GROUP INDIVIDUAL THERAPY FOR PATIENTS BY USE OF THE HOMEBALANCE INTERACTIVE SYSTEM FOR BALANCE TRAINING: FEASIBILITY STUDY, MONITORING PATIENTS´ INDIVIDUAL PERFORMANCE

J. Petioky[1]; M. Janatova[2], K. Hana[2]

1/ Rehabilitation Centre Kladruby, Kladruby, Czech Republic
2/ Joint Department of Biomedical Engineering Czech Technical University and Charles University, Prague, Czech Republic

INTRODUCTION

This model of effective use of therapeutic time (man-hours) using modern Homebalance (HB) technology as a substitute for individual therapy could lead to the recommendation of establishing this type of individual therapy for a group of patients led by 1 therapist, thus reducing staff and time requirements. The aim of this study is to demonstrate that high quality of exercise is maintained in such groups, where each patient exercises individually, but according to their own individual program and after instruction from the primary therapist.

METHODOLOGY AND DESIGN

The interactive Homebalance system has been used during diagnosis and therapy. During training, the patient stands on the force platform and controls the game scene displayed on the tablet display by changing the position of their centre of gravity. First, the physiotherapist teaches patients how to control training scenes by using the correct movement patterns.

After that, Homebalance can act as a virtual assistant therapist which renders motor learning more effective by providing exact tasks and giving visual feedback in real time. Thanks to this assistance, the physiotherapist can provide quality individual therapy to a larger group of patients at the same time. In the pilot feasibility study, before the therapy began, standard dynamic scenes were performed on the platform and a posture diagnosis of the patient was made. Based on the results of this, the focus and difficulty level of the therapy were then set.

CRITERIA FOR THE INCLUSION OF PATIENTS IN THERAPY

The study included patients with a diagnosis of vertebral algic syndrome (VAS) in the subacute and chronic phases, who were hospitalized in Rehabilitation center Kladruby (RUK). A fundamental condition was the active cooperation of the patient and their understanding of the instructions. Inclusion in the group took place at the earliest after a 1 week stay in RUK and after training by a primary therapist during normal individual physiotherapy sessions.

DEMOGRAPHIC TABLE
Patients and therapy

Gender	No. of patients	Average age (years)	Number of group therapies with HB per week	Lenght of each therapy (min.)	Scoring of reference scene [s]
Male	14	47,8	1	5 + 15	57
Female	24	48,6	1	5 + 15	70

THERAPY ROUTINE

- 4 x weekly normal individual therapy with a physiotherapist (1:1 ratio)
- 1 x weekly group individual therapy supervised by a therapist using HB (1:7 ratio), in place of normal individual therapy

THERAPY DESIGN TERAPIE (20 min. total)

1. **Initial therapy - entry into group individual therapy**
   a. Testing and reference exercises using HB (3 min.)
   b. Therapy with HB (5 min.) – scoring
   c. Independent exercise by the patient following training from the primary therapist (15 min.)
2. **Continuing therapy**
   a. Therapy with HB (5 min.) – scoring
   b. Independent exercise by the patient following training from the primary therapist (15 min.)
3. **Output Therapy + Output Testing**
   a. Testing and reference exercises using HB (3 min.)
   b. Therapy with HB (5 min.) – scoring
   c. Independent exercise by the patient following training from the primary therapist (15 min.)

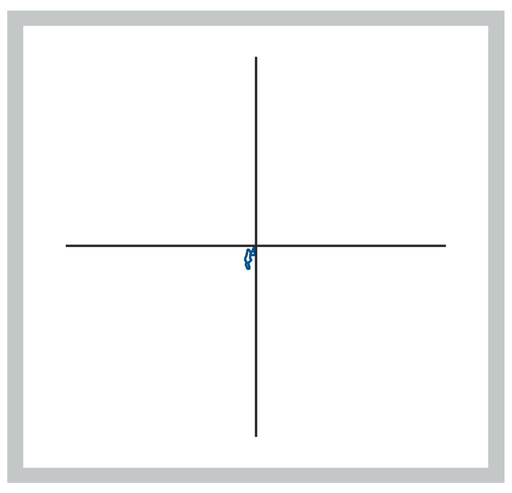
(all under the supervision of the therapist – supervision of the whole group)

Testing is performed in a position of uncorrected posture (placement of legs on the center of the platform at waist width) – spontaneous stance.

Therapy is performed in a posturally controlled = corrected position (activity of inner balance system, proprioceptive neuromuscular facilitation, corrected pelvis position, corrected head position, centering of shoulder blades, controlled deepened breath)

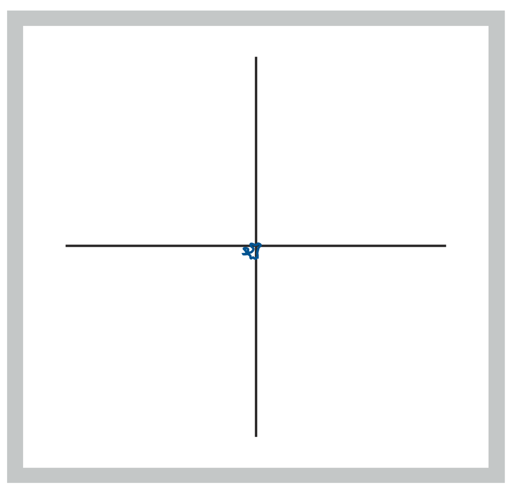
The assessment of the patient is made using a statokinesiogram and is based on the achieved level of exercise, scoring record in the therapeutic games and the ability to maintain a corrected posturally controlled position.

ILLUSTRATIVE STATOKINESIOGRAMMES AND THERAPY



statokinesiogram
quiet stance before therapy

illustration of therapy



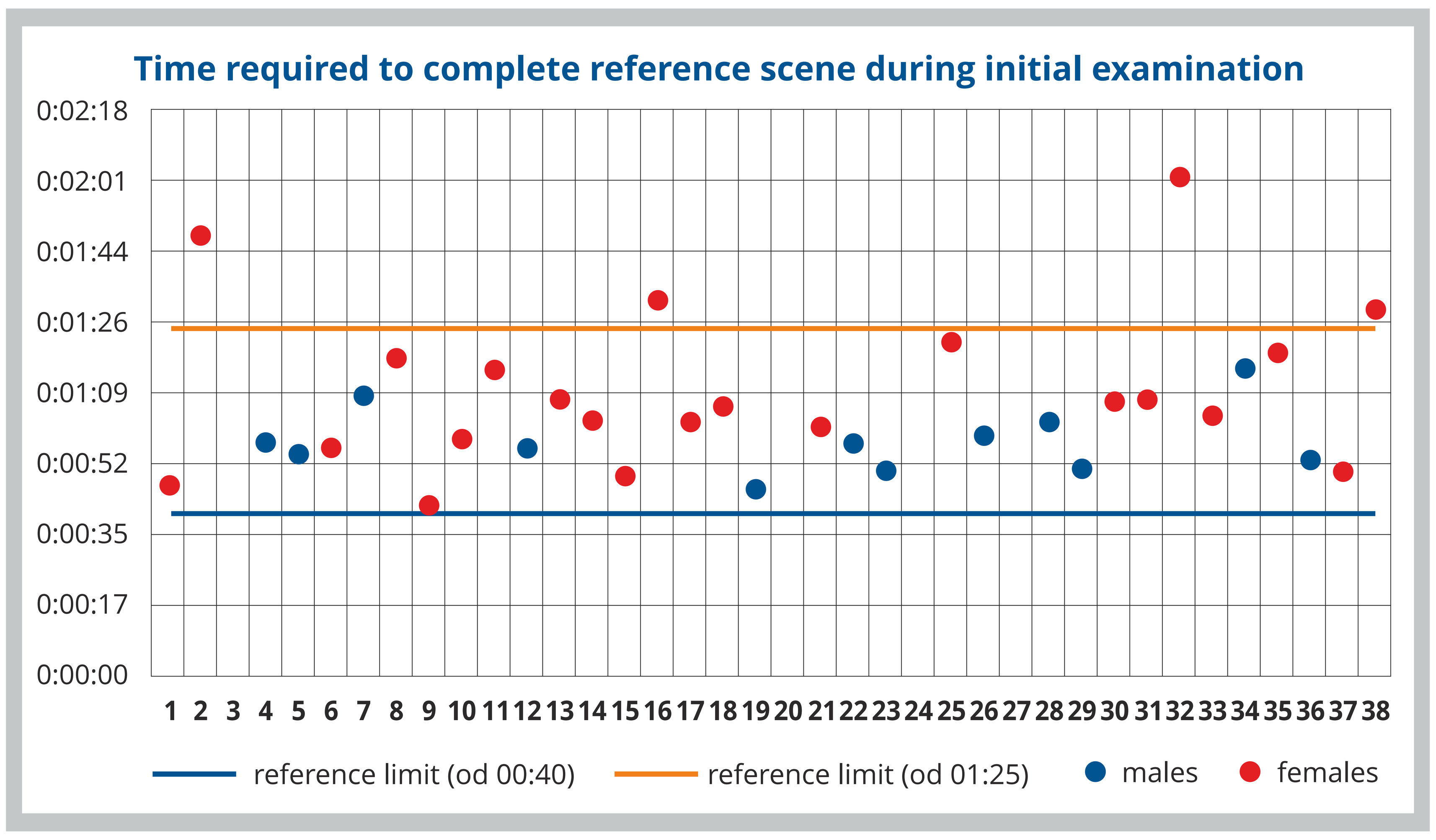
statokinesiogram
quiet stance after therapy

RESULTS

The average time required to complete the standard dynamic scene was 67 seconds (57 s – men, 70 s – women). during the initial examination. A total of four of the 38 probands at the initial examination had a time which was higher than the standard for a healthy population.

During the initial examination, patients were observed in terms of their ability to reduce the length of time needed to meet the demands of the standard dynamic scene. The average improvement in scoring in the therapeutic game was by 23 seconds. A more significant improvement was achieved by patients who performed poorly at the initial examination and had a scoring record in the therapeutic game which was higher than the standard for a healthy population.

During the examination, balance stance was demonstrated using latero-lateral symmetry. A more significant improvement in posture was detected when visual feedback was given. However, symmetry also occurred without this visual feedback of seeing the centre of gravity on the tablet screen.

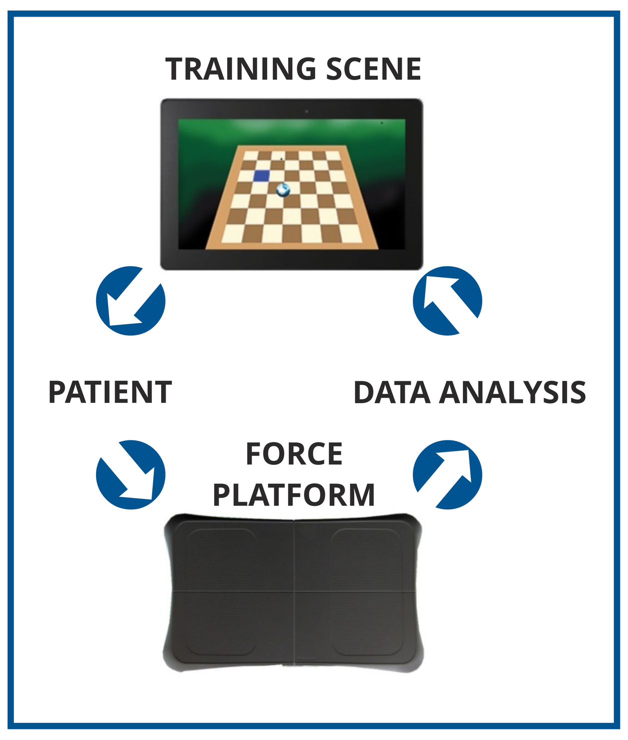


CONCLUSION

The design of therapy was accepted across the patient group without the occurrence of any undesirable side effects. The effective use of therapeutic time (man-hours) using modern HB technology was evaluated in 38 patients who exercised within the range of one exercise unit using HB per week.

The average use of therapeutic time in group individual therapy was 1:7. With the utilisation of 1 therapist in 3 x 30 minute training units, a total of 21 therapies, the number of therapists needed for regular individual therapy was decreased by 18 therapists, thus by 86%. An important factor was the objective demonstration of the therapeutic effectiveness of this type of therapy, which can reduce the staffing demands (number of man-hours of treatment and number of patients) of the provided therapy while maintaining the quality of the therapy provided with demonstrable and objective results.

To make further recommendations and to set up therapeutic planning, it is necessary to carry out a longer study with additional objective therapeutic trials as well as to provide a larger patient population for subsequent data analysis.



Kontakty:
Jakub Pětioký: jakub.petioky@rehabilitace.cz
Markéta Janatová: marketa.janatova2@lf1.cuni.cz
Karel Hána: hana@fbmi.cvut.cz

FIRST FACULTY OF MEDICINE Charles University

FACULTY OF BIOMEDICAL ENGINEERING CTU IN PRAGUE