1 *Equifit – patient's device*

2 *Usage in daily training*

EQUIVERT – NEW SOLUTION FOR DIZZINESS THERAPY

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Dizziness symptoms

Right after pain the second most symptoms why patients seek medical assistance are dizziness and equilibrium problems. In contrast to other sensory organs the equilibrium sense is composed of multiple organ and function systems. Besides the equilibrium organ in the internal ear other organ and function systems are eyes, the proprioceptive system with receptors in muscles and joints as well as parts of the central nervous system, in which incoming information is processed and integrated to a general impression. Disturbances in one of the function systems lead initially to subjective dizziness and coordination difficulties. Then again this leads to driving incapacity and incapacity to work. Especially for elderly patients there exists an increased risk of falling. If there comes no quick cure of this disease, the central compensation processes lead to a gradual improvement of symptomatology after a very long period of time.

Success due to individual training

Various studies show the positive effect from structured equilibrium training onto the development of compensation process. Especially biofeedback procedures are suitable for this purpose. Because of fundamental considerations the compensation is the better supported, the fewer other involved systems of the equilibrium regulation assume the regulation. Because it is all about central neural learning processes, even the regularity of training and the possibility for individual adjustment depending on learning progress plays an important role. Depending on disease pattern and specification of dizziness the training approach needs to be individualized for each patient.

Screening/training system "EquiVert"

Fraunhofer IMS developed together with their partners, the university Duisburg-Essen, the company GED, and HNOnet-NRW a novel screening and training system consisting
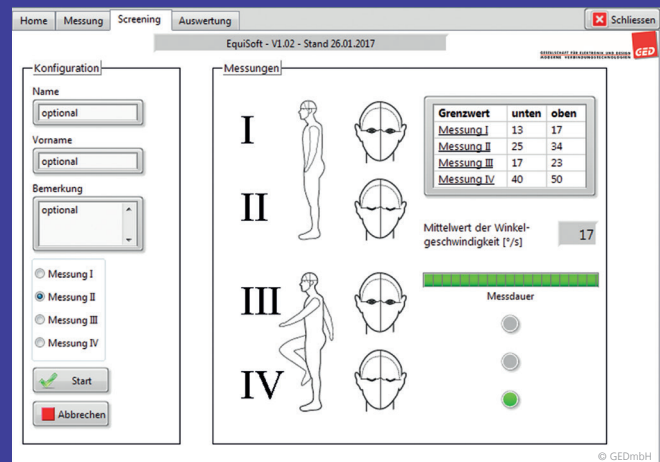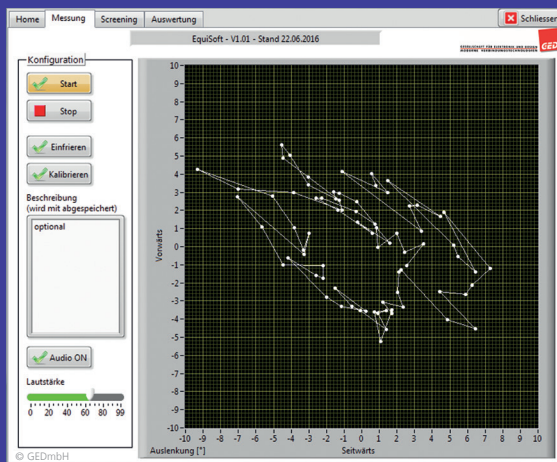
of various device versions and extensive software that does not only support the physician with the diagnosis and evaluation of severity level, but also helps the patient with his individual therapy in the form of daily training. Central element of the EquiVert system is a small embedded system consisting of a microcontroller, accelerometer and rotation rate sensor, audio amplifier, memory, data interface and mobile power supply with rechargeable battery.

Patient's device "EquiFit"

The embedded electronic is compactly constructed and in the patients device "Equi-Fit" firmly attached to the headphones, which the patient uses during training sessions in order to get instructions via speech and acoustic feedback through surround sounds, while the sensors capture and analyze his movements. An interactive instruction of the training process is possible for the patient because of a novel intuitive acoustic and gestural operating interface, which is also like all the other functionalities implemented in the extensive embedded software of the system. Data transfer for success monitoring onto the PC of the attending physician is possible via USB connection.

Physician's device "EquiMedi"

For the diagnosis and therapy planning in the physician's office there is a device firmly attached to a PC, on which the associated software graphically displays the captured dizziness screening information, and automatically calculates a measurable value for the severity level of the dizziness and to classify it via traffic light symbol.

Outlook

EquiVert is going to be improved and additional functionalities are going to be even more user-friendly. A smartphone application that has access to the patient's device data via NFC is in preparation.

EquiMedi – Physician's device

- Sensory capturing of compensatory movements for position control on the patients head
- Objective classification of the severity level of dizziness through a traffic light system
- Guided measuring processes for screening for avoiding of mistakes and to simplify operations
- PC software to graphically display screening information and result values
- Acoustic feedback via surround sounds (optional eligible)

EquiFit – Patient's device

- Sensory capturing of compensatory movements for position control on the patients head
- Acoustic feedback via surround sounds
- Acoustical training instructions (optional multilingual)
- Device operations through speech and gesture control
- Training session with increasing degree of difficulty depending on training success
- Real-time evaluation of training success with recording of training history
- Storage of training data for medical evaluation through the physician
- In preparation: Smartphone application with connection through NFC

3 Measured value acquisition

4 Screening evaluation