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Is technology affecting our health?

Smart devices can make our professional and personal lives easier and more enjoyable, but along with the positives may come some downsides.

By Kathryn Murphy, DNSc, NP

Technology is everywhere. You can't travel on a plane, walk down the street, or visit with family without technology being there in some form. We have devices for communicating, listening to music, and reading. Some of us have smart homes that respond to our commands. Many of us have video game systems, healthcare apps, and digital learning tools. Almost every aspect of life now has technology associated with it.

People are often so engrossed with this technology that they forget to live in the real world, not the virtual world. Social media sites alone are an increasing presence. Eighty-seven percent of millennials state that their smartphone never leaves their side, with 80% checking their smartphone first thing in the morning and 88% using the camera on their smartphone weekly.

The use of technology can affect both our physical and mental health. Some of these effects are transient, whereas others may be permanent. On the positive side, technology can assist with learning, help people with disabilities, and make daily work tasks and chores more efficient (see *Nurses' exposure to technology in the work setting*). Generally, more research is needed to thoroughly assess the positive and negative effects of technology on health.

Because nurses are often patients' first contact in the healthcare arena, we can be pivotal in assessing the effects of technology on a person's health as part of our health assessment. Along with assessment, we must also educate our patients on the importance of balance when using technology.

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Physical health effects

Physically, individuals are at risk for a sedentary lifestyle and may experience sleep problems, eyestrain, hearing loss, neck/back strain, and "text thumb."

Sedentary lifestyle

Technology can make our lives more efficient, but it can also encourage a sedentary lifestyle. A person who works at a computer all day and then goes home to use some form of technology for entertainment is especially at risk. The longer a person sits in front of a TV or video game, the more likely he or she will die at a younger age. Walking, running, swimming, or games that involve the body such as volleyball and tennis can help balance the negative effects of extended technology use. However, even when sedentary, one study demonstrated that fidgeting can counteract some of the adverse effects of prolonged sitting. In fact, there was no increased risk of mortality with the use of technology if one fidgets while sitting.

In our role as educators, we can encourage our patients to move often while sitting by bending over, moving their legs and arms, or working in a standing position. Also recommend that for each hour of technology use, your patient takes 1 hour to do an alternative activity.

Nurses' exposure to technology in the work setting

It isn't just our patients who are at risk for the adverse effects of technology overuse; nurses are exposed to a variety of smart devices in the workplace and noise can reach dangerous levels.

For example, hospitals are increasingly utilizing virtual remote assessments via video feed to interact with the patient and healthcare team. And clinical nurses are often provided with a cellular-link device that pages their phone directly when a patient pushes the call light.

To avoid distractions that may negatively affect patient safety, stay away from using personal cellular or other devices during work hours. If noise is a problem at your facility, exposure can be monitored by implementing a noise stoplight, which signals green when the decibel level is low and red when it's too high.

Sleep problems

Electronic book readers have light-emitting diodes that transmit blue wavelength light. Prolonged exposure to blue lights can cause eyestrain and fatigue. It can also interfere with sleep patterns. Studies have shown that exposure to blue light can suppress levels of melatonin, a hormone that promotes sleep and allows for increased alertness the following morning. Exposure to blue light also reduces the amount of rapid eye movement (REM) sleep, the form of sleep in which dreams occur. REM sleep aids memory consolidation and transmissions between neuronal networks in the brain, allowing the brain to function more effectively.

Sleep deprivation can also be caused by the anxiety created about missing a call or text, staying up later to use devices, and interruptions in sleep due to calls and texts. To counteract these effects, teach your patients about proper sleep hygiene, including limiting the use of light-emitting devices or smartphones close to bedtime.

Vision problems

Close computer work can cause dry eyes, light sensitivity, double vision, fatigue, and headaches. Additionally, handheld devices demand that users position themselves close to the equipment. This can result in increased use of eye muscles to focus, which leads to more strain. According to a survey conducted by the Vision Council, 70% of adults have experienced some symptoms of eyestrain from digital device usage, including using small cellphone screens to watch videos and movies. Blue wavelength light can penetrate deep into the eye and damage retinal cells. This accumulative damage may contribute to macular degeneration. It's particularly important to balance the use of technology in children to decrease the risk of nearsightedness.

On the other hand, technology is being developed to correct vision problems. Engineers have created a prototype tablet display that can compensate for a person's

vision loss. A team of researchers from the University of California at Berkeley and the Massachusetts Institute of Technology have developed an algorithm that adjusts the intensity of light from single computer pixels based on the user's specific visual impediment. This research is in the early stages and may be useful for patients with unusual vision alterations.

Teach your patients how to decrease eyestrain, such as using the 20-20-20 rule. Take a 20 second break every 20 minutes and look at something 20 feet away. Encourage patients to change the background color of their devices from bright white to cool gray. They should adjust the screen so that it's directly in front of their face and slightly below eye level, and position their body so that there's sufficient distance from their eyes to the screen (about one arm's length away). Finally, they should blink more often to lubricate their eyes.

Hearing problems

Teenagers and young adults are most at risk for hearing loss from the use of earbuds or headphones in conjunction with personal audio devices. Studies indicate that almost 50% of individuals age 12 to 25 are exposed to unsafe levels of sound while using personal audio devices. According to the World Health Organization (WHO), unsafe sound levels can occur with an exposure to an excess of 85 decibels for 8 hours or 100 decibels for 15 minutes. The WHO recommends that the highest level of noise exposure in a workplace is 85 decibels for up to a maximum of 8 hours. So if a person finishes work and then goes home and listens to a personal audio device, he or she may unknowingly move into unsafe levels. Today, there are smartphone apps to assist with monitoring safe listening levels and adjusting use accordingly.

Ask your patients about occupational exposure to noise. Teach them to prevent hearing loss by limiting the amount of time they use personal audio devices, keeping the volume down on the device, and using noise cancelling earbuds or headphones.

Teach your patients to take a 20 second break every 20 minutes and look at something 20 feet away.

Neck/back strain

The use of smartphones, computers, tablets, and other devices can contribute to severe neck strain. When a person's neck bends forward and down, the weight on the cervical spine is increased. The effect is like hyperextending a finger and holding it there for an hour. As the tissue stretches for a long period of time, it can get inflamed and damage may occur. Neck strain can also contribute to headaches and back strain. The use of devices causes our necks to bend more frequently. Overtime, this poor posture can lead to early degeneration of the spine.

Encourage your patients to avoid neck strain by looking down at a smartphone without bending their neck. Also, the use of periodic neck range-of-motion exercises can assist with decreasing strain. Lastly, limiting the amount of time using these devices can help.

Text thumb

The repetitive gripping motions used while texting or video gaming results in constriction of the flexor tendon in the thumb. This can cause painful snapping when the thumb goes through the range of motion. The thumb may also lock in a curled position. Text thumb results in inflammation in the tendons and the synovial sheath that protects it. Repetitive motions can lead to a painful, weakened grip and degeneration, causing permanent tendon damage. Researchers in Turkey found that the more a person texts, the greater the thickness of the tendons, resulting in more pain and weakness of grip.

Other joints may be affected by the prolonged use of technology. Too much time holding a cellphone to the ear, resting elbows on a desk, or keeping arms bent in

an acute angle can contribute to cubital tunnel syndrome or increased tension in the tunnel through which the ulnar nerve passes in the elbow. Symptoms include numbness or tingling in the hand or fingers and soreness of the elbow or forearm.

Teach your patients to change positions frequently, use both hands to limit the burden on one appendage, take time between texts and resting their arms on a table, and incorporate bluetooth technology to decrease time holding a phone to prevent these health problems.

Mental health effects

Mentally, technology can shorten attention spans, contribute to increased anxiety and narcissism, decrease capacity for emotional intelligence, and lessen solitary time.

Memory changes

At the cellular level, the communication networks between nerve cells in the brain change in response to experiences and stimuli. It's the strength and efficiency of these networks that allow the brain to be successful in processing and storing information. The use of screen-based devices can produce changes in nerve cell behavior. Attention spans are shorter, personal communication skills are reduced, and the ability to think abstractly is decreased.

As information expands, attention spans decrease. A study comparing students in Singapore and the United States showed that Singaporean students spent an average of 1 hour trying to solve an advanced math problem, whereas American students spent a total of 34 seconds before giving up on it. The speed of technology may be decreasing the skill of waiting or frustration tolerance when things don't go as planned.

In one UCLA study, experienced web users displayed fundamentally different neural structures in the prefrontal cortex. When Internet use or gaming becomes excessive, studies indicate atrophy in the frontal lobe where executive functions, such as planning, prioritizing, organizing, and impulse control, occur. There may also be damage in the insula—the part of the brain that involves the capacity to develop empathy and compassion for others. And volume loss of gray matter has been seen in the striatum, which is involved in the suppression of socially unacceptable impulses.

In contrast, a 2009 UCLA study demonstrated that engaging in Internet searches actually increase brain activity. Specifically, using the Internet stimulates neuronal circuitry more than reading a book. This may be due to the use of interactive websites.

Multitasking, such as checking e-mails while in a meeting, is common in today's world. Technology can falsely convince a person that multitasking is effective and efficient. Yet, research demonstrates that the opposite is true. Most of the time, the brain can't perform two complex tasks, such as listening to a lecture and texting, at once. Each of these tasks demands the attention of the prefrontal cortex at the same time. This results in less proficiency as the person loses time being distracted and experiences more mental fatigue.

Multitaskers find it more difficult to filter out extraneous information than those who perform one task at a time. They also take longer to juggle problems and switch tasks, and spend more wasted time looking for information. In addition, a person's memory of what's being learned may be impaired

did you know?

Older patients and technology

Pew Research Center data show that the number of older adults using the Internet has grown, with more than half of Americans over age 65 using it on a daily basis. Older people can benefit from the stimulation of neurons that occurs with technology. However, the complexity of technologic devices can cause undue anxiety in some older individuals.

The best way to help your older patients with technology is to teach them basic steps. Sitting down for a one-on-one training session and allowing return demonstrations will increase device operating success and decrease anxiety. Also, positive reinforcement for small accomplishments helps older patients fell less inept and more confident about not only using the device, but asking questions later about other features.

How technology affects health

cheat sheet

- Sedentary lifestyle
- Sleep problems
- Vision problems
- Hearing problems
- Neck/back strain
- Text thumb
- Memory changes
- Emotional instability
- Emotional intelligence changes
- Loss of solitary time

if his or her attention is split and the depth of information processing may be less because of the distraction of multitasking.

This finding is also true in children. However, a recent study found that as attention spans decreased, visual reasoning skills increased. Children raised with technology from an early age were able to understand complex visual images and increase the focus on details in the images. They also developed better hand-eye coordination. In the classroom, technology can assist learning with programs that offer rewards for success, assistive devices for student with disabilities, and web searches to investigate a topic.

Emotional instability

Who we are and how we feel about ourselves is now being tied to social media sites that have continual updates of personal status. The majority of the postings are positive, with emotional contagion dispersing happiness through cyberspace. Yet, some studies have shown that exposure to positive posts can actually produce envy and reduce well-being in some individuals. Whether a social media post elicits a positive or negative response may relate to the actual relationship between the person who posts and the individual who views the post. In other words, close friends in the real world and not just on social media more often view the post as positive. In addition, some people may use the feeling of envy to strive to improve their own life, whereas others may react with low self-esteem.

Recent studies have focused on how prolonged Internet use may actually increase feelings of well-being through the building of social relationships and participating in a virtual community. This is true particularly for shy individuals who are less likely to form social relationships and more apt to conceal information about themselves. These individuals may be less threatened when engaging in virtual relationships. In return, this participation can increase the person's sense of well-being and provide a new forum for interaction.

Teens, in particular, are more sensitive to the approval of others on social media. Cyberbullying is prevalent, with over half of teens either participating in bullying or victims of bullying. Examples of cyberbullying include spreading rumors online, circulating unattractive images of another teen online, texting unkind messages about another teen, and pretending to be someone else online to hurt another teen. Cyberbullying can be very upsetting to an adolescent and may lead to depression, anxiety, and suicide. Crucial to the effect of cyberbullying is the fact that once something is posted online, it never really goes away and can resurface later in a person's life.

Counsel parents on talking to their teens about bullying, having the computer in a central location, and limiting the time their teens spent on social media sites.

Keep in mind that adults aren't immune to cyberbullying either; peers in the work setting may be targets. Employees with knowledge of cyberbullying should alert management to ensure that the work environment remains positive.

Emotional intelligence changes

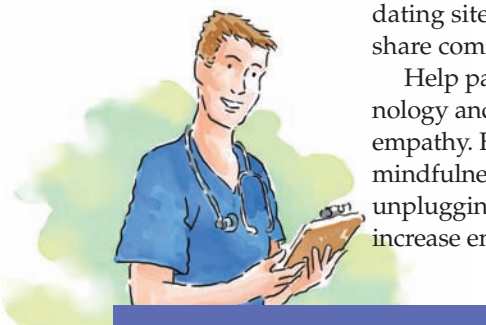
Our increased use of technology may lead to a decrease in emotional intelligence. Empathy levels among college students have decreased by 40% over the last 10 years. As the world presents more options through the Internet, long-term commitment decreases. Just look at how often we change channels on the TV or on our personal audio device to get to a better choice. The Pew Research Center indicates that

millennials prefer digital rather than in-person interaction. Forty percent state that they often substitute texting, video chats, and e-mail for actually meeting up with friends for social interaction. This may decrease the ability to use eye contact, listen to others, and interact face-to-face.

Reality TV, daily social media posts, and personal blogs all focus on an individual and what he or she is doing or saying. This externalization of a person's identity can result in an increase in narcissism—a personality trait associated with self-absorption, egocentrism, overestimation of one's abilities, a sense of entitlement, and a disregard for others. Social media sites promote sharing trivial parts of one's life and gaining attention from this sharing. Moreover, the amount of time spent using social media reduces face-to-face interactions, which assist people to develop essential social skills, such as empathy, compassion, and concern for others.

With technology focused on personal needs and self-expression, there may be less time to form real-time relationships. People can invent who they want to be online rather than present who they really are. On the other hand, social media can assist people to meet in person. Numerous dating sites help people find others who share common values and interests.

Help patients strive for a balance of technology and interpersonal dialogue and empathy. Encourage face-to-face interaction, mindfulness and relaxation practices, and unplugging from technology to help increase emotional intelligence.



Signs of Internet addiction

cheat sheet

- Preoccupation with Internet games or activities
- Withdrawal symptoms when not engaging in Internet activities
- Unsuccessful attempts to stop these activities
- Lying to others about the amount of Internet usage
- Interference with work and/or relationships
- Consistently using the Internet to relieve anxiety

Loss of solitary time

Interaction with technology is creeping into the solitary time we need to decompress and "reboot." Just as we need sleep to rest and process the day's events, we need solitary time to strengthen our inner selves. Having one's self-esteem based on social media makes us more dependent on others for approval. Being connected 24/7 doesn't really allow for alone time and can cause hyperarousal.

Private time allows for reflection and creativity; our muscles relax, energy is stored, food is metabolized, our pupils constrict to reduce stimuli, and our heart rate and BP slow. During this time, the neurotransmitter acetylcholine is released, which increases blood flow and alertness in the prefrontal cortex to help the brain process information more effectively. Not only is alone time important to creativity, it's also crucial to self-esteem and emotions. By allowing time to self-sooth and be alone, we can learn to manage emotions and find solutions within.

Can we get addicted?

When technology use becomes an addiction, there can be both social and cognitive changes that alter the person's life. Engaging in some technologic activities can create an increase in the release of dopamine, a neurotransmitter that helps regulate emotional responses, producing a feeling of enjoyment. When the person stops engaging in the activity, he or she needs another "fix" to get a release of dopamine. For this reason, the person continues to increase the use of the technology to ensure a feeling of pleasure. Research has shown that prolonged Internet use can decrease the number of dopamine transporters, which results in more available dopamine, thus increasing euphoria.

Although Internet addiction isn't a formal psychiatric diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders, 5th edition*, it's listed as a condition for further research to possibly be included in the next version of the manual. Symptoms of Internet

Technology use screening

Ask your patients the following questions:

- How many hours a day do you use a computer, TV, smartphone, tablet, or video game system?
- Have you lost sleep from using your device(s)?
- How often do you have neck pain or tightness after using technology?
- How often do you have thumb pain after using technology?
- How often do you experience dry eyes or eye strain after using technology?
- Have you felt sad when using or after using social media sites?

addiction include a preoccupation with Internet games or activities, withdrawal symptoms when not engaging in these activities, attempts to stop engaging in these activities, lying to others about the amount of Internet usage, interference with a person's activities of daily life such as work or relationships, and using the activities to relieve anxiety. One study found that social anxiety increases when individuals are addicted to the Internet. Most of these symptoms also occur with other addictive disorders; treatment for Internet addiction may include those that are therapeutic for other addictions.

Assess your patients for signs of distress or risk of Internet addiction (see *Technology use screening*). Establishing contacts for crisis intervention and treatment are important if a problem is found.

Keeping our eyes on it

As nurses, we play an important role in assessment and intervention. With the increasing use of technology, it's important to incorporate the patient's use of technology in the health assessment. First, finding out how much technology influences a patient's life can help you assist him or her to achieve a more balanced, healthy lifestyle. Include questions about what devices are utilized, how often they're used, and the effect on the patient's everyday life. If you note either physical or psychological symptoms, plan for education or intervention as needed. Through assessment and education, we can help ensure that our patients strike a balance between technology use and time spent engaging in other activities. ■

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