Chasing the sinusoid:
Extrinsic motivation and monitoring of friction loaded squat exercise training

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**Purpose** Ageing societies are seeking for exercise trainings that efficaciously combat frailty and imbalance of its increasing population of older adults. However, proper executions of such exercises are labour intensive, amongst others, due to their repetitive character and are generally perceived as boring. This so-called lack of company barrier, limits adherence and henceforth makes them less suitable for unsupervised training. Here we present the design of a friction loaded squat training support tool that uses gaming technology to create extrinsic motivation for sustained execution of squats. Recent studies show that the combination of resistance training and core strength is an effective mean to improve power and strength of limbs, as well as to improve overall balance performance of older adults.

**Method** We implement an iterative design approach with palpable artefacts referred to as design science. The three principal stakeholders in a game-based training tool are: the physiotherapist, the game designer, and the client. The subsequent prototypes gradually include various dimensions of training and motivation. Initial training aspects include a clear trail of the proper execution of a squat. Feedback on the correct execution will be included in future versions. Motivational aspects start with engagement, i.e., by exploiting novelty and including game-play elements such as a scoring system providing feedback of in and out-game actions.

**Results & Discussion** A friction loaded squat movement plotted in the time domain boils down to a sinusoid. This target trail of the exercise is fitted to individual needs of the client by varying its amplitude and frequency. Feedback on the correct execution has been deferred to future versions of the tool. The graphical theme, look and feel, and implementation of the interactive sinusoid have been established through paper-prototype experiments with a small group of potential clients. In addition we built on the experience of testing a tool that supports friction-less sit-to-stand exercise, in which the mere event is important rather than the precise movement in time. The current prototype adheres to the design for acceptance principle. It is a “trivial game”, which implements a readily recognisable exercise trail (a sinusoid), an engaging setting, a scoring system, and to some extent curiosity and free roaming. The obvious trail is an important aspect for the therapists. The game-play elements adhere to extrinsic motivation of clients, whereas the integration into a true game is an accepted basis for game designers. Experience sampling with the multiple stakeholders indicates the game demonstrates qualities related to adherence and acceptance. More importantly this prototype and tests induce innovations in design, innovations in activities, and a positive intent to use the tool for unsupervised training.

**References**

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