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Development of prosthetic hands stagnated for 20 years: study

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The development of body-powered prosthetic hands has stagnated for over twenty years. That is the main conclusion of a study by researchers from TU Delft and the University of Groningen into this type of prosthesis, which is published in the *American Journal of Rehabilitation Research and Development*.

The study, which was carried out by researchers from TU Delft and the University of Groningen, measured the force required to operate a number of contemporary body-powered prosthetic hands. The researchers compared the results to earlier measurements from 1987 and came up with remarkable results: today's prosthetic hands perform equally or less well than those from 1987. The grip strength of the hands is insufficient and a very high operating force is required. Another remarkable result: a prosthetic hand developed in 1945 performed better in the test than the newer prosthetic hands.

TU Delft researcher Gerwin Smit: "The study offers a possible explanation why over half of all people with a body-powered prosthetic hand do not use it or even wear it. Besides this, some prosthetic arm users tend to suffer overload problems over time. These problems may well be a result of the excessive operating force required." This is currently being researched further in Groningen and Delft.

Worldwide over 30% of prosthesis users wear a body-powered prosthesis. A body-powered prosthesis is operated by pulling a cable (a little like the brake cable on your bike). This cable is attached to a

harness worn on the opposite shoulder. Subtle movements between the arm wearing the prosthesis and the opposite shoulder pull the cable taut and open the prosthesis. Another popular prosthesis is the electric prosthesis. This is worn by about 40% of prosthesis users worldwide. Then there are also cosmetic prostheses.

The big question that the researchers raised as a result of this study was why there is hardly any investment in body-powered prostheses. Gerwin Smit: "With current technology it must be possible to easily improve prostheses, resulting in enormous progress for those who have to use them. In recent decades, millions have been invested in electric prostheses. The difference in price between the types of prosthesis may have influenced this, as the retail price of an electric prosthesis is around 10 to 100 time higher than a body-powered prosthesis. This makes it more attractive from a commercial point of view to invest in electric prostheses. Yet despite the investments, electric prostheses are slower and heavier than body-powered prostheses."

In order to solve the problems of prosthesis users, TU Delft is working on making improvements to body-powered prosthetic hands. The ultimate aim is to develop a lightweight prosthetic hand with a lower operating force and a higher grip strength.

Provided by Delft University of Technology