biomarkers derived from routines can potentially be used in diagnostic decision support systems, but also in monitoring systems providing feedback on a daily basis.

6.6 Conclusion

Unsupervised discovery of latent structures in data from activity monitors is becoming more relevant due to the increasing amount of available multimodal data. Using relatively simple assumptions and settings, we have shown that interpretable and consistent results can be obtained from a large set of unannotated real-life data concerning a large population of COPD and healthy subjects. We have shown that PA routines can be used effectively to integrate and represent the underlying structure of PA measures and physiological responses that characterize the activities of the subjects under study. In particular, it is shown that PA routines in COPD patients and healthy subjects are considerably different regarding their composition and that they show certain consistent trends depending on COPD clinical characteristics. The discovered PA routines were found suitable to label, in an unsupervised way, subjects and assessed days. Moreover, inferring the routine structure on day segments of relatively short duration, it was possible to model PA routine patterns across the day and to identify moments in time in which transitions of the most active routines occur. Some methodological considerations need to be taken into account. First, demographics information (such as working activities) and comorbidities were not available which could influence PA. Second, the routines identified would benefit from a sensitivity study using a new sample of COPD-healthy pairs matching with the same characteristics. Although a more detailed clinical interpretation of the discovered routines is extremely interesting and planned as follow-up of this study, the discovered PA routines apparently reflect the stage of the disease as measured by common clinical practice and could be valid constructs to quantify PA behaviour change in patient with limited exercise capacity such as with COPD. As such, it is an encouraging step into the direction of practical applications of these techniques in daily life to design, for instance, interventions and coaching systems (see Figure 42) with realistic goals for this population.