Adjustable prosthetic sockets

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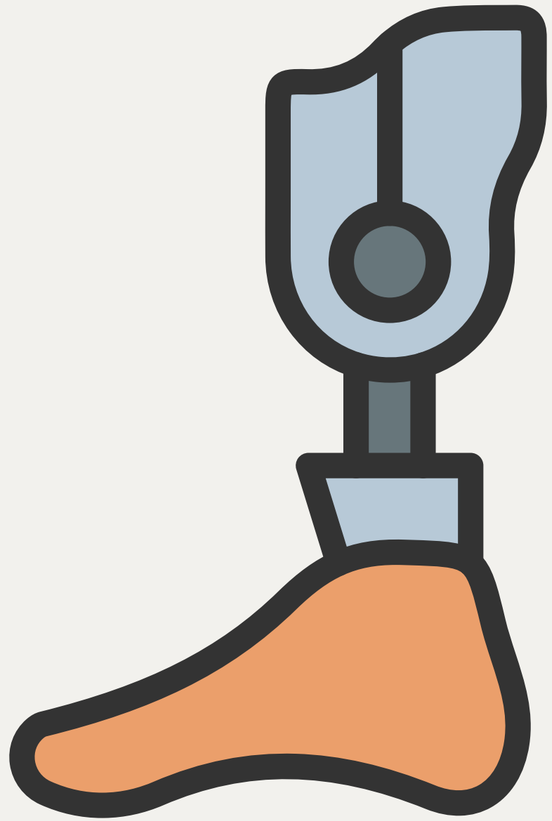
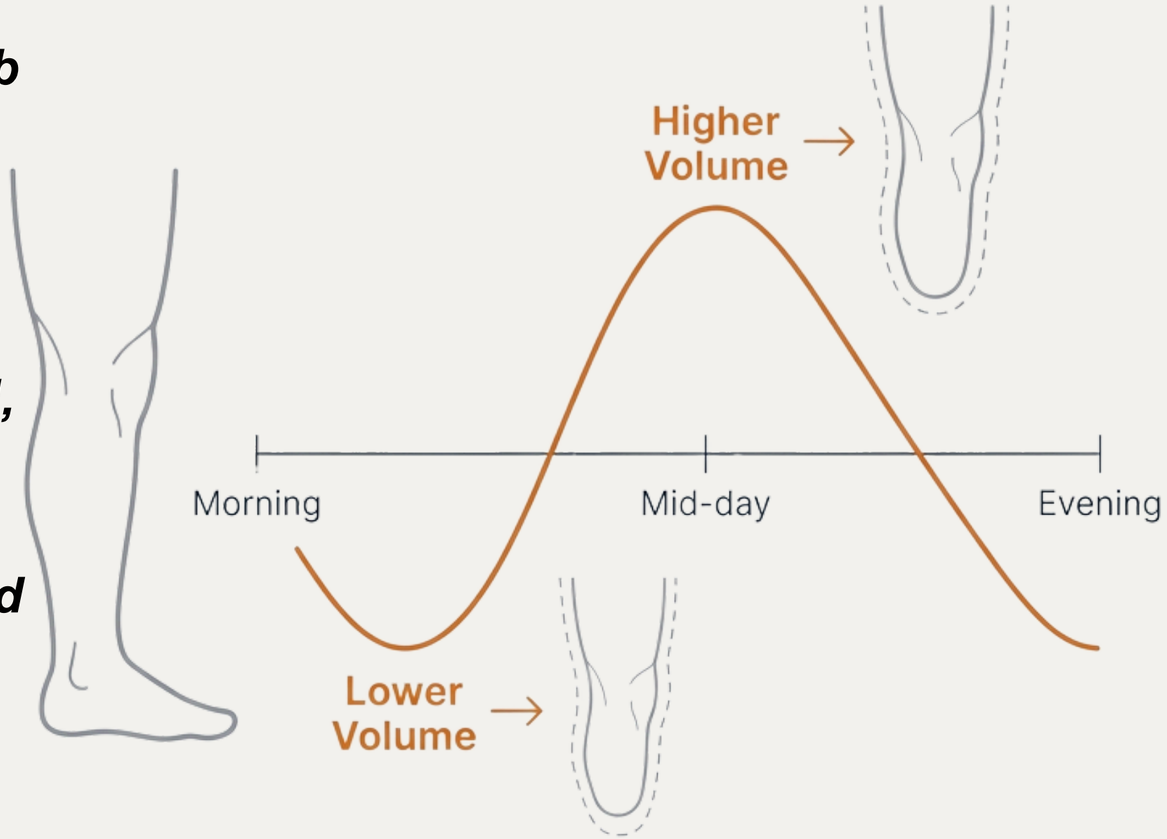


Introduction

- ***Many amputees experience daily changes in limb volume, causing discomfort with traditional sockets.***

- ***Adjustable sockets provide a personalized, adaptable solution that enhances stability, control, and user confidence.***

- ***Leading companies such as Ottobock, Össur, and Unlimited Tomorrow have pioneered innovative adjustable socket technologies, making these solutions more effective and widely available.***



Pioneering Manufacturers:

Ottobock. ÖSSUR. Unlimited Tomorrow

Importance of adjustable prosthetic sockets in modern prosthetics

1. Enhancing user comfort through customization.

- **Accommodation of changes over time**
- **Reducing chances of irritation and discomfort**

2. Improving functional performance of prosthetics

- **Enhancing stability and control**
- **Facilitating active lifestyles**

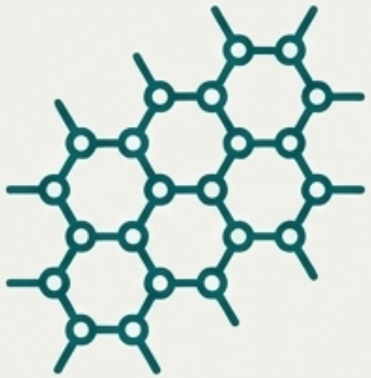
How do adjustable prosthetic sockets improve user comfort and mobility?

- **By customization for individual needs, tailored adjustments over time and enhanced control such sockets increase comfort.**

- **Mobility is so increased by the improved balance, stability, range of motion and reduced risk of accidents and injury.**

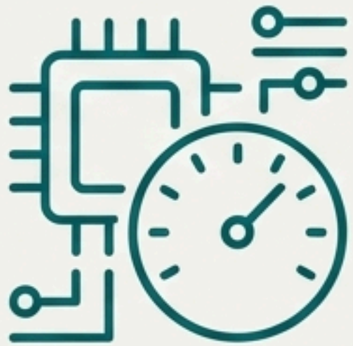
- **When comfort and mobility are increased, confidence, independence, emotional well-being and quality of life are boosted as a result.**

Technological advancements in adjustable prosthetic socket design



Material technology enhancements

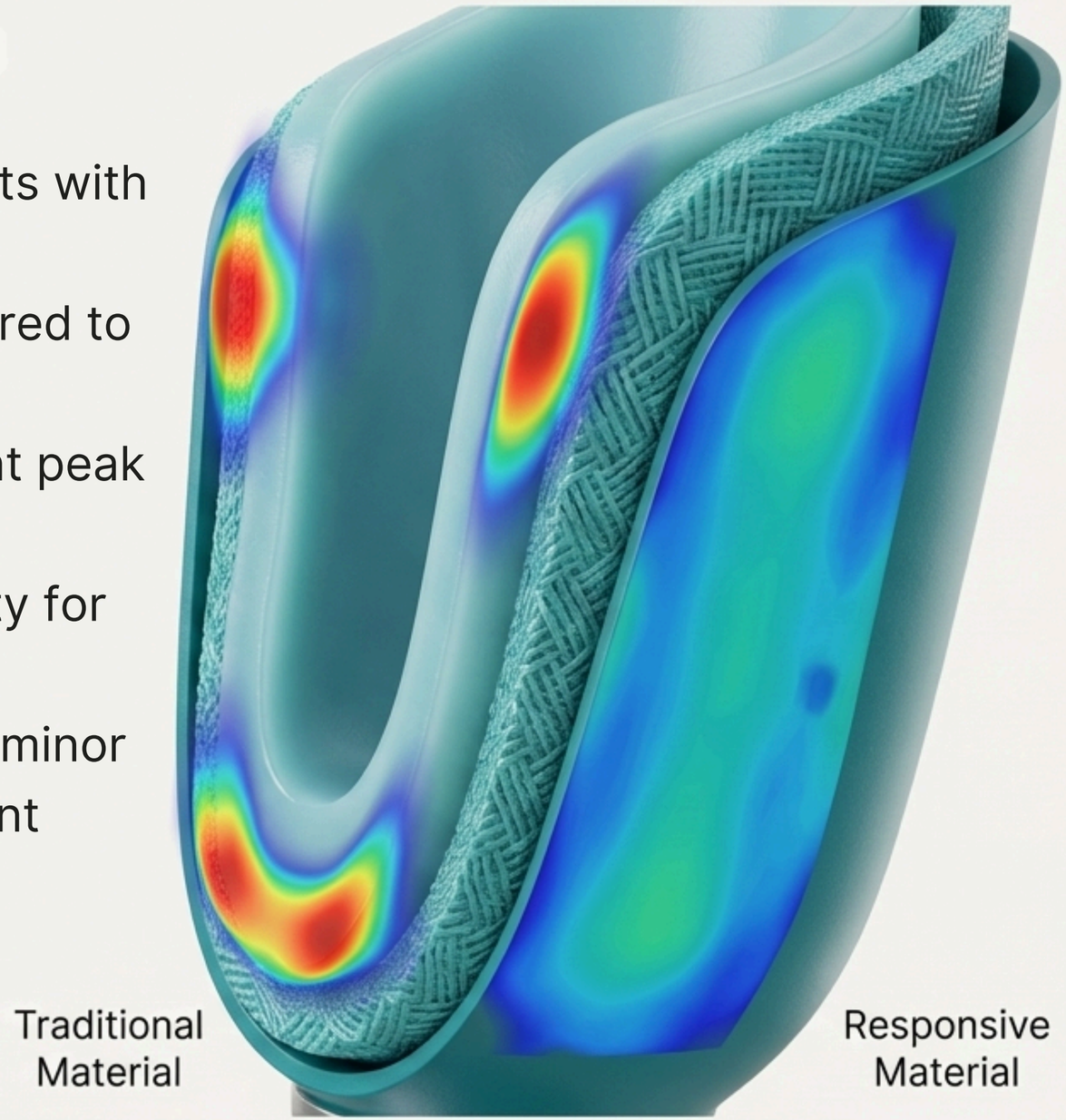
Customization techniques advances



advanced technologies in socket design

Responsive Materials

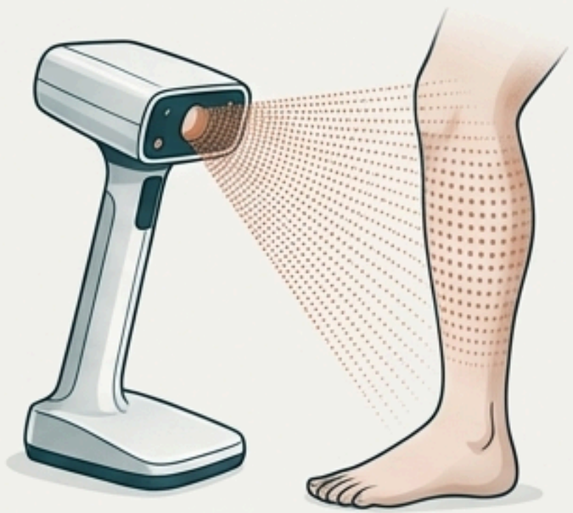
- **Key Concept**: The first layer of innovation starts with the socket material itself.
- Modern composites and polymers are engineered to be smart, durable, and responsive.
- They intelligently distribute pressure to prevent peak loading points.
- They combine flexibility for comfort with rigidity for control.
- This creates a socket that passively adapts to minor volume changes, reducing the need for frequent adjustments.



Personalized Fabrication with 3D Printing

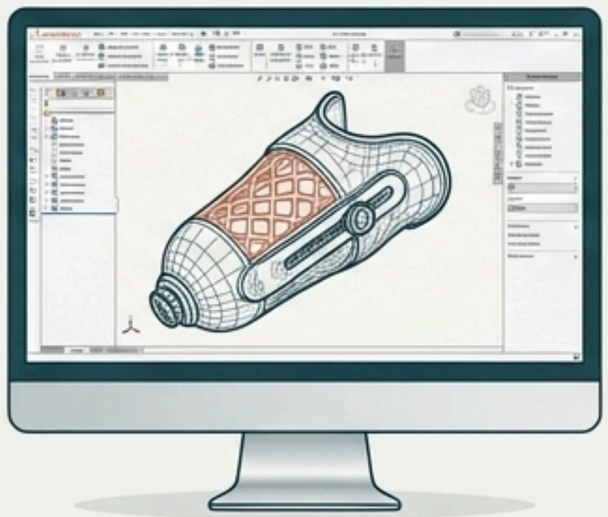
Digital manufacturing, specifically 3D printing, allows for the creation of custom-fitted adjustable sockets with a level of precision and complexity previously unattainable.

3D Patient Scan



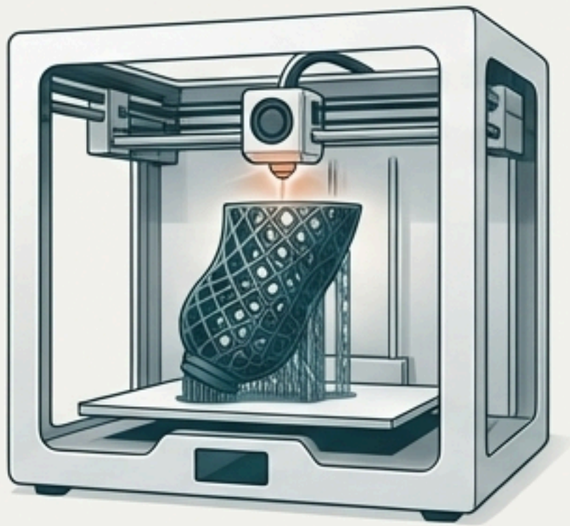
the process begin with a 3D scan fro the residual limp and take its exact measurements

Digital Design



the scan is converted to a digital design and modify the pressuer areas

Additive Manufacturing

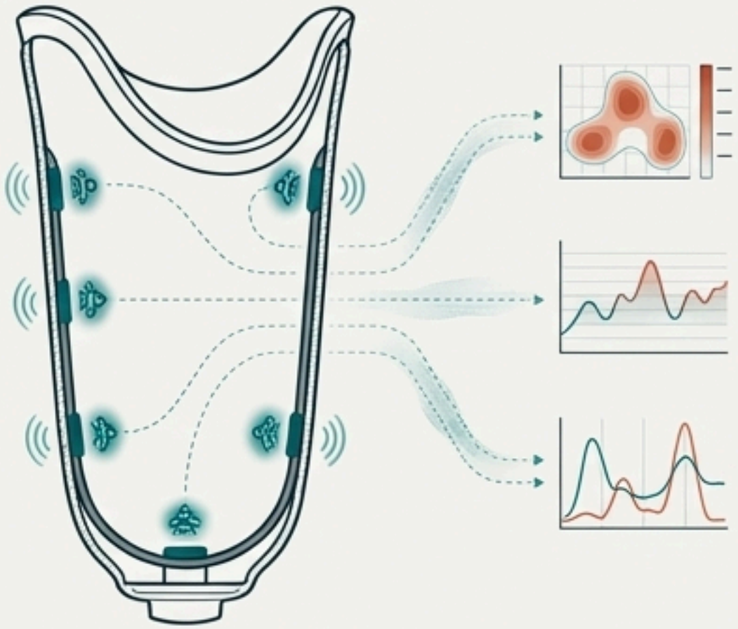


using Additive Manufacturing the socket is printed layer by layer which make it accurate and customized

Intelligent Integration for Real-Time Control

Embedded Sensors

Micro-sensors integrated into the socket wall provide real-
time data on pressure, temperature, and gait. This allows
clinicians to make evidence-based adjustments and
empowers users to understand their fit.



Case studies: success stories with adjustable prosthetic sockets

this is christ a BK amputee.
he is a great athlete; he ride from 20 to 60 miles a day

Outcome 1: Enhanced Comfort and Reduced Risk of Discomfort based on Christ, he said it feel like its a part of his body and very lightweight.

Case studies: success stories with adjustable prosthetic sockets

this is christ a BK amputee.
he is a great athlete; he ride from 20 to 60 miles a day

Outcome 2: Increased Mobility and Functional Ability he was looking forward, and he put no hand on the treadmill.

The Domino Effect of a Static Fit

Physical Cost:
Pressure Points &
Skin Irritation

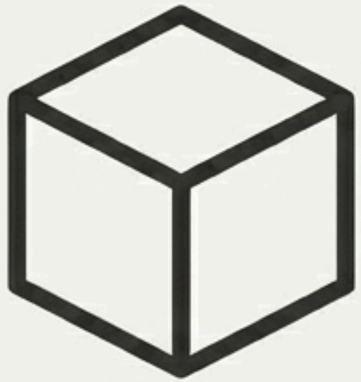
Poor Fit

Emotional Cost:
Reduced Confidence &
Quality of Life

Functional Cost: Instability
& Reduced Gait Efficiency

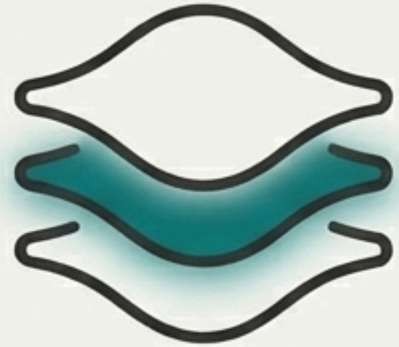
From Rigid Containment to Responsive Adaptation

The Traditional Standard



Built with rigid plastics or carbon fibers. This design prioritizes structural integrity over flexibility, which can limit user comfort.

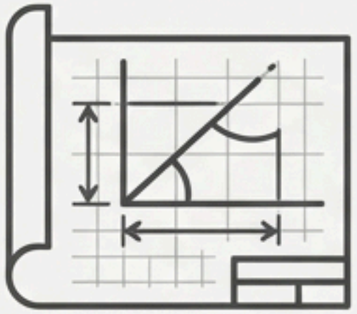
The Adjustable Paradigm



Utilizes innovative, responsive, and advanced materials. This focus on material science directly improves the socket's adaptability to the user's body.

From a Fixed Form to a Modifiable Fit

The Traditional Standard



Characterized by a less complex, fixed design. Significant changes in fit typically require a complete socket replacement.

The Adjustable Paradigm

Designs are often more complex, integrating mechanisms that offer adjustability and allow for later modifications without remanufacturing.

From Subjective Reporting to Actionable Feedback
Actionable Feedback

The Traditional Standard

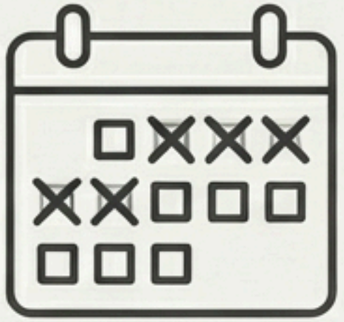
Relies on subjective user descriptions of comfort and fit, which can be difficult to translate into precise physical adjustments.

The Adjustable Paradigm

With adjustable sockets, the user's feedback becomes more accurate and more objective. Adjustments can be made in real-time, making feedback easy to manage and act upon.

From Reactive Fixes to Proactive Fine-Tuning

The Traditional Standard



May require more frequent professional adjustments, leading to potential inconvenience and cost for both users and healthcare providers.

The Adjustable Paradigm

The integrated adjustability reduces the frequency of required professional interventions, allowing for ongoing fine-tuning outside the clinical setting.

From a Defined Replacement Cycle to an Extended Lifespan

The Traditional Standard

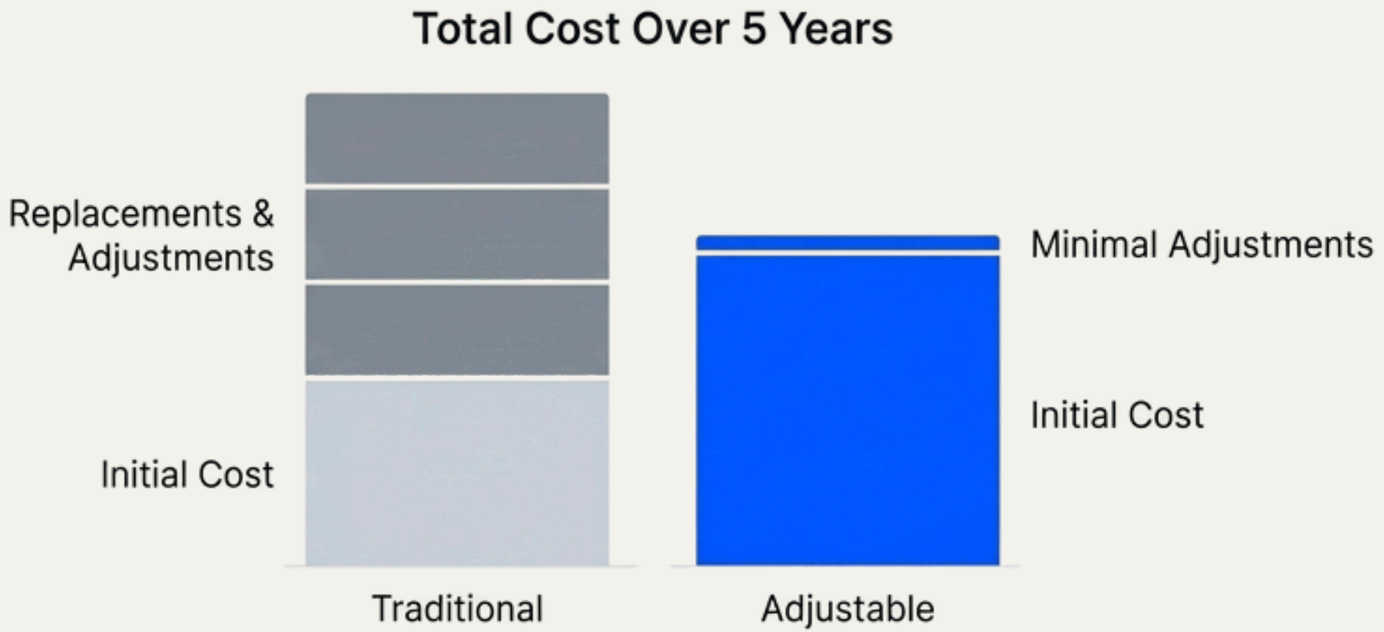
Durability is often defined by the material's lifespan and the need for replacement due to changes in fit.

The Adjustable Paradigm

The advanced materials and adaptive design of adjustable sockets often contribute to a longer lifespan, as the device can be modified rather than replaced.

From Recurring Costs to Long-Term Investment

While the initial investment for an adjustable socket may seem higher, its durability and adaptability deliver significant cost savings over time.



Cost Effectiveness

Minimizing the need for multiple socket replacements.

Durability

The materials and design of adjustable sockets often contribute to a longer lifespan.

The Comprehensive Advantage: A Side-by-Side Comparison

Factor	Traditional	Adjustable
Materials	Rigid & Limiting	Responsive & Adaptive
Design	Fixed & Simple	Complex & Modifiable
Feedback	Subjective	Objective & Actionable
Maintenance	Frequent & Professional	Infrequent & User-Aided
Durability	Shorter Lifespan	Longer Lifespan
Cost	High Lifetime Cost	High Long-Term Value

A Major Advancement: The Adjustable Prosthetic Socket

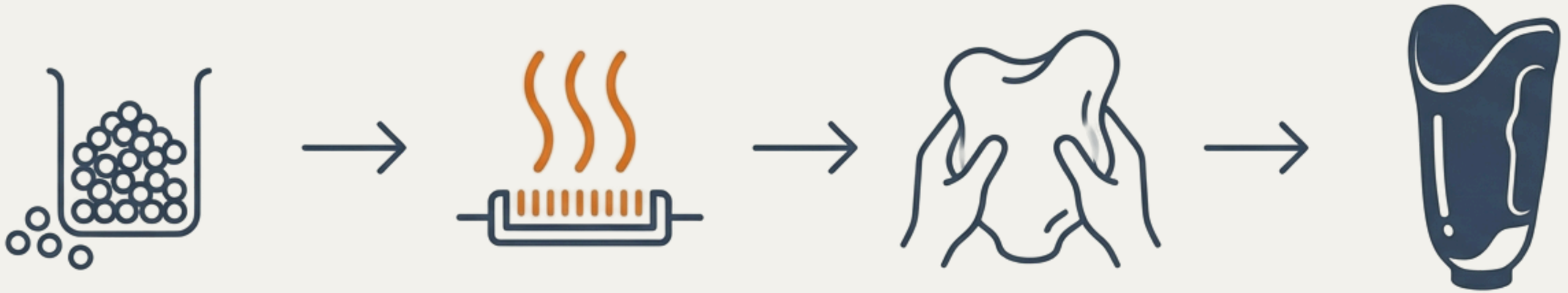
Adjustable prosthetic sockets represent a paradigm shift in prosthetic care. They are designed to address limb volume changes directly.

Their defining characteristic is the ability to be modified instantly by the user, empowering them to maintain a precise fit throughout the day.

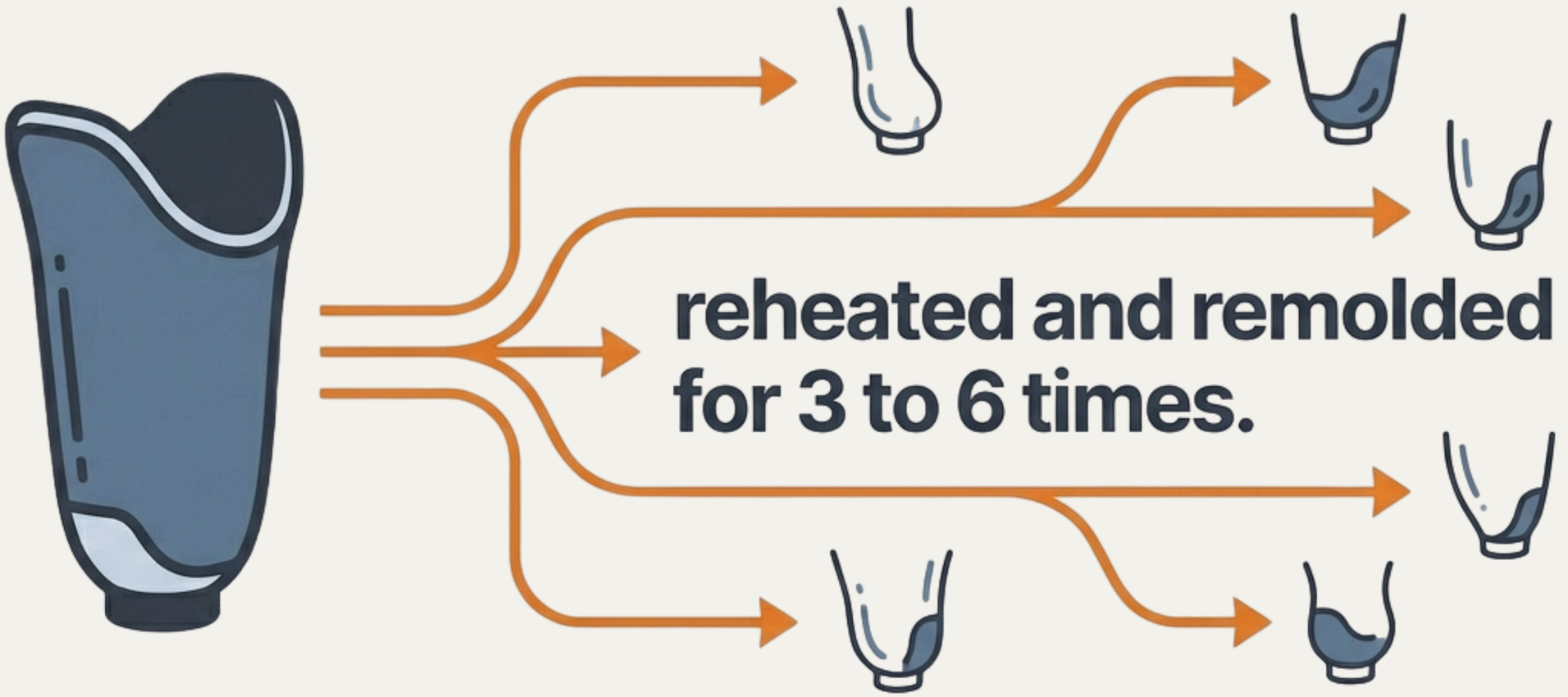
Innovation is Driven by Responsive and Reusable Materials

A key trend in adjustable socket development is the use of advanced, heat-responsive materials. These thermoplastics can be precisely heated and then custom-molded directly to the user's limb.

This process is not a one-time fitting. The materials are engineered for reusability.



One Socket, Multiple Lives



This allows for using the same socket for the same user through various stages of limb maturation, or in some cases, even for different users depending on limb sizes.

Technology in Practice:
The Amparo Adjustable Socket

The Amparo socket is a prime example of this technology, utilizing a heat-moldable design that enables rapid, in-clinic or in-field fitting and adjustment.

Conclusion

• Adjustable prosthetic sockets represent a major advancement in prosthetic care, addressing one of the biggest challenges faced by amputees: daily residual limb volume changes and discomfort.

• Their ability to be modified instantly allows users to maintain better comfort, improved stability, and more consistent mobility throughout the day—without frequent clinic visits.

• Recent studies, including those by Baldock and Highsmith, demonstrate clear improvements in functional performance and overall quality of life when using adjustable sockets.

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Any questions?

Thank you