Development of a User-adaptive Mobile System to Support Running Training for Beginners

Physical activity is an important aspect of a healthy lifestyle. Moderate physical activity for a minimum of 30 minutes on five days a week is recommended. Running is a popular activity to achieve this goal, as it employs most muscles and consumes most energy relative to training time. It does not require memberships in sports clubs and is not bound to time tables, making it a good casual sport.

However, for a successful training, the intensity of a run is an important factor. Physiological parameters like the heart rate, breathing rate, or blood lactate concentrations allow an objective assessment of the intensity of a running training. While measuring the blood lactate concentration would be optimal, it is hard to measure during a run. However, the heart rate as still very reliable parameter is easy to measure and consequently became the dominant physiological parameter for assessing the intensity. Additionally, the perceived exertion can be used for the intensity assessment. Several scales have been developed to allow the assessment of the perceived exertion, e.g. the Borg-RPE-Scale, a scale ranging from 6 to 20, with 6 being the lowest intensity and 20 the highest. It has been proven, that the perceived exertion strongly correlates with the exertion indicated by the physiological parameters. Using it for intensity assessment allows covering much more parameters influencing the intensity, like fatigue or muscle ache.

Technical support systems for supporting the running training are a commonly used by runners. Generally, the systems consist of a heart rate sensor and a watch displaying the heart rate and possibly other information, like running time, to the runner. We present our work on developing a technical support system especially for beginning runners, using a user-centred design approach. We focus on optimising heart rate displays by conveying information not only visually to the runners, but also using vibro-tactile feedback, allowing a constant feedback without the need of looking at a watch. We investigate how the perceived exertion can be assessed technically during a run and introduce the concept of using it in combination with heart rate measurements to optimise the running training.

We contribute with a user-centred development of a tactile heart rate display. We show that a tactile design based on five heart rate zones can effectively support runners. For assessing the perceived exertion, we present two approaches, the prediction of user input and input methods on modern smart watches. We contribute by showing that the predictive approach is not effective, but we clearly identify a range based input method for the Borg-RPE-Scale allowing to assess the perceived exertion while running. As further contribution, we developed a concept on how heart rate and perceived exertion can be used together in a support system and evaluated an innovative mobile application using this approach and the other concepts we developed in this thesis. Our final contribution is the evaluation of how running groups can be supported technically by analysing opportunities and restrictions in this context with the help of a mobile application.