Opportunity and Significance
This device was developed to enhance the quality of life of a dog that has an amputated front limb, and it was designed to replicate normal leg functions.[1]

Technical Objectives
• Support and balance weight of dog
• Detachable
• Lightweight
• Traverse up and down stairs
• Water, ice, and snow resistant
• Durable and adaptable parts
• Function with given stump length

Design Input
Goals:
• Weigh under 15 lbs.
• Material will have less than 1% water absorption
• Material will withstand temperatures between -51ºF-112ºF
• Material will have a high traction
• Be able to accommodate variations in leg height between 1-1.5 in.
• Avoid and accommodate wear
• Be comfortable at the stump for the user
• Be about 11.25 in. tall

Constraints:
• Cost $1500 or less
• Be able to function with 2.5 in. of stump and shoulder support
• Support and balance at least 230 psi
• Maintain Brock’s height of 22-23 in.

Design Output
• Be a 3D printed prosthesis
• Securely fit and stay in place on stump
• Have replaceable parts to accommodate wearing
• Have a durable and detachable end piece
• Have an adjustable height
• Use ABS Plastic for main component of leg
• Use Aluminum for crutch portion
• Have curved Thermoplastic Elastomer end piece
• Have a harness for a suspension system
• Have a comfortable foam piece
• Utilize Epoxy Glue for assembly of parts

Options:

Materials:
Cone Shaped Body
Top:
• Medical Foam
• Nylon cloth
Body:
• ABS Plastic
Crutch Portion:
• Aluminum
End Piece:
Outer Layer:
• Thermoplastic Elastomer
Inner Layer:
• ABS Plastic

Next Steps for Development:
Test device’s ability:
• To withstand extreme temperatures
• To traverse up and down stairs
• To be comfortable on Brock’s stump
• To stay in place on the stump
• To function over an extended period of time
• To accommodate Brock’s height of 22-23 inches

Improvements:
• Make the device universal for other dogs
• Make the device more environmentally friendly
• Manufacture the device at a lower cost

References