



WIRELESS DEVICES MAY CAUSE HARM

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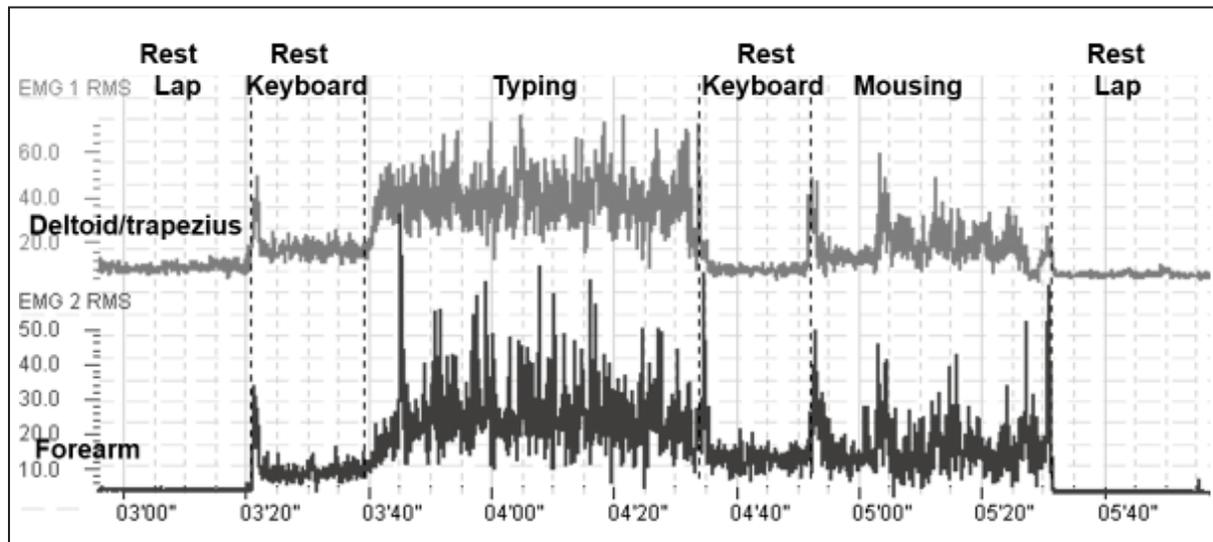


Figure 1: Muscle tension of the neck and shoulders when the person is typing or mousing. Usually the person is totally unaware of this tension. The muscle tension even occurs when the hands are just resting on the keyboard (Peper, Harvey, & Tylova, 2006).

Tension at work

Many employees unknowingly tighten their shoulders while working at their computer, laptop or tablet and biofeedback is a powerful tool to teach a person to relax their muscles and/or optimize ergonomic positions. The muscle biofeedback makes the invisible visible and most employees are totally surprised when they see their own covert muscle tension. An example of this covert tension while working at the computer is shown in figure 1.

While recording muscle tension, we sometimes observe much larger electrical signals that were not the actual signals produced by the contracting muscles but artifacts. These signals are produced by the client's mobile phone or other wireless devices. When we initially observed this artifact, we wondered if it could be a health risk; since this signal can be many times larger than the biological muscle activity (electromyography as shown in figure 1) as shown in Figure 2. This signal was caused by the microwaves radiating from the cell phone antenna as it communicated to the nearby cell phone tower. As long as the cell phone and the wireless devices are being used for talking, texting, streaming data, or audio and visual media, they are communicating with the tower. In addition, most cell phones, connect every 900 milliseconds to the tower to report its location.

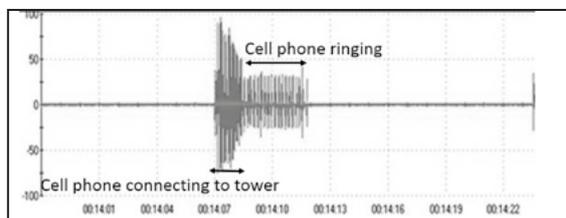


Figure 2: Electrical signal recorded from the EMG sensors placed on the person when the cell phone was located 1 cm from sensors.

Microwaves

Exposed by microwave radiation at 1 watt of power output from the antenna while talking is not the same as being blasted for two minutes by 1000 watts necessary to bring a cup of water to boil in a microwave. But most of us have had the experience of feeling the heat of your mobile phone against your ear or the warmth of the laptop against your stomach and thighs, although most of this heat is caused by the battery. We are now tend to be connected 24/7 and often keep cell phones and other wireless devices on our body. Men stash it in their pant pockets or on their belt with a holster, while women sometimes store it in their bra.

We use smartphones and tablets as a communication device for texting, talking, updating our social networks, searching the

web, and as an alarm clock next to our head while sleeping. Smart phones and tablets have become omnipresent in our world. They are used in classes, while waiting for appointments (the stack of dated magazines have become irrelevant), and they are the last thing we check before going to sleep.

In our 2012 survey, university students used mobile phones and tablets/i-Pads for at least 118 minutes a day, of which 40 minutes occurred just before going to sleep. This meant that they spent 19.7 days a year texting/talking on their smartphones (Waderick et al, 2013) as shown in figure 3

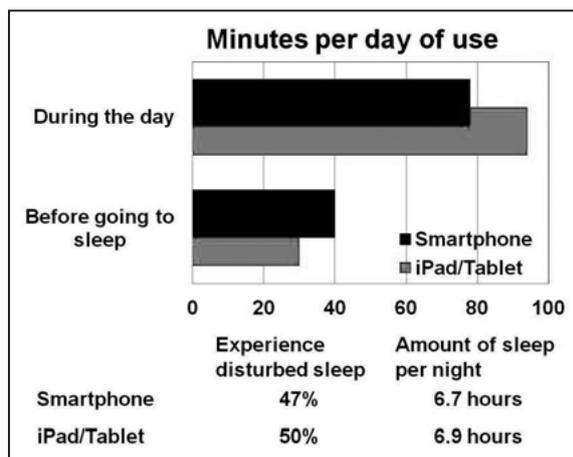


Figure 3: Minutes of smart phone and tablet use by students and the percentage of disturbed sleep and hours of sleep (from: Waderich et al., 2013).

Recognizing Risk

In less than 20 years, we can no longer imagine a life without these wireless devices and go into a panic when they are missing. We have accepted the new technology and assumed that it is safe. Yet, could this be similar to the early cigarette debates in the tobacco industry? Or the discovery that X rays were dangerous for pregnant women? Or how we were accepting asbestos in our lives? We now know better. When radar was initially developed in World War II, some sailors on ships in the North Atlantic

Ocean warmed themselves by momentarily standing in front of the radar beam. While they did get warmer, they also became sterile for a period of time since heating the testicles with radar reduced sperm production. Could a similar effect occur by the heat and/or microwaves emitted from a laptop, a tablet or cell phone against the abdomen or lap? The microwaves we use for cooking is covered by a metal case, to prevent danger to our body.

Research findings over the last twenty years have often been ambiguous, although indicating that there is a risk (Davis, 2010; Corle et al, 2012). A neutral perspective is reported by the International Agency for Research into Cancer (IARC), which is part of the World Health Organization World Health Organization (WHO). As of 2011, the WHO has classified mobile phones (and any wireless device that uses microwaves to communicate) as a 'Group 2b' risk, which means that they are "possibly carcinogenic to humans" and there is "limited evidence" that something causes cancer in people, and even the evidence from animal studies is "less than sufficient".

2B or not 2B

Research studies report that adults who have used mobile phones intensively for at least ten years, experience an increase in brain cancer (glioma and acoustic neuroma), salivary gland cancer, and even rare eye cancers on the side of the head where the cell phone was predominantly held (Schüz et al, 2006; Corle et al, 2012). Some men diagnosed with testicular cancer had the cancer occur in the testicle that was closest to the pant pocket where they stashed their cell phone (Davis, 2013). More recently, some women who have habitually stashed their cell phone in their bra have been diagnosed with a rare breast cancer located beneath the area of the breast where they stored their cell phone. Watch the heart-breaking TV interview with Tiffany. She was 21 years old when she developed breast cancer which



Figure 4: School party. Texting is a part of the party experience.



Figure 5: Family time while waiting for an airplane. Each family member is captured by their device.

was located right beneath the breast where she had kept her cell phone against her bare skin for the last 6 years. (<http://www.youtube.com/watch?v=1FA4Mhc30Ug>)

While these rare cases could have occurred by chance, they could also be an early indicator of risk. Most research studies were based upon older adults who have tended to use their mobile phone much less than most young people today. About 25% of the eight year old children have cellphones in the Netherlands (Altijd binnen bereik, 2009). At the age of 12 almost all children has a cellphone, as they need the app's for their school information, homework and social live. As shown in figure 4 and 5.

The higher the education of their parents, the more infants and toddlers are entertained by smartphones and tablets – the new technological babysitter. The possible risk may be much

greater for young people since their bodies and brains are still growing rapidly. Research has already indicated that students who use text before going to sleep have more disturbed sleep (Munezawa, et al, 2011).

Instead of waiting for twenty or thirty years to find out definitively whether the antenna radiation is, or is not, harmful, you should rather adapt the precautionary principle and reduce your and your children's exposure. The simplest strategy is to keep the devices away from your body. The further the device is away from the body, the less power of the antenna signal reaches you, as shown in figure 6.

Why take the risk!

Act now and reduce the exposure to the antenna radiation by implementing the following suggestions (some of these suggesting are even part of the consumer directions of your device):

- Keep your phone, tablet or laptop in your purse, backpack or attaché case. Do not keep it on or close to your body.
- Use the speaker phone or plug-in earphones with microphone while talking. Do not hold it against the side of your head, close to your breast or on your lap. (The unread instruction manual for the cell phones does state that the phone should be held at least 2 cm away from the head).
- Text while the phone is on a book or on a table away from your body.
- Put the tablet and laptop on a table and away from your lap/genitals.
- Turn the Wi-Fi or 3 G off during the night or when not necessary.
- Be old fashioned and use a cable to connect to your home router instead of relying on the Wi-Fi connection.

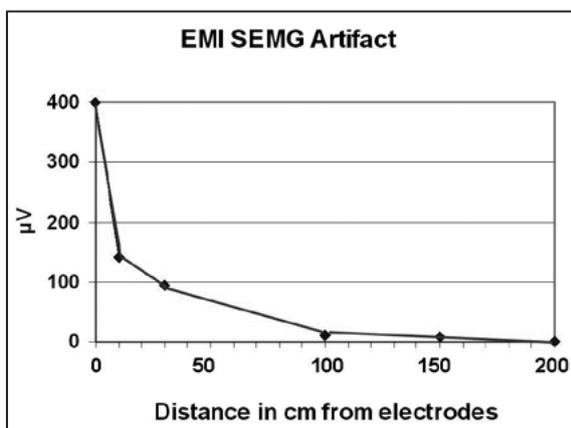


Figure 6: Decrease in amplitude of microwave emission as recorded from the skin as a function of distance (from: Lin, I.M. & Peper, E., 2009).

- Keep your calls short and enjoy the people in person.
- Support legislation to label wireless devices with a legible statement of possible risk and the specific absorption rate (SAR) value. Generally, higher the SAR value, the higher the exposure to antenna radiation.

More information

For more information see the book, *Disconnect - The Truth about cell phone radiation, What the industry is doing to hide it, and How to protect your family*, by the epidemiologist, Devra Davis, Ph.D. In the Netherlands, Zembla (2012) has made a controversial TV documentation, *Ziek van je mobieltje*, about the risks of cellphones (Link for this TV program: <http://www.uitzendinggemist.nl/afleveringen/1261572>).

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