Background: Impact of disease and disease activity in RA is measured with questionnaires such as the health assessment questionnaire (HAQ) or composite scores such as the disease activity score (DAS-28). These methods may miss signs of disease activity because they are typically performed only at hospital visits. Measuring physical activity continually may assist in the early discovery of relapses in the future. In addition, measuring physical activity may be relevant for predicting the risk of developing comorbidities such as cardiovascular disease [1]. Activity tracker devices have been tested in RA patients for this purpose, but the disadvantage is that they can only be carried for a limited period of time and are expensive, which makes them unsuitable for long-term cohort studies [2]. As an alternative, obtaining physical activity data from the patient’s own smartphone using a dedicated and secure activity tracker app incurs no added costs, but the reliability of this method has never been tested in patients with RA.

Objectives: The aim of this study was to validate the use of the standard Android-operated smartphone step-counter pedometer in patients with RA.

Methods: Clinical characteristics were obtained. Two typical Android smartphones running the Android virtual step counter sensor were tested in a treadmill test-bed setup at 6 different speeds, ranging from 2.5 km/h to 5 km/h. Patients walked 100 steps at each test speed wearing the Android devices placed in a stomach pouch. Software running on a Windows PC communicated in real time with both phones, and the PC software also allowed the investigator to easily record the manually observed steps using clicker functionality, which were then automatically linked to the steps recorded from the smartphones.

Results: Median (interquartile range) disease duration was 13 (4-21) years, DAS-28 2.2 (1.6-2.9), and MAHAQ 0.2 (0-0.9). Seventy-six percent of the patients were rheumatoid factor positive, 75% were Anti-citrullinated peptide antibody positive, and 70% had erosive disease.

The overall difference in device step counts versus the observed was 5.9% mean average percentage error for both devices. Most of the error was introduced at the 2.5 km/h speed tests where the mean error of the two devices was 18.5%. From 3 km/h, the mean average percentage error of the two devices was below 5% and from 3.5 km/h and up the mean average percentage error of the two devices was below 3%. A box plot of the data is demonstrated in Figure 1.

Figure 1. Box plot of number of steps with both devices at the six different speeds. Both walking speed and walking cadence had a significant impact on the pedometer validity, as both speed and cadence were negatively correlated to the absolute percent error measured by both devices (p<0.001), which indicates that the greater the speed and/or cadence, the lower the step counting error rate.

Conclusion: The two tested Android pedometer applications were valid in patients with rheumatoid arthritis, but walking with very low speed may represent a challenge. Next step will be field tests evaluating the setup including active volunteers.

REFERENCES: