Original Article

Hyper Mobility and Low Back Pain in the Athletic Population

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Objectives: It is important to recognize any risk factors for the development of injuries in the athletic population. The aim of this study was to investigate the association between joint hyper mobility and low back pain in Iranian hyper mobile and non-hyper mobile athletes.

Methods: 50 athletic patients with low back pain (age=23.20±12.79 years) and 51 healthy athletes (age=24.28± 13.70) from Iranian athletic teams were screened for hyper mobility using the Beighton score (0-9, with higher scores indicating increasing hyper mobility). The athletes' profiles, medical histories and chosen sport were collected by means of a questionnaire.

Results: The mean (SD) Beighton score in females with low back pain and healthy subjects were 5.07±2.30 and 4.93±1.79 respectively. However, no significant difference was found between the two groups (p=0.54). The mean (SD) Beighton score in males with low back pain was also higher (5.11±1.72) than in healthy subjects (4.36±1.82). However, the result of an independent t test showed no significant difference between the two groups (p=0.07).

Discussion: Further studies are needed to determine the effects of hyper mobility on low back kinematics and injuries in different sport types.

Key words: athletic injury, hyper mobility, low back pain, benign joint hyper mobility syndrome, sport injury

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Introduction

Joint hyper mobility is defined as a condition in which synovial joints move beyond their normal limits (1,2). Epidemiologic studies have shown that the incidence of joint hyper mobility is higher in women (5-57%) than in men (2-35%), and that its presence is influenced by age, gender and ethnicity (3-6). Hyper mobility may be associated with no problems, but many researchers have reported that in some individuals it predisposes them to increased incidence of soft tissue injuries, nerve compression disorders, osteoarthritis, sprains, subluxations and dislocations (7-9). Proprioception deficits and muscle weakness have also been found in hyper mobile people, making them more vulnerable to minor damage during daily activities (10-12). Based on such research and discussion in the literature, it suggests that hyper mobile individuals should avoid strenuous physical activity because of a possible increased risk of athletic injury. However, many hyper mobile persons are currently participating in athletic activities (9,12). There are limited studies with regard to whether hyper mobile athletes are more vulnerable to a higher risk of injury. Kujala et al. (13), Hopper et al. (14) and Decoster et al. (15) found no relationship between hyper mobility and injuries in athletic populations. However, Acasuso-Diaz et al. (16) and Klemp et al. (17) have found a higher risk of injuries among soldiers and ballet dancers. Konopinski et al. (18), Smith et al. (19) and Stewart and Burden (20) also found that hyper mobility was significantly associated with an increased prevalence of injuries in soccer, netball and rugby players.

Low back pain is a common complaint in the general population with 60-80% of adults experiencing it at some time in their lives (21). Among athletes, low

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back pain may arise from multiple structures, including the intervertebral discs, facet joints, sacroiliac joints, spinal nerves, ligament sprains and muscle strains. In addition, trauma and overuse injuries are often seen, especially in sports requiring hyperextension flexion and rotation, which make athletes more vulnerable to low back pain (21,22). It is important to recognize any risk factors for the development of low back pain in the athletic population. The identification of risk factors for athletes who are susceptible to injury may be helpful for implementing preventive measures and treatments against injury. Thus, the aim of this study was to investigate the association between joint hyper mobility and low back pain in Iranian female and male hyper mobile and non-hyper mobile athletes.

Methods

This was a case control study, conducted in training and rehabilitation centers of Iranian athletic teams in the city of Tehran. 50 athletic patients with low back pain (36 males, 14 females, mean age =23.20±12.79 years) and 51 healthy athletes (36 males, 15 females, mean age =24.28± 13.70) from Iranian athletic teams were screened for hyper mobility using the Beighton method. Each participant completed a health history and sport participation questionnaire about demographics, years of athletic participation and history of back disorders and pain. After completing the questionnaire, participants were given numerical scores of 0 to 9 according to the Beighton method (3), one point being awarded for the ability to perform each of the following tests: 1- Passive extension of the little fingers beyond 90º. 2- Passive opposition of the thumbs to the flexor aspects of the forearms. 3- Hyperextension of the elbows beyond 10º. 4- Hyperextension of the knees beyond 10º (these four maneuvers are performed on the right and left sides). 5- Forward flexion of the trunk so that the palms easily touch the floor. A score of 5 or higher meets the Beighton score for hypermobility (5). Subjects were excluded if they had had previous shoulder surgery and any upper extremity or spine abnormality (4). The control group was age and sex matched, with same inclusion and exclusion criteria but with no low back pain. Before participating in the study, all subjects signed an informed consent form approved by the Human Subjects Committee of the University of Social Welfare and Rehabilitation Sciences. The physical characteristics of the subjects in each group are shown in table (1).

The data was analyzed using SPSS statistical software, version 19. Descriptive statistics were used to determine mean values of age, height and weight in each group. Independent t tests were performed to compare the Beighton scores for hypermobility between the athletes with low back pain and healthy athletes. The significant level for all statistical tests was set at $P<0.05$.

Results

The study sample included 50 athletes with low back pain and 51 healthy athletes. 72 athletes (71.3%) were male and 29 athletes (28.7%) were female. The sample was divided based on gender. Descriptive statistics for the measurement scores based on gender in two groups (low back pain and healthy) are presented in table (1). The chosen sports of the participants were: wrestling, basketball, volleyball, soccer, weight-lifting, boxing, handball, swimming, rock-climbing and karate.

There was no statistically significant difference in the subjects' ages, weights and heights between the two sexes, and between the low back pain and healthy groups ($p>0.05$) (Table 1).

The mean (SD) Beighton scores in females with low back pain and healthy subjects were 5.07±2.30 and 4.93±1.79 respectively. However, no significant difference was found between the two groups ($p=0.54$). The mean (SD) Beighton score in males with low back pain was also higher 5.11±1.72 than in healthy subjects 4.36±1.82. However, the result of an independent t test showed no significant difference between the two groups ($p=0.07$) (Table 1). The result of independent t test also showed no significant difference in female and male Beighton scores in both the low back pain and healthy groups ($P>0.05$) (Table 1).

Table 1. Results of independent t test comparing of study variables by sex and health status

variable	sex	Mean SD		p-value
		Low back pain	healthy	
Age (year)	female	23.86(4.67)	22.87(3.99)	0.54
	male	21.39(4.36)	22.58(5.22)	0.29
p-value		0.08	0.85	
Weight(Kg)	female	56.14(7)	55.13(15.64)	0.82
	male	74.67(12.70)	78.14(11.69)	0.23
p-value		0.00	0.00	
Height (Cm)	female	163.5.(6.79)	155(29.65)	0.30
	male	178.53(6.81)	180.05(5.92)	0.31
p-value		0.00	0.00	
Beighton score	female	5.07(2.30)	4.93(1.79)	0.85
	male	5.11(1.72)	4.36(1.82)	0.07
p-value		0.94	0.31	
Exercise per day (hour)	female	2.71(1.27)	3.33(1.76)	0.29
	male	3(1.35)	3.47(1.98)	0.24
p-value		0.49	0.81	
Exercise per week (day)	female	4.78(2)	4.53(1.99)	0.73
	male	5.46(1.42)	5.28(1.52)	0.57
p-value		0.81	0.15	
Exercise duration (year)	female	8.64(5.21)	8.80(1.20)	0.91
	male	7.61(3.82)	9.75(4.44)	0.03
p-value		0.44	0.42	

Discussion

The results of this study showed that the mean (SD) Beighton score in females and males with low back pain and healthy females and males were 5.07±2.30, 5.11±1.72 and 4.93±1.79, 4.36±1.82 respectively. However, no significant difference was found in the Beighton scores between the groups ($p>0.05$). Reviewing the hyper mobility articles shows an apparent lack of agreement on a cut-off point for the Beighton score that demonstrates a clear hyper mobility diagnosis. Some researchers use a Beighton score of 4.9, other researchers use a Beighton score or 5.9, and still other researchers use a Beighton score of 6.9. Beighton originally suggested the 0 to 9 scale without any cut-off point (3). It is clear that the various cut-off points can make a significant difference in hyper mobility prevalence. Boyle et al. (23) reported a good-to-excellent intra-rater reliability for the Beighton score when a cut-off score of 5 or greater was selected. In this study, a cut-off score of 5 or greater represents hyper mobility.

The finding of this study showed the athletes with low back pain were hyper mobile. However, because Beighton score cut-offs of both 4 and 5 have been frequently used, the healthy group also may be considered hyper mobile. One weakness of this study is that our subjects have participated in different types of sporting activities. Studies have documented that low back pain prevalence can vary between sports. Also, in addition to hyper mobility, other factors such as heavy physical work, frequent bending, twisting, lifting, pulling and pushing, repetitive activity, static postures and vibrations predispose athletes to injury (21,22). Although there wasn't any significant difference between the Beighton scores of males and females with low back pain and healthy athletes, the low back pain group showed greater Beighton scores (5 versus 4). Thus, based on the results of this study, our results agree with some previous studies which found that hyper mobility was significantly associated with an increased prevalence of injuries in athletes (16-20). The basic pathology in joint hypermobility is attributed to the involvement of collagen fibers of connective tissue that lead to a decrease in the tonus of the body's elastic tissue. The loss of soft tissue strength is accompanied by unstable joints with laxity (1,9). It also has been suggested that hyper mobility is associated with the loss of proprioception acuity. Joint hyper mobility may lead to deconditioning which affects muscle strength and performance. Sahin et al. (11) showed significantly low knee extensor muscle strength in persons with hyper mobility. They hypothesized the lengthening of the quadriceps muscle and pain-related inactivity as well as joint instability and proprioception defect as potential causes of knee extensor weakness. Diminished proprioceptive discharge from the lax joint may lead to repetitive stresses on the joint, causing damage to articular tissues (11).

In contrast to many studies that have shown increased prevalence of injuries with hyper mobility, some studies have shown no relationship between hyper mobility and injuries in athletic populations (13-15). The explanation as to why hyper mobile and non-hyper mobile persons demonstrated similar injury risks may be attributable to the emphasis placed upon preventative measures and appropriate training (1,3,11).

Several studies have examined joint position sensation and kinesthesia (proprioception) in athletes. Some investigators believe that repetitive movements of throwing athletes can lead to improved proprioceptive abilities (24,25). Improved proprioception and muscle strength have been seen in hyper mobile individuals following an 8-week closed kinetic exercise program (26). Therefore, proprioception studies suggest that athletic activity may be protective for hyper mobile athletes. Some studies have shown that proprioception and joint-stabilizing abilities are trainable. This suggests that it is possible that athletic activity may actually be protective for hyper mobile athletes. Overall, according to that result of our study and previous studies, it can be suggested that hyper mobile athletes may be able to avoid some injuries with appropriate training and the use of strapping and supports to increase mechanical support around susceptible joints (24-26).

Conclusion

There was no significant difference between the Beighton scores of males and females with low back pain and healthy athletes, although the low back pain group demonstrated a greater Beighton score. This suggests that hyper mobile athletes may be able to avoid some injuries with appropriate measures.

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