

## 3D Printed Phantom Head

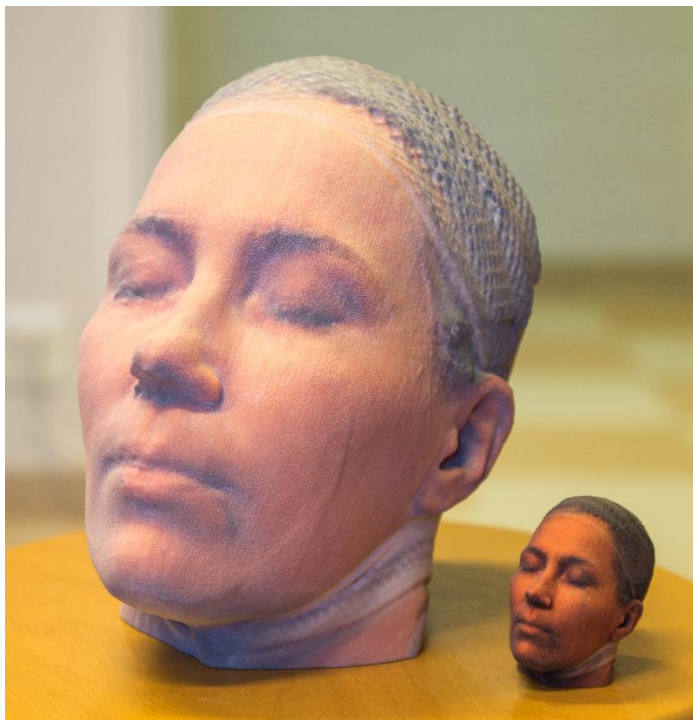
Repetitive Transcranial Magnetic Stimulation (rTMS) is a non-invasive method used to stimulate brain. It is used for example in treating medication resistant depression. In modern navigated TMS, the coil is positioned accurately over desired target by means of an on-line MRI navigation. Targets are located beforehand based on brain anatomy.

There are many TMS protocols used in clinical practice and personnel needs to be trained on implementation of these treatments. Targeting the coil with acceptable accuracy level in reasonable time requires practising. Typically, training of the user to operate the system is performed on human subjects, which is costly. With the help of 3D imaging and 3D printing the model of a phantom head could be 3D printed and used instead of human subjects in training.

The implementation of the 3D printing based phantom head consisted of fringe 3D imaging, smoothing of the 3D model, 3D printing with two different 3D printing methods, and anthropological measurement verification. Especially the 3D imaging and the 3D printing required multiple experimental set-ups in order to achieve the expected accuracy level.

The phantom head was first 3D printed in miniature size by a powder based 3D printer in order to verify the shapes of the model and the precision of the printing technique. After the miniature sized head was printed successfully, the same head was 3D printed in real life size with the same powder based 3D printer. The real size head was used in anthropological measurement verification. After confirming the correct size and model of the 3D phantom head it was 3D printed using a plastic extruding 3D printer.

Figures show examples of 3D printed phantom heads.





This experimental study was done in collaboration with a medical physicist, technicians and physicians from Satakunta Hospital District and researchers and engineers on automation from Satakunta University of Applied Sciences. Several of the 3D printed phantom heads are now in use and they are being further developed continuously.

To read more click here:

[https://www.theseus.fi/bitstream/handle/10024/107638/2016\\_D\\_1\\_SAMK\\_UAS\\_symposium\\_Smart\\_TechnologyInSmartUse\\_2016.pdf?sequence=3&isAllowed=y](https://www.theseus.fi/bitstream/handle/10024/107638/2016_D_1_SAMK_UAS_symposium_Smart_TechnologyInSmartUse_2016.pdf?sequence=3&isAllowed=y)

[www.3dprintproject.org](http://www.3dprintproject.org)