

Case Study: Joe Yeske

Age:	63 y/o male
Cause:	Traumatic injury at work
Vocation:	Cabinet Make and Woodworker
Interventions:	Naked Prosthetics Thumb prototype, non-dominant left hand

Purpose

This case study discusses the benefits attained by a patient with traumatic amputations on his nondominant thumb, index, and middle fingers, after intervention with a Thumb prosthesis prototype from Naked Prosthetics (Olympia, WA).

Patient History

Joe is a 63-year-old male with traumatic amputation of fingers 1-3. His injury occurred in February of 2017 at work as a cabinet maker. A piece of plywood caught and pulled his nondominant hand across the blade from the rear side, causing injuries to digits 1-4. He underwent surgery the same day to amputate his thumb at the IP joint, amputate digits 2 and 3 at the MCP joints, and repair nerve damage to digit 4.



During the coming months, Joe experienced crippling phantom limb pain. Today, Joe is pain-free, thanks to a combination of acupuncture and pulsed radio frequency therapy. Due to nerve damage, he has no sensation in his 4th digit.

Patient Objectives

As a woodworker, Joe relies heavily on his nondominant hand to assist with holding tools and materials in order to perform his work effectively. Tasks such as making fine adjustments on his equipment, reaching power switches on hand-held tools, grasping power tools, carrying stacks of material, and guiding wood through joiners and saws, all require the use of both hands. At home, his injury impacted his ability to perform daily activities such as applying toothpaste to his toothbrush and opening bottles. He found it impossible to grasp a sheet of paper, button his shirt, or hold a hamburger. Joe's injury not only affected his physical ability, but it had a dramatic impact on his personal life. He avoided public excursions, such as going to restaurants, because he needed assistance with cutting his food. While spending time with family and friends, he would find himself hiding his thumb behind objects to avoid upsetting them. He expressed this reluctance by saying "I feel bad for my loved-ones because they feel bad for me."

Prosthetic Intervention

Joe was accepted into the Naked Prosthetics Thumb beta study program in June 2017. Through this program he was sized and fit with a custom prototype of a mechanical prosthesis as part of a product feasibility evaluation. The device is suspended on and driven by his residual thumb. A mechanism is used to translate MP joint flexion into articulation at the artificial distal phalanx in an intuitive manner. The prototype was delivered in July. As of this report he has been wearing it for five weeks.



Outcome Measures

We utilized the QuickDash to assess changes over time in pain, ability to perform ADLs, and work (pre and post intervention); the TAPES-R to assess psychosocial adjustment and satisfaction with the prosthesis; and the Jebsen-Taylor Hand Function Test (JHFT) as a functional performance evaluation.

QuickDASH Outcome Measure		
	Quick DASH	Work Module
Able-bodied Average	11	10
Pre-Device	55	69
5 weeks post	20	31

Five weeks post-intervention, Joe is showing dramatic improvement in his scores in every category.

TAPES-R		
	Score	Max
General Adjustment	19	20
Social Adjustment	16	16
Limitation Adjustment	9	20
Satisfaction with Prosthesis	23	24

The subject showed marginal improvement in the JHFT performance times for card turning and checkers, and was slower in other tasks while using the prosthesis. The pictures below demonstrate that compensation grasp patterns were reduced with the use of the prosthesis, which could be part of the reason Joe reports less overall upper limb pain with prosthesis use.

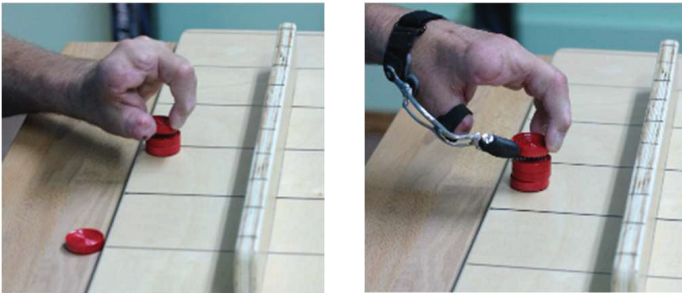


Figure 1: Opposition grasp during JHFT



Figure 2: Lifting paperclip during JHFT

Additional Results:

- 20 lb to 33 lb grip strength increase in 2 weeks
- able to cut and hold own food again
- can tie necktie and shoelaces
- better grasp on objects - phone, paper, buttons
- wears device for 12-15 hrs/day in 100° heat at work
- can grip tools and work objects, drive, move furniture

Joe reports that he chooses to wear the device every day, for nearly every activity he needs to perform. At work, in blistering summer heat, he regularly wears the device for more than 15 hours at a time without discomfort or fatigue.



Joe also reports that the feedback he receives through the prosthesis has allowed him to return to a grasp pattern that does not require direct visual feedback. Joe explains that he is learning to sense when he is making contact and applying force between his thumb and ring finger. More and more frequently, he is finding that he doesn't need to see what he is grasping. It also allows Joe to grasp two-handed tools such as shovels and axes, providing a secure grip. Recently, Joe proudly reported that he went to his favorite restaurant for pork tenderloins and did not need assistance cutting them.

