**AN OVERVIEW**

**ON**

**ANATOMY**

**OF**

**HUMAN HANDS**

**AND ITS RELATION WITH PROSTHETIC ARM**

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**INTRODUCTION :**

Prosthetic arms are artificial devices that replace the function and appearance of a missing upper limb. They can be used by people who have lost their arm due to trauma, disease, or congenital conditions. Prosthetic arms can restore some of the abilities and sensations that are lost after an amputation, such as grasping, reaching, and feeling objects. However, prosthetic arms also pose many challenges and limitations for the users, such as fitting, comfort, control, and embodiment. The purpose of this paper is to explore the history, development, and current state of prosthetic arm technology, as well as the psychological and social aspects of living with a prosthetic arm.

Amputation is the surgical removal of a limb or part of a limb that is severely damaged or diseased. Amputation can be a life-saving procedure in cases of severe infection, cancer, or trauma. However, amputation also has significant physical and emotional consequences for the person who undergoes it. Amputation can cause pain, phantom sensations, reduced mobility, body image issues, depression, anxiety, and social isolation. Therefore, amputation requires not only medical care but also psychological support and rehabilitation.

The psychology of amputated people is a complex and diverse topic that involves various factors and outcomes. Some of the factors that influence the psychological adjustment of amputated people are the cause and level of amputation, the availability and suitability of prosthetic devices, the social support and stigma they receive, and their personal coping strategies and resilience. Some of the outcomes that reflect the psychological well-being of amputated people are their satisfaction with their prosthesis, their quality of life, their self-esteem, their emotional regulation, and their social participation.

The history of prosthetic arm dates back to ancient times, when wooden or metal devices were used to replace missing limbs. The earliest known prosthetic arm was found on a mummy in Egypt dating back to 950 BC. The device consisted of a wooden shoulder socket with a leather strap and an iron hand with fingers that could be bent manually. The first functional prosthetic arm was developed by Ambroise Paré in the 16th century. He designed a mechanical hand that could be controlled by strings attached to the opposite shoulder. Since then, prosthetic arm technology has evolved significantly with the advances in materials, mechanics, electronics, and computer science.

The popularity of prosthetic arm among amputated people varies depending on several factors, such as the availability, affordability, accessibility, and acceptability of prosthetic services and devices. [According to a systematic review by Micó-Amigo et al](https://www.dezeen.com/2022/02/24/esper-bionics-human-prosthetic-arm-mind-control/)[1](https://www.dezeen.com/2022/02/24/esper-bionics-human-prosthetic-arm-mind-control/" \t "https://edgeservices.bing.com/edgesvc/_blank), only between 27% to 44% of upper limb amputees use prosthetic arms. Some of the reasons for low prosthetic use are poor fit, discomfort, lack of functionality, cosmetic dissatisfaction, and social stigma. [However, some studies have also reported high rates of prosthetic acceptance and satisfaction among upper limb amputees who receive appropriate prosthetic care and training](https://www.ottobock.com/en-au/what-to-know-about-prosthetic-arms-and-hands" \t "https://edgeservices.bing.com/edgesvc/_blank) [2](https://www.ottobock.com/en-au/what-to-know-about-prosthetic-arms-and-hands" \t "https://edgeservices.bing.com/edgesvc/_blank)[3](https://www.mdpi.com/2227-7080/10/5/103" \t "https://edgeservices.bing.com/edgesvc/_blank).

The benefits of prosthetic arm for amputated people can be categorized into functional, sensory, aesthetic, and psychosocial domains. Functionally, prosthetic arms can enable amputated people to perform various activities of daily living that require grasping, manipulating, or reaching objects. Sensory-wise, prosthetic arms can provide feedback about the position, movement, force, or temperature of the artificial limb or the object being touched. Aesthetically, prosthetic arms can improve the appearance of the residual limb and make it look more natural or realistic. Psychosocially, prosthetic arms can enhance the self-confidence, self-image, mood, and social integration of amputated people.

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**MUSCLES IN HUMAN HAND :**

Muscles are the tissues in the body that can contract and relax to produce movement. There are different types of muscles in the human body, such as skeletal, smooth, and cardiac muscles. In this article, we will focus on the muscles of the hand, thumb, elbow, wrist, and forearm.

## **Hand Muscles**

The hand muscles are responsible for the fine movements of the fingers and the palm. They are divided into two groups: **Intrinsic and extrinsic muscles**.

## **Types of Hand Muscles**

* **Intrinsic muscles**: These are the muscles that originate and insert within the hand. They are further divided into three subgroups: thenar, hypothenar, and interosseous muscles.
  + **Thenar muscles**: These are the muscles that form the fleshy part of the thumb. They include the abductor pollicis brevis, flexor pollicis brevis, opponens pollicis, and adductor pollicis.
  + **Hypothenar muscles**: These are the muscles that form the fleshy part of the little finger. They include the abductor digiti minimi, flexor digiti minimi brevis, and opponens digiti minimi.
  + **Interosseous muscles**: These are the muscles that lie between the metacarpal bones of the hand. They include the dorsal interossei and the palmar interossei.
* **Extrinsic muscles**: These are the muscles that originate from the forearm and insert into the hand. They are further divided into two subgroups: flexors and extensors.
  + **Flexors**: These are the muscles that bend the fingers and the wrist. They include the flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus, and flexor carpi radialis.
  + **Extensors**: These are the muscles that straighten the fingers and the wrist. They include the extensor digitorum, extensor digiti minimi, extensor pollicis longus, extensor pollicis brevis, extensor indicis, and extensor carpi radialis.

## **Thumb Muscles**

The thumb muscles are responsible for the movements of the thumb, such as abduction, adduction, flexion, extension, and opposition. They are divided into two groups: intrinsic and extrinsic muscles.

## **Types of Thumb Muscles**

* **Intrinsic thumb muscles**: These are the same as the thenar muscles of the hand. They include the abductor pollicis brevis, flexor pollicis brevis, opponens pollicis, and adductor pollicis.
* **Extrinsic thumb muscles**: These are the same as some of the extrinsic hand muscles. They include the flexor pollicis longus, extensor pollicis longus, and extensor pollicis brevis.

## **Elbow Muscles**

The elbow muscles are responsible for the movements of the elbow joint, such as flexion and extension. They are divided into two groups: anterior and posterior muscles.

## **Types of Elbow Muscles**

* **Anterior elbow muscles**: These are the muscles that bend (flex) the elbow. They include the biceps brachii, brachialis, brachioradialis, pronator teres, and pronator quadratus.
* **Posterior elbow muscles**: These are the muscles that straighten (extend) the elbow. They include the triceps brachii and anconeus.

## **Wrist and Forearm Muscles**

The wrist and forearm muscles are responsible for the movements of the wrist joint and the rotation of the forearm (pronation and supination).

They are divided into two groups: **anterior and posterior muscles.**

## **Types of Wrist and Forearm Muscles**

* **Anterior wrist and forearm muscles**: These are mostly flexors of the wrist and pronators of the forearm. They include some of the extrinsic hand muscles as well as some other forearm muscles.
* **Posterior wrist and forearm muscles**: These are mostly extensors of the wrist and supinators of the forearm. They include some of the extrinsic hand as well as some other forearm muscles.

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**BONES :**

The human hand is a complex and versatile organ that enables various functions and movements. The hand consists of 27 bones that can be divided into three groups: carpals, metacarpals, and phalanges . The carpals are eight small bones that form the wrist and the base of the palm. The metacarpals are five long bones that extend from the carpals to the fingers. The phalanges are the bones of the fingers, each finger having three phalanges (proximal, middle, and distal) except for the thumb, which has two (proximal and distal) .

The **carpals** are arranged in two rows of four bones each: the proximal row and the distal row. The proximal row consists of the scaphoid, lunate, triquetrum, and pisiform bones. The distal row consists of the trapezium, trapezoid, capitate, and hamate bones. The carpals form an arch that creates a space called the carpal tunnel, through which tendons and nerves pass from the forearm to the hand. The carpal tunnel syndrome is a condition that occurs when the median nerve is compressed in the carpal tunnel, causing pain, numbness, and weakness in the hand.

The **metacarpals** are numbered from one to five, starting from the thumb side of the hand. The metacarpals have three parts: the base, which articulates with the carpals; the shaft, which is the main body of the bone; and the head, which articulates with the phalanges. The metacarpals give shape to the palm and allow for abduction, adduction, flexion, and extension of the fingers. The metacarpophalangeal joints are the joints between the metacarpals and the proximal phalanges. These joints are also known as knuckles.

The **phalanges** are numbered from one to five, starting from the thumb side of the hand. Each finger has three phalanges: proximal, middle, and distal. The thumb has only two phalanges: proximal and distal. The phalanges enable fine motor skills and manipulation of objects by forming different types of grips. The interphalangeal joints are the joints between the phalanges. There are two types of interphalangeal joints: proximal interphalangeal joints (PIP) and distal interphalangeal joints (DIP).

To connect a prosthetic arm to the bones of the hand, different methods can be used depending on the type and level of amputation. One possible method is osseointegration, which involves implanting a metal screw into the bone of the residual limb and attaching a connector to it that can interface with the prosthesis . This method provides a direct connection between the skeleton and the prosthesis, which can improve stability, comfort, and range of motion . However, this method also has some risks and challenges, such as infection, fracture, loosening, or rejection of the implant .

Another possible method is using electrodes that are implanted in the muscles and nerves of the residual limb to control the prosthesis. These electrodes can detect electrical signals from the muscles (myoelectric signals) or from the nerves (neural signals) and transmit them to a control system in the prosthesis that can activate different movements and functions . This method can provide a more natural and intuitive control of the prosthesis, as well as sensory feedback from the prosthesis to the brain . However, this method also has some limitations and difficulties, such as signal interference, noise, or adaptation .

In conclusion, the bones of the human hand are an essential part of the structure and function of the hand. They provide support and flexibility to the soft tissues and allow for various movements and functions. To connect a prosthetic arm to the bones of the hand, different methods can be used depending on the type and level of amputation. Each method has its own advantages and disadvantages, and further research and development are needed to improve the performance and quality of life of amputees.

Source: Conversation with Bing, 29/9/2023

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**JOINTS IN HUMAN HANDS :**

**STRUCTURE & FUNCTION OF DIFFERENT CATEGORIES OF JOINTS :**

***Synarthrosis (Immovable Joints):***

*Structure*: Synarthroses are joints where bones are tightly connected and allow little to no movement. They are held together by dense fibrous connective tissue. Examples include sutures in the skull and the gomphosis of teeth in their sockets.

*Function*: These joints provide stability and protection to vital organs, such as the brain within the skull. Research on the anatomy and biomechanics of cranial sutures could provide insights into their structure and function.

***Amphiarthrosis (Slightly Moveable Joints):***

*Structure*: Amphiarthroses permit limited movement and are characterized by cartilaginous or fibrous connections. An example is the symphysis pubis in the pelvis.

*Function*: These joints absorb shock and allow for slight movement while maintaining stability. You can search for research on the biomechanics of pubic symphysis to understand its structure and role.

***Diarthrosis (Freely Moveable Joints):***

*Structure*: Diarthroses are the most flexible joints and typically have a synovial cavity with synovial fluid, articular cartilage, and a joint capsule. Common examples include the knee and shoulder joints.

*Function*: These joints enable a wide range of movements, from simple hinge-like motion to complex rotational movements. Research on diarthrodial joint biomechanics and osteoarthritis management could provide valuable insights.

**SEVERAL TYPES OF JOINTS & THEIR STRUCTURE AND FUNCTIONS:**

***Fibrous Joints:***Fibrous joints are joints where bones are tightly connected by dense fibrous connective tissue and allow little to no movement. They provide stability and protection to vital organs, such as the brain within the skull. There are three types of fibrous joints: sutures, syndesmoses, and gomphoses.

*Structure*: Fibrous joints consist of dense fibrous connective tissue that holds bones together. There are three types:

* **Sutures**: .Sutures are found between flat bones in the skull and are characterized by interlocking edges of bone that are filled with very short connective tissue fibers. Sutures are immovable in adults, but they allow some movement during birth to facilitate the passage of the baby’s head through the birth canal. Sutures also enable the growth of the skull in infants and children. [Research on cranial sutures has shown that they have complex biomechanical properties that depend on factors such as age, suture type, loading direction, and hydration](https://www.slideshare.net/lenfunk/joint-biomechanics" \t "https://edgeservices.bing.com/edgesvc/_blank)
* **Syndesmoses**: Syndesmoses are joints where bones are connected by longer connective tissue fibers, such as ligaments or interosseous membranes. Syndesmoses allow more movement than sutures, but less than synovial joints. An example of a syndesmosis is the distal tibiofibular joint, where the distal ends of the tibia and fibula are joined by an interosseous membrane and ligaments. [This joint allows some degree of rotation and translation during ankle movements](https://www.slideshare.net/lenfunk/joint-biomechanics)[2](https://musculoskeletalkey.com/13-biomechanics-of-joints/" \t "https://edgeservices.bing.com/edgesvc/_blank).
* **Gomphoses**: Gomphoses are joints where teeth are embedded in sockets (alveoli) in the maxilla or mandible. The teeth are held in place by periodontal ligaments, which consist of collagen fibers that attach to the cementum of the tooth and the alveolar bone. Gomphoses are also immovable in adults, but they allow some movement during tooth eruption in children. [Gomphoses act as shock absorbers and transmit occlusal forces from the teeth to the jawbone](https://www.slideshare.net/lenfunk/joint-biomechanics)[3](https://en.wikipedia.org/wiki/Biomechanics" \t "https://edgeservices.bing.com/edgesvc/_blank).

***Cartilaginous Joints:***Cartilaginous joints are joints where bones are held together by cartilage and allow limited movement. They absorb shock and allow for slight movement while maintaining stability. There are two types of cartilaginous joints: synchondroses and symphyses.

*Structure*: Cartilaginous joints are held together by cartilage and allow limited movement. There are **two** types:

* **Synchondroses**: ynchondroses are joints where bones are connected by hyaline cartilage, which is a smooth and translucent type of cartilage. Synchondroses are mostly immovable, but they allow some growth and remodeling of bones. An example of a synchondrosis is the epiphyseal plate in growing long bones, which is a thin layer of cartilage that separates the epiphysis (end) from the diaphysis (shaft) of the bone. [The epiphyseal plate allows longitudinal growth of bones until it ossifies and becomes an epiphyseal line in adults](https://www.slideshare.net/lenfunk/joint-biomechanics)[4](https://www.physio-pedia.com/Biomechanics_of_the_Hip" \t "https://edgeservices.bing.com/edgesvc/_blank)
* **Symphyses**: [1](https://www.slideshare.net/lenfunk/joint-biomechanics" \t "https://edgeservices.bing.com/edgesvc/_blank).Symphyses are joints where bones are connected by fibrocartilage, which is a tough and resilient type of cartilage that contains collagen fibers. Symphyses provide both flexibility and strength to withstand compression and tension forces. An example of a symphysis is the pubic symphysis in the pelvic region, which is a slightly movable joint that joins the two pubic bones by a disc of fibrocartilage. [The pubic symphysis allows some degree of rotation, translation, and deformation during childbirth and pelvic movements](https://www.slideshare.net/lenfunk/joint-biomechanics)[5](https://www.hindawi.com/journals/abb/2020/7451683/" \t "https://edgeservices.bing.com/edgesvc/_blank).

***Synovial Joints:***Synovial joints are the most common and complex type of joints in the human body. They consist of a synovial cavity filled with synovial fluid, articular cartilage that covers the articulating surfaces of bones, a joint capsule that surrounds the joint and is reinforced by ligaments, and sometimes additional structures such as menisci, bursae, or fat pads. Synovial joints enable a wide range of movements, from simple hinge-like motion to complex rotational movements. There are six types of synovial joints: hinge, condyloid (ellipsoid), saddle, planar (gliding), pivot, and ball-and-socket.

***Structure***: Synovial joints are the most common and complex. They consist of:

* ***Synovial Cavity:*** A fluid-filled space that reduces friction between articulating bones.
* ***Articular Cartilage:*** A layer of hyaline cartilage that covers the articulating surfaces of bones.
* ***Joint Capsule:*** Surrounds the joint and is reinforced by ligaments.
* ***Synovial Fluid:*** Lubricates and nourishes the joint.

***Types of Synovial Joints &their functions :-***

* **Hinge Joint:** Hinge joints allow movement in one plane (uniaxial) like a door hinge. They permit flexion and extension movements only. An example of a hinge joint is the elbow joint, which consists of two articulations: the humeroulnar joint between the trochlea of the humerus and the trochlear notch of the ulna, and the humeroradial joint between the capitulum of the humerus and the head of the radius. The elbow joint is stabilized by collateral ligaments on both sides and by muscles that cross the joint.
* **Condyloid (Ellipsoid) Joint:** Condyloid (ellipsoid) joints allow movement in two planes (biaxial) like an oval-shaped surface fitting into an elliptical cavity. They permit flexion-extension and abduction-adduction movements, but not rotation. An example of a condyloid joint is the wrist joint, which consists of two articulations: the radiocarpal joint between the distal end of the radius and the proximal row of carpal bones, and the midcarpal joint between the proximal and distal rows of carpal bones. The wrist joint is stabilized by ligaments that connect the radius, ulna, and carpal bones, and by muscles that cross the joint.
* **Saddle Joint:** Saddle joints are characterized by two concave surfaces that fit together like a rider in a saddle. They allow movement in two planes (biaxial) like a condyloid joint, but with greater flexibility. They permit flexion-extension, abduction-adduction, and some degree of rotation. An example of a saddle joint is the carpometacarpal joint of the thumb, which consists of an articulation between the trapezium bone of the wrist and the first metacarpal bone of the thumb. The thumb joint is stabilized by ligaments that connect the trapezium and the metacarpal, and by muscles that cross the joint.
* **Planar (Gliding) Joint:**Planar (gliding) joints allow gliding or sliding movements in various directions, depending on the shape and orientation of the articulating surfaces. They have relatively flat or slightly curved surfaces that slide over each other. An example of a planar joint is the intercarpal joint in the wrist, which consists of multiple articulations between adjacent carpal bones. The intercarpal joints are stabilized by ligaments that connect the carpal bones, and by muscles that cross the wrist.
* **Pivot Joint:** Pivot joints permit rotational movement around a central axis, like a spinning top. They allow only one degree of freedom (uniaxial). An example of a pivot joint is the atlantoaxial joint between the first two cervical vertebrae (atlas and axis), which consists of an articulation between the dens (odontoid process) of the axis and the anterior arch of the atlas. The atlantoaxial joint allows head rotation, such as when shaking the head to indicate “no”. The atlantoaxial joint is stabilized by ligaments that connect the atlas and the axis, and by muscles that cross the neck.
* **Ball and Socket Joint:**Ball-and-socket joints are the most mobile type of synovial joints. They allow movement in all directions (multiaxial). They consist of a spherical head (ball) that fits into a cup-like socket. Examples of ball-and-socket joints are the hip and shoulder joints. The hip joint consists of an articulation between the head of the femur and the acetabulum of the pelvis. The hip joint is stabilized by ligaments that connect the femur and the pelvis, and by muscles that cross the joint. The shoulder joint consists of an articulation between the head of the humerus and the glenoid cavity of the scapula. The shoulder joint is stabilized by ligaments that connect the humerus and the scapula, by muscles that form the rotator cuff, and by other structures such as the labrum, bursae, or fat pads.

References:

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**NERVOUS SYSTEM IN HUMAN HANDS**

Here is some information about the nervous system of human hands with its classifications and types:

The nervous system of human hands is a part of the peripheral nervous system (PNS), which is the part of the nervous system that connects the central nervous system (CNS) to the rest of the body. The PNS consists of two main types of nerves: sensory nerves and motor nerves. [Sensory nerves carry information from the receptors in the skin, muscles, joints, and other organs to the CNS, while motor nerves carry commands from the CNS to the muscles and glands](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank)[1](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank).

The sensory nerves of the human hands are responsible for detecting various stimuli, such as touch, pain, temperature, pressure, and vibration. They transmit these signals to the spinal cord and brain, where they are processed and interpreted. [The sensory nerves of the human hands can be classified into four types based on their function and structure](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[2](https://byjus.com/biology/nervous-system/" \t "https://edgeservices.bing.com/edgesvc/_blank):

* Mechanoreceptors: These are nerve endings that respond to mechanical stimuli, such as stretching, compression, or deformation. They are located in the skin, subcutaneous tissue, and deep tissues of the hand. They can be further divided into four subtypes: Merkel cells, Meissner corpuscles, Ruffini endings, and Pacinian corpuscles. Each subtype has a different sensitivity and adaptation rate to stimuli.
* Nociceptors: These are nerve endings that respond to noxious stimuli, such as extreme heat, cold, or pressure. They are located in the skin and deep tissues of the hand. They can be further divided into two subtypes: A-delta fibers and C fibers. A-delta fibers are thin myelinated fibers that transmit fast and sharp pain signals, while C fibers are thin unmyelinated fibers that transmit slow and dull pain signals.
* Thermoreceptors: These are nerve endings that respond to changes in temperature. They are located in the skin of the hand. They can be further divided into two subtypes: cold receptors and warm receptors. Cold receptors are activated by temperatures below 35°C (95°F), while warm receptors are activated by temperatures above 45°C (113°F).
* Proprioceptors: These are nerve endings that respond to changes in position and movement of the body parts. They are located in the muscles, tendons, ligaments, and joints of the hand. They provide feedback on the length, tension, and force of the muscles and tendons, as well as the angle and direction of the joints.

The motor nerves of the human hands are responsible for controlling the movements of the muscles and glands of the hand. They transmit commands from the spinal cord and brain to activate or inhibit muscle contraction or gland secretion. [The motor nerves of the human hands can be classified into two types based on their origin and function](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[1](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank):

* Somatic motor nerves: These are nerves that originate from the ventral horn of the spinal cord and innervate the skeletal muscles of the hand. They are involved in voluntary movements, such as grasping, writing, or typing.
* Autonomic motor nerves: These are nerves that originate from the sympathetic or parasympathetic ganglia and innervate the smooth muscles and glands of the hand. They are involved in involuntary movements, such as sweating, blushing, or goosebumps.

[The main nerves that supply the sensory and motor innervation of the human hands are the median nerve, the ulnar nerve, and the radial nerve](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[1](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank). [These nerves originate from the brachial plexus, which is a network of nerve fibers formed by the anterior rami of the spinal nerves C5-T1](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[3](https://my.clevelandclinic.org/health/body/23123-peripheral-nervous-system-pns" \t "https://edgeservices.bing.com/edgesvc/_blank). The brachial plexus is located proximally in the root of the neck and axillary region.

[The median nerve passes through the carpal tunnel under the flexor retinaculum of the hand and distally divides into common and proper palmar digital nerves](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[3](https://my.clevelandclinic.org/health/body/23123-peripheral-nervous-system-pns" \t "https://edgeservices.bing.com/edgesvc/_blank). [It predominantly supplies the thenar muscles (abductor pollicis brevis, adductor pollicis, flexor pollicis brevis, and opponens pollicis), as well as the lateral two lumbricals, and some skin areas on the palmar and dorsal aspects of the thumb, index, middle, and half of the ring finger](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[1](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank).

[The ulnar nerve enters the hand under the superficial part of the flexor retinaculum and divides into superficial, deep, and dorsal branches](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[3](https://my.clevelandclinic.org/health/body/23123-peripheral-nervous-system-pns" \t "https://edgeservices.bing.com/edgesvc/_blank). [It innervates the hypothenar muscles (abductor digiti minimi, flexor digiti minimi, opponens digiti minimi, and palmaris brevis), as well as the medial two lumbricals, the palmar interossei, the dorsal interossei, and some skin areas on the palmar and dorsal aspects of the little finger and half of the ring finger](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[1](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank).

[The radial nerve provides mainly cutaneous innervation along the outside of the thumb, as well as the dorsal aspects of the index, middle, and half of the ring finger](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[1](https://www.kenhub.com/en/library/anatomy/hand-anatomy" \t "https://edgeservices.bing.com/edgesvc/_blank). [It also innervates some muscles on the dorsal side of the hand, such as the extensor pollicis longus, extensor pollicis brevis, and abductor pollicis longus](https://www.kenhub.com/en/library/anatomy/hand-anatomy)[3](https://my.clevelandclinic.org/health/body/23123-peripheral-nervous-system-pns" \t "https://edgeservices.bing.com/edgesvc/_blank).

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