STOW-ABLE PASSIVE SUPERNUMERARY DORSAL GRASPING

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RESNA
Rehabilitation Engineering and Assistive Technology Society of North America

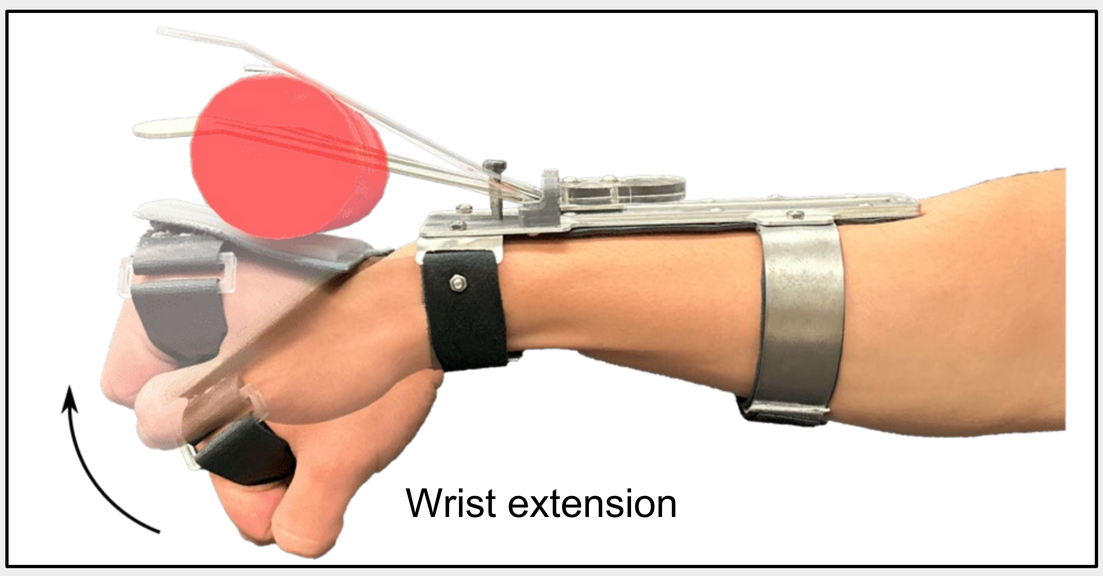
EDG

Motivation

- Spinal Cord Injury (SCI) at cervical levels results in tetraplegia, but active **wrist extension** remains for people with SCI at C6 and below
- Unlike earlier versions [1,2], this new **electronics-free Passive Dorsal Grasper** offers a lightweight and seamless wearable design.

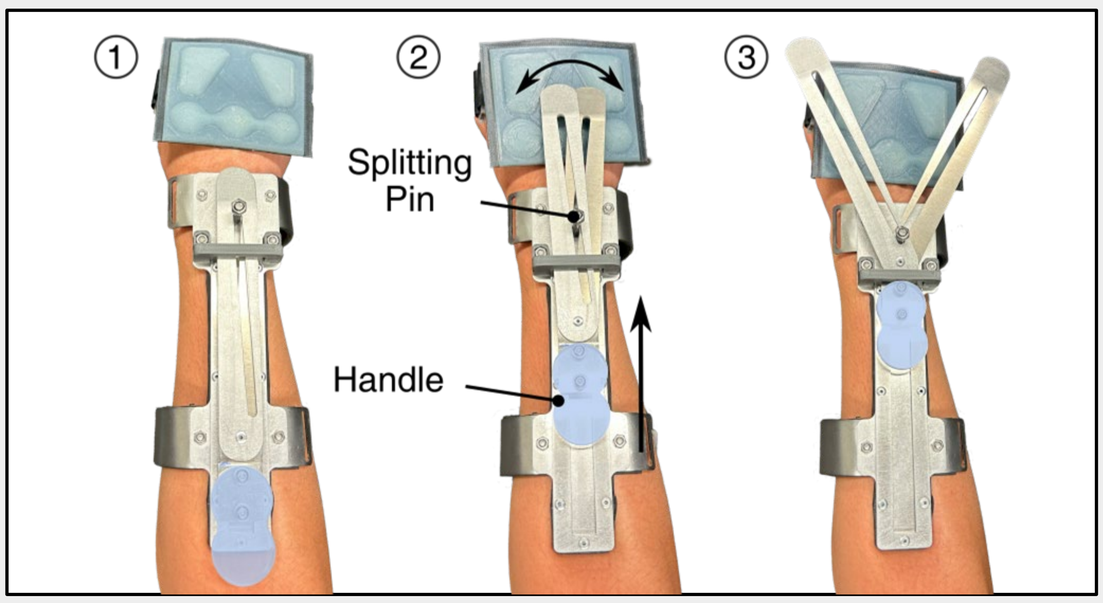
The Passive Dorsal Grasper

Supernumerary dorsal grasping

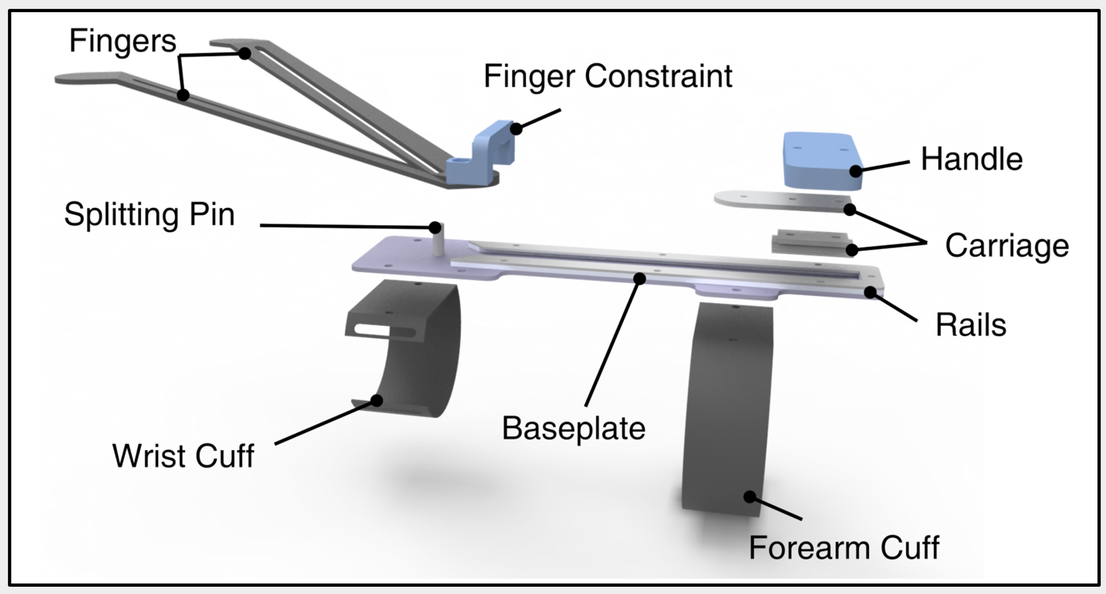


- **Two deployable supernumerary fingers** positioned above the dorsal side of the hand work in opposition to wrist extension to enable grasping.

Stow-ability of the Passive Dorsal Grasper

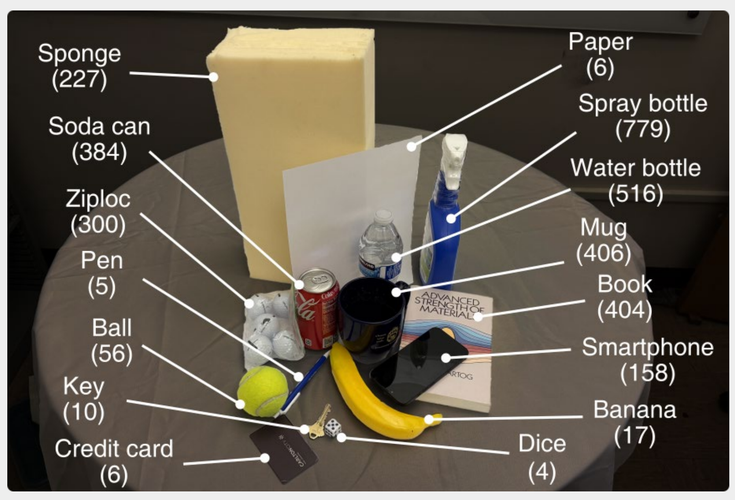


Compact design with a linear rail for stow-ability

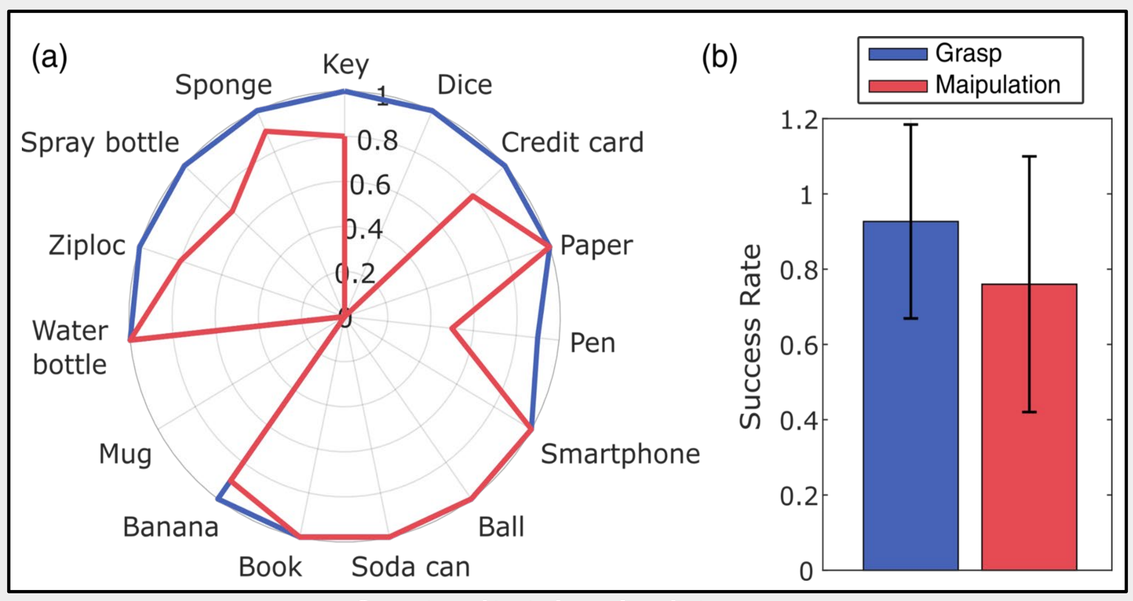


Demonstration

Grasp and Manipulation Test with a C5-6 subject



- 15 ADL objects with weights (g)
- Grasp: lift an object up
- Manipulation: Supination & Pronation



(a) Success rates for individual objects
(b) Average success rates for grasp and manipulation

In-home demonstration with a C5/6 subject



(a) Grasping a sauce bottle out of a refrigerator
(b) Grasping a milk carton on a cutting board

Acknowledgements & References

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- Trainee Fellowship (Grand No. DGE 2124913)
- CAREER (Grant No. 2237843)

[1] J. Lee, L. Yu, L. Derbier, and H. S. Stuart, “Assistive supernumerary grasping with the back of the hand,” in 2021 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2021, pp. 6154-6160.

[2] J. Lee, A. I. W. McPherson, H. Huang, L. Yu.,Y. Gloumakov, and H. S. Stuart (2025). Expanding functional workspace for people with c5-c7 spinal cord injury with supernumerary dorsal grasping. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 33, 22–33.