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Robot-assisted detection of subclinical dementia: progress report and preliminary findings

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Background

Earlier identification of an underlying AD pathology could increase chances that preventive or curative treatment will be more successful. Human limitations in sensory capacity, attention and parallel processing could mean that automatic and simultaneous registration from several information channels in combination with artificial intelligence processing could advance diagnostic precision and accuracy. In this study we report the progress of an interdisciplinary project to develop robot-assisted diagnostics to detect early neurocognitive disorder.

Method

Behavior in 100 patients without previous evidence of cognitive disorder is recorded during their first clinical examination visit. We record gaze, pupil dilations, skin temperature changes, speech characteristics, mimics, pulse, heart rate variability, and motor activity (see image 1). We then use machine learning to identify behavior signals and signal patterns that can distinguish between persons with and without an underlying neuropathology. In addition, we perform human analysis of recorded video and audio on each patient. Over 40 behavior categories are carefully checked, among them repetitions, irrelevant deviations, hesitations, degree of problem awareness, restlessness and inadequate word usage. This analysis is performed by a semi-blinded interdisciplinary expert group of clinically experienced geriatricians, speech therapists, psychologists, nurses, and experts in automatic verbal and non-verbal behavior analysis.

The results from this study will be implemented to further develop a social robot platform (Furhat, see image 2) with adequate sensors and algorithms so that it can interact with patients and assist in the diagnostic process.

Result

Approximately 25 patients have so far been recorded and analyzed. Preliminary results are that the diagnostic prediction by the expert group, solely based on observation of patient behavior from audio and video, fully has coincided with the diagnostic outcome from the subsequent clinical evaluation. Another observation has

been the amount of clinically relevant behavior revealed through careful human behavior observation that the interviewing physician did not observe during the actual interview.

Conclusion

Artificial intelligence could represent an untapped potential for improving sensitivity and accuracy in diagnostic procedures to detect early neurocognitive disorders.

Tables and Figures

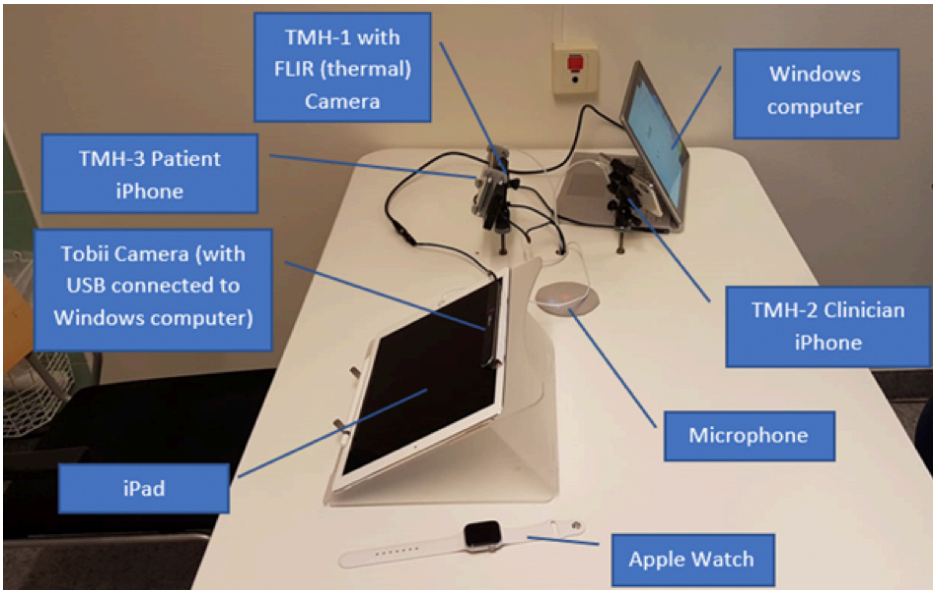

Image 1. Recording sensors in EACare

Image 2. The Furhat robot