the *European Journal of Preventive Cardiology* suggests that yoga may help protect against heart disease. The research was led by Professor Myriam Hunink, of Erasmus University Medical Center in Rotterdam and Harvard School of Public Health in Boston. It was a review of 37 randomized studies involving 2,768 participants.

The research found that yoga is linked to the reduction of several key risk factors for heart disease, including lower body mass index (BMI), weight loss, improved cholesterol levels, lower blood pressure, and reduced heart rate. Researchers also found that when it came to these improved risk factors, there was no significant difference between yoga and other forms of exercise.

Yoga asana to support the cardiovascular system

Inversions:

(sources for the cardiovascular system:

1. <https://www.livescience.com/42081-normal-heart-rate.html>
2. <https://yogainternational.com/article/view/new-study-highlights-yogas-cardiovascular-benefits>
3. <http://journals.sagepub.com/doi/abs/10.1177/2047487314562741>
4. Paula Chu, Rinske A Gotink, Gloria Y Yeh, Sue J Goldie, MG Myriam Hunink (2014). *The effectiveness of yoga in modifying risk factors for cardiovascular disease and metabolic syndrome: A systematic review and meta-analysis of randomized controlled trials*. Erasmus University of Rotterdam. *European Journal of Preventative Cardiology*)

The Endocrine (hormonal) system

When boys and girls reach puberty, an increase in hormone production spurs a rapid growth spurt. The growth spurt accounts for about 20 percent of the full adult height in both sexes.

Girls will typically begin puberty 2-3 years earlier than boys, although there are exceptions. They will develop breasts, begin to grow pubic, underarm, and leg hair, and start their menstrual cycles. They will also experience growth spurts that will mean they are often taller than most boys of the same age.

Boys will develop leg, underarm, chest and facial hair and genitals will grow. Their voices will deepen and they will experience nocturnal emissions (wet dreams). Mid to late teens usually signifies an intense growth spurt as the pituitary gland is activated to stimulate growth.

Girls often become conscious of weight gain associated with puberty. Dieting and obsession with body image becomes increasingly a focus for girls. Many girls develop eating disorders during their teenage years.

As a yoga teacher, you can reinforce healthy messages about body image, encouraging the acceptance of many different body types and pointing out the fact that yoga is a great way to regulate and balance hormones to support a girl's menstrual cycle and also to regulate her weight.

Teens may express readiness to engage in sexual relationships, however, they may not be emotionally ready to deal with the consequences. They'll often attach themselves emotionally to the act of sexual engagement and will find it hard to separate from this, especially girls.

Since they are still learning how to weigh consequences and incorporate logical reasoning, they will sometimes make decisions based on what they think is expected rather than their own personal values and beliefs.

It is wonderful for teens to have someone they can talk to about their sexuality and it can be difficult for parents to broach this subject with their own children. Take care when opening discussions of this nature though, because teens will come from varied backgrounds and there may be cultural and religious sensitivity around this topic. It is best to be open and honest when a teen asks about your opinion on the topic of sexuality and sex.

Summary of safety considerations of the endocrine system when teaching 12-18 year olds

Benefits of yoga to the teen's endocrine system

Yoga asana and tools to support the teen's endocrine system