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Differences in Disability, Fear Avoidance and Habitual Physical Activity between Two Subgroups of People with Low Back Pain

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Abstract

Background: While various studies have compared functional limitation and fear of movement differences between people with and without low back pain (LBP), but it is not clear what differences exist in the functional limitation and demographic variables in classified LBP people based on the movement system impairment (MSI) model. Therefore, this study was designed to compare the disability, fear avoidance and habitual physical activity between LBP subgrouped people and healthy subjects. Methods: A total of sixty women between 18 and 55 years of age voluntarily participated in this study. They were divided into three groups (20 healthy, 20 Rotation Extension (R.E), and 20 Rotation Flexion (R.F)). Participants completed self report measures including Oswestry Disability Index (ODI), Tampa Scale of Kinesiophobia (TSK) and Baecke habitual physical activity questionnaire (BHPAQ). Results: compared with the R.F subgroup, people in the R.E group reported greater level of disability and fear on movement during daily tasks ($p < 0.05$). Conclusion: These results may have important implications for understanding differences evaluation and treatment of people with LBP. When assessing people with and without LBP, characteristics such as activity limitation, movement behavior and LBP classification should be considered.

Keywords: Low Back Pain, Classification, Activity Limitation, Fear Avoidance.

Introduction

Low back pain (LBP) is a common musculoskeletal problem (Hoffman, Harris-Hayes and Van Dillen, 2010). LBP imposes an enormous annual financial burden and causes disability around the world (Hoffman, Harris-Hayes and Van Dillen, 2010; Andersson, 1999). In almost 95% of cases, the source of LBP is unknown as it cannot be attributed to specific clinical or radiographic findings, so-called Non-Specific LBP (NSLBP) (Sahrmann, 2002). In a large number of individuals (10–59%) symptoms continue to be chronic and lead to functional disabilities (Orakifar et al., 2018).

Different variables such as biomechanical, psychological and social factors which can contribute to pathophysiological changes and

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maintenance of functional disabilities in chronic LBP (CLBP) (Sadeghisani et al., 2015; Sadeghisani et al., 2015; Sadeghisani et al., 2017). Clinicians have tried to find ways to further improve treatment effectiveness in individuals suffering from LBP. Although exercise has been shown to be an effective approach for the treatment of CLBP, no specific form of exercise has been shown to be most effective for improving LBP-related functional limitation (Hoffman et al., 2011). Researchers have proposed that the lake of consistent evidence to support the effectiveness of conservative treatments may be due to the use of heterogeneous groups of people with LBP (Hoffman, Harris-Hayes and Van Dillen, 2010; Hoffman et al., 2011; Harris-Hayes and Van Dillen, 2009). This heterogeneity, combined with wide inclusion criteria, tends to dilute the treatment effect. Therefore, multiple classification systems have been developed to divide LBP subjects into homogeneous subgroups of similar characteristics based on biophysical, psychosocial, or both variables (Orakifar et al., 2018).

The movement system impairment (MSI), one of the most popular model based on standardized clinical examination to categorize patients with LBP (Sahrmann, 2002). The MSI approach proposes that loss of precision in joint movements resulting from repeated movements and prolonged static postures during daily activities may induce motor control alterations in patients with mechanical LBP (Sahrmann, 2002).

To date, relationship between the level of functional disability and various factors such as movement impairment, fear-avoidance responses and the level of habitual physical activity have been studied in several researches (Hoffman, Harris-Hayes and Van Dillen, 2010; Gombatto et al., 2013; Kim, Yoo and Choi, 2013; O'Sullivan, 2005; Swinkels-Meewisse et al., 2003; Vlaeyen et al., 1995). Some studies have shown that people with high level of back pain, they have a higher functional disability (Hoffman, Harris-Hayes and Van Dillen, 2010; Gombatto et al., 2013; Kim, Yoo and Choi, 2013). Other studies investigated that the correlation between the severities of fear avoidance of movement with the degree of functional disability that shows the level of fear avoidance of movement has a stronger relationship than severity of LBP with the functional disability in the LBP people (O'Sullivan, 2005; Swinkels-Meewisse et al., 2003; Vlaeyen et al., 1995). However, in those studies it is not clear what differences exist in the functional limitation, demographic variables between two most prevalent subgroups of people with LBP, classified based on the MSI model. Therefore, this study was designed to compare the disability, fear avoidance and habitual physical activity between LBP subgrouped people and healthy subjects.

Methods

Subjects:

In total, 60 females participated in the study. The control group included 20 healthy subjects with no history of LBP during the last year, and the study group was divided into two LBP subgroups using a standardized clinical MSI model, i.e., 20 subjects in to the Rotation with Flexion (R.F) group, and 20 subjects in to Rotation with Extension (R.E) group. The examination was conducted by two expert physiotherapists with 12 years of clinical experience in managing people with musculoskeletal conditions and with advanced training in the MSI approach (Sahrmann, 2002; Harris-Hayes and Van Dillen, 2009). The reliability of examiners to sub-categorized people with LBP based on MSI model has been found to be acceptable (Harris-Hayes and Van Dillen, 2009).

Subjects in the control group were matched to subjects with LBP group for age, gender, height and weight. Inclusion criteria included NSLBP, symptoms lasting longer than six months.

People were excluded from the study if they reported any of the following: pregnant, unable to perform fundamental movements of the spine and extremities, diagnosis of marked spinal deformity, spondylolisthesis, spinal stenosis, spinal instability, systemic inflammatory condition (Hoffman, Harris-Hayes and Van Dillen, 2010, Orakifar et al., 2018).

The present study was conducted at the Musculoskeletal Rehabilitation Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. Written informed consent was obtained from all participants.This study was reviewed, accepted, and approved by the Ethical Committee of Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Self report and clinical measures:

Subjects with LBP completed a self-report questionnaire that used to obtain each participant's demographic characteristics and history of LBP. Disability levels were assessed and quantified using a reliable and valid Persian version of the Oswestry Disability Index (ODI) questionnaire (Mousavi et al., 2006). Pain-related fear of movement was assessed using the Persian version of the Tampa Scale of Kinesiophobia (TSK) (Swinkels-Meewisse et al., 2003). In three groups, levels of physical activity were examined using the Persian version of the Baecke habitual physical activity questionnaire (BHPAQ) (Sadeghisani et al., 2016).

The ODI questionnaire, is a golden standard for low back functional outcomes, is composed of 10 questions (each question has a scale from 0 to 5) which measures LBP disability in different activities of daily living. CLBP patients were asked to mark the best answer according to their state in each section. Then, the scores were measured; the higher the score, the greater the disability. Scores on the ODI range from 0% to 100%, with 0% indicating no disability and 100% indicating maximum disability (Mousavi et al., 2006).

Total score of TSK varies from 17 to 68, with higher values indicating greater kinesiophobia. Subjects scoring below 37 were classified as demonstrating a low risk of kinesiophobia (high risk of kinesiophobia was labeled when the score went above 37) (Swinkels-Meewisse et al., 2003).

BHPAQ is a tool that evaluates individual's habitual physical activities over the previous 12 months. This questionnaire consists of 16 questions within three main domains of physical activities (occupational, sport, and recreational) in the previous 12 months. Measurement of individual physical activities is achieved by calculating the sum of the scores obtained from occupational, sport, and recreational categories (Sadeghisani et al., 2016). All participants were assessed by two experienced physical therapist for hamstring extensibility using the hamstring length test.

Statistical analysis

Data was analyzed using SPSS version 22, and the criterion threshold for significance was set at α=0.05. Mean and standard deviations by group were calculated for all variables. For all variables, normal distribution was established using the Kolmogorov-Smirnov (K-S) test. Two groups comparison were made using the independent t- test. Differences between the three groups were tested by one-way ANOVAs. Multiple comparisons followed by the Tukey's correction.

Results:

Participant characteristics are given in Table 1. As the results show, no significant differences were found between groups in regard to age, height, weight and BMI (p values > 0.05).

In regards to the functional limitation and ODI score, the R.E group demonstrated significantly higher level of disability than the R.F group (p = 0.001). Also, people in the R.E group had greater level of fear of movement (Tampa score) than the R.F group in the daily activity (p = 0.000**).** Differences in the BHPAQ and hamstring extensibility between the three groups were statistically significant (P < 0.05) (Table 2).

Discussion:

The LBP is the leading cause of physical impairments (Sahrmann, 2002; Orakifar et al., 2018). The LBP is affected by different biological, psychological, and social factors, biomechanical factors are considered as the most prominent risk factor of the condition (Sadeghisani et al., 2015; Sadeghisani et al., 2017). Classification schemas for LBP, such as MSI model, use common clinical features of subgroup people with LBP and reported to improve treatment for subjects with CLBP (Maluf, Sahrmann and Van Dillen, 2000). In the previous studies, the role of the LBP on the functional activity was prominent (Hoffman, Harris-Hayes and Van Dillen, 2010; Gombatto et al., 2013; Kim, Yoo and Choi, 2013; Hodges and Moseley, 2003; Leeuw, 2007). However, differences between LBP subgroups were not examined in movement behavior pattern. Therefore, the purpose of the current study was to compare the disability, fear avoidance and habitual physical activity between two LBP subgrouped people and healthy subjects.

In this study, two LBP subgroups, classified according to the MSI model, demonstrated predictable differences in movement behavior and functional limitation during daily task. Subjects in the R.E group displayed significantly higher level of disability index and fear avoidance of movement than subject in the R.F group. Despite no differences between two LBP subgroups in duration of LBP (Table 1), LBP- related disability was greater in the R.E group than the R.F group. There are potential explanations for the higher level of disability during daily functional activity. It is due to people in the R.E group may be a compensatory response to reduce pain or protect injured tissues. Thus, extremes of lumbar and lower extremities are avoided, thus minimized pain (Shum, Crosbie and Lee, 2005). Another reason behind this difference may be related to differences in the level of fear avoidance between the groups. Several studies have established that psychological factors, such as level of fear avoidance, are related to disability in people with LBP more than pain intensity (O'Sullivan et al., 2005; Swinkels-Meewisse et al., 2003; Vlaeyen et al., 1995).

The results of the current study also suggest that people in the R.F group demonstrated increase stiffness and decrease extensibility of the hamstring muscle compared to the R.E and healthy subjects. Impairment in hip extensor muscles, such as the hamstring tightness, has been proposed to justify such lumbopelvic movement impairments (Kim, Yoo and Choi, 2013; Shum, Crosbie and Lee, 2005). The

hamstring tightness may increase posterior pelvic rotation and eventually limit hip flexion ROM. Many clinical studies have suggested that various factors, such as strength, tension, or length of muscles or ligaments, may be affected in static or dynamic postures of the pelvis and lumbar spine (Orakifar et al., 2018; Kim, Yoo and Choi, 2013; Shum, Crosbie and Lee, 2005).

Our results support the proposal that in people with mechanical LBP, repeated use of direction-specific, stereotypic movement patterns result in generalized strategies that affect their daily activity, and the continued use of these strategies contribute to changes in movement system elements such as variations in movement pattern (Orakifar et al., 2018). The MSI theory has also proposed that different groups of patients may have different lumbar spine impairments, because they may engage in different activities (Sahrmann, 2002). It is proposed that the repeated use of the altered lumbar movement pattern may lead to an accumulation of lumbar tissue stress, micro or macro level tissue injury, and eventually pain (Sahrmann, 2002; Orakifar et al., 2018). The MSI based classification and treatment allows physical therapists to diagnosis and treats musculoskeletal conditions based on principles of the kinesiopathologic model where impaired alignments and movements are proposed to induce pain and pathology (Sahrmann, 2002).

The current study had a number of potential limitations. First, all participants were female subjects, because it was assumed that specific differences in movement patterns could occur between genders. Therefore, the results of the study also may not be generalized to all people. Another limitation of the present study is the small sample size of the groups. Finally, in the current study, functional activity tests were not examined. Therefore, future studies are recommended to include functional activities as well.

Conclusion

People in the R.E subgroup of LBP demonstrated higher level of disability index and more fear of movement during daily activities. The results of this study showed that two subgroups of people with LBP had different behavior when performed daily activity that represent needs of classification of people with LBP to homogenous group.

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Conflict of interest: None declared.

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Table 1. Characteristics and demographic differences between the three groups (R.F, R.E, Control).

Variable	Control (n= 20)	R.E (n= 20)	R.F (n= 2)	P-value
Age (yrs)	35.29 (9.62)	37.18 (9.06)	36.09 (12.92)	0.747
Height (cm)	160.67 (5.85)	163.81 (4.78)	162.73 (6.84)	0.720
Weight (kg)	67.52 (8.05)	68.29 (9.03)	68.12 (6.70)	0.667
BMI (kg/m^2)	25.71 (3.98)	27.10 (3.02)	26.39 (2.81)	0.951
Duration of LBP (yrs)	N/A	7.94 (3.53)	5.45 (3.88)	0.097
R.E: Rotation with Extension syndrome; R.F: Rotation with Flexion syndrome				

Table 2. Clinical variables comparison between the three groups (R.F, R.E, control).

Variable	Control (n= 20)	R.E (n= 20)	R.F (n= 20)	P-value	Post-hoc Tukey's correction
ODI score	N/A	27.13 (6.32)	18.73 (4.02)	**0.001**	-
TSK score	N/A	51.56 (2.18)	39.36 (5.39)	**0.000**	-
BHPAQ_Work	4.81 (0.40)	2.59 (0.29)	2.07 (0.39)	**0.024**	R.F vs. control: **0.034** R.E vs. control: **0.045** R.F vs. R.E: 0. 640
BHPAQ _Sport	3.31 (0.46)	2.97 (0.43)	2.23 (0.45)	0.565	-
BHPAQ _Leisure	3.20 (0.44)	1.97 (0.37)	2.23 (0.29)	**0.046**	R.F vs. control: 0.234 R.E vs. control: **0.034** R.F vs. R.E: **0.049**
Hamstring length (°)	87.22 (6.99)	82.26 (7.79)	73.79 (6.24)	**0.0347**	R.F vs. control: **0.034** R.E vs. control: 0.645 R.F vs. R.E: 0.058
R.E: Rotation with Extension syndrome; R.F: Rotation with Flexion syndrome; ODI: Oswestry Disability Index; TSK: Tampa Scale Kinesiophobia					