Trunk Muscle Performance and Work-Related Musculoskeletal Disorders among Manual Lifting with Back Belt Wearing Workers

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Objective: *to determine the effects of back belt use on trunk muscle performance and the association between those performance outcomes with Work-Related Musculoskeletal Disorders (WMSDs).*

Material and Method: *All manual lifting workers in one grocery distribution, warehouse center were interviewed about the history of illness, back injury, WMSDs, lifting manner, and experience of back belt use. They were assessed for trunk muscles performance including the flexion (F), the extension (E) and the right and left side bridge (RSB and LSB) endurance test and Exercise Level of Lumbar Stabilization test (ELLS). Pearson's correlation and Spearman's rank correlation statistics were used to determine the association.*

Results: *One hundred and seven males, aged 18 to 42 years participated in the study. Most participants had ELLS at levels 2 (31.1%) and 3 (30.2%). The mean F, E, RSB and LSB endurance times were 62.33, 88.62, 77.17 and 77.33 seconds, respectively. The greatest area of WMSDs was the lower back (53.33%). Significant correlations were found between the ELLS and RSB ($r = 0.244$, $p = 0.012$) and between the ELLS and LSB ($r = 0.199$, $p = 0.041$). Significant correlations were found between pain scale of back pain and ELLS ($r = -0.299$, $p = 0.016$). Significant correlations were found between the number of WMSD areas and trunk flexion endurance ($r_s = -0.263$, $p = 0.007$), right trunk endurance ($r_s = -0.195$, $p = 0.044$), left trunk endurance ($r_s = -0.325$, $p = 0.001$) and endurance ratio of RSB/LSB ($r_s = 0.224$, $p = 0.022$). Furthermore, most participants (84.1%) had imbalanced endurance of RSB/LSB. Duration and frequency of back belt use did not correlate with any trunk muscle performance. This may have been because few participants did not wear belts (10.1%) or wore belts sometimes (26.6%).*

Conclusion: *Low correlation was found between back belt use and WMSDs. To prevent back injury, the lifting workers should be trained to balance their trunk muscles endurance, especially right and left trunk muscles and to stabilize their lower back while lifting.*

Keywords: *Back belt, Ergonomics, Lifting, Trunk stabilizer muscle, Endurance*

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Although many studies did not recommend healthy workers to wear back belts as protective devices for lower back pain (LBP)[1-3], currently back belts are still commonly applied by lifting workers while performing their manual handling tasks in many factories. A previous study[4] suggested that back belts can be applied while lifting, as it can enhance *rectus abdominis* (RA) activity to facilitate abdominal pressure. Wearing back belts might not cause *transversus abdominis* (TrA) muscle weakness, if worn only while lifting and removed when not lifting. The TrA is an important trunk stabilizer muscle that primarily attributes stability to the spinal column through the elevation of intra-abdominal pressure (IAP)[5]. Workers performing lifting tasks during belt wearing and generating more activity of the TrA was found to correlate significantly with increased exercise level of lumbar stabilization (ELLS) more than workers who generated less activity of the TrA[6]. However, the imbalance of the trunk muscles between abdominal and back muscles or between right and left lateral trunk

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muscles should be of concern among back belt wearing workers, as back belts enhance much more activity of the RA than the erector spinae (ES) while lifting[4].

McGill[7] established isometric endurance holding times and ratios between torso extensors, flexors and lateral flexors (stabilizers) for clinical assessment and rehabilitation using a simple measurement of endurance holding times in four tests. The tests demonstrated good reliability, with coefficients >0.97 for the repeated tests on five consecutive days and again eight weeks later. In addition, endurance interpretation measured using the ratio relationship among three muscle groups (flexor, lateral and extensors), included 1) RSB/LSB >0.05, 2) F/E >1.0, and 3) RSB or LSB/E >0.75, and indicated imbalance of the trunk muscles[4,8].

The ELLS was the specific exercise program designed to increase muscular control of the lumbar spine especially for the TrA muscle. The underlying concept of these exercise programs is the ability of the muscular system to maintain a neutral position of the spine to prevent excessive lumbar segmental motion that subsequently leads to high levels of repetitive stress and tissue damage[9]. The ELLS consists of seven levels of exercises, performed in sequence from easiest to the most difficult in the supine position. The increase in exercise difficulty is based on the biomechanical construct, involving the quantity of torque that the lumbar muscles increase on activity by the mass of leg and moment arm from the center of mass of the leg to the axis of rotation.

A previous study reported that back injury rate increased among lifting workers who stopped using back belts after wearing them for a certain period of time[10]. The injuries may be caused by three reasons including 1) insufficient generation of TrA activity while lifting, 2) day-long back belt use or 3) imbalance of trunk muscles endurance. Therefore, it would be beneficial to identify the factors contributing to back injuries among lifting workers who used back belts. The present study aimed to determine the effects of back belt use on trunk muscle performance and the association between those performance outcomes with Work-Related Musculoskeletal Disorders (WMSDs).

Material and Method

Participants

The present study was conducted at a grocery distribution, warehouse center. The workers who had been working with manual lifting tasks for at least 6 months were invited to participate in this study. All participants were healthy with no problems of speech and hearing affecting communication, no neurological system or psychological disorders affecting verbal instruction and ability to perform all tests of trunk muscle performance. Participants who had a history of abdominal or back surgery within 12 months were excluded from the study. The protocol for the study was approved by the Mahidol University Institutional Review Board (COA. No. MU-IRB 2010/003.0501).

Materials and instruments

Interview form

An interview form was used to interview all participants about the history of illness, back injury, WMSDs, experience of back belt wearing, daily activities and exercise, as well as characteristics of job tasks, weight of lifted product, lifting distance and lifting manner.

Endurance test device for trunk muscle

The endurance test devices used for three groups of trunk muscle tests according to the guidelines of the test form[7] including flexor, extensor, and right and left lateral trunk flexor muscle group. Devices included stopwatch, test table and mattress, a 45-degree wedge (40x50x80 cm), made of a wooden board, strap and towel for stabilizing the pelvis, knees and ankles during endurance test, stand and bar for marking the maintained position.

Pressure biofeedback unit (PBU)

This unit, called the Stabilizer (Chattanooga, Australia), was used to test for the ELLS. The pressure gauge ranged from 0 to 200 mmHg to indicate the pressure for feedback.

Procedures of the study

Participants who met the inclusion criteria were invited to participate in the study. Then subjects read and signed informed consent forms before participation.

Interview and physical examination

This station was operated by an experienced physical therapist to check all interview form data and to perform physical examination according to WMSDs for all participants.

Endurance tests

Procedures and commands were modified from McGill[7]. Before the endurance test, each participant performed stretching exercises for 5 minutes. After, the participant assumed the starting position for each test and was allowed to practice the test for 2 minutes. A feedback pad with an adjustable stand was placed to monitor the trunk position during all isometric trunk endurance tests.

1) Extension endurance test (E)

The participant was in the prone lying position on the test table with arms crossed on the chest. The lower body was fixed by three straps including hips, knees and ankles. The upper part of the body (from the upper border of the iliac crest) extended over the edge of the test table with the upper trunk supporter. To maintain the participant in this position, a feedback pad with an adjustable stand was placed on the mid of both scapulas.

2) Flexion endurance test (F)

The participant was in a bent-lying position with the upper part of the body leaning on a wedge (45-degree angle from the test table), the hip and knee bent at 90 degrees and ankle fixed by ankle strap. The arms crossed at the chest. A feedback pad with an adjustable stand was placed on the sternum.

3) Left side bridge test (LSB)

This LSB test was designed to test the left lateral flexor of the trunk. The participant was positioned on the left side lying with legs extended. The right foot was placed in front of the left foot to warrant stability. The head and neck rested on a pillow on the upper limbs supporter. The participant was instructed to lift the left hip off the table to maintain a straight line through full body length. A feedback pad with an adjustable stand was placed over the right iliac crest.

4) Right side bridge test (RSB)

This RSB test was designed to test the right lateral flexor of the trunk. The participant was positioned similarly to the LSB test except that the participant was positioned on the right side lying and the left foot was placed in front of the right foot.

The test continued until the participants could not control their posture or had any signs of fatigue, exhaustion, pain, cramp, or discomfort at muscles. The maximum time of the test was 240 seconds. The next test was performed after the previous test for 5 minutes. After completing all four endurance tests, each participant performed the stretching exercise for cool down.

ELLS

In this study, ELLS was performed as described previously[6] following the guidelines from Thongjunjua[11] and proved to have good reliability among Thai participants. To start testing, the examiner aligned the PBU bag under the participant's back at L1-S2 level and inflated the air to a pressure of 40 mmHg. Then all participants completed the tests in order. In each test, the participant was instructed to perform hollowing of the abdominals and maintain the pressure at 40 mmHg ($\pm$4 mmHg) for 3 breathing cycles. The degrees of difficulty of the test exercise ranged from level 1 (very easy) to level 6 (very difficult).

Statistical analysis

SPSS program for windows, version 17, was used to analyze all data. Descriptive statistics was applied to explain baseline demographics and the findings of the study. Pearson's correlation statistics was used to determine the association between ELLS and trunk muscle performance and between back pain scale and trunk muscle performance. Spearman's rank correlation statistics was used to determine the associations between number of WMSDs and trunk muscle performance and between duration and frequency of back belt wearing and trunk muscle performance.

Results

During the study period, 107 healthy manual lifting workers from the same distribution center participated in this study. The participant's ages ranged from 18-42 years, with BMI 15.35-32.10 kg/m^2. One participant was excluded from all performance tests due to severe low back pain. Therefore, the number of participants totaled 106. From the interview data, most participants in the present study had been wearing back belts for more than 1 year (54.9%), others for 3 months to 1 year (12.2%), <3 months (19.5%) and never used back belt (7.1%). The highest frequency of belt wearing was every time they worked (63.3%), never used (6.4%), not used now >4 months (3.7%) and sometimes (26.6%). All participants performed lifting tasks using stoop and trunk twisting manner.

WMSDs

The greatest related area of WMSDs among manual lifting workers in the present study was the lower back (53.33%), followed by the upper back (18.1%), arms (15.24%), neck (12.38%) and legs (9.52%). 25.2% of manual lifting workers did not report WMSDs

Table 1. Correlations between ELLS, number of WMSDs areas and back pain scale with trunk muscle endurance (n = 106)

Variable	Muscle performance	Correlation coefficient	
		r	*p*-value
ELLS	Flexion	0.084	0.392
	Extension	0.118	0.228
	Right side bridge	0.244	0.012*
	Left side bridge	0.199	0.041*
	Flexion/extension	-0.108	0.278
	RSB/LSB	0.084	0.392
Number of WMSD areas[a]	Flexion	-0.263	0.007**
	Extension	-0.184	0.058
	Right side bridge	-0.195	0.044*
	Left side bridge	-0.325	0.001**
	Flexion/extension	-0.193	0.050
	RSB/LSB	0.224	0.022*
	ELLS	-0.083	0.396
Back pain (pain scale 1-10)	Flexion	-0.143	0.256
	Extension	0.063	0.615
	Right side bridge	-0.073	0.563
	Left side bridge	-0.121	0.337
	Flexion/extension	-0.229	0.071
	RSB/LSB	0.152	0.234
	ELLS	-0.299	0.016*

* Significant difference at *p*-value <0.05; ** Significant difference at *p*-value <0.01
[a] Correlation coefficient from Spearman's rank correlation statistic
RSB = right side bridge; LSB = left side bridge

symptoms. Most manual lifting workers had WMSDs for at least one area (52.3%), while others had two areas (15%), three areas (5.6%) and four areas (1.9%).

Trunk muscle performance test

The outcomes of the trunk muscle endurance test were described as the range from minimum to maximum value (mean ± standard deviation). F ranged from 14 to 156 second (62.33±34.50 second), E ranged from 9 to 194 second (88.62±88.62 second), RSB ranged from 6 to 182 second (77.17±48.92 second) and LSB ranged from 16 to 266 second (77.33±51.34 second). The numbers of participants related to each level of ELLS were level 1 = 1 (6.6%), level 2 = 33 (31.1%), level 3 = 32 (30.2%), level 4 = 30 (28.3%), and level 5 = 4 (3.8%).

Correlations between trunk muscle performance and WMSDs

Significant Pearson's correlations were found between the ELLS and the RSB (r_p = 0.244 and p = 0.012) and between the ELLS and LSB (r_p = 0.199 and p = 0.041) (Table 1, upper). For WMSDs, significant Spearman's rank correlations were found between number of WMSD areas and F (r_s = -0.263 and p = 0.007), between WMSDs and RSB (r_s = -0.195 and p = 0.044), between WMSDs and LSB (r_s = -0.325 and p = 0.001) and between WMSDs and ratio of RSB/LSB (r_s = 0.224 and 0.022) (Table 1, middle). Concerning back pain (upper and lower back), significant Pearson's correlations were found between pain scale of back pain and ELLS (r = -0.299, p = 0.016) (Table 1, lower).

Using endurance ratio score, most participants showed the balance of trunk muscle only in F/E (77.9%).

Others trunk endurance ratios represented greater numbers in the unbalanced trunk muscle group including RSB/LSB (84.1%), RSB/E (57%) and LSB/E (54.2%).

Correlations between trunk muscle performance and back belt use

The duration and frequency of belt use did not correlate with any trunk muscle performance in this study (Table 2).

Table 2. Correlations between duration of back belt use and frequency of back belt use with trunk muscle endurance and ELLS (n = 106)

Variable	Muscle performance	Correlation coefficient[a]	
		r	*p*-value
Duration of belt wearing	Flexion	0.004	0.972
	Extension	0.178	0.114
	Right side bridge	0.072	0.523
	Left side bridge	-0.003	0.978
	Flexion/extension	-0.093	0.422
	RSB/LSB	0.079	0.494
	ELLS	0.062	0.585
Frequency of belt wearing	Flexion	0.004	0.970
	Extension	0.045	0.645
	Right side bridge	0.085	0.388
	Left side bridge	0.030	0.761
	Flexion/extension	-0.210	0.830
	RSB/LSB	0.005	0.957
	ELLS	0.015	0.876

* Significant difference at *p*-value <0.05; ** Significant difference at *p*-value <0.01
[a] Correlation coefficient from Spearman's rank correlation statistic
RSB = right side bridge; LSB = left side bridge

Discussion

The study showed significant correlations between the ELLS, representing the TrA activity and both of the right and left lateral trunk muscle endurance. Thus, lifting workers, with less endurance of the lateral trunk muscles, might have led to poor back muscle stabilization.

Most participants (77.9%) in the present study had balanced F/E endurance ratio score. The results could not support the hypothesis that back belt enhanced much more activity of the abdominal than back muscles and might cause unbalanced F/E ratio. However, most participants (84.1%) had unbalanced endurance of RSB/LSB, which might lead to asymmetrical control of the TrA muscle of the right and left trunk to stabilize the spine. Thus, asymmetrical lifting position in these participants, which usually relied on the dominant side, could be assumed to increase the ability of TrA control in one side rather than the other, so that asymmetrical spinal stabilization may occur as a consequence.

Regarding WMSD symptoms, significant correlations were found between the number of WMSD areas and F, RSB, LSB and RSB/LSB trunk endurance. That signified the participants who had poor abdominal and lateral trunk endurance as well as RSB/LSB imbalance had a greater number of WMSD symptoms. In addition, significant correlations were found between back pain and ELLS. That signified the participants who had low level of ELLS may cause increased pain scale of back pain symptoms.

The duration and frequency of back belt use did not correlate with trunk muscle performance in this study. This may be caused by the low number of participants who had not worn belts at all or only sometimes.

Clinical implications

Physical therapists and occupational safety officers should recommend back belt wearing workers undergo a specific lifting training and exercise program that can prevent low back injury. For lifting training, we recommend avoiding an asymmetrical lifting manner to prevent imbalance of lateral trunk muscles and suggest workers to contract more TrA during belt wearing. For an exercise program, endurance training on the lateral trunk muscles should be added with abdominal and back muscle endurance to enhance spinal stabilization while lifting and prevent WMSDs among these manual lifting workers.

Conclusion

This study recommended back belt users employ symmetrical instead of asymmetrical lifting in stoop and twisting manners to improve balance of trunk muscle endurance especially the lateral trunk muscle to prevent low back injury. Lateral trunk muscle endurance should be added in exercise programs to enhance the potential of back stabilization as this lateral trunk endurance was significantly correlated with ELLS. To confirm the findings of this study, future studies should focus on trunk muscle performance of back belt users before and after wearing back belts for at least 6 months. In addition, the follow-up program of trunk muscle endurance after providing a training program, suggested by this study, should be considered.

What is already known on this topic?

TrA activity was known to correlate with the exercise level of lumbar stabilization, in which the greater the level of ELLS, the more the ability to control the trunk stability. Unbalanced trunk muscle endurance was found to correlate with low back injury.

What does this study add?

Wearing back belts was not a primary cause of unbalanced trunk muscles as represented by the F/E ratio not more evident in the unbalanced group. The lateral trunk endurance and pain scale of back pain symptoms were found to correlate with ELLS. Thus, the greater the endurance of the lateral trunk muscle indicated, the more the ability to control spinal stability while lifting and might consequently reduce low back injury and number of WMSDs areas. In addition, a greater ability to control spinal stability while lifting indicated fewer symptoms of back pain among back belts users.

Potential conflicts of interest

None.

References

1. The National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC). Workplace Use of Back Belts. Atlanta, GA: NIOSH, CDC; 1994.
2. McGill SM, Norman RW, Sharratt MT. The effect of an abdominal belt on trunk muscle activity and intra-abdominal pressure during squat lifts. Ergonomics 1990; 33: 147-60.
3. van Poppel MN, Koes BW, van der Ploeg T, Smid T, Bouter LM. Lumbar supports and education for the prevention of low back pain in industry: a randomized controlled trial. JAMA 1998; 279: 1789-94.
4. Kurustien N, Mekhora K, Jalayondeja W, Nanthavanij S. Trunk stabilizer muscle activity during manual lifting with and without back belt use in experienced workers. J Med Assoc Thai 2014; 97 (Suppl 7): S75-9.
5. Hodges P, Kaigle HA, Holm S, Ekstrom L, Cresswell A, Hansson T, et al. Intervertebral stiffness of the spine is increased by evoked contraction of transversus abdominis and the diaphragm: in vivo porcine studies. Spine (Phila Pa 1976) 2003; 28: 2594-601.
6. Kurustien N, Mekhora K, Jalayondeja W, Nanthavanij S. Correlation of exercise level and electromyography of trunk muscles during manual lifting among experienced back belt users. In: Yamamoto S, editor. New ergonomics perspective: selected papers of the 10th Panpacific Conference on Ergonomics, Tokyo, JAPAN, 25-28 August 2014. London: Talor & Francis Group; 2015: 113-8.
7. McGill SM, Childs A, Liebenson C. Endurance times for low back stabilization exercises: clinical targets for testing and training from a normal database. Arch Phys Med Rehabil 1999; 80: 941-4.
8. McGill S. Low back disorders: evidence-based prevention and rehabilitation. United State of America: Human Kinetics; 2002.
9. Hagins M, Adler K, Cash M, Daugherty J, Mitrani G. Effects of practice on the ability to perform lumbar stabilization exercises. J Orthop Sports Phys Ther 1999; 29: 546-55.
10. Reddell CR, Congleton JJ, Dale HR, Montgomery JF. An evaluation of a weightlifting belt and back injury prevention training class for airline baggage handlers. Appl Ergon 1992; 23: 319-29.
11. Thongjunjua S. Effects of lumbar stabilization exercises on exercise level attained in healthy subjects [thesis]. Bangkok: Mahidol University; 2005.

สมรรถภาพของกล้ามเนื้อลำตัวและความผิดปกติทางระบบกระดูกและกล้ามเนื้อเนื่องจากการทำงานในพนักงานยกของที่สวมเข็มขัดพยุงหลัง

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วัตถุประสงค์: *ศึกษาผลของการสวมเข็มขัดพยุงหลังต่อสมรรถภาพกล้ามเนื้อลำตัว และความสัมพันธ์ระหว่างผลการทดสอบสมรรถภาพกล้ามเนื้อในด้านต่างๆ และความผิดปกติของระบบกระดูกและกล้ามเนื้อ (WMSDs)*

วัสดุและวิธีการ: *ผู้นิพนธ์ทำการสัมภาษณ์พนักงานยกของทั้งหมดที่ทำงาน ณ ศูนย์กระจายสินค้าแห่งหนึ่ง เกี่ยวกับประวัติการเจ็บป่วย การบาดเจ็บบริเวณหลัง ตำแหน่งของ WMSDs ท่าทางการยก ประสบการณ์ การสวมเข็มขัดพยุงหลัง และทดสอบสมรรถภาพของกล้ามเนื้อลำตัว ได้แก่ ความอดทนของกล้ามเนื้อก้มตัว (F) แอ่นหลัง (E) เอียงตัวทางขวาและเอียงตัวทางซ้าย (RSB และ LSB) และการทดสอบหาระดับความแข็งแรงของกล้ามเนื้อเสริมความมั่นคงของหลังส่วนล่าง (ELLS) โดยการวิเคราะห์ความสัมพันธ์ของข้อมูลด้วยสถิติ Pearson correlations และ Spearman rank correlations*

ผลการศึกษา: *ผู้เข้าร่วมวิจัยเป็นพนักงานยกของเพศชาย จำนวน 107 คน อายุ 18-42 ปี ส่วนใหญ่มีค่า ELLS ที่ระดับ 2 (31.1%) และระดับ 3 (30.2%) ค่าเฉลี่ยของระยะเวลา F, E, RSB และ LSB เท่ากับ 62.33, 88.62, 77.17 และ 77.33 วินาทีตามลำดับ ตำแหน่งร่างกายที่เป็น WMSDs ส่วนใหญ่คือ หลังส่วนล่าง (53.33%) พบความสัมพันธ์อย่างมีนัยสำคัญทางสถิติระหว่างค่า ELLS และ RSB (r_p = 0.244, p = 0.012) และ LSB (r_p = 0.199, p = 0.041) พบความสัมพันธ์อย่างมีนัยสำคัญทางสถิติ ระหว่างค่าระดับความเจ็บปวดของอาการปวดหลัง scale และค่า ELLS (r_p = -0.299, p = 0.016) พบความสัมพันธ์อย่างมีนัยสำคัญทางสถิติระหว่างจำนวนตำแหน่งร่างกายที่เป็น WMSDs และค่าความอดทนของ F (r_s = -0.263, p = 0.007), RSB (r_s = -0.195, p = 0.044), LSB (r_s = -0.325, p = 0.001) และค่าอัตราส่วน ความอดทนของกล้ามเนื้อ RSB/LSB (r_s = 0.224, 0.022) นอกจากนี้ยังพบว่าผู้เข้าร่วมวิจัยส่วนใหญ่ (84.1%) มีความไม่สมดุลของค่าอัตราส่วนความอดทนของกล้ามเนื้อ RSB/LSB แต่ไม่พบความสัมพันธ์ระหว่างระยะเวลา และความถี่ของการสวมเข็มขัดพยุงหลังกับทุกการทดสอบของสมรรถภาพกล้ามเนื้อ ทั้งนี้อาจเนื่องมาจากมีจำนวน พนักงานที่เข้าร่วมการทดสอบเพียงส่วนน้อยที่ไม่ได้สวมเข็มขัดพยุงหลัง (10.1%) หรือสวมเป็นบางครั้ง (26.6%)*

สรุป: *การสวมเข็มขัดพยุงหลังและ WMSDs มีความสัมพันธ์กันอย่างมีนัยสำคัญทางสถิติต่ำ เพื่อป้องกันการบาดเจ็บหลัง พนักงานยกของควรได้รับการฝึกเพิ่มความอดทนของกล้ามเนื้อลำตัวอย่างสมดุล โดยเฉพาะกล้ามเนื้อด้านข้างลำตัวทั้งซ้ายและขวา และฝึกการควบคุมกล้ามเนื้อเสริมความมั่นคงของหลังส่วนล่างขณะยกของ*