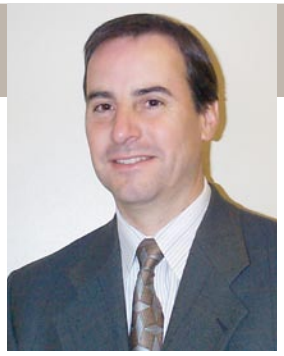
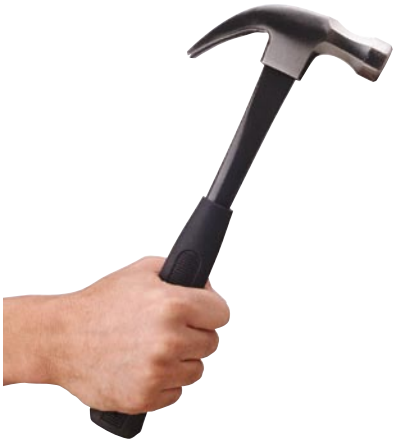
Grasping the Importance of Our Hands



by Douglas G. Smith, MD

"The art of life is to show your hand."
– E.V. Lucas, English author and critic

Our hands do so much for us. They are capable of a wide variety of functions: touching, grasping, feeling, holding, manipulating, caressing, and more. They are a vitally important part of who we are and how we see ourselves.



Our hands can perform extremely gentle and precise actions such as writing a letter, painting a picture, threading a needle or playing a violin. Our hands also enable us to perform heavy labor, such as digging with a shovel, swinging an ax, using a jackhammer to drill through concrete, or pounding a railroad spike with a sledgehammer. We use our hands to feel whether something is rough or smooth, hot or cold, sharp or dull. We hold a child's hand as we cross the street. We caress the hair of a loved one.

Even when we're talking, our hands are a key part of who we are and what we say. Many of us use our hands to help express ourselves while we're talking. There's an old joke: "If you want me to stop talking, tie my hands!" You probably know people who can't talk without using their hands for visual aids. You might be like that yourself. Our hands play such an important role in how we communicate, we even use them regularly in figures of speech. Common phrases include: "touching on an important point;" "grasping a concept;" "getting your arms around an idea;" "taking a hands-on approach;" "fingering the bad guy;" and "reading a map like the back of your hand." And, of course, the hands literally do the talking when a person uses sign language.

Figure 1

When I think about the differences between our upper and lower limbs, I'm reminded of the song "These Boots Are Made for Walking'" by Nancy Sinatra. That's because, in essence, our legs are made for walking. Our hands, however, do so much more. The hand is an amazingly multifaceted "terminal device" located at the end of the arm. You can compare it to the end piece on a big erector set. Your shoulder, upper arm, elbow, forearm and wrist are all part of a biological erector set. They are designed to put your hand where you want it to be, doing what you want it to do. They not only put the hand into the positions you want, they lift, rotate and stabilize it.

The physical space in which we move our hands, their global sphere of motion, exceeds our "personal space," as illustrated in Figure 1.

We can extend our hand beyond where it normally reaches by thrusting our shoulder and arm forward. We can lean back to reach far behind us. Your legs work within the plane of your body, within the plane of walking. Sure, it's cool to be able to bring your foot up behind your head, but, unless you're a ballet dancer, you don't *need* to do that. But there are many times when you need to place your hand behind your head, such as for grooming, or to stretch forward to grasp something that's out of reach. To take off your shoe, you need to get your hand to your foot. It's this incredible ability for hand placement that helps highlight a big difference between the abilities of the hand and foot.

The Brain, Body Image and Saying "Hello"

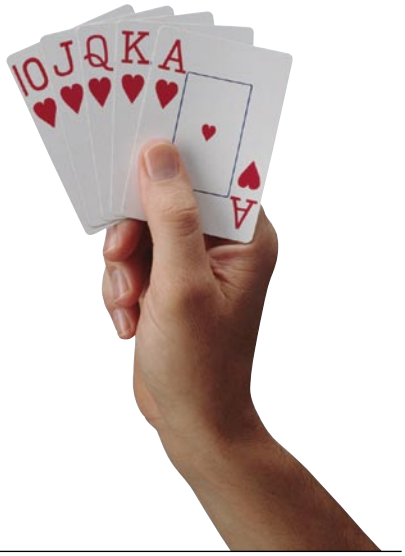
The brain dedicates a lot of "space" to the face and hands. The illustration of the little man in Figure 2 helps show the parts of the body that the brain is most concerned with. Note how the hands and face are especially emphasized. That means a large portion of our gray matter is devoted to those things and functions pertaining to the face and hands, the two leading characteristics of our body image.

Think about it. We're more likely to show the world our face and hands than any other part of ourselves. When I look around a lecture hall while giving a talk, the audience's faces and hands are always visible. If the weather is warm, some might be wearing shorts so part of their legs are visible. A sleeveless blouse reveals more arm. But what we typically see of other people most often are the face and hands.

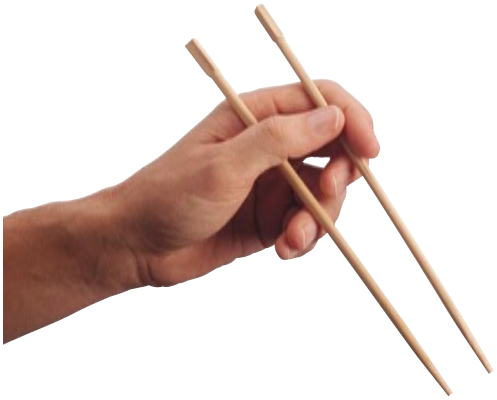
Figure 2
By Lynne McFarland. Used by permission of Prosthetics Research Study

People may have different beliefs, opinions and traditions throughout the world, but one universal element of our humanity is that people in so many different cultures and walks of life use their hands to greet one another. In the West, this usually involves shaking hands with another person. A handshake can mean either "hello" or "goodbye." Historically, it's also is a way of showing another person you're not concealing a weapon in your hand. The handshake not only conveys a greeting, it lets another person know whether you're friend or foe.

Elsewhere, people greet each other with the hands extended, palms together. This can be a gesture of "welcome" or "farewell." It also can convey another message. In some parts of the world, leprosy (Hansen's disease) still exists. When this microbacterium attacks the nerves, it often results in muscle atrophy in the hands, creating a visible hollow between the thumb and index finger. In some cultures, extending your hands may show another person that you don't have leprosy. The gesture says, "My hands are healthy, so I am healthy."



No matter the culture or social context, our hands and face are parts of the way we present ourselves to others. A smile is intended to convey warmth and friendliness. An extended hand or hands are designed to



convey a greeting and show another person we are not dangerous or ill. The hands and face are the most important parts of body image.

Surgery and Decision-Making

There are significantly different schools of thought concerning amputation surgery or salvage for an upper or lower limb. When deciding whether to embark on a course to salvage a severely injured leg or choose amputation, the leading consideration is whether the person will be able to walk on the injured limb and it can support his or her bodyweight. If not, amputation may offer a course that will reduce pain and enable the person to undergo prosthetic rehabilitation.

With upper limbs, it can be difficult to tell early in the surgical decision-making process whether the hand will retain some aspects of grasping and positioning if salvage is attempted. My view is that, generally, if the person can retain some grasp and positioning ability, it is beneficial to attempt to save an upper limb because it probably will be more useful than a prosthesis. It's not unusual to wait, even for years, to see how much useful function actually returns before deciding whether to proceed with an amputation.

When thinking of the benefits of saving an upper limb, even one that will have extremely limited function, my thoughts turn to former U.S. Senator and presidential candidate Robert Dole. Dole suffered severe wounds in World War II that left his right arm virtually immobile. He was hit by enemy machinegun fire when he crawled out of a foxhole to help a fellow solider who had been wounded. His right arm was so badly injured, it was barely recognizable. He was not expected to live.

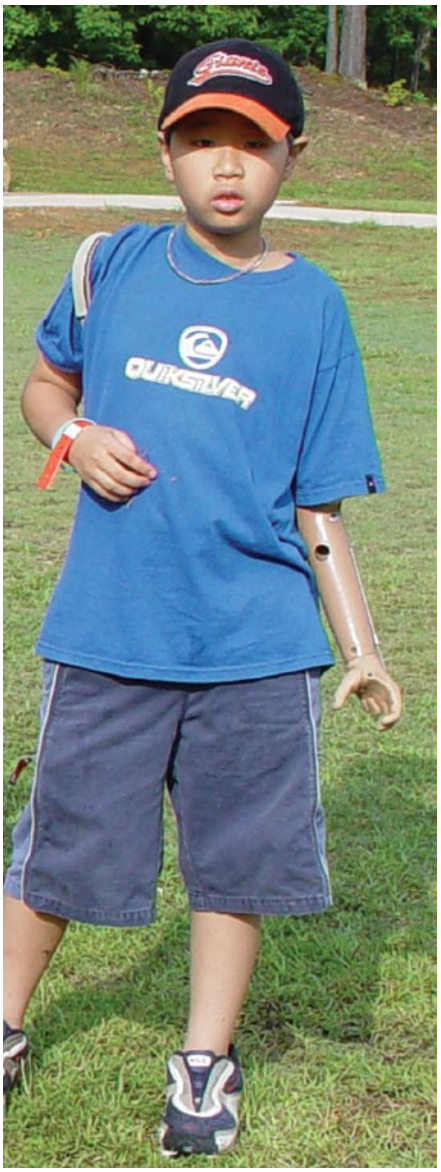
But Dole survived and went on to undergo nine operations over the next three years to rehabilitate his arm. Early on, Dole realized that a limb with very limited function appeared empty and inactive. He discovered that positioning a pen in his hand added a sense of function and drew less attention to his disability.

After his presidential bid in 1996, Dole delivered the keynote address at a meeting of the American Academy of Orthopaedic Surgeons. The senator discussed his orthopaedic surgeries, physical limitations and pain, among other topics. Senator Dole overcame a devastating injury to become a dedicated public servant and one of our nation's leaders.

Pain and Upper-Limb Amputations

Unfortunately, many people with upper- or lower-limb amputations experience amputation-related pain. In my practice, people with upper-limb amputations seem to have more vivid and intense amputation-related pain problems. This pain can be caused by neuromas, the mushroom-shaped growth of nerve endings that often scar at the end of severed nerves. Neuromas in the arm tend to be far more sensitive and irritated by pressure than neuromas in the leg. Also, while people with either upper- or lower-limb amputations may experience phantom pain, the pain tends to be more vivid and intense in the upper limb. Often, positional phantom pain involves a feeling that the missing hand and wrist are forced into a severely flexed grip position.

As previously discussed, pain in the upper limbs for people with amputations may stem, in part, from the amount of space the brain devotes to our hands. Simply put, our brain may be more focused on our hands. Plus, the hand typically has more sensitive nerve fibers. For example, we use our hands to feel whether something is hot or cold, smooth or rough, sharp or dull because the sensation of touch is strongest in our fingers and hands. Our hands are at the end of the "erector set" of our arms, so they're designed to be used for touch as well as placement and grasping.

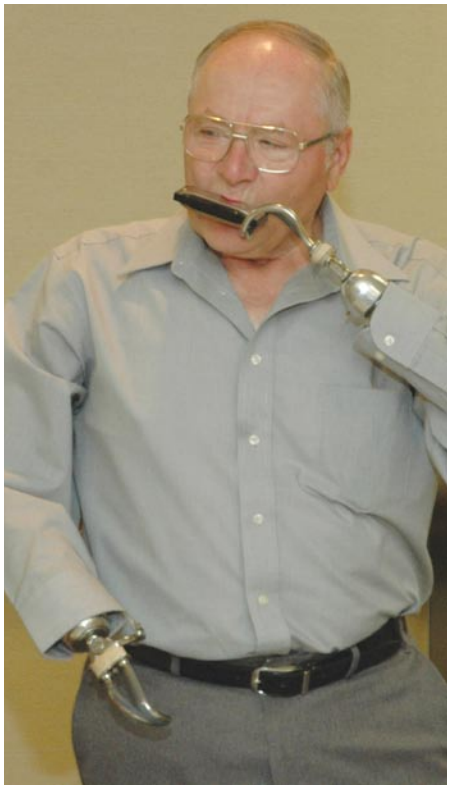


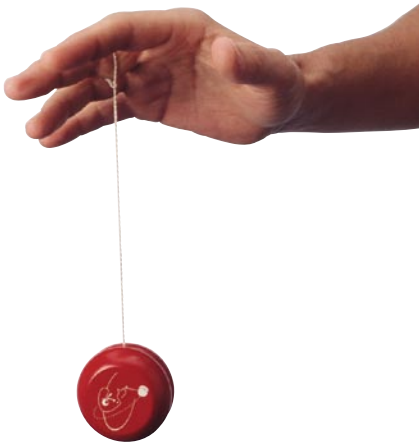
Prosthetics

Upper-limb prostheses are more complex and complicated than lower-limb prosthetic devices. Remember, our hands perform a huge range of activities, from gentle and precise to industrial strength. The primary function of our legs is walking. Lower-limb prostheses do an amazing job in helping people to walk again. They really replace the primary function of walking and, sometimes, even running. But we demand more from our hands.

Whether it's lifting a cup, moving a chair or scratching the back of your head, you use your hands in a different set of motions in a three-dimensional plane countless times per minute, yet they resolve in a unified motion to complete the tasks. Despite many marvelous technological advances in prosthetic engineering, upper-limb prostheses just can't duplicate all these motions. We often don't need to actually see our hands while they work. But a person with an upper-limb prosthesis does need eye contact with the device to make sure it's doing what he or she wants it to do, where it needs to be done.

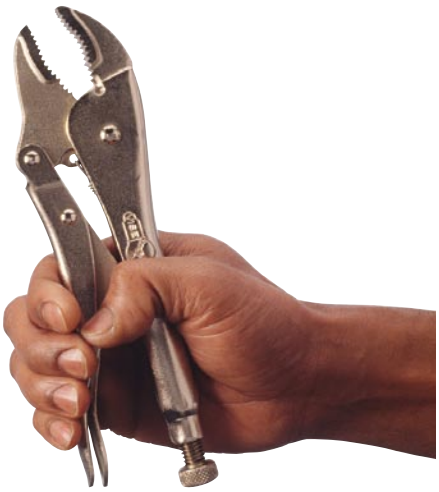
For example, if you want to pick up a cup, you think, "No problem." You reach for it, grasp it, bring it up to your mouth, drink, then put it back down in what you think of as one continuous motion. But actually a series of many complex motions went into performing this simple task. You may not have been conscious of it, but part of your brain was constantly firing a series of commands like an air traffic controller: "Shoulder forward; elbow open; hand rotating, opening, closing; wrist lifting, no tipping, no spilling; bring it to the mouth; easy does it, now stop; check temperature before proceeding." Our brain is processing a million things at once, yet we're barely conscious of it, if at all. The hand gives





us so much sensory feedback, details that a prosthesis simply can't transmit to the brain. As Helen Keller once said: "I sometimes wonder if the hand is not more sensitive to the beauties of sculpture than the eye."

Upper-limb prosthetic use requires a tremendous amount of thinking to become fluid and dexterous. In fact, the thinking can become so complex that it becomes overwhelming. A person who loses a hand or arm may decide it's simpler and less mentally taxing to use only his or her sound arm, rather than a prosthesis. It becomes far more automatic to use the sound arm than to expend the mental energy necessary to think through the many steps of a complex motion when using an upper-limb prosthesis.



Prosthetic technology in general has advanced tremendously over the years. But reproducing function has been more successful for lower limbs than upper limbs. Nothing yet can absolutely replace the loss, but prostheses for legs tend to fill in more adequately than prostheses for arms, both functionally and cosmetically. With pants and shoes, it's easier to conceal a lower-limb prosthesis. The human factor is also involved. Most patients I've seen who have had major lower-limb loss have a strong desire to walk again. So they work, sometimes long and hard, to learn how to use a prosthesis. While technology has produced some marvelous upper-limb prostheses, many patients choose to use their remaining sound limb, instead of a prosthesis, for most or all functions of the upper limb.

Looking Ahead

This column marks the beginning of a journey we're about to take from the fingertips all the way up to the shoulder. In the coming months, articles focusing on upper-limb amputations will highlight the unique decision-making, surgery, rehabilitation and prosthetic issues that are involved. Another surgeon, Dr. Robert Markison, has said, "The upper limb is the lightning rod to the soul." Our hands and arms are more than mere anatomical tools that perform tasks for us, much more. They also help interpret the world for us and express who we are. ■

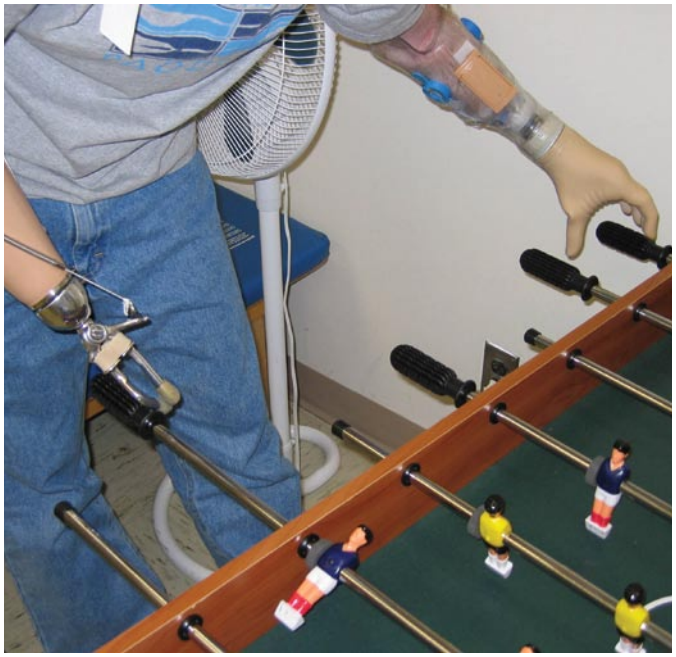


Photo courtesy of U.S. Army