

Motivation and Background

1. High abandonment rates stemming from unreliable designs
2. Tendon Actuated Prosthesis Hand (TAPHI) is lightweight and custom designed



Figure 1. Prosthesis End Effector Comparison. This figure shows a comparison of a prosthesis used for research, a prosthesis on the market, and a human hand.

Objective

This project verified the TAPHI process and design with an amputee participant to promote customized, comfortable, and personalized design generation for prosthesis users.

Methods

1. 3 Step Process of TAPHI Production: molding the limb, modifying in CAD, and manufacturing
2. Scanning the mold with Pop 3 Scanner; simultaneously uploading to Revo Scan Software to be exported to a CAD Software
3. Printed out of TPU 90 and Generic PLA

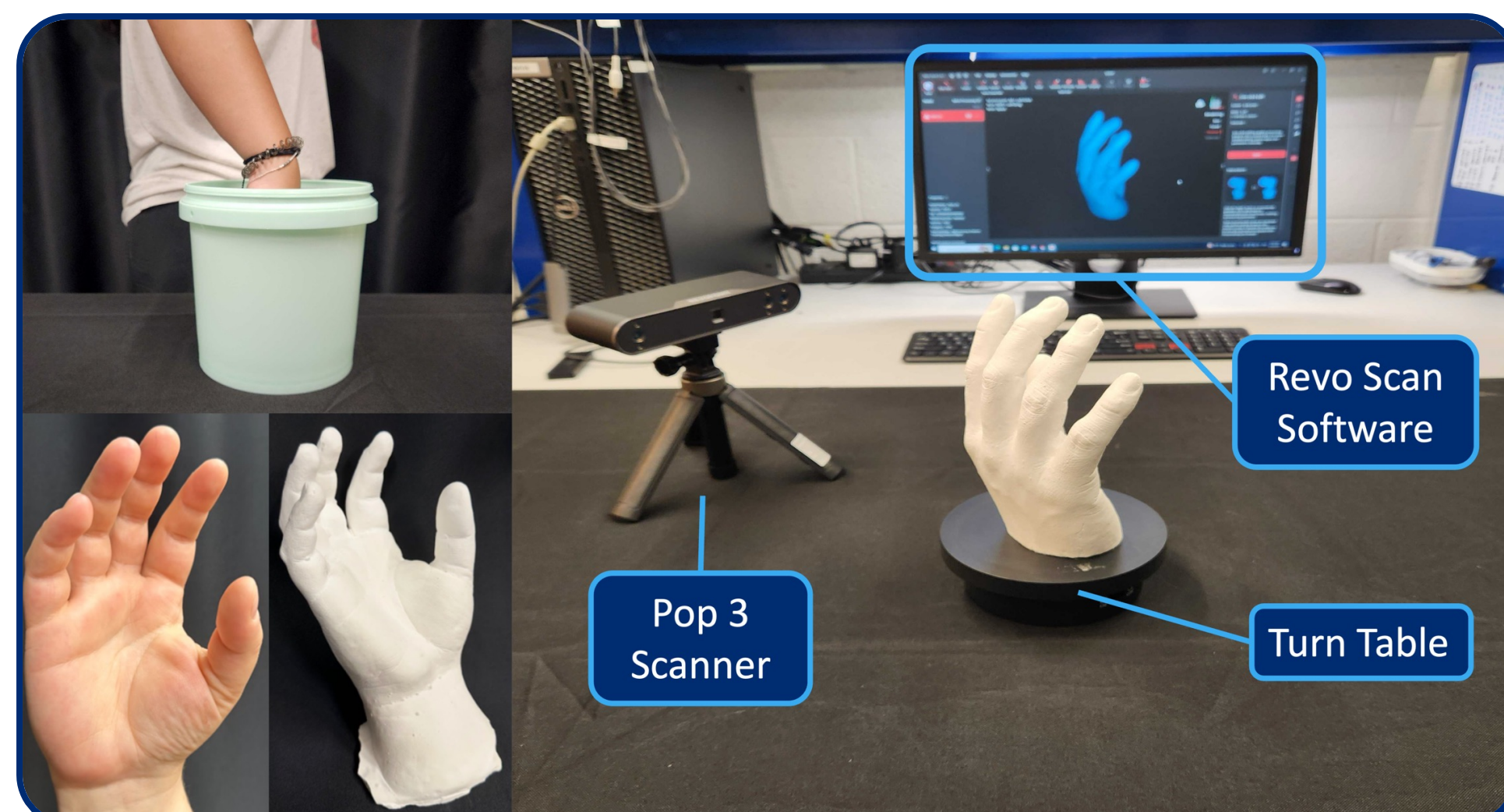


Figure 2. From Mold to CAD. This figure shows a how the mold taken from the participant is translated into a CAD software.

Results



Figure 3. Process of Creating a Custom Tendon Actuated Prosthesis Hand. This figure shows a step by step process into how a prosthesis hand is created from a limb.

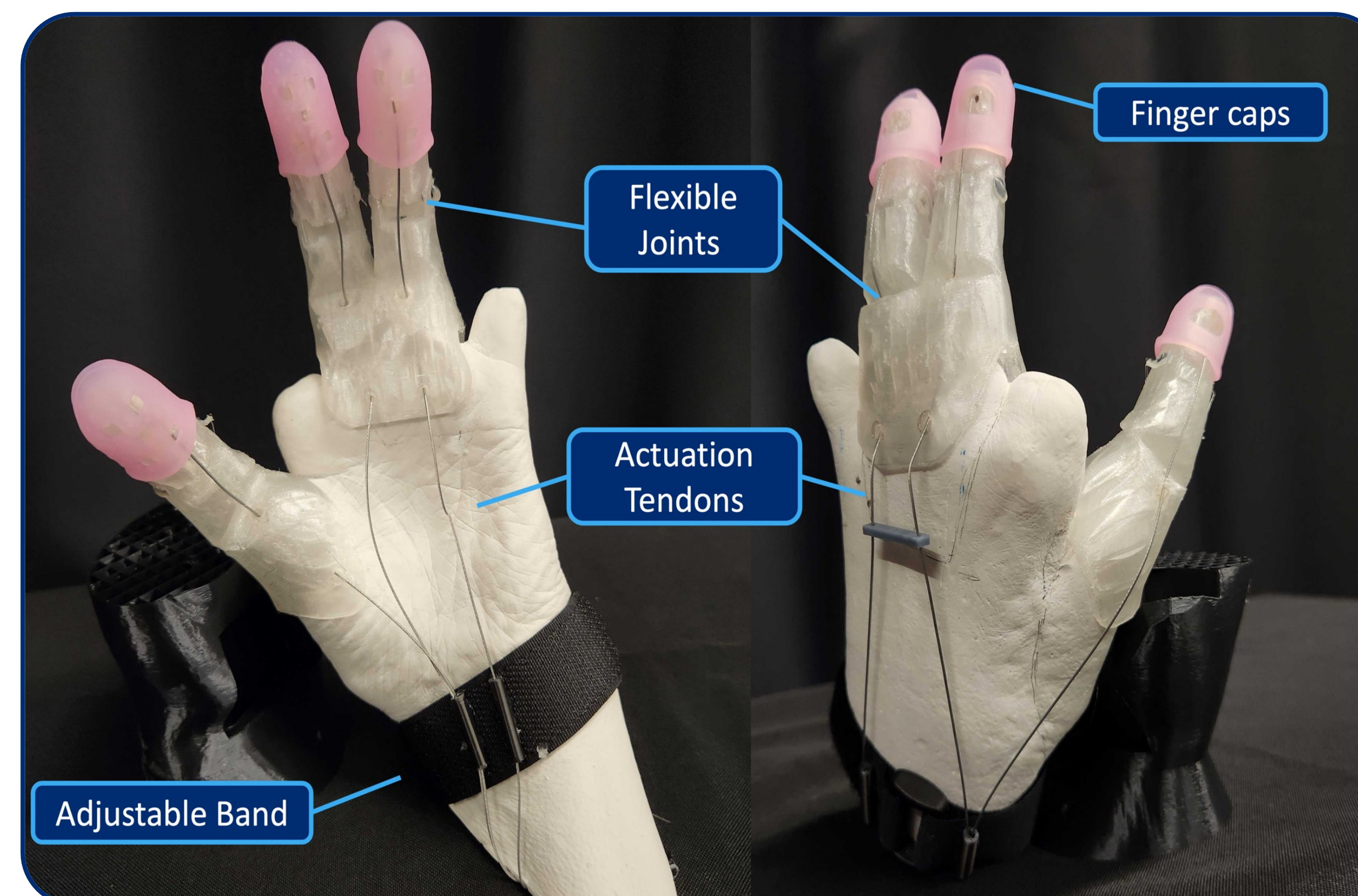


Figure 4. Customized Prosthesis Fingers for Residual Limb. This figure shows custom prosthesis fingers formed from the participants residual limb.

Conclusion

1. Produce custom tendon actuated end effectors directly informed by an individual's biology
2. Tailored design to user specifications

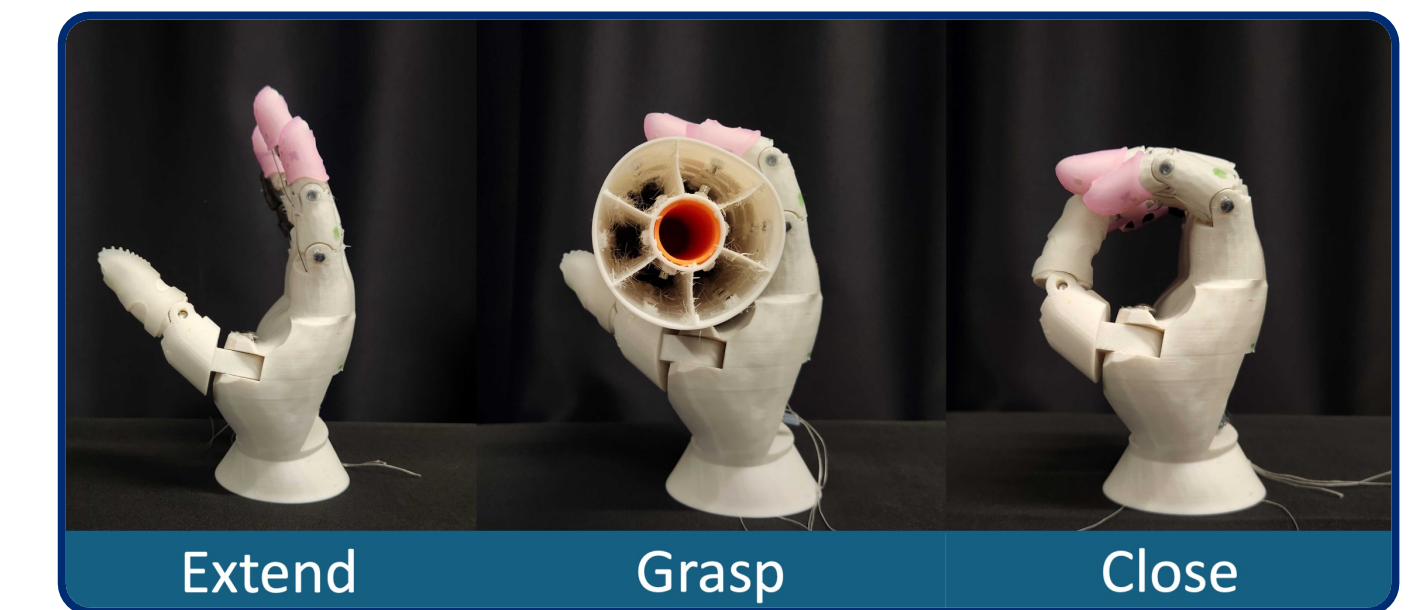


Figure 5. Actuation Abilities. This figure shows how far opened and closed the prosthesis is able to actuate.

Future Directions

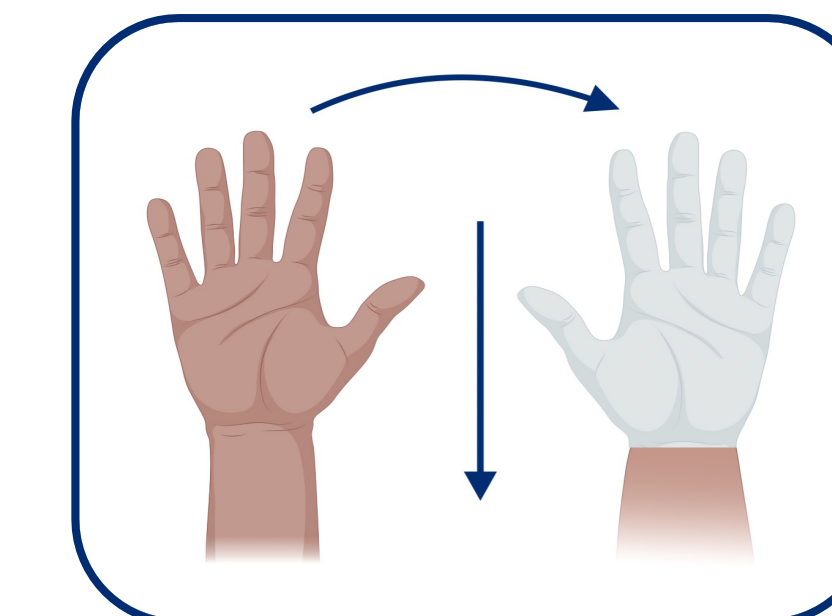


Figure 6. Mirroring Intact Limb onto Residual Limb Technique. This figure shows the technique to use an intact limb to mirror onto a residual limb.

1. Individual finger tendon actuation
2. Optimize materials for comfort (overall) & gripping (finger tips)
3. Use TAPHI process to mirror the intact limb to create custom end effectors for below the elbow prosthesis users
4. Qualitative assessments for finger prosthesis
5. Quantitative assessments for research designed prosthesis hand

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References

- (1) Dexterous Robotic Hands & Teleoperated Robots. Shadow Robot. (2024, July 29).