Effect of an exercise program for posture correction on musculoskeletal pain

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Abstract. [Purpose] The present study investigated the effect of an exercise program for posture correction on musculoskeletal pain. [Subjects] Between September 2, 2013 and November 3, 2013, an exercise program was performed in 88 students from S University in K city (male students, n = 34; female students, n = 54). [Methods] The exercise program for posture correction was performed for 20 minutes per session, 3 times a week for 8 weeks. Pain levels were measured using a pain scale, and pain levels before and after the exercise program were compared. [Results] Overall, pain levels of the participants were lower after the exercise program than before the program, and significant differences in pain levels were noted in the shoulders, middle back, and lower back. [Conclusion] In conclusion, shoulder pain, mid back pain, and low back pain were relieved with the exercise program for posture correction. Therefore, the findings of this study can be used to improve the work efficiency of students as well as people engaged in sedentary work.

Key words: Posture correction exercise, Posture, Pain

INTRODUCTION

Presently, working with a computer has become common, as computers are being widely use in homes and workplaces, and the working time in a sedentary posture is increasing1). Especially, children and teenagers are spending a lot of time seated at a desk or working with a computer because of excessive learning activities at private educational institutes, group private lessons, or home learning. Generally, posture is defined as the relative disposition of the body parts in relation to the physical position, such as standing, lying down, and sitting. Correct posture involves a straight spine, which maintains the natural curve of the spine in the human body2). Correct posture minimizes the strain on the human body by maintaining balance of the muscles and skeleton. This balanced musculoskeletal state protects the supporting structures in the body and prevents damage or progressive deformation in all positions, including standing, lying down, and sitting. Additionally, correct posture implies not inclining the body forward, backward, left, or right3).

Therefore, the importance of correct posture should be emphasized, and maintaining correct sitting posture is especially important because the strain on the back is greater in a sitting posture than a standing or lying down posture, although some differences may be present between postures4). Working with a computer requires maintaining a seated posture for a long time, and therefore, it is very difficult to maintain correct posture5). People tend to change their posture according to habits, such as slouching and crossing the legs, and they maintain a bad posture regardless of their recognition of incorrect posture and desire to maintain correct posture. If incorrect postures become a habit at an early age, individuals maintaining those postures may adapt and consider them comfortable, and this can cause strain on the spine, pelvis, muscles, tendons, joints, bones, and discs, which can lead to fatigue and deformation6). Thus, incorrect habits, such as excessive use of computers, use of desks and chairs without proper height, lack of health care education, lack of exercise, carrying heavy school bags, and inappropriate postures when studying or watching television, affect the shape of muscles, deform the skeleton, and cause abnormal development, which prohibit the maintenance of correct posture7).

Incorrect posture has many negative effects on the spine. For example, joint imbalance limits the movement of the tendons and muscles and makes normal exercise and movement difficult. Additionally, incorrect posture can cause pain8). Moreover, such a posture indicates an incomplete relationship among body parts, and it creates inefficient balance owing to stress on the supporting structures of the body and prevents proper functioning of the structures of the body. This can cause problems in appearance as well as pain and...
physical disability. Therefore, correct posture is essential for maintaining balance of the body, proper arrangement of supporting structures, and effective functioning of the body; therefore, to say that correct posture is a prerequisite of a healthy life is not an exaggeration. However, not enough systematic programs for posture correction are available to the public.

Therefore, the present study aimed to present a method for efficiently working in a seated posture by investigating the changes of musculoskeletal pain in students after participating in an exercise program for posture correction.

SUBJECTS AND METHODS

The present study included 88 (34 males and 54 females) students from S university located in K city. The mean ages of the male and female participants were 23.4 and 21.1 years, respectively (Table 2). The purpose and procedures of the research were fully explained to the participants, and demographic data were collected from participants who agreed to participate in the study. Information on the pain level was collected using a questionnaire. All research materials were sent to the Committee of Science Research of Inje University for approval.

The initial evaluation and postprogram evaluation of pain were performed using the visual analog scale; each participant marked pain levels in the neck, shoulders, middle back, lower back, and pelvis on a 10-point scale. After explaining the pain scale, the participants indicated their current pain level by choosing a number from 0 (no pain at all) to 10 (unbearable pain), which were displayed along a horizontal line. This scale is widely used in clinical settings as it is known to best reflect the pain level and has been utilized as an important tool to assess the effect of pain treatment. Between September 2, 2013 and November 3, 2013, an exercise program for posture correction was performed for 20 minutes per session, 3 times a week for 8 weeks. The exercise program was based on the program presented in the study by Park and Park. The exercise program in the first week mainly included stretching, while the program from the second week to the eighth week included activities for correcting bad posture and straightening body shape, which can help improve concentration and be continued after the study (Table 1).

The collected data were analyzed using SPSS for Windows, version 18.0. Frequency analysis was performed to investigate the general characteristics of the participants. The independent t-test and paired t-test were performed to evaluate pain in relation to the general characteristics of the participants and to compare pain levels before and after the program, respectively. For verifying statistical significance, the significance level was set at α = 0.05.

RESULTS

Pain levels according to the general characteristics of the participants are presented in Table 3. Pain levels in the neck, shoulders, middle back, lower back, and pelvis were recorded using the pain scale. In terms of gender, female participants had higher pain levels compared to those in male participants. In terms of sitting time, participants with an average sitting time of 4–6 hours per day had the highest pain levels. Additionally, in terms of sitting habits, participants with a slouching habit had the highest pain levels. Participants who did not exercise regularly had higher pain levels compared to those in participants who exercised regularly.

Comparisons of pain levels before and after the exercise program are presented in Table 4. Pain levels in the neck, shoulders, middle back, lower back, and pelvis were higher in females than in males. This result is similar to that reported in previous studies, which showed higher pain levels in the neck and shoulders in female office workers than in male office workers. These higher pain levels in females than in males may have several causes. First, physical phenomena, including menstruation, may contribute to higher pain levels in the lower back in female individuals. Second, physically, female individuals may have weaker bodies compared to those of male individuals. Third, the sensitivity to pain may be greater in female individuals than in male individuals. Additionally, the muscle strength is lower in female individuals than in male individuals; therefore, female individuals have a higher risk of posture imbalance. To reduce such risk, the increase of muscle strength and flexibility through regular overload exercise is necessary.

In the present study, the exercise program reduced pain levels in the participants, and this result is identical to that reported in a previous study, which showed that an exercise program including yoga and stretching reduced pain levels in the lower back in high school students. Additionally, in another study, pain levels in the neck and shoulders in participants significantly reduced after 4 weeks of performing stretching exercises compared to those before the exercise program. In a study by Jung and Chae, which was limited to the cervical region, the pain level on the pain scale significantly decreased by 38.8% after 8 weeks of stretching compared to that before stretching. Another study investigated the effect of isometric exercise on back pain, and reported a significant decrease in back pain after the exercise program (improvement in walking ability, ability to sit on a hard chair, and reduction in handicap), and the study reported that performance of gymnastics and stretching exercise in a standing position corrected posture, decreased the pain level, and resulted in a tendency to improve quality of life. The results of the above-mentioned studies show that steady exercise corrects posture, which improves the balance of the body, and relaxes the whole body, which relieves musculoskeletal pain. Therefore, the development and introduction of suitable exercise programs will contribute to the physical...
Table 1. Exercise program for posture correction

| Week | Item                          | Exercise instructions                                                                 |
|------|-------------------------------|----------------------------------------------------------------------------------------|
|      | Deep breath                   | 1. Lift both arms while inhaling through the nose.                                      |
|      |                               | 2. Lower arms forward while inhaling.                                                   |
| Week 1 | Straightening shoulders and flanks | 1. While seated, straighten your right hand and put your left hand on your waist. Incline your body toward the left side while counting “one, two, three, four.” Return to the original position while counting “five, six, seven, eight.” |
|      |                               | 2. Perform the same action on the opposite side.                                         |
|      | Calf stretching               | 1. Perform a squat while seated on the chair.                                            |
|      |                               | 2. Shake both hands and both arms by moving them as much as possible.                   |
|      | Squat while seated            | 1. While seated with your back in contact with the back of the chair, grab your shoulders with both hands crossed at breast level and pull the shoulders. Rest your buttocks firmly on the chair and spread your legs while maintaining lordosis of the lower back. |
| Weeks 2–8 | Pelvic tilt exercise         | - Pull your jaw downward and droop your head toward your breast. Inhale and then exhale through your mouth while looking down and bending your back, while stretching both elbows toward the pelvic joint. Maintain the posture for over 10 seconds and then return to the original posture. |
|      | Spine flexibility exercise    | 2. In the cat pose, straighten your right leg slowly while maintaining a neutral posture (linear) of the spine (do not lift or detach the right pelvis). At the same time, lift your left arm. Relax muscle strain after maintaining the pose for 10 seconds and lower your left arm and right leg. |
|      | Adductor muscle strengthening exercise | 3. Pull your jaw downward while lying down on the floor and bend both knees. Move both knees to your breast, and wrap the knees with your hands. Then pull them toward your breast. Return to the original posture after maintaining the pose for over 7 seconds. |
|      | Body stretching               | 4. Kneel down and straighten both your arms forward. Straighten your shoulders and touch the floor. |
|      | Lower muscle static strengthening exercise | 5. While seated, bend both your knees and cross both ankles. Push your ankles in opposite directions to create contact. Maintain the posture for 10 seconds, and then relax. |
|      | Abdominal muscle strengthening exercise | 6. Lie down on the floor, looking at the ceiling and raising both your knees. Lift your upper body slowly and wrap both arms around your knees. Maintain the posture for 5 seconds while looking at your belly button. Return to the original posture and repeat the whole procedure thrice. |
|      | Head and neck stretching      | 7. Straighten your neck and lower back while pushing down your vertex with both hands crossed. Maintain the posture for 3 seconds, and then stretch your shoulders and elbows, relaxing the strained neck and shoulder muscles. |

Table 2. General characteristics of the study participants (n = 88)

| Characteristics | Male (n = 34) | Female (n = 54) |
|-----------------|--------------|-----------------|
| Age (yrs)       | 23.2 ± 2.1*  | 21.3 ± 1.7      |
| *Values are mean±SD |

Table 3. Pain levels according to the general characteristics of the participants (n = 88)

| Characteristics                          | Group       | M ± SD     |
|------------------------------------------|-------------|------------|
| Gender                                   | Male        | 10.2 ± 8.1* |
|                                          | Female      | 18.1 ± 9.8* |
| Average sitting time per day             | 4–6 hours   | 22.5 ± 8.0 |
|                                          | 7–9 hours   | 18.0 ± 10.3|
|                                          | 10–12 hours | 16.0 ± 7.8 |
|                                          | >13 hours   | 15.0 ± 16.9|
| Crossing legs                            | Slouching   | 21.7 ± 7.8*|
| Bad habit in the sitting posture          | Resting chin on hand | 16.8 ± 12.3* |
|                                          | Sitting on the edge of chair | 16.7 ± 11.7* |
|                                          | Inclined sitting | 13.5 ± 2.1* |
| Regular exercise                         | Yes         | 16.7 ± 10.4 |
| *Values are mean±SD, *Significant difference p<0.05 |

Table 4. Comparison of pain levels before and after the exercise program

| Characteristics       | Before M ± SD | After M ± SD |
|-----------------------|---------------|--------------|
| Neck pain             | 3.1 ± 2.4*    | 2.6 ± 2.3    |
| Shoulder pain         | 4.1 ± 2.4**   | 3.2 ± 2.6**  |
| Middle back pain      | 2.9 ± 2.3*    | 2.3 ± 2.4*   |
| Low back pain         | 3.9 ± 2.7*    | 3.2 ± 2.8*   |
| Pelvic pain           | 2.2 ± 2.3     | 1.9 ± 2.2    |
| *Values are mean±SD, *p < 0.05, **p < 0.01
and mental health of society.

This study has some limitations. The study included only students, and it may be difficult to generalize the results to other individuals owing to the age of the participants, their area of residence, and other such factors. Additionally, the participants may have not maintained an accurate posture during the exercise program. Further studies with a large number of participants of different ages from diverse backgrounds and regions are required. Additionally, conducting exercise programs in groups on a regular basis may help individuals exercise regularly and maintain correct posture.

Although this study had some limitations, the results obtained from investigating the effect of an exercise program for posture correction on musculoskeletal pain can be used as a basis for the improvement of learning efficiency and health in students and workers.

REFERENCES

1) Curnow D, Cobbin D, Wyndham J, et al.: Altered motor control, posture and the Pilates method of exercise prescription. J Bodyw Mov Ther, 2009, 13: 104–111. [Medline] [CrossRef]

2) Moon HH: The effect of correction exercise program on primary school students with idiopathic scoliosis. J Sport Leis Stud, 2007, 31: 1033–1041.

3) Chen KM, Chen MH, Hong SM, et al.: Physical fitness of older adults in senior activity centres after 24-week silver yoga exercises. J Clin Nurs, 2008, 17: 2634–2646. [Medline] [CrossRef]

4) Lee KU, Kyeon JI, Kim HS, et al.: Back exercise program with lumbar extension resisting exercise in patients with chronic low back pain. Annals of Rehab Med, 20: 536–541.

5) Cho HY, Kim EH, Kim J: Effects of the CORE exercise program on pain and active range of motion in patients with chronic low back pain. J Phys Ther Sci, 2014, 26: 1237–1240. [Medline] [CrossRef]

6) Carter JB, Banister EW: Musculoskeletal problems in VDT work: a review. Ergonomics, 1994, 37: 1623–1648. [Medline] [CrossRef]

7) Kim JK, Lee SJ: Effect of stretching exercise as work-related musculoskeletal pain of neck and shoulder. Korean J Phys Edu, 43: 655–662.

8) Park MJ, Park JS: Effect of a posture training program on cobb angle and knowledge of posture of elementary school students]. Taehan Kanho Hakhoe Chi, 2003, 33: 643–650. [Medline]

9) Anderson CA, Harvey RJ: Discriminating between problems in living: a examination of measure of depression, loneliness, shyness, and social anxiety. J Soc Clin Psychol, 1988, 6: 482–491. [CrossRef]

10) Moon JH, Lee JS, Kang MJ, et al.: Effects of rehabilitation program in adolescent scoliosis. Ann Rehab Med, 1996, 20: 424–432.

11) Jung CY, Kim EJ, Hwang MS: The research of pain and functional disability assessment scales for knee joint disease. J Korean Acupu Moxibu Med Soc, 2010, 27: 123–142.

12) Hodge PW: Core stability exercise in chronic low pain. The Orthoped Clinic of North America, 34: 243–254.

13) Barry BK, Carson RG: Transfer of resistance training to enhance rapid coordinated force production by older adults. Exp Brain Res, 2004, 159: 225–238. [Medline] [CrossRef]

14) Ko HK, Kim S: The health behavior of high school students and its associated factors. J Korean Coun Child Rights, 2003, 7: 2–21.

15) Jung EJ, Chae YR: The effects of self stretching on shoulder pain and shoulder flexibility of hospital nurses. J Basic Nurs Sci, 2002, 14: 268–274.

16) Tse MM, Pun SF, Benzie IF: Affective images: relieving chronic pain and enhancing quality of life for older persons. Cyberpsychol Behav, 2005, 8: 571–579. [Medline] [CrossRef]