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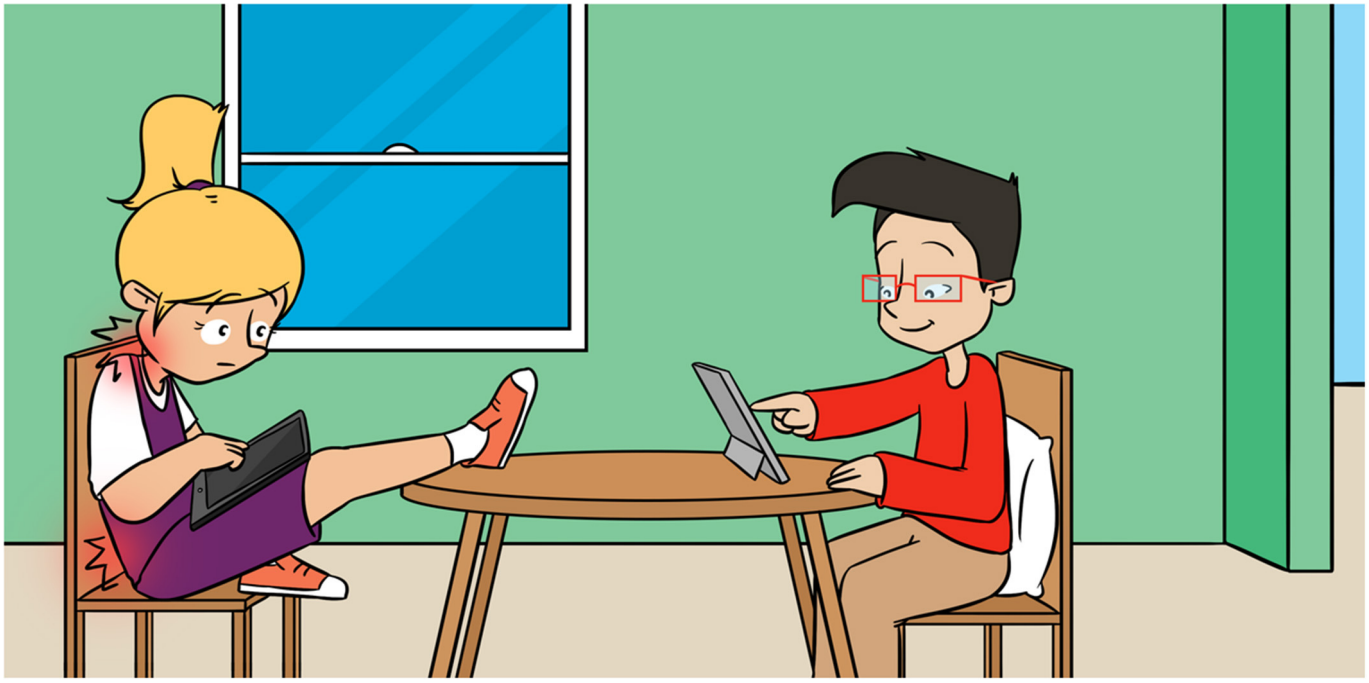

ELECTRONICS: THE ENEMY OF POSTURE AND HOW TO PROTECT YOURSELF

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YOUNG REVIEWER:

NOAH

AGE: 9

The way you sit or stand during everyday activities can have a big impact on your health. Poor posture can make certain muscles weak, can cause pain, and can even make it harder to take a deep breath! Maintaining good posture can be difficult, especially while using handheld electronics, such as cell phones and tablets. Many students like you and even adults, spend several hours every day looking down at a screen to read books, play games, or watch movies. Looking down at a screen can put a lot of stress on the neck muscles, which can lead to pain and other health problems in the future. In this article we describe good and poor posture, and we discuss how electronic devices can affect posture. But do not fear! We also provide tips on how to adjust your posture and stay healthy while using your electronics.

WHAT IS POSTURE?

POSTURE

The way your body is positioned at rest or during activity.

ANATOMICAL NEUTRAL

The ideal posture that puts muscles and bones in proper alignment.

Posture is the way you position your body, even while you are reading this article! Whether you are lounging on the couch, lying on your bed, or sitting at a desk, these are all postures. However, some postures are better than others. Better postures are those that line up your bones and muscles in the most balanced way. These balanced postures are called **anatomical neutral**. In an anatomically neutral posture, all the parts of your body are working together, and one part is not working harder than it should. Postures that are anatomically neutral also reduce unnecessary stress on your body. To help improve your posture and even your overall health, there are a few general facts you should know about posture and its effects on your body!

POSTURE AND THE BODY

You have probably heard the adults in your life tell you, "Sit up straight," "Do not slouch," and "Pick your head up!" But why?

MUSCULOSKELETAL SYSTEM

A combination of the bones and muscles of the body working together.

To answer that, let us start by defining the term **musculoskeletal system**. This system is made up of muscles (musculo-) and bones (-skeletal), working together to perform all the movements needed during a day. The musculoskeletal system plays an extremely important role in your posture, and posture affects your musculoskeletal system. Here is how it works: your muscle cells can actually become shorter or longer in response to your long-term postures. For example, take a moment to slouch right now. In your slouched position, you will notice that your shoulders roll forward. This position causes the muscles on the fronts of your shoulders to shorten and the muscles on the backs of your shoulders to lengthen. Also, in your slouched position, your head extends forward. This causes your neck muscles to lengthen in the front and shorten in the back so you can still look forward (Figure 1).

Slouching may not seem like a big deal, but if you use this posture a lot, it can become a big problem! Over time, if poor posture causes your muscles to change length, your shoulders, neck, arms, and hands will not work as efficiently as they should. This happens because muscle cells stop working properly because of the change in muscle length. When the muscle cells are not working correctly, you can also have decreased muscle strength. Then movements become more difficult and require more energy to complete. All these changes can occur because of poor posture.

Your posture can even impact your breathing. The diaphragm, the muscle responsible for breathing, needs lots of room to work correctly. When you slouch, your diaphragm cannot properly expand, and it becomes harder to breathe. As a quick example, try sitting in the most slouched posture you can and take a deep breath. Now, sit up

Figure 1

An anatomically neutral posture is shown on the left. A slouched posture is shown on the right, with rounded shoulders and extended neck, which can lead to muscle length changes (Image credit: Michelle Wang).

Figure 1

very straight and take a deep breath again. You should be able to breathe more deeply and easily when sitting up straight! Although you can fix your slouched posture now, over time it will become more challenging to correct your posture and sit up straight. This is because of the lengthening and shortening of the muscle cells that happens over time.

POSTURE AND ELECTRONIC DEVICES

Now that you understand how a slouched posture can lead to long-term changes in your body, it is important to recognize what types of activities can affect your posture. Think for a moment—when do you find yourself in slouched postures? Chances are these postures happen when you are hunched over a phone, tablet, or laptop. Electronic devices are used for entertainment and now are being used more often for virtual schoolwork. Because electronic devices are so popular, it is important to recognize how these activities influence your posture.

If you are reading this article on a tablet or cell phone, you may notice that your neck is bent forward quite a bit. This usually occurs when the device is placed flat on a table or in your lap, because the only way to still see the screen is to bend your neck forward and look down [1]. This position, called **neck flexion**, causes up to five times more force on your neck muscles compared to sitting with your head upright [1]! This is bad news because it causes a lot of additional stress on your musculoskeletal system.

NECK FLEXION

Forward bend of the head and neck.

If you are reading this article on a laptop, you may have a slouched posture that includes a rounded back. This is probably because your

Figure 2

Electronic devices can contribute to poor posture. Notice how the boy is creating a rounded back and increased neck flexion to look down at a device that is placed too low.

Figure 2

computer screen is too low. If your laptop is too low, you naturally slouch to see the screen better (Figure 2). Slouching is one of the most dangerous postures for young people. It causes a lot of compression on the discs in your spine. These discs are like marshmallows between the bones of the spine, which are called vertebrae. The discs protect the vertebrae from impact. If the discs get too compressed, they cannot properly protect your spine from everyday forces or injuries. As you can see, how electronic devices are used can affect your posture and your whole body.

POSTURE AND PAIN

So, using electronic devices can lead to poor posture. But how does poor posture lead to pain? Remember that poor posture causes muscles to shorten and lengthen in abnormal ways. This change in muscle length can lead to weakness and cause the muscles to not work well. When muscles are not working properly, specialized cells called **nociceptors** can be activated. Nociceptors communicate pain signals between your body and your brain. Nociceptors send pain signals to your brain when your muscles are placed in positions they do not like.

NOCICEPTORS

Cells in the body that detect pain and send pain signals to the brain.

Another way poor posture leads to pain is from wear-and-tear on parts of your body that are not designed to absorb a lot of force. Remember the discs in your back described earlier? When poor posture leads to compression on the discs, the vertebrae in your back absorb more force than normal. This can result in pain. Additionally, the compressed discs may push on nerves near the spine [2]. When discs push on nerves, nociceptors are activated. Research has shown that activation

Figure 3

Improved posture while using a device can increase long-term health. Notice how the boy has used a pillow to support his back and a pillow and tray table to raise the device higher. As a result, there is less strain on his neck and back.

Figure 3

of nociceptors not only sends pain signals to your brain but also influences other areas of your body. When nociceptors are activated, your heart, lungs, and digestive system all become less efficient as well [2]. Overall, reducing the activation of nociceptors is good for your musculoskeletal system and many other parts of your body, too!

WHAT NOW?

The good news is you can reduce nociceptor activation by using an anatomically neutral posture. This will decrease pain and keep your body functioning properly. Improving your posture is not just something you should do when you get older! Teenagers have an increased risk for pain due to poor posture [3]. This means that it is important to pay attention to your posture now!

Why does all of this matter? And what should you do about it? Young people are sometimes unaware that their postures could be doing long-term damage because the short-term effects of poor posture are less noticeable. It is important to remember that your body is always adapting to your posture. If you spend a long time during the day on computers, phones, and tablets, your musculoskeletal system is adapting to this posture. In fact, spending more than 2 h a day on your phone significantly increases the chances that you will have back pain [4]. The good news is preventing the negative effects of poor posture does not require a lot of effort. In fact, making small adjustments throughout your day can improve your posture.

For example, when using an electronic device, try to place it on a desk in front of you or use a case that props the device up higher, instead of looking down at the device in your lap [5] (Figure 3). Another suggestion is to hold your phone up just a little higher and further away from your body when texting or scrolling. This will help protect your body and decrease strain on your neck. If you are sitting, try using a few pillows for back support, to keep your back straight instead of

slouching. By making these changes, you will help to decrease your chances of developing pain and other health problems [6]. Lastly, take some time away from your device and get your body moving! Take a walk or play a game with friends or family. This gives your body a break and decreases the prolonged stress on your body from a slouched posture. Remember, small adjustments every day can help you live a healthier life with less pain! So, try one of these tips to put your muscles and bones in a better posture and keep learning!

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REFERENCES

1. Douglas, E. C., and Gallagher, K. M. 2018. A radiographic investigation of cervical spine kinematics when reading a tablet in a reclined trunk position. *Appl. Ergon.* 70:104–9. doi: 10.1016/j.apergo.2018.02.020
2. Weston, P., Le, P., and Marras, W. 2017. A biomechanical and physiological study of office seat and tablet device interaction. *Appl. Ergon.* 62:83–93. doi: 10.1016/j.apergo.2017.02.013
3. Gustafsson, E., Thomee, S., Grimby-Ekman, A., and Hagberg, M. 2017. Texting on mobile phones and musculoskeletal disorders in young adults: a five-year cohort study. *Appl. Ergon.* 58:208–14. doi: 10.1016/j.apergo.2016.06.012
4. Shan, Z., Deng, G., Li, J., Li, Y., Zhang, Y., and Zhao, Q. 2013. Correlational analysis of neck/shoulder pain and low back pain with the use of digital products, physical activity and psychological status among adolescents in Shanghai. *PLoS ONE* 8:e78109. doi: 10.1371/journal.pone.0078109
5. Vasavada, A. N., Nevins, D. D., Monda, S. M., Hughes, E., and Lin, D. C. 2015. Gravitational demand on the neck musculature during tablet computer use. *Appl. Ergon.* 58:990–1004. doi: 10.1080/00140139.2015.1005166
6. Lee, S. P., Hsu, Y. T., Bair, B., Toberman, M., and Chien, L. C. 2018. Gender and posture are significant risk factors to musculoskeletal symptoms during touchscreen tablet computer use. *J. Phys. Ther. Sci.* 30:855–61. doi: 10.1589/jpts.30.855

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YOUNG REVIEWER

NOAH, AGE: 9

I am a 9 year old kid named Noah. I like to code and read during my free time, and can type at over 40 words per minute. I like to play the piano, and know two guitar chords. My favorite song to play is "Turkish March," by Ludwig van Beethoven. When I grow up, I would like to become a teacher.

AUTHORS

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Erica is a student physical therapist at the University of Wisconsin–Milwaukee. She loves adventure and the outdoors. Her goal is to become a traveling physical therapist so she can explore the world while helping kids and adults improve their physical movement and manage their pain. Erica is especially interested in how the brain and nervous system play a role in people with chronic pain. She wants to be a physical therapist who advocates for and empowers people living with chronic pain. In her free time, Erica loves doing yoga by the beach, reading in her hammock, and longboarding! *alwaysinspired02@gmail.com

EMILY KATHERYN BROWN

Emily is a student physical therapist and avid animal lover. She completed her college degree at Penn State University and currently attends University of Wisconsin–Milwaukee where she is completing her Doctor of Physical Therapy. Her dream job is one in which she can incorporate her love of animals into physical therapy practice to help kids and adults get back to living healthier and happier lives! In her spare time, Emily enjoys taking her dog on bike rides and outdoor hikes and training her to do tricks. She also enjoys playing with her two cats and traveling.

CHRISTINE RUMINSKI

Christine is a student physical therapist at the University of Wisconsin–Milwaukee. She loves learning about the human body and how it works. Her goal as a physical therapist is to help people learn to walk and get back their independence after severe injuries. Outside of school, Christine enjoys playing soccer and playing the piano. She

became a youth soccer coach in 2018 so that she could teach a new generation of players to play the game she loved so much growing up.

TAMARA BETH MILLER

Tamara's first degree was in Physical Therapy and over the years she got to treat a lot of patients with many different types of conditions. Tamara returned to school to learn more, because she found that the more patients she saw, the more questions she had. In her continued education she learned more about human movement (kinesiology) and conducting research. Now she gets to use her education in the best job ever, as she mentors Physical Therapy students in their own research!