

## Case Study: Rudy Torrez

Age:	51 y/o male
Cause:	Traumatic injury at home
Vocation:	Sales Manager
Interventions:	PIPDriver on 4th digit of his non-dominant hand

### Purpose

This case study discusses the phantom limb pain relief experienced by a patient with traumatic partial amputation of his non-dominant 4th digit after intervention with a PIPDriver™ from Naked Prosthetics (Olympia, WA).

### Patient History

Rudy is a 51-year-old male with traumatic amputation of his left 4th finger at the middle phalanx, just distal to his PIP joint. His injury occurred in September of 2018 when working at home on a table saw. While making final cuts for his project, his fingers were positioned too close to the blade and were drawn into it. Rudy suffered damage to his left thumb, index, middle, and ring fingers. The surgeon's initial plan was to remove the entire ring finger, amputating at the MCP joint. Rudy requested, if possible, to salvage as much of his 4th digit as possible so he could still wear his wedding ring. The surgeon was able to save most of the digit and, in doing so, allowed it to be a good candidate for prosthetic intervention. The surgery also resulted in Rudy maintaining a functioning thumb and fused IP joints of the index and middle fingers. During the long months of recovery following surgery, Rudy worked with an occupational therapist to learn how to live with his new physical limitations and cope with his often present phantom limb pain.

### Patient Objectives

At the time of his injury Rudy had less than a year of graduate school remaining to earn his degree in Organizational Development and Leadership. Obtaining this degree required a significant amount of typing and general computer use which meant Rudy had to re-learn



Left Hand



Right Hand



how to type with the new physical limitations of his left hand. The injury also affected his current employment as it became difficult to carry out the physical responsibilities of operating heavy machinery and moving heavy equipment. The largest barrier Rudy had to overcome however, was the limited education on how to desensitize his residuum. He believes the lack of learning how to desensitize his finger, directly lead to frequent bouts of phantom limb and nerve pain.

Phantom limb pain (PLP) can occur as a result of and following an amputation and causes shooting or throbbing pains that the body interprets as originating from the now-amputated limb. Doctors are unsure of the exact cause of PLP, but believe it is likely a result of the brain receiving mixed nerve feedback following amputation. There is no defined treatment for PLP, with a combination of medication and therapeutic interventions being the most effective. Rudy's lack of desensitization

treatment during occupational therapy may be one reason why he experiences PLP in his residuum daily. The pains often last for several minutes at a time and cause a “mild discomfort.” Before receiving his prosthesis, Rudy’s only way to diminish the pain was to don a glove over his left hand and massage the area of the absent digit.

### Prosthetic Intervention

The residual length, range of motion (ROM) and strength of his middle phalanx post-surgery allowed Rudy to be an optimal candidate for a PIPDriver by Naked Prosthetics. The PIPDriver fabricated for him is a custom, body-driven prosthesis that functions via the patient’s intact residuum distal to the PIP joint. The custom-made prosthesis is designed to match his sound side length and mimic natural, intact motion. The prosthesis is self-suspended on the residuum via a secure, intimate fit at the base of the finger and is enhanced by removable shims, which can accommodate for volume changes throughout the day. The PIPDriver restores length to the amputated digit, protecting the sensitive distal end while allowing for intuitive, functional use. Rudy received the prosthesis approximately seven months post-amputation and, at the time of this case study, has been wearing the PIPDriver for seven months.



The Short Form McGill Pain Questionnaire is an outcome measure that helps describe and categorize the types of pain experienced by the test taker. The different sections describe the sensory qualities, affective qualities, and evaluative aspects of pain. Scoring this outcome measure can be done in three ways: the Pain Rating Index (PRI) - Rank Value, which allows the participant to score 15 pain descriptors on a scale of one to three and is divided into Sensory and Affective Subscales; a PRI – Scale Value, which asks the participant to make a mark that represents their pain on a visual analog scale; and Number of Words Chosen score. In all scoring sections, a high score indicates more pain experienced by the person taking the measure.

After receiving his prosthesis, Rudy scored very low in each section, signifying that the pain he experiences after receiving his prosthesis are mild and have little daily affect on him. Each of the pain adjectives he chose to describe his pain were all in the “mild” score and included words such as “throbbing” and “shooting.” The percentage of the PRI – Scale Value score is almost identical to his combined PRI – Rank Value scores showing a consistency in describing the mild pain he is experiencing, which helps in demonstrating the high validity of this outcome measure.

QuickDASH Outcome Measure		
	QuickDASH	Work Module
Able-bodied Average	11	10
Rudy: 7 months post prosthesis	25	0

### Outcome Measures

The following self-report outcome measures were administered seven months post-intervention of the PIPDriver: the QuickDASH to assess Rudy’s ability to perform ADLs, and work responsibilities; TAPES-R to assess psychosocial adjustment and satisfaction with the prosthesis; and McGill Short Form Pain to assess the type of PLP post prosthetic intervention.

Short Form McGill Pain Questionnaire		
	Score	Max
Sensory Subscale	5	33
Affective Subscale	0	12
PRI - Scale Value	1.5	10
Number of Words Chosen	5	15

The scores on the QuickDASH and Work Module subset of questions reflect symptoms of musculoskeletal disorders of the upper limb and the ability to perform common activities. Again, higher scores represent more disability. Rudy’s score on the QuickDASH is within one standard deviation ( $\pm 14.68$ ) of the average able-bodied score and he performs better on the work module than the average able-bodied person since receiving his prosthesis. This signifies that Rudy self-reports a low level of disability that is similar to that of an able-bodied person.

TAPES-R		
	Score	Max
General Adjustment	16	20
Social Adjustment	15	16
Limitation Adjustment	16	20
Satisfaction with Prosthesis	21	24

TAPES-R is administered post-intervention as a measure of prosthetic satisfaction and psychosocial adjustment. High scores on the TAPES-R are indicative of greater levels of adjustment and/or satisfaction with the prosthesis. Rudy's high scores on this outcome measure thus show he has adjusted well and has high satisfaction with his prosthesis, without feeling like it limits his activities.

## Benefits

Rudy reports wearing the PIPDriver approximately eight hours per day and has noted countless functional benefits from using it. Of note, this prosthesis has enabled him to type more effectively, easing the burden on the numerous papers he had to submit for graduate school and reports the PIPDriver now feels like a part of him. This device also makes performing the physical demands of his job easier by helping him lift heavy objects and allowing for the distribution of weight across more surface area. One of the unique benefits of using the PIPDriver that Rudy expresses, and warrants further research, is the relief of his PLP that he gets from the. When a surge of phantom limb pain comes, he reports that he now just rubs the tip of his PIPDriver, and the pain slowly dissipates. Rudy says additional surgeries would be required for his intact fingers in an attempt make them more functional, and that if he had known about Naked Prosthetics prior to his amputation, he may have advocated for different surgical decisions regarding his other fingers.

