

# Development of measuring devices for evaluating hand force in rheumatoid arthritis

Björk M<sup>1</sup>, Thyberg I<sup>2</sup>, Nordenskiöld U<sup>3</sup>, Lindstrand J<sup>4</sup>, Brodin N<sup>5</sup>, Rosengren J<sup>6</sup>, Brorsson S<sup>7</sup>

*<sup>1</sup>Rehabilitation Center and Department of Medical and Health, Sciences, Linköping University, Linköping, Sweden, <sup>2</sup>Department of Rheumatology, Department of Clinical and Experimental Medicine, Linköping University, Linköping, Sweden, <sup>3</sup>Neuroscience and Physiology, Clinical Neuroscience and Rehabilitation, University of Göteborg, Sweden, <sup>4</sup>Rehabilitation Center, County Council of Östergötland, Linköping, Sweden, <sup>5</sup>Division of Physiotherapy, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Sweden & Division of physiotherapy, Department of Orthopaedics, Danderyds hospital, Stockholm, Sweden, <sup>6</sup>Department of Hand Surgery, South General Hospital, Stockholm, Sweden, <sup>7</sup>Health and Welfare, Dalarna University, Falun, Sweden*

## Introduction

Rheumatoid arthritis (RA) is associated to impaired hand function and difficulties to perform daily activities despite contemporarily early instituted medication. Hand force in finger flexion, which is strongly related to difficulties to perform activities, has often been measured with the electronic device Grippit that no longer is manufactured. Thereby the GRIP-it was recently developed. Since the hand force in finger extension also is related to daily activities the electronic device EX-it newly has been developed.

## Aim

The aim was to describe i) hand force in finger flexion and finger extension in RA using GRIP-it and EX-it and relate these results to the Grippit ii) to explore relations between Grippit and GRIP-it to age, hand stiffness, hand pain during rest and hand pain during GRIP-it and Grippit measure and to iii) analyze possible sex differences.

## Method

69 patients (74% women) with RA were recruited at a rheumatology unit in Sweden. The mean age (64 years (sd 12)) did not differ significantly between men and women, neither did the HAQ score (women 0.9 (0.9) vs men 0.4 (0.5)). Data for Grippit, GRIP-it, EX-it, hand pain and hand stiffness were obtained at a visit to an occupational therapist at the clinic. Data for the right hand was analyzed regarding correlations and in the multiple regression analysis. The study protocol has been approved by the Local Ethic Committee and patients gave their written informed consent to participate.

## Results

The correlation between Grippit and GRIP-it was high in both women and men ( $r = 0.93$ ;  $r = 0.92$ ). The correlation between EX-it and Grippit was high in women ( $r=0.76$ ) and not significant in men ( $r=0.28$ ). In regression models, controlling for sex, EX-it and Grippit were significantly explained by stiffness and age rather than by pain (at rest and at time for measure respectively). GRIP-it was significantly explained only by stiffness. No differences

were seen between sexes regarding hand stiffness or hand pain but women have lower hand force than men in both flexion and extension.

## Conclusions

Not surprisingly women have lower hand force in finger flexion and finger extension than men and the newly developed GRIP-it is highly correlated to Grippit. Measuring hand force in extension in men adds further information as it is not related to hand force in flexion. When controlled for sex, grip and finger extension forces as measured by the three instruments are related to stiffness in hands and are not discriminative for pain.

In clinical practice the assessment and interventions of hand dysfunction are important and related to activities of daily living. The newly gained knowledge of these assessment tools can be used for evaluation of rehabilitative interventions aimed at increasing hand force in finger flexion and finger extension and thereby facilitating daily activities.