



Original Article

The effect of abdominal drawing-in exercise and myofascial release on pain, flexibility, and balance of elderly females

SEONG HUN YU, PhD, PT¹⁾, YONG HYEON SIM, PhD, PT²⁾, MYUNG HOON KIM, PhD, PT³⁾,
JU HEE BANG, PhD, OT⁴⁾, KYUNG HYUN SON, PhD, PT⁵⁾, JAE WOONG KIM, PhD, PT⁵⁾,
HYUN JIN KIM, PhD, PT⁵⁾*

¹⁾ Department of Physical Therapy, Gwangju Trauma Center, Republic of Korea

²⁾ Department of Physical Therapy, Seoyeong University, Republic of Korea

³⁾ Department of Physical Therapy, Gwangju Health University, Republic of Korea

⁴⁾ Department of Occupational Therapy, Sehan University, Republic of Korea

⁵⁾ Department of Physical Therapy, Hanlyo University: Deongnye-ri, Gwangyang-eup, Gwangyang-si, Jeollanam-do 545-704, Republic of Korea

Abstract. [Purpose] This study is designed to compare the effects of abdominal drawing-in exercise and myofascial release on pain, flexibility, and balance of elderly females. [Subjects and Methods] Forty elderly females aged 65 or older who had complained of low back pain for three months or longer were selected as the subjects. They were randomly and equally assigned to either an abdominal drawing-in group or a myofascial release group. The subjects conducted exercise three times per week, 40 minutes each time, for eight weeks. As evaluation tools, visual analogue scale for pain, remodified schober test for flexibility, and upright posture with eye opening on hard platform, upright posture with eye closing on hard platform, upright posture with eye opening on soft platform, upright posture with eye closing on soft platform using tetraX for balance were used. [Results] The abdominal drawing-in exercise group saw significant difference in pain and balance after the exercise compared to before the exercise. The myofascial release group saw significant difference in pain and flexibility after exercise compared to before the exercise. [Conclusion] The above study showed that abdominal drawing-in exercise affected elderly females regarding pain and balance and myofascial release influenced their pain and flexibility.

Key words: Abdominal drawing-in exercise, Myofascial release, Balance

(This article was submitted Apr. 20, 2016, and was accepted Jun. 16, 2016)

INTRODUCTION

In modern society, development of public health medicine and socio-economic progress resulted in the improvement in life environment and the extension of the average lifespan, accelerating increase in the aged population. The population of those aged 65 or older has continuously increased since 1990 and the population is 12.7% as of 2014 and expected to be 24.3% in 2030, and 40.1% in 2060. At this point when society is entering a super-aging society resulting from an increase in average lifespan, elderly people's health has emerged as a serious issue¹⁾. To look at health problems of the elderly, the rate of hypertension is highest at 54.8%, followed by rheumatism and arthritis at 40.4%, and low back pain and ischialgia at 19.9%. Decrease in physical activities in accordance with the industrialization of the society and degraded physical functions caused by sedentary life increased the occurrence frequency of low back pain and triggered an economic problem resulting from increases in treatment costs²⁾.

*Corresponding author. Hyun Jin Kim (E-mail: gini51@naver.com)

©2016 The Society of Physical Therapy Science. Published by IPEC Inc.

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License <<http://creativecommons.org/licenses/by-nc-nd/4.0/>>.

Low back pain is a pain in the lumbar region from the second lumbar vertebrae where the nerves end to the sacroiliac articulation³). It is a pain resulting from humans' walking erect unlike other animals and 80% of the whole population experiences low back pain during their lifetime. Ten to twenty percent of acute low back pain becomes chronic due to pain and disability for longer than three months⁴). The causes of low back pain are diverse. Low back pain is divided into: spinal low back pain triggered by direct vertebral lesions such as herniation of intervertebral disc and lumbosacral sprain, which are the most common causes, trauma, degeneration, inflammation, tumors, and congenital deformity; low back pain brought about by different relevant diseases such as urolithiasis, cystitis, all kinds of obstetric and gynecological diseases, and systemic diseases such as diabetes; and psychogenic low back pain caused by mental tension and stress⁵). In the case of elderly people, as they grow older, they undergo degenerative changes of their vertebra, and gradual atrophy and decrease in muscle strength around the vertebra lead to damage to their trunk soft tissues and the weakening of muscle strength, which act as a main cause of low back pain⁶).

Abdominal drawing-in method, which is effective for improving stability and balance senses among different exercise methods effective for low back pain, pulls the abdominal wall inward, contracting the internal oblique abdominal muscle and transversus abdominis muscle and increasing intra-abdominal pressure. Abdominal drawing-in is an exercise method effective for stabilization of the transversus abdominis muscle and the multifidus muscle. The exercise also acts in activating the abdominal muscles and having hip joint muscles stabilize the pelvis and as a result force is effectively delivered to the hip joint and the lower limbs^{7, 8}).

Myofascial release (MFR), one of the treatment methods for low back pain, is largely used for adjusting pain in the musculoskeletal system lesions such as muscle fibers and myofascial trigger points. In order to heighten treatment effects, muscular relaxation is maximized. When MFR was applied to the iliopsoas muscle of chronic low back pain patients, their low back pain decreased and their lumbar flexion increased. MFR is one of the therapeutic exercises that may heighten flexibility of the muscles and mobility of the joints⁹).

However, most hospitals apply basic physical therapy to the elderly in order to treat their low back pain but do not provide a program using abdominal drawing-in or MFR. Accordingly, this study compares the effects of abdominal drawing-in exercise and MFR programs on pain, flexibility, and balance of the elderly females.

SUBJECTS AND METHODS

The subjects of this study were elderly females aged 65 or older who consented to participate in this study and signed an agreement for the experiment. This study was approved by the research agency, and all participants provided written informed consent. Those who were not able to perform the exercise due to spondylolysis, malignant tumor, neurological lesion, or severe pain were excluded from this study. Forty elderly females who had complained of low back pain for at least three months were randomly and equally divided into an abdominal drawing-in group (n=20) and an MFR group (n=20). The age, height, and weight of the abdominal drawing-in group were 69.4 ± 4.1 years old, 158.1 ± 4.5 cm, and 59.2 ± 10.1 kg, respectively. The age, height, and weight of the MFR group were 70.4 ± 3.2 years old, 156.3 ± 4.9 cm, and 58.3 ± 5.7 kg.

The subjects conducted the exercises three times per week, for 40 minutes each time, for a total of eight weeks. They conducted warm-up exercises for 10 minutes, main exercises for 20 minutes, and cool-down exercises for 10 minutes. The abdominal drawing-in group received training using a pressure biofeedback device (Stabilizer, Chattanooga Group Inc., USA)¹⁰). The pressure biofeedback device is a simple device providing feedback about the qualitative aspect and preciseness of exercises. It is largely used for exercises to heighten stability of the neck, waist, and pelvis. The subjects lied comfortably, flexed their knee joints at 90 degrees, and conducted the exercise. The pressure biofeedback device was located at the waist of the subjects. The subjects were instructed to pull the naval up and down so that the abdomen was slightly hollow after the pressure of the device was increased a little. Each time the subjects conducted the exercise for 10 seconds and took a rest for five seconds. Ten times were considered as one set. They conducted the exercises for five to seven sets for 20 minutes¹¹). For MFR, diverse techniques for the waist were employed: shaking the ilium, relaxing one anterior superior iliac spine, putting pressure on and relaxing the inguinal region of abdomen, putting pressure on the iliopsoas muscle with both hands' fingertips, putting pressure on the iliopsoas muscle with both thumbs, putting pressure on the iliopsoas muscle with the palms after erecting the knees, putting pressure on the iliopsoas muscle after flexing the hip joint, and putting pressure on the iliopsoas muscle while flexing the hip joint and extending the knees⁸).

In order to evaluate the subjects' pain, a visual analogue scale was employed. Zero points were given for no pain and 10 points were given for the severest pain. The subjects were instructed to give a mark according to their degree of pain¹²). For the testing of flexibility, a remodified schober test (RST) was used to separate and measure movement of the lumbar region. The center of the line connecting the subjects' posterior superior iliac spine and a spot at 15 cm above it was marked. The distance change was measured when the subjects stood and flexed their spine maximally¹³). Tetrax (Tetrax Ltd., Ranmat Gan, Israel) was utilized to measure balance. Tetrax measures changes in pressure applied to each force plate and shows the stability of the center of the gravity. This equipment receives weight load and movement degree from four pressure sensing points and shows weight distribution to the monitor, exhibiting balance distribution while standing. Measurements were taken under the conditions of normal eye open (NO), normal eye closed (NC), pillow with eye open (PO), and pillow with eye closed (PC)¹⁴).

Table 1. The comparison of pain, flexibility and balance in abdominal drawing-in and myofascial release

	Period	AMDI group (n=20) ^a	MFR group (n=20) ^b
		M ± SD	M ± SD
VAS (score) ^c	Pre	6.9 ± 0.7	6.9 ± 0.6
	Post	5.1 ± 0.8*	5.0 ± 0.6*
RST (cm) ^d	Pre	4.4 ± 1.2	4.2 ± 1.2
	Post	5.5 ± 1.1	5.8 ± 0.6*
NO (score) ^e	Pre	21.7 ± 1.8	20.9 ± 2.5
	Post	19.9 ± 1.9*	19.8 ± 2.4
NC (score) ^f	Pre	32.1 ± 2.1	31.9 ± 2.5
	Post	29.8 ± 2.4*	29.8 ± 2.1
PO (score) ^g	Pre	27.9 ± 2.1	28.2 ± 1.9
	Post	25.7 ± 1.9*	26.8 ± 1.8
PC (score) ^h	Pre	41.5 ± 2.4	41.5 ± 2.6
	Post	39.7 ± 2.2	40.2 ± 2.9

^aAbdominal drawing-in group, ^bMyofascial release group, ^cVisual analogue scale, ^dRe-modified schober test, ^eUpright posture with eye opening on hard platform, ^fUpright posture with eye closing on hard platform, ^gUpright posture with eye opening on soft platform, ^hUpright posture with eye closing on soft platform.
*paired t-test, *p<0.05

Window SPSS 18.0 was used for the statistical analysis. A paired t-test was used for before and after comparisons, and an independent t-test was used for between group comparisons with a significance level of $\alpha=0.05$.

RESULTS

Pain after the eight weeks of exercise was significantly different in both groups compared to before the eight weeks of exercise (Table 1) ($p<0.05$). The MFR group experienced significant difference in flexibility compared to before the eight weeks of exercise ($p<0.05$). The abdominal drawing-in group saw significant difference in balance ability under the conditions of NO, NC, and PO compared to before the eight weeks of exercise ($p<0.05$). There was no significant difference between the two groups in pain, flexibility, and balance.

DISCUSSION

In modern society, development of public health medicine and socio-economic progress has resulted in improvement in life environment and an extension of the average lifespan. This has led to an accelerating increase in the elderly population. As a result, health problems for the elderly have emerged as a serious issue. Among them is the frequent and long lasting occurrence of low back pain which gives a great deal of discomfort to their life. Elderly people undergo restrictions to their activities due to pain and may experience joint deformity and loss of agility, flexibility, and muscle strength. In addition, an increase in pain and a decrease in flexibility can lead to a weakening of their balance ability. The reason why balance is important is because loss of your sense of balance exposes elderly people to the risk of falling, heightening the probability of injuries as a result^{6, 15}.

Abdominal-drawing in exercise may stabilize the abdomen through training on consecutive motor controls. According to a study, an abdominal drawing-in exercise group among low back pain patients saw significant improvement in respiratory patterns and expiratory volume of the abdomen^{16, 17}. In the present study as well, the abdominal drawing-in exercise group experienced a decrease in pain, which is considered to be the case because the patients performed exercise for themselves and their muscle strength improved, decreasing their pain. According to another study, after conducting tai chi exercise, elderly females saw improvements in balance and gait and Korean dancing led to increases in their balance ability, flexibility, and muscle strength. In addition, after muscle strengthening exercises, their muscle strength and balance ability improved and after conducting health physical exercises, their balance was enhanced^{18, 19}. In the present study as well, elderly females' balance ability significantly improved after abdominal drawing-in exercises. Abdominal drawing-in exercises may be simply performed anywhere. It is also considered to change elderly people's slightly stooped posture and improve their balance. Nonetheless, previous research on abdominal drawing-in exercises is lacking and a lot of research is needed.

MFR is a treatment technique that induces imbalance of the body into a balanced condition and into a stable and comfortable state. It is applied in order to maximally promote relaxation of tense tissues that trigger pain²⁰. According to a study,

when MFR was applied to whiplash syndrome patients, their pain decreased. MFR was effective for the treatment of neck pain patients²¹⁾. According to another study, when MFR was applied to neck pain patients, their extension angle significantly increased and when it was applied to patients with a shortened iliopsoas muscle, their waist flexion angle increased^{9, 22)}. In the present study as well, when MFR was applied to elderly females with low back pain, their pain significantly decreased and their flexibility significantly improved. It is considered that MFR decreased pain, which in turn increased movement and flexibility. When elderly people with chronic low back pain relax the iliopsoas muscle, their gait and lumbar flexion may be improved. Relaxation of the iliopsoas muscle should be applied in a way of preventing secondary damages and giving help to their ordinary life.

The present study showed that abdominal drawing-in exercise affected pain and balance and MFR influenced pain and flexibility. Accordingly, based on the present study, objective and efficient exercise should be applied when planning a rehabilitation program for elderly females. A follow up study should consider pain, flexibility and balance in a comprehensive manner to reduce elderly people's secondary injuries.

REFERENCES

- 1) Statistics Korea: Elderly Statistics, 2015.
- 2) Fritz JM, Cleland JA, Speckman M, et al.: Physical therapy for acute low back pain: associations with subsequent healthcare costs. *Spine*, 2008, 33: 1800–1805. [[Medline](#)] [[CrossRef](#)]
- 3) Park HS, Lee SN, Sung DH, et al.: The effect of power Nordic walking on spine deformation and visual analog pain scale in elderly women with low back pain. *J Phys Ther Sci*, 2014, 26: 1809–1812. [[Medline](#)] [[CrossRef](#)]
- 4) Ha YS, Lee JS, Kim SS, et al.: The effect of sling exercise therapy and motor control exercise on pain, ADL performance and trunk muscle strength in patients with chronic low back pain. *J Orient Rehabil Med*, 2012, 22: 151–162.
- 5) Ko JK: [Comparing the effects of drug therapy, physical therapy, and exercise on pain, disability, and depression in patients with chronic low back pain]. *Taehan Kanho Hakhoe Chi*, 2007, 37: 645–654. [[Medline](#)]
- 6) Song RY, Ahn SK: Effect of lumbar stabilization exercise on back pain, physical fitness, sleep, and depression in middle-aged women with chronic back pain. *Korean J Adult Nurs*, 2008, 20: 84–94.
- 7) Kisner C, Kolby LA: *Therapeutic exercise: foundations and techniques*, 6th ed. Philadelphia: FA Davis Company, 2012.
- 8) Neumann P, Gill V: Pelvic floor and abdominal muscle interaction: EMG activity and intra-abdominal pressure. *Int Urogynecol J Pelvic Floor Dysfunct*, 2002, 13: 125–132. [[Medline](#)] [[CrossRef](#)]
- 9) Kim YS: The effects of iliopsoas myofascial release on reducing low back pain and increasing hip flexion ROM. Chosun University, Dissertation of Master's Degree, 2012.
- 10) Lee JS: Effects of selective exercise for abdominal deep muscle and lumbar stabilization exercise on trunk muscle activation and thickness of transverse abdominis. Daegu University, Dissertation of Master's Degree, 2014.
- 11) Lee JM, Yi CH, Kwon OY, et al.: The effect of lumbar stabilization exercise for caregivers with chronic low back pain. *Phys Ther Korea*, 2011, 18: 9–17.
- 12) Von Korff M, Deyo RA, Cherkin D, et al.: Back pain in primary care. Outcomes at 1 year. *Spine*, 1993, 18: 855–862. [[Medline](#)] [[CrossRef](#)]
- 13) Gill K, Krag MH, Johnson GB, et al.: Repeatability of four clinical methods for assessment of lumbar spinal motion. *Spine*, 1988, 13: 50–53. [[Medline](#)] [[Cross-Ref](#)]
- 14) Lee KG, Chun MH, Kim BR, et al.: The effects of biofeedback balance training using interactive balance system in acute stroke patients. *ARM*, 2009, 33: 41–47.
- 15) Acar S, Demirbükten İ, Algun C, et al.: Is hypertension a risk factor for poor balance control in elderly adults? *J Phys Ther Sci*, 2015, 27: 901–904. [[Medline](#)] [[CrossRef](#)]
- 16) Hodges PW: Core stability exercise in chronic low back pain. *Orthop Clin North Am*, 2003, 34: 245–254. [[Medline](#)] [[CrossRef](#)]
- 17) Park DJ: Altered respiratory pattern of individuals with LBP and effects of abdominal exhalation maneuver. Pusan Catholic University, Dissertation of Master's Degree, 2013.
- 18) Kim SJ: Risk factors of falling in the elderly in urban cities. Ewha Womans University, Dissertation of Master's Degree, 2012.
- 19) Park HN, So WY, Suh SH: The effects of 12 weeks traditional Korean dance on functional fitness and metabolic syndrome risk factors in Korean elderly women. *Korean Soc Sports Sci*, 2014, 23: 1295–1307.
- 20) Kuruma H, Takei H, Nitta O, et al.: Effects of myofascial release and stretching technique on range of motion and reaction time. *J Phys Ther Sci*, 2013, 25: 169–171. [[CrossRef](#)]
- 21) Lee MH, Park RJ: The effect of MFR and taping on the pain level in whiplash injury. *J Korean Soc Phys Ther*, 2004, 16: 125–141.
- 22) Seo HK, Gong WT, Lee SY: The effect of myofascial release and transcutaneous electrical nerve stimulation on the range of motion and pain in patient with chronic cervical neck pain. *J Korean Orthop Man Ther*, 2005, 11: 1–12.