

Case Study:
Nick Armstrong

Age:	25 y/o male
Cause:	Traumatic injury at work affecting both hands
Vocation:	Welder and auto-mechanic
Interventions:	Four MCPDrivers™, dominant right hand

Purpose

This case study highlights the functional and psychosocial benefits attained by a patient with traumatic partial digit amputations, after intervention with four MCPDrivers™ on his dominant right hand.

Patient History

Nick is an active 25-year-old male with five proximal phalanx amputations across both hands. His injury occurred in 2012 on the job as a welder. While operating a steel roller, both hands were pulled into the machine, causing severe crushing injuries and degloving to both hands. He spent a month in the hospital undergoing dozens of surgeries, including skin grafts, joint fusing on his left hand, and an unsuccessful replantation of his right finger #5. The medical team was unsure if Nick would have any use of his hands considering the level of trauma, tissue damage, and structure loss. But after months of therapy, Nick surpassed expectations and regained some function and range of motion from his residual digits.

At the time, there were no functional finger prostheses on the market that were suitable for Nick's required level of activity, strength, and use.

Patient Objectives

Nick's primary objectives were to be able to fully grasp objects with confidence, to return to work as a welder and auto mechanic, and to be able to continue his hobbies, which include maintaining he and his fiancé's land and horses.

His residual digits allowed him to hold objects, but without a firm grip. He was able to lift a hammer, but unable to swing or control it. The loss of fingers on his right hand also greatly diminished his ability to perform the fine motor tasks required in his work.



Figure 1(a): Left Hand



Figure 1(b): Right Hand



Like many people who have experienced disfigurement of the hands, Nick's self-esteem and confidence had also plummeted. He stopped engaging in handshakes and would try to hide his hands from view. He states, "it may not matter to them but in my mind, I'm thinking 'I'm different, they're staring at me.'" He states that even interacting with a cashier for a financial transaction caused him serious distress.

Prosthetic Intervention

After healing and therapy, Nick was fit with a cosmetic device that provided no functionality. His prosthetist, David Rotter, advised Nick to refrain from trying other prosthetic devices because nothing on the market at that time could accommodate Nick's level of amputation and rugged lifestyle requirements. Rotter was aware that innovations were in process, and wanted Nick to wait and see if a more appropriate solution would become available.

In 2015, Naked Prosthetics first started demonstrating and testing its new prosthesis, the MCPDriver™. The MCPDriver™ is a body-powered functional digit prosthesis for individuals who have an amputation(s) proximal to the PIP joint. Based on measurements

provided by a clinician, each device is designed and fully customized by an engineer for an individual patient. It allows each digit to articulate and abduct naturally and independently. The devices are designed and fabricated with strength and function in mind, to allow people to get back to their lives. Nick proved to be a good candidate, as each of his fingers had enough residual digit to enable him to engage and drive this body-powered device.



Figure 2 First time with device

Nick was asked to be a beta tester and was instrumental in the development of the product. After completing a sizing with his prosthetist and test-fitting several iterations, Nick was fit with four MCPDrivers™ on his right hand. Nick was able to use the devices immediately after the fitting. This rapid acclimation speaks to the success of the custom design, which seeks to restore phalanx length and joint location to prior anatomical measurements. Figure 2 shows Nick using the device for the first time to put a watch on, a task that requires independent digit motion and high precision. Figure 3 shows his device from the palmar side with a work tool.

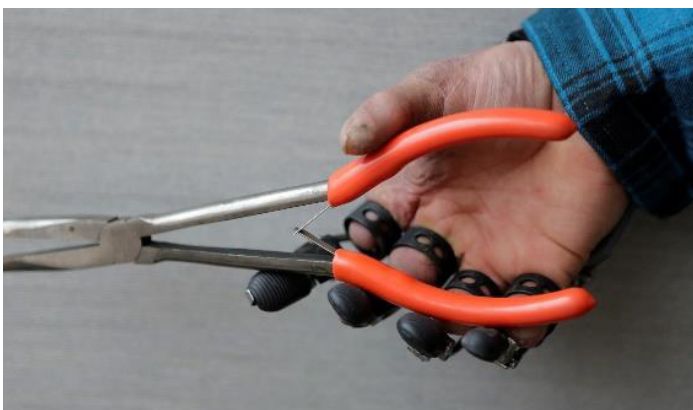
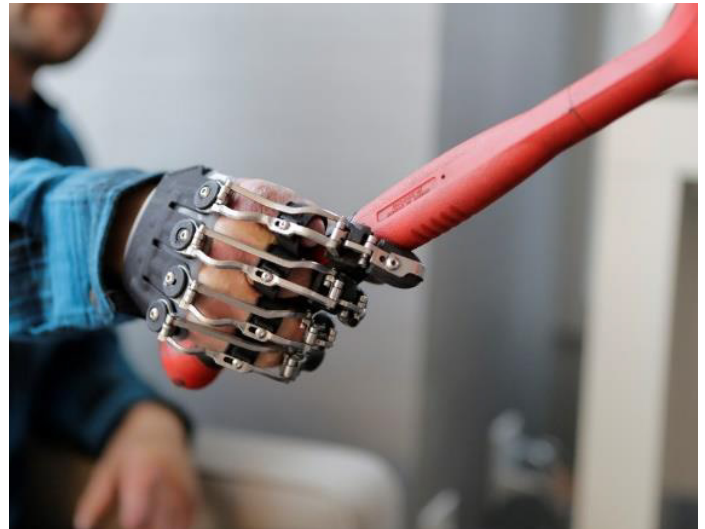


Figure 3 Palmar view



Outcome

As of February 2017, Nick has been wearing four MCPDrivers™ on his right hand for over a year. He has returned to work as an auto mechanic and welder, and uses the devices every day for approximately eight hours. Nick uses his devices for power grasps and object handling, as well as for fine motor skills such as automotive wiring jobs. The device offers the added benefit of residuum protection, which is often a significant factor for finger amputees with hypersensitivity. He states that his right hand with prostheses is more capable than his left hand, with its injured structures and scar tissue.

Nick states that the emotional impact has been just as important to him as the functional ability he regained. He states that when he introduces himself and shakes hands, he “used to be the guy with the missing fingers, and now is the guy with the cool hand.” He and his fiancé related that when he is out socializing, he has now become the center of attention in a positive way because of his prostheses, and even lets people try them on for fun. He states “Yeah they’re staring and they’re curious, but it’s more of a positive thing for me because I know they’re thinking ‘wow that’s cool, what is that?’ It’s positive. It takes a very negative situation and puts a very positive spin on it.” Nick’s fiancé states, “Since Nick received his prostheses, his self-esteem is back to where it was before his injury.”

Despite the high demands that Nick puts on his devices, they have only experienced two part replacements. The breaks were both at the adduction/abduction connection point on the back plate, which is where the highest forces are transmitted in heavy lifting. Naked Prosthetics designed him a strengthened back plate, which he is using now.

When sitting down with Nick, it becomes very apparent how comfortable he is with his devices. Without looking, he picks things up and drums his fingers on the table. The devices have become a part of him and he is able to do tasks now without consciously

thinking about it. He can also feel when he has a hold on an object. "I know when I'm grabbing something; I know when I'm moving each finger."

Nick continues to grow stronger with his devices. "I know its capabilities now too. I still find new things that I can do with it, new ways to pick things up, or open something. It's definitely become a part of me." He plans on getting a fifth device for his residual digit on his left hand.

