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A New Generation of Back Training: Interactive Back-trainer System with Augmented Visual Biofeedback for the Management of Non-Specific Chronic Low Back Pain

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Introduction

Non-specific chronic low back pain (NCLBP) is a highly intractable disorder. Lumbar stabilization exercise (LSE) is one of the core physiotherapy interventions for managing NCLBP. With advances in medical technology, an innovative back training program using a computerized back-trainer system was introduced to provide real-time visual biofeedback and quantified measures during LSE via interesting games. Patients experienced more fun which facilitates their active participation and compliance of the exercise program.

Objectives

To evaluate the effectiveness of the innovative back training program on improving pain, disability level, and quality of life (QoL) for patients with NCLBP.

Methodology

A prospective, parallel-group, pretest-posttest study was conducted. Subjects with diagnosis of NCLBP and aged between 18 to 50 years old were recruited and allocated into either (i) innovative training (IT) group or (ii) conventional exercise (CE) group. In addition to conventional physiotherapy interventions, all subjects received 16 sessions of 20-minute LSE twice per week for 8 weeks. LSE consisted of rhythmic arms lifting movement in three different positions while low back maintained in equilibrium. All subjects received same exercise but back-trainer system was only provided in IT group. Outcome measures included Numerical Pain Rating Scale (NPRS), Hong Kong Chinese version of the Roland Morris Disability Questionnaire (RMDQ-HK), and Chinese (HK) SF-12 Health Survey-Version 2 (SF-12v2). Evaluations were done at baseline and on completion of the program.

Result

Fifty-four patients (25 males, 29 females), with mean age 42 ± 5 years old, were recruited. Baseline characteristics of the groups were comparable. Both study groups

demonstrated significant improvement on pain reduction, disability level, and QoL on completion of training. However, subjects in the IT group demonstrated significantly greater improvement than the CE group in NPRS (61% vs. 40%, $p < 0.05$) and RMDQ-HK (20% vs. 14%; $p < 0.05$). A trend of a greater increase in SF-12v2 was observed in the IT group than the CE group though it did not reach statistical significance ($p = 0.165$). Interactive back training program and conventional LSE were both effective for improving pain, disability level, and QoL in people with NCLBP. The additional use of computerized back-trainer system effectively achieved a greater improvement. The successful incorporation of advance technology in back exercise in this study symbolized a breakthrough of physiotherapy service into a new era.