Terminology of biomechanics

Biomechanics is the application of mechanical principles to living things. This is a study of the study of the mechanics of engineering living organisms

Biomechanics or biomechanics is that science that researches the movement of any living organism from all aspects (anatomical - physiological - psychological - physical - mechanical - physical), and which deals with the force affecting living bodies, whether in the state of rest or movement, and this movement may be Above the

-

surface of the earth or planets, or in a water medium .or in space

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ApplicationsThe study of biomechanics ranges from the internal functioning of the cell, to the movement and development of organs, to the mechanical properties of soft tissues and bones. With the development of the understanding of the physiological behavior of living tissues, biomechanics is also concerned with the study of the musculoskeletal system. In addition, knowledge in this field is used in the design of organs, prostheses

Departments of Mechanics:

- **(First) statics:Static is the branch of mechanics that researches the stillness of bodies under the influence of a group of influences called forces. The forces that do not change in the state of the body are described as equilibrium, and the body is said to be in a state of equilibrium under its influence. Therefore, static is sometimes called (the science of balance of bodies)(Second) Dynamics:And dynamics is the branch of mechanics that researches the movement of solid bodies**

Dynamics is divided into two main parts:1- Kinematics:It examines the properties of motion from a geometric point of view (describing movement and an abstract description without exposure to the forces causing it) such as position, displacement, velocity and acceleration.2- Kinetics:It examines the effect of forces causing or changing motion

study of force and its components

study of force and its components

Force is an effect that affects the bodies, causing a change in the

body's state, direction, position, or movement. The force can

change the velocity of an object with mass (as well as moving a stationary object), which means giving the object .acceleration

Force is a vector quantity (which has magnitude and direction). It is

measured in the SI units in units of Newtons and denoted by the symbol F

Types of force

gravitational force

Electromagnetic force

The weak force

Strong nuclear power

resultant force

The resultant force may act on the body by one or more forces. Whereas, if two or more

forces affected a body, those forces can be replaced by one force called the resultant

force, which is a single force equivalent in its effect to the set of forces acting on the

.body

Forms of resultant force

If the two forces are in the same direction, then the resultant force is equal to the sum

of the two forces (power 1 + power 2). If the two forces are in opposite directions, then

the resultant force is equal to the difference between the two ,forces (Force 1 - Force 2)

and the direction of movement is in the direction of the greater force. If the two forces

are equal in magnitude and opposite in direction, then their result is zero, and the body

.is in equilibrium

.

:force

Mass -1

Speed -2

Radius -3

Centrifugal force (decentralization) and centrifugal :force (central)

/ Definition of

:Decentralizing force *

It is this force that kicks the player or athlete out of the axis of rotation, that is, it kicks

.him out

:Centrifugal force

It is the force that pulls the athlete or athlete in the direction ,of the axis of rotation

.that is, it pulls him inward

Centrifugal force is the opposite of centrifugal force

The higher the intensity curve, the more negatively affects the .velocity

The higher the speed, the - .greater the repelling force

The speed depends mainly on the step length and the step frequency

static and dynamic equilibrium

Dynamic equilibrium is the steady state of a reversible reaction

where the rate of the forward reaction is the same as the

reaction rate in the backward .direction

Static equilibrium, also known as ,mechanical equilibrium

means the reaction has stopped. In other words, the system is

at resit

What is the difference between static and

?dynamic equilibrium

Static equilibrium is a state ;where bodies are at rest

dynamic equilibrium is a state where bodies are

moving at a constant velocity (rectilinear motion). In

both cases the sum of the forces acting on them is

zero

?equilibrium

If an object is at rest and is in a ,state of equilibrium

then we would say that the object is at "static

equilibrium." "Static" means stationary or at rest. ... The

state of the object is analyzed in terms of the forces

acting upon the object

?equilibrium

There are three types of ,equilibrium: stable

.unstable, and neutral

study of moments

What is moment

The Moment of a force is a measure of its tendency to cause a body to rotate about

a specific point or axis. This is different from the tendency for a body to move, or

translate, in the direction of the force. In order for a moment to develop, the force

must act upon the body in such a manner that the body would begin to twist. This

occurs every time a force is applied so that it does not pass through the centroid of

the body. A moment is due to a force not having an equal and opposite force

.directly along it's line of action

Imagine two people pushing on a door at the doorknob from opposite sides. If both

of them are pushing with an equal force then there is a state of equilibrium. If one

of them would suddenly jump back from the door, the push of the other person

would no longer have any opposition and the door would swing away. The person

who was still pushing on the door created a moment

?What are the types of moments

.Clockwise moments

Anticlockwise moment

the law of moment

When an object is balanced (in equilibrium) the sum

of the clockwise moments is equal to the sum of the

anticlockwise moments. Force 1 x its distance from

pivot = Force 2 x distance from the pivot

?moment

The Moment of a force is a measure of its tendency to

cause a body to rotate about a ... .specific point or axis

The magnitude of the moment of a force acting about a

point or axis is directly proportinoal to the distance of the

... .force from the point or axis

Moment = Force x Distance or M = (F)(d)

What are the application of ?moments

.In bicycle long pedals are used

In bicycle, the pedals are used to rotate the toothed wheel

about an axis passing through its centre. When long pedals

are used, the distance of the force from the axis of rotation

is more. Thus less (moment arm) force is required to rotate

the toothed wheel due to large turning effect

What is difference between moment

?and couple

What is the difference between ?Moment and Couple

Moment of force is the measure of turning effect of a

force about a point. A couple consists of two equal and

opposite forces acting with two different but parallel

lines of action. Each force has its .own moment

Stress distribution to the body

.point

If the stress is the same over the entire body, it is defined as a measure of the average

amount of force applied per unit .area

A:f/a

Medium stress or also called nominal stress or engineering stress.a

The force acting on space.f

It is a measure of the density of the total internal forces acting inside an object across an

imaginary cross-sectional area, in response to the applied external forces and the forces of

the object (the effect of gravity is considered the force of an .object)

The one for stress in the SI is the pascal, symbolized by (Pa), which is a shorthand name for

one newton (force) per square meter (area one). It is itself the pressure one, which is also

measured by force in one area. Geometric quantities are usually measured in megapascals

or gigapascals (GPa). ,(MPa) Stress per British unit is expressed in pounds per square inch

or kilograms per square ,(psi) .inch (ksi)

In vertical stress (tensile or compression) the force is perpendicular to the surface that the

force is acting on. In shear stress, the force is parallel to the .surface it is acting on

As with forces, stress cannot be measured directly, but it can be calculated from

measurements of strain, knowing the elastic properties of the material. There are devices

that indirectly measure stress, such as a strain gauge and a manometer

On your body, on your mental state, on your

behavior Headache, anxiety, overeating or not

eating Muscle tightness or pain, restless

outbursts of anger Chest pain, loss of

motivation, poor concentration, drug or

alcohol addiction Fatigue, feeling

overwhelmed, using tobacco products A

change in desire for intimacy, irritation and

anger. Social withdrawal Upset stomach

Feeling sad and depressed Decrease in the rate

of exercise

static alignment

Static alignment is the condition of the machinery

at rest (think of the alignment we perform when

the equipment is first installed). Static alignment

gives us the opportunity to correct issues such as

soft foot, gross misalignment and to bring the

system to within specifications

?Alignment

While we have previously identified that alignment is the primary cause of

premature coupling failures (see post here), a further explanation of static versus

.dynamic alignment is in order

Static alignment is the condition of the machinery at rest (think of the alignment

we perform when the equipment is first installed). Static alignment gives us the

opportunity to correct issues such as soft foot, gross misalignment and to bring

the system to within .specifications

Dynamic alignment is the condition of the machinery .during sustained operation

Think of an electric motor moving from its mechanical center to the electrical

center, the thermal growth experienced by an internal combustion engine or a

shaft moving axially in response to forces in the machine train. It is common to

perform a “hot alignment check” on equipment. A hot alignment check is when

the machinery is allowed to achieve its operational steady .state condition (i.e

after a compressor train has operated for a minimum of 24 hours) and is then shut

down with the express intention of quickly performing an .alignment verification

Depending in the machinery, dynamic alignment is preferred as the equipment

will experience measurable changes and can result in the equipment operating

beyond alignment specifications .from the initial static condition

dynamic alignment

Dynamic alignment is defined as an ongoing

process of neuromuscular postural responses

occurring at an unconscious level, and can refer to

the body in stance or in motion, in a variety of

conditions

? What does alignment mean

alignment: body placement or posture; the

relationship of the skeleton to the line of gravity

and the base of support. Proper alignment

lessens strain on muscles and .joints

examples of dynamics

The use of different gradations of energy to

perform a movement is often described as

adding quality to movement. Specifically, we

identify six qualities: sustained, ,percussive

swinging, suspended, collapsed, .and vibratory

What is the difference between ?posture and alignment

In short, alignment includes the .consideration of FORCES

Or said another way, posture is the visible orientation of

parts and alignment encompasses the invisible forces

created by particular movements. Many of you are

working on your alignment, which is not to say that you

.are not working on your posture

?alignment

Possible signs that your spine is :out of alignment include

.chronic headaches

.lower back pain

.neck pain

.knee pain

.hip pain

.frequent illnesses

.excessive fatigue

numbness or tingling in the .hands or feet

?aligned

One quick way to check if your body is in good alignment

is by the way you walk. Simply walk around your home

and take a look at how your feet ,are positioned. Ideally

your foot's line of progression should form an angle of

degrees with a line from the center of your heel to 4-7

.your second toe

Gait analysis

Gait analysis, more specifically, the study of

human movement, using eye and ,brain monitors

additional devices are added to measure body

movements, body mechanics, and muscle

activity.Gait analysis is used to evaluate and treat

individuals with conditions that affect their ability

to walk. They are also commonly used in sports

biomechanics to help athletes run more

efficiently and to identify posture or movement

.problems in people with injuries

FactorsThe gait analysis is modified or modified by

many factors, and changes to the normal gait pattern

can be transient or permanent. The factors can be of

different types:External: such as ,terrain, shoes

clothes, and cargoFundamental: ,gender, weight

height, age, etc.Physical: such as weight, height, and

fitnessPsychological: personality type and

emotionsPhysiological: ,Anthropometric properties

i.e. measurements and body

proportionsPathogenesis: for ,example, trauma

neurological diseases, ,musculoskeletal deformities

and psychological disordersThe parameters taken into

account for the gait analysis are as follows:Step

lengthStep lengthRhythmSpeedDynamic baseProgress

.lineFoot angleHip angle

TechniquesGait analysis includes measurement, in

which measurable parameters are presented and

analyzed, and interpretation, in which conclusions

are drawn about the topic ,(health, age, size

weight, speed, etc.). Analysis is the measurement

of the following:Temporal / spatialIt consists of

calculating speed, tempo length, pitch, etc. These

measurements are done by:Stopwatch and

markers on the ground.Walking on a pressure

mat.Laser range sensors scan a plane a few

centimeters above the ground.Inertial sensors and

software for interpreting 3D gyroscopes and 3D

acceleration data

design the symes prosthesis

?What is Symes

A Syme amputation is an amputation done through the

ankle joint. The foot is removed but the heel pad is saved

so the patient can put weight on the leg without a

prosthesis (artificial limb). The goals of a Syme

amputation are to remove diseased tissue or a

non-usable

foot and create a functional, .painless limb

What type of prosthetics are ?there

There are Four Main Types of Artificial Limbs. These

include the transtibial, transfemoral, transradial, and

transhumeral prostheses. The type of prosthesis

depends on what part of the limb is missing. A

transradial prosthesis is an artificial limb that replaces an

arm missing below the elbow

?prosthesis

A transtibial prosthesis replaces the function of missing

anatomical segment(s) from .below the knee to the floor

This excludes partial feet . The way we do it. The

prosthetic socket is the main connection between the

residual limb and the prosthesis

?What is a Boyd amputation

The Boyd amputation is a surgical technique used to treat

osteomyelitis of the foot. This amputation is a technically

more difficult procedure to perform than the Syme

amputation, but it offers certain advantages. The Boyd

amputation provides a more solid stump because it

preserves the function of the .plantar heel pad

?prosthesis

Prosthesis: While prosthetics refers to the science of

creating artificial body parts, the artificial parts

themselves are called prosthesis. One piece is called a

prosthesis, but multiple pieces are called prostheses. This

term applies to any artificial limb regardless of whether it

.is an upper or lower limb

biomechanics of partial foot

Biomechanics is the science of the movement of a living body, including how muscles, bones, tendons, and ligaments work together to produce movement. Biomechanics is part of the larger field of kinesiology, with a

special focus on the mechanisms of movement. It is both fundamental and applied science, and it encompasses the research and practical use of its .results

Biomechanics includes not only the structure of the bones and muscles and the movement that can produce them, but also the mechanisms of blood circulation, kidney function, and other body functions. The American Biomechanics Association says that biomechanics represents the broad interaction between mechanics and biological systems. Biomechanics not only the human body but also animals and even extends to plants and

mechanical processes inside ..cells

Elements of Biomechanics

Statistics: the study of systems that are balanced, either at rest .or moving at a constant speed

Dynamics: the study of systems that operate with acceleration .and deceleration

Kinematics: Describe the effect of forces on a system, and its movement patterns including linear and angle changes in velocity over time. Position, displacement, velocity and .acceleration are studied

Kinematics: the study of the causes of movement, forces, and .moments in action

Jobs in biomechanics

Specializations within :biomechanics include

Biological Sciences: Studies in human, animal, cell and plant .biomechanics

Exercise and sport: applying biomechanics to human .performance in athletics

Health Sciences: Researching the causes, treatment, and prevention of injury, and using biomechanics to design

rehabilitation programs and .equipment

Ergonomics and human factors: application of biomechanics to human-machine interfaces, functional and work designs and .processes

Engineering and Applied Sciences

Professional Societies for .Biomechanics

International Biomechanics Society

American Biomechanics Association

International Society for .Biomechanics in Sport

Alignment of symes prosthesis , the type 18 windows in the socket

Syme's prosthesis

An ankle disarticulation is commonly referred to as Symes, this procedure removes the ankle and places the heel pad on the distal tibia for occasional weight .bearing capacity

the socket of a prosthesis

The prosthetic socket is the device that joins your residual limb (stump) to the prosthesis.

The socket is made just for you, according to the condition and shape of the residual limb. ... A 'check socket' can easily be changed to suit your shape, wearability and comfort if .required

a transtibial prosthesis

A transtibial prosthesis replaces the function of missing anatomical segment(s) from below the knee to the floor. This excludes partial feet . The way we do it. The prosthetic socket is the main connection between the .residual limb and the prosthesis

How do you make a prosthetic socket

One way to create a prosthetic socket is by using the bubble-forming method: a thermoplastic socket material is heated in an infrared or convection oven until it starts to drop into a bubble-like shape. The bubble is then pulled over a positive mould of the patient's stump and is left to .harden completely

the difference between a prosthesis and a prosthetic

Prosthetics: Prosthetics refers to the technical and medical process of creating artificial limbs and fitting them on

individuals who underwent an amputation surgery. ... Prosthesis: While prosthetics refers to the science of creating artificial body parts, the artificial parts themselves are called .prosthesis

What are prosthetics made of ?today

A wide variety of materials are used to create the actual limb, including acrylic resin, carbon fiber, thermoplastics, silicone, aluminum, and titanium. To create a life-like appearance, a foam cover can be applied and .shaped to match the real limb

Endoskeletal prosthesis

Endoskeletal Prosthetic Systems

Endoskeletal prostheses utilize aluminum, titanium, graphite and other tubular material to form the central supporting structure, and they usually have modular or interchangeable connectors and other components such as knees .and feet

Can you get a prosthetic leg above the knee

An above-knee prosthesis includes a socket, knee joint,

ankle joint, and foot components. You will receive a temporary prosthesis at first while your residual limb continues to heal and shrink/shape over several months of healing. The prosthesis will be modified to fit .as needed over this time

designs were effective for lower leg prosthesis

Socket technologies

Modern socket designs, such as the Comfort Flex socket for lower limb prosthesis, isolate muscle groups and are a more anatomically correct design than

previous sockets for the individual with an amputation .above the knee

Deviation kind causes and treatment

causes deviation

When the cartilage has worn away significantly, your bones start to rub together in the joint. This damages the joints and can cause them to become distorted and bend. Other causes of deviation include: psoriatic arthritis, a type of chronic arthritis also caused by your immune system attacking your . joints

deviation treated

deviation due to problems affecting the muscles or ligaments in the wrist may respond to physical therapy. Wrist and hand exercises may increase muscle strength and improve range of motion. People can perform these exercises at home while wearing a splint or a brace to keep the fingers from .moving

causes deviation in rheumatoid arthritis

Weakened radiocarpal ligaments cause radial rotation of the

metacarpals and carpus on the radius, which results in ulnar deviation of the MP joint via the Z .mechanism

Can drift be corrected

The drift splint is recommended for persons whose deviation at the MCP joints can be corrected .with mild to moderate force

How can deviation be ? prevented

Use both hands to lift and hold heavy objects. Avoid using the handles on objects such as pots or coffee mugs (use oven mitts

for hot objects). Try to avoid doing too many activities that move your fingers in the direction, such as opening jars or using doorknobs (keep internal doors cracked, for .example)

Does arthritis cause fingers to bend

Sometimes, you may feel grinding or grating when you use a finger joint. As your arthritis progresses, you may notice bony nodules at the affected joints. You may also see deformities in your finger. Your finger may seem bent to the side at a joint or

it may appear to be permanently .flexed or bent down at a joint

Why do old people's fingers get ?crooked

Mechanical wear and tear that builds up over time is the most common cause of osteoarthritis, but it can also develop due to an injury. When an injury changes the alignment of a joint, it can damage the cartilage more rapidly. In the hands, this damage causes enlarged joints .and crooked fingers

the 4 stages of rheumatoid arthritis

Stage 1: Early RA

Stage 2: Antibodies Develop and Swelling Worsens

Stage 3: Symptoms Are Visible

Stage 4: Joints Become Fused

Can you fix a crooked finger

If you have severe joint deformity - painful, crooked fingers and toes - surgery may be an option. It won't cure your RA, but it can improve the deformity, ease pain, and help your joints work better. Some common types of surgery include: Synovectomy - removal of the lining of the joint, called .the synovium

How can I fix crooked fingers at home

Finger Stretch

Place your hand palm-down on a table or other flat surface

Gently straighten your fingers as flat as you can against the surface without forcing your joints

Hold for 30 to 60 seconds and then release

Repeat at least four times with .each hand

Biomechanics of T.K prosthesis

the components of a prosthesis

The basic components of a prosthesis include the following

Socket (plastic receptacle in which the residual limb is contained)

.Appendage (hand or foot)

Joint (wrist, elbow, shoulder, .ankle, knee, or hip)

Connecting module that connects the appendage and .joint to the socket

the five design considerations ?for a prosthesis

Location,2- strength vs. -1 weight,3- attachment, 4-available materials

and cost-5

How do prosthetics work with the musculoskeletal system to ?enable movement

In an able-bodied person, the brain signals to a muscle to move, and that movement sends feedback to the brain that allows it to sense how a muscle is .moving

What is the difference between a prosthetic and prosthesis

The term “prosthetic” is also used as an adjective to describe items. ... Prosthesis: While prosthetics refers to the science

of creating artificial body parts, the artificial parts themselves are called prosthesis. One piece is called a prosthesis, but multiple .pieces are called prostheses

the four types of prosthetics

There are Four Main Types of Artificial Limbs. These include the transtibial, transfemoral, transradial, and transhumeral prostheses. The type of prosthesis depends on what part of the limb is missing. A transradial prosthesis is an artificial limb that replaces an .arm missing below the elbow

an example of a prosthesis

The classic example of a prosthesis is a false leg or arm to replace one that has been amputated. A diseased heart valve can be removed and replaced by an artificial one. ... Another example of a cosmetic prosthesis is a glass eye designed to replace an eye lost .in surgery

the interface socket of a prosthesis

Socket is an important part of every prosthetic limb as an interface between the residual limb and prosthetic components. Biomechanics of socket-residual limb interface, especially the

pressure and force distribution, have effect on patient satisfaction .and function

Alignment and force distribution of T.K 22 prosthesis

prosthetic alignment

Alignment of a prosthesis is defined as the position of the socket relative to the other prosthetic components of the limb. During dynamic alignment the prosthetist, using subjective judgment and feedback from the patient, aims to achieve the most suitable limb geometry for best .function and comfort

bench alignment

Bench alignment, which is the assembly of the. various components can be done without the aid. of any special devices. The other two procedures. require the aid of a device or devices if optimum placement of the components is to be .achieved

the components of a prosthesis

Structural components of a limb prosthesis

Socket (plastic receptacle in which the residual limb is (contained)

(Appendage (hand or foot)

Joint (wrist, elbow, shoulder, (ankle, knee, or hip)

Connecting module that connects the appendage and .joint to the socket

How do you align prosthesis

Using an app on your phone--like Skitch or similar--divide your socket into two equal parts. Proceed to draw a mid-line from your socket down to your foot. The line should also bisect the heel of your prosthetic foot or fall slightly to the inside (within 3/16 (.inch)

?What is lower limb prosthesis

A lower limb prosthesis refers to a prosthesis that replaces any part of the lower limb to restore the functional and/or cosmetic purpose of the lower limb. This may include artificial components that replace the hip, .thigh, knee, ankle and foot

What do we call a prosthesis that ?replaces a leg above the knee

A transfemoral prosthesis is an artificial limb that replaces a leg missing above the knee. Transfemoral amputees can have a very difficult time regaining

normal movement. In general, a transfemoral amputee must use approximately 80% more energy to walk than a person with two .whole legs

?What is Endoskeletal prosthesis

The endoskeletal prosthesis has a tubular structure connecting the components and is covered by cosmetic foam. The primary components of the prosthesis are the socket, suspension system, foot, and knee unit. This terminology is different from that used by surgeons in describing .the amputation levels

Gait devaiation of A.K prosthesis

What phase of the gait cycle is a transfemoral amputee most ?unstable

The most unstable phase of gait for a transfemoral amputee is at heel strike

?What is vaulting gait deviation

Background: Vaulting is a gait compensatory mechanism used by transfemoral amputees to assist toe clearance during the prosthetic swing phase. It is defined by a plantar flexion of the contralateral ankle during the single-limb support phase

Why would you see an abducted ?gait in an amputee

By bending to the prosthetic side, the amputee relieves pressure on the lateral aspect. Lateral trunk bending. This is usually present when an amputee walks with an abducted gait. Most of the causes of abducted gait can be responsible for lateral bending

?What is an abducted gait

Abnormal wide base (abducted gait) (stance & swing) Stance between heels is abnormally far apart. Hip abductor contracture or spasticity. Proximal-medial device discomfort. Instability

(patient has neuropathy and uses the wide base of support to avoid falling)

What are the causes of gait ?deviation

Gait deviations in lower limb amputees can be broadly broken into the patient and the :prosthetic causes

Patient Causes: Muscle weakness. Contracture. Pain. Decreased confidence in the prosthesis or residual limb. .Habitual/learned behaviours

Prosthetic Causes: Prosthetic malalignment. Poor-fitting prosthetic socket

?What is hemiplegic gait

Hemiplegic gait includes impaired natural swing at the hip and knee with leg circumduction. The pelvis is often tilted upward on the involved side to permit adequate circumduction. With ambulation, the leg moves forward and then swings back toward the midline in a circular movement

What is knee disarticulation ?prosthesis

Various approaches have been used to securely attach a knee disarticulation prosthesis to the intact femur. ... While single-axis knees incorporating friction,

pneumatic and hydraulic control mechanisms can be used, polycentric designs provide a more proximal knee center and achieve better toe clearance in swing phase

foresees distribution

on A.k prosthesis

?What is above knee prosthesis

An above knee (AK) or transfemoral (TF)

prosthesis is custom made for a person

who has had a AK or TF amputation. The

prosthesis consists of a custom made

socket, liner, knee, pylon, and .foot

Sometimes the prosthesis may consist of

a sleeve or other harness, depending on

the suspension system used for that

patient

What is the height of the anterior wall

?of above knee prosthesis

The actual height of the anterior brim

varies with the individual and is

limited by contact with bony

prominences. It usually extends from

..to 2-1/2 in 2

What are the five design

?considerations for a prosthesis

What are the five design

?considerations for a prosthesis

,Location, strength vs. weight

attachment, available materials

and cost 6

What are the components pylon of a

?prosthesis

The internal frame, or skeleton, of a

prosthetic limb is called the pylon. It

has traditionally been formed of metal

rods, as it must provide structural

support. ... The socket is the part of the

prosthetic device that connects to the

patient's residual limb or limb .stump

What are the components of an above

?the knee prosthesis

Elements of an Above Knee Prosthesis

An above knee prosthesis is comprised

,of a suspension sleeve, socket

prosthetic knee, pylon and prosthetic

foot, with the prosthetic socket being

the most important part your

..prosthesis