exercise training feedback systems. Figure 9 shows excellent system accuracies in the validation with healthy subjects for all performance classes. The remaining classification errors could be explained by the fact that participants could not always maintain speed and range of motion, while performing all repetitions of an exercise. Lowest accuracy for the error combination Too slow & too small (performance class 9) could be attributed to the challenge in performing individual exercises, e.g. Leg lift (Ex. 5). With regard to the clinical analysis, errors in counting Steps up occurred for all patients (Figure 12). This can be explained by the fact that patients often toed the step before completing it. For Patient 1, the lowest counting accuracy was obtained. Patient 1 was the oldest and most severely affected participant in the study and for this patient the exercises were more difficult to perform fluently. From literature it is known that tremor is larger for slow and small movements [43], which may have resulted in peak detection errors and lower counting accuracies for Elbow circles and Leg lift exercises. When analysing exercises within a small range of motion, the algorithm was more sensitive to noise and resulted in wrong peak detection. The lowered recognition accuracies (Figure 13) of our intervention study compared to healthy participant validation could indicate the effect of vibrations due to muscle tremor. Teaching and training were performed very close in time. The variation of how patients would perform the exercises at home may be higher and exercise memorisation may have diminished. Nevertheless, we think that patients could benefit from the COPDTrainer app when training at home: it is probable that patients will perform more errors at home and thus the system's guidance feedback on movement errors will be more effective compared to the clinical setting. For this study, the therapist's presence during all study sessions was required to ensure patient safety. During the train-mode, the therapist did not aim at influencing the exercise performance of patients in any way. Moreover, the therapist was a well-known person to the patients. Still, patients may have been affected in their behaviour in subtle form since they were watched by another person. This would differ from the setting at home. We also considered video recording the exercise repetitions, but apart from the unmet safety requirements, cameras may imply even stronger physiological stress to patients. They were used to train in presence of a therapist while not in presence of a camera. Subsequent clinical studies should aim at a step-wise reduction of supervision through therapists or other means, in order to accustom patients with the new technology. This work focuses on evaluating performance and feedback efficacy of a patient training system using a smartphone only. Our primary goal was to derive an easily reusable modelling approach. We did not investigate in long-term usability, motivational aspects, and user acceptance. Nevertheless, we have taken these aspects into account by choosing the smartphone as sensing and feedback platform. While in our study, patients did not express issues in handling the phone, it is clear that further app design refinement could support patients. We believe that smartphone apps can be optimised for wide user acceptance. A wearable device would incur less weight to carry and be more comfortable during training. In contrast, patients are already familiar with smartphones. Patients could immediately use them remotely, even in developing countries where distances may not allow them to attend a rehab centre regularly. Our training and modelling approach can be used as well with wearable sensor bracelets or smartwatches that integrate audio or vibration feedback.