

## Wearable Compulsive Behaviour Detection: Clinical Study on Hand Washing

<b>Project partners</b>
Albert-Ludwigs-Universität Freiburg, Universität Basel
<b>Project duration / Awarded funding</b>
02/02/2021 – 12/06/2022 / 24,000€
<b>Short description of the project</b>
<p>This interdisciplinary project combined the expertise of computer science and clinical psychology. The goal of this study was to develop the core function of an app that recognizes compulsive hand washing using wearable technology. By applying machine learning to inertial wrist motion we aimed for detection with high recall (&gt; 80%) and maximum precision – using consumer off-the-shelf hardware. This novelty has the potential to considerably advance the field of personalized medicine, in particular computer-aided assessment and therapy of mental disorders such as obsessive-compulsive disorders.</p>
<b>Concrete implementation of the project (What was the funding used for?) (max. 500 characters (including spaces))</b>
<p>We hired and trained research assistants who supported all parts of the administration and implementation of the study, including the recruitment of the participants, conducting standardized interviews to establish the inclusion and exclusion criteria under close supervision of the project leaders, assignment of the smartwatches and collection of the smartwatches at the end of the study. They also supported the data transfer between the collaborating partners. Additionally, a small part of the funding was used to compensate the participants for taking part in the study.</p>
<b>Project result(s) and continuation of collaboration (max. 500 characters (including spaces))</b>
<p>We managed to recruit the planned number of participants (N = 21) and to collect sensor data of approx. 6250 h. The number of total hand washing was M = 388 per participant, the number of compulsive hand washing was M = 70,8 per participant. Sensor data and video data are currently being pre-processed before they can be analysed using machine learning algorithms.</p> <p>The project team is continuing their collaboration to analyse the sensor, video and questionnaire data of the current project. Once the data is analysed, we will prepare a manuscript for publication and apply for joined funding to evaluate the use of the app as an adjunct in the treatment of obsessive-compulsive disorder.</p>

We have already published the data of our first pilot study (Burchard et al., 2022; Wahl et al., 2021) and a second paper is currently under review (Wahl et al., 2022).

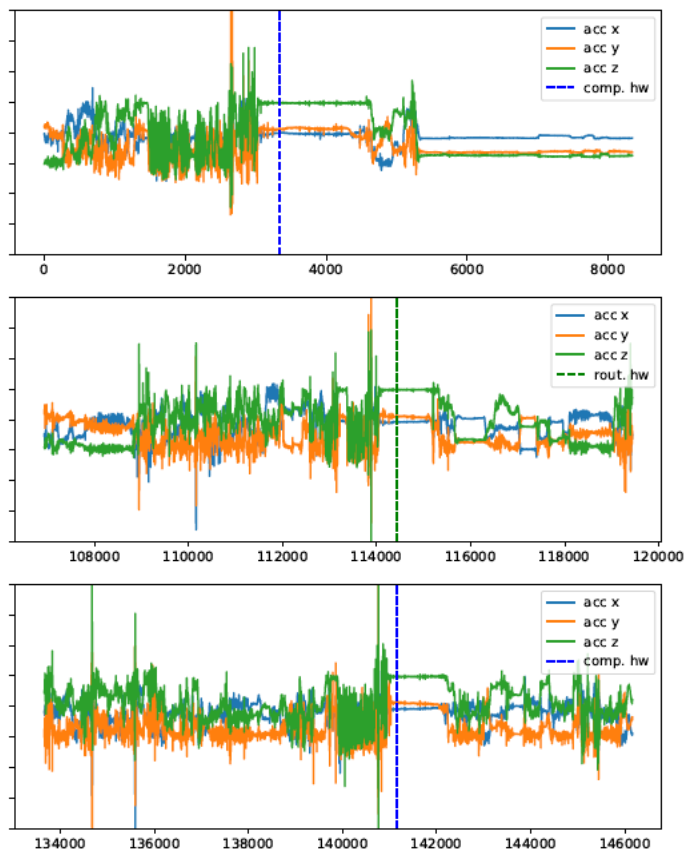
Burchard, R., Scholl, P. M., Lieb, R., Van Laerhoven, K., & Wahl, K. (2022, September 11–15). WashSpot: Real-time spotting and detection of enacted compulsive hand washing with wearable devices. 2022 International Symposium on Wearable Computers (ISWC 2022), Atlanta, GA and Cambridge, UK. <https://doi.org/10.1145/3544793.3563428>

Wahl, K., Scholl, P. M., Wirth, S., Miché, M., Häni, J., Schülin, P., & Lieb, R. (2022). On the automatic detection of enacted compulsive hand washing using commercially available wearable devices: A feasibility study. *Computers in Biology and Medicine*, 143, 105280. <https://doi.org/10.1016/j.combiomed.2022.105280>

Wahl, K., Scholl, P. M., Miché, M., Wirth, S., Burchard, R., & Lieb, R. (2022). Real-time detection of obsessive-compulsive hand washing with wearables: Research procedure, usefulness and discriminative performance. Manuscript submitted for publication

### Further information (links, articles, photos)

Examples of the sensor data of one participant



Note: y-axes = acceleration, x-axes = samples

The blue dotted line corresponds to a confirmation that compulsive hand washing has been performed; the green dotted line corresponds to a confirmation that routine hand has been performed.