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Io Do Una Mano Association

Io Do Una Mano association is the Italian chapter of **e-NABLE**, a global community of makers, engineers, occupational therapists, designers.

Our aim is to help people, particularly children, with congenital or acquired upper limb deficiencies by modeling, 3D printing, and distributing **free mechanical customized devices**.



3D functional sport prostheses

Our goal is to facilitate access to sports activities for the disabled, designing devices suitable for those who want to play sports without having Olympic ambitions that are more affordable.

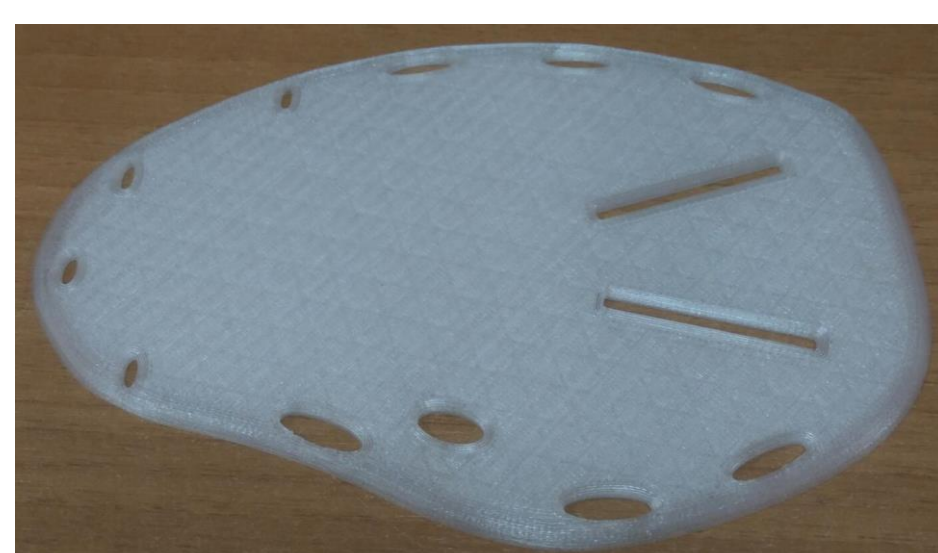
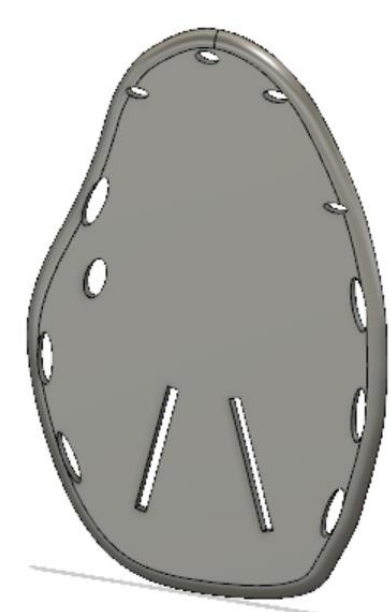
The following are examples of **sports devices** that have been fully designed and 3D printed by Io Do Una Mano.

All the devices were 3D printed using different materials according to different models and applications.

Swimming

The absence of a hand and/or a forearm determines an imbalance that can cause [1]:

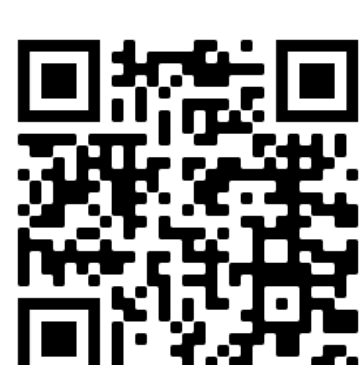
1. intracyclic fluctuations in swimming speed [2]
2. the development of compensation strategies [3]



Design: paddle with straps that can be adapted to different amputations and different arm sizes.

Material: Polypropylene based material with an antibacterial additive. It is suitable for applications in aggressive environments, such as swimming pool water. It resists attack by hydrocarbons, strong acids and bases, and peak temperatures up to 100°C.

How we act



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Cycling

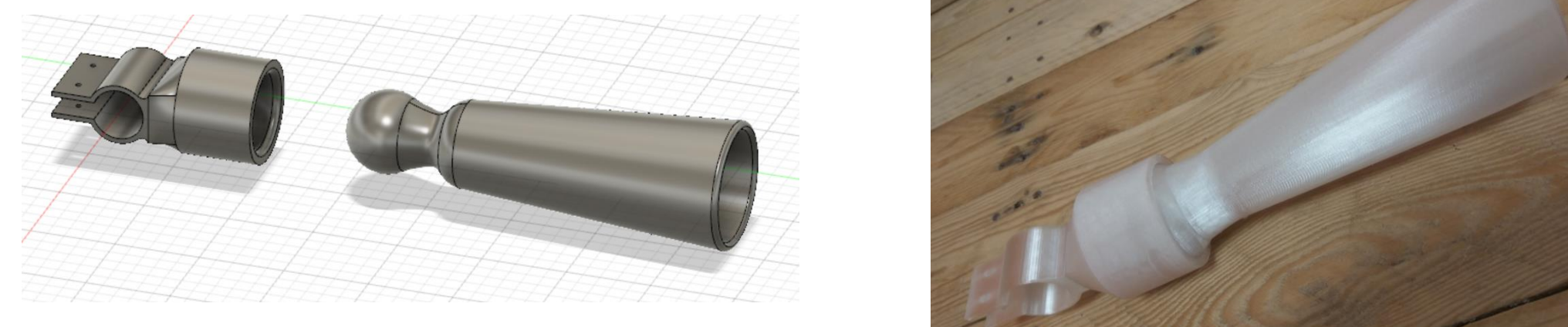
Three different models for different types of amputations and needs:

- **Non-binding model**



Design: support where people can insert their stump, that attaches to the handlebar. By inserting the stump inside the support, the user can easily control the movements of the handlebar.

- **Binding model**



Design: attachment to the handlebar (A) inside which, through a spherical system, a funnel is wedged (B).

The recipient fits the arm inside this funnel and, thanks to the spherical system, turns the bicycle by rotating the handlebar.

- **Handlebar transposition**

Users: for people with hand, wrist and elbow joints, but no forearm.



Design: tool that on the side of the missing body part translated toward the person the handle to grip.

Material: PLA stabilized to hydrolysis and UV attack, thus suitable for outdoor environments.

This material, when cook the printed piece at 100°C for 15 minutes, crystallize thus achieving superior mechanical strength and temperature resistance up to 100°C.

Acknowledgements

We thank the company LATI 3D for providing the materials for building the sports devices. We also thank Madlab 2.0 for 3D printing the devices.

[1] LECRIVAIN, Gregory, et al. Using reverse engineering and computational fluid dynamics to investigate a lower arm amputee swimmer's performance. *Journal of Biomechanics*, 2008, 41.13: 2855-2859.
[2] PAYTON, C. J.; WILCOX, C. Intra-cyclic speed fluctuations of uni-lateral arm amputee front crawl swimmers. *Portuguese Journal of Sport Sciences*, 2006, 6.2: 73-75.
[3] DYER, Bryce TJ; DEANS, Sarah A. Swimming with limb absence: A systematic review. *Journal of Rehabilitation and Assistive Technologies Engineering*, 2017, 4: 2055668317725451.