

“Pattern recognition is like changing from a manual gear shift to a cutting-edge automatic transmission.”

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## Dr Thomas Fuchsberger discusses Ottobock’s Myo Plus pattern recognition



Quality for life

Dr Thomas Fuchsberger has been the senior consultant and deputy chief of the Department of Plastic, Reconstructive and Aesthetic Surgery and Hand Surgery at Klinikum Traunstein, which is part of Südostbayern Kliniken AG, since 2017. Prior to that, he was a senior consultant at BG Klinik in Tübingen. In collaboration with Tübingen University and Ottobock, he treated the first patients with the Myo Plus prosthesis control during a clinical trial there.

### **Dr Fuchsberger, what indications is the Myo Plus prosthesis control with pattern recognition used for, and at what point is it used?**

The adaptive Myo Plus control can help patients with a unilateral or bilateral transradial amputation control their prosthesis intuitively with their thoughts. Thus far, no ideal time for fitting patients has been specified. In our study, we primarily treated patients who were already using a conventional system. However, recent amputees will also be fitted with the Myo Plus as their initial device in future.

### **How does prosthesis control technology with pattern recognition work?**

When a person thinks about a certain hand movement or grip, the brain sends corresponding signals to the muscles. The muscles then carry out the movement or grip. After an amputation, the hand and its function are still mapped in the brain. Amputees can still imagine moving their hand. The signals are still sent as well, but the corresponding organ to carry out the command is missing. Myo Plus pattern recognition uses eight electrodes to measure the incoming signals on the forearm and recognises patterns that are characteristic for individual movements. Using complex

algorithms, the device learns to classify and amplify signals and patterns so they can be assigned to a prosthesis movement.

**What do you consider to be the benefits of this technology?**

The biggest benefit overall is that the prosthesis learns from the user – unlike previous systems, where the user has to learn how a prosthesis works or needs to adapt to the way the prosthesis functions. Because the Myo Plus prosthesis control can receive and process more signals than conventional systems, the prosthesis can intuitively replicate more hand movements and functions. The prosthesis can thus be controlled more quickly, more precisely and more intuitively. A user no longer has to switch back and forth or attempt to generate other movements using co-contractions. This makes the handling of the prosthesis even more suitable for patients' individual routines, which increases user acceptance of the prosthesis.

**You just mentioned the acceptance of the prosthesis by the user. What role does this play from a socio-economic perspective?**

When the intended movements can be implemented more effectively by the prosthesis, users gain more self-confidence in their everyday lives. Having more security and self-confidence in handling the prosthesis helps users reintegrate into their social and professional lives more successfully. In the case of work accidents in particular, I expect to see clear improvement with respect to returning to work and the length of time people are unable to work.

**How can doctors and O&P professionals tell that treatment with the Myo Plus pattern recognition and intuitive prosthesis control is successful?**

In the first training session, a cuff with eight electrodes is applied to the patient's forearm. An app (available for Android and Apple operating systems) visualises the movement patterns of the intended hand movements and functions. This visualisation helps the patient practise generating clear, distinct patterns. Within around 30 to 45 minutes, the doctor and O&P professional can estimate whether this prosthesis will be successful.

**What can patients do to control the prosthesis even better?**

The app lets patients recalibrate the control themselves. They can practise movement patterns more effectively, refine them and then save them. This makes sense, because the situation at the first fitting is often different from the individual situation at home or the requirements in the workplace. The more precisely the movement patterns are generated, the better the communication between human and machine works.

**How many patients are capable of generating such patterns on average?**

In theory, nearly all patients. Even those who had an amputation years ago can still recall the functional patterns of their phantom hand. So you can't make blanket statements and say that someone who had an amputation 20 years ago is no longer capable of learning this, or that someone who has worn a conventional prosthesis for 15 years is unsuitable because they have become too used to the conventional prosthesis.

**Is the Myo Plus prosthesis control also an option for amputees with congenital disorders?**

More research is certainly required to determine whether patients with congenital disorders can benefit from a "thought-controlled" prosthesis. However, I think that even patients who have been missing the respective arm since birth can learn to do this, just as they also learn to use conventional prostheses. When patients see what possibilities they have compared with conventional controls and how well they can learn to handle the prosthesis with visual support, they will want the new technology. However, we can't answer this question conclusively yet.

**An amputation is a life-changing event for a patient. How do you prepare users for wearing a prosthesis?**

It's naturally a catastrophe for patients when they learn that we have to amputate a hand or part of their arm. This not only affects their appearance, of course, but also their functional abilities, and that brings worries about being able to live independently or losing their job along with it. And it's important to remember the phantom pain that can occur after an amputation. The important thing is to talk with those who are affected. You have to put yourself in their position and show them possible solutions and how to get there. Thanks to outstanding technologies, we can imitate many functions incredibly well today. This gives people their quality of life back to a large extent. As soon as the decision to amputate has been made, we as an interdisciplinary team – the doctor, O&P professional, therapist and patient – think about what the ideal device should look like in order to achieve this.

**According to the German Pain Society, around 60%-80% of amputees feel pain in the amputated body part.<sup>1</sup> Can prosthesis control also help to minimise phantom pain?**

In clinical practice, we often see that many patients suffer from phantom pain. In addition to the pain they experience, this naturally also affects the use of their

prosthesis. In our study, we observed that the Myo Plus and pattern recognition allowed us to give affected patients some “normality” back by reconstructing the function of their limbs. And to put it in simple terms, this feedback was also perceived in the brain, thus alleviating and reducing phantom pain. This is definitely another interesting aspect that requires further research.

## Sources

<sup>1</sup>Deutsche Schmerzgesellschaft [German Pain Society] (2012). Phantom Pain. Accessed on 10 August 2018:

<https://www.dgss.org/patienteninformationen/schmerzerkrankungen/phantomschmerz/>

## Media contact

Sebastian Zavelberg  
Corporate Communications  
Ottobock SE & Co. KGaA  
Prenzlauer Allee 242, 10405 Berlin, Germany  
Phone: +49 30 206 039 889  
Mobile: +49 151 188 835 08  
E-mail: [sebastian.zavelberg@ottobock.de](mailto:sebastian.zavelberg@ottobock.de)

ottobock.    