

Case Study

Effects of a self-assessment device for pelvic position on chronic back pain and range of motion of the trunk

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Abstract. [Purpose] The purpose of the present study was to investigate the effects of a self-assessment device for pelvic position in a computer user with back pain. [Subjects] A 37-year-old man who complained of low back pain at L3–5 levels was the participant. [Methods] In this study, a self-assessment device for the pelvic position was developed. The patient was instructed in self-assessment of the pelvic position and an exercise program for two months. Prior to this instruction, the visual analog scale score and range of motion of the trunk were assessed. [Results] After the instruction in self-assessment of the pelvic position and exercise program, the visual analog scale score decreased from 7 to 3, and trunk flexion, extension, and bilateral lateral flexion range of motion were increased compared to the initial assessment. [Conclusion] Therefore, use of self-anthropometers and measuring methods in patients with chronic back pain is considered an important area of study.

Key words: Chronic back pain, Pelvic position, Self-assessment

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INTRODUCTION

Recently, with increased use of devices such as computers and smartphones, the number of complaints involving musculoskeletal pain in areas such as the wrist, shoulder, neck, and low back has been on the rise^{1, 2)}. Working on these devices often requires a posture involving cervical and low back flexion for a prolonged duration, as the users have to constantly look at the screen display^{3, 4)}. Owing to these inappropriate postures, the users are continually subjected to static loads¹⁾. This phenomenon leads to excessive cervical and lumbar muscle activities and is a major cause of severe stress and pain in the surrounding tissues and joints¹⁾. The resulting conditions are referred to as cumulative trauma disorders, and force, postures, and repetitiveness are commonly mentioned as the three causal factors of these disorders^{3, 4)}. Long-term computer use is a typical example of an activity where all these factors that have serious effects on the body are involved¹⁾. Musculoskeletal disorders are a widespread concern among adolescents computer users²⁾. Previous studies have shown that more than 80% of computer users report occasional discomfort in the back, neck, wrist, and shoulders²⁾. Although the discomfort or pain is initially managed with the interventions, musculoskeletal problems are

recurrent because of intrinsic factors such as a habitual bad posture and absence of long-term management^{1, 3, 4)}. For this reason, self-anthropometers and measuring methods should be investigated. Currently, however, measuring instruments for management of musculoskeletal system conditions or monitoring of current conditions are insufficient; particularly, no instrument with a self-assessment function that would enable patients to check changes in their musculoskeletal system is available. The purpose of the present study was to investigate the effects of a self-assessment device for pelvic position in a computer user with back pain.

SUBJECTS AND METHODS

A 37-year-old man who complained of low back pain (LBP) at L3–5 levels was the participant. The purpose and methods of the study were explained to the participant before study inclusion, and informed consent was obtained from the participant according to the principles of the Declaration of Helsinki. He complained of continuous LBP for 2 years, and the examination revealed a posterior pelvic tilt. He had not undergone any specific treatment for this condition. He presented with mechanical LBP, without radiating pain. He experienced pain and stiffness in his low back on forward flexion in the standing position with knees fully extended. The visual analogue scale (VAS) score for back pain was 7. A self-assessment device for pelvic position was developed. This instrument was made using a tilt sensor. This sensor can be utilized for measurement of actual values of anterior/posterior motions. An accelerometer sensor was included; the acceleration values and the extent of movement and activities were measured using mathematical transformation

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formulas. In particular, different movements were calculated in the X, Y, and Z planes. Two sensors were utilized in linkage with each other for anterior, posterior, and lateral pelvic movements; highly reliable values were obtained. This instrument was in the form of a pelvic belt that could be worn to measure anterior, posterior, and lateral pelvic movements. In the prototype used in the present study, a display device was placed in front of the patient in his field of view, so that he could identify the measured values. Visual effects using red and green colors were applied so that the user could identify the degree of hypo- or hyper-motion during anterior, posterior, and lateral pelvic movement. The subject periodically assessed his pelvic position after prolonged computer use with the self-measuring instrument and carried out the exercise program based on the results of the assessment. The patient was instructed in self-measurement and the self-exercise program for two months, which helped control the pain. The VAS score and range of motion (ROM) of the trunk before and after the instruction were assessed and compared. When the display showed a red light indicating an anterior pelvic tilt, the patient performed posterior pelvic tilt exercises. The patient assumed the supine position with his knees bent, feet flat on the floor, arms crossed, and hands placed his chest. In the prone position, his hips and legs were off the end of a table or bench. Tightening the buttock on one side, he extended the leg up toward the ceiling while maintaining a neutral spine. When the display showed a red light indicating a posterior pelvic tilt, he performed exercises for an anterior pelvic tilt. He stood with his feet shoulder width apart and both hands holding 5-kg weights; he then flexed the trunk slowly until parallel with the floor while maintaining the natural arch of the back with the shoulder blades back and then slowly returned to the starting position. He sat on a table with his hips and knees flexed to 90°. Reciprocal flexion to above 120° hip flexion on both sides was performed with the knees flexed to 90°. When the display showed a red light indicating a lateral pelvic tilt, he performed trunk stretching exercises in all directions. VAS and trunk ROM were measured and compared before and after management using self-assessment and exercise for two months.

RESULTS

After self-assessment for pelvic position and the exercise program, the VAS was decreased to 3 from the initial score of 7; additionally, trunk flexion, extension, and left and right lateral flexion angles (55°, 18°, 24°, and 23°, respectively) were increased when compared with the initial assessment (62°, 23°, 30°, and 32°, respectively).

DISCUSSION

Management of the irreversible musculoskeletal damage caused by prolonged computer use takes a long time^{1, 5)}. As with all other conditions, effective treatment of musculoskeletal system conditions requires eliminating the fundamental causes of pain, which prevents progression toward irreversible degeneration. Early detection when the damage is still reversible is therefore important^{1, 5)}. The present study investigated effects of a self-assessment device for pelvic position in a computer user with back pain. Devices that enable patients to detect the damage in the initial stages should be developed, and patients should be educated in the use of these devices. The mechanical properties of tissues around the lumbo-pelvic region, i.e. the muscle length or nerve tension, affect lumbo-pelvic motion and contribute to LBP⁶⁾. Daily repetitive movements owing to sustained computer use while seated in a chair may result in hyper-stress on the tissues of the spine and pelvis. The pelvic position is generally more closely related to LBP^{1, 5)}. In the present study, there was a significant decrease in back pain and increase in trunk ROM after self-assessment and exercise. Effective management of chronic musculoskeletal pain is markedly different from that of acute musculoskeletal pain⁷⁾. It requires self-management, where the patient checks and makes corrections as necessary^{7, 8)}. Therefore, self-anthropometers and measuring methods are considered an important area of study in patients with back pain related to a chronic musculoskeletal disorder. The need for these methods will increase in the future as they enable early management of musculoskeletal disorders.

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