



## EFFECTIVENES OF HIPERMOBILITY ON SPORT INJURY AMONG YOUNG PLAYERS

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### ABSTRACT

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The aim of this study is to investigate the relationship between hypermobility and sport injury in different sports branches. A total of 256 athletes who were 15,7±7,6 years average age from 5 different branches (football: 52 basketball: 28 volleyball: 32 swimming: 28 and athletics: 19) participated in the study voluntarily. Beighton hypermobility diagnostic scoring and sport injury history questionnaire were used to data collection. Study showed that; 19.5% of the participants were found to be advanced hypermobile. The highest rate of hypermobile was found in Volleyball branch (n: 12/37.5%). The incidence of hypermobility syndrome in women was found to be higher than in men (42.3%). 58.9% of the athletes had previously had a injury, the type of sprain injury was the most common type of injury (37.7%), the foot and ankle was the most injured body part (48.1%). Injury mostly occurs in training (45.3%). Overuse was the most injury reason (35.2%). Duration of the recovery was 1-3 weeks mostly answered (30.9%). Injury mostly seen in football branches (60.9%). No relationship was found between the injury status of the athletes and hypermobility levels (p= 0.103). As a result of the research; hypermobility prevalence was 19.5% found among participants. According to gender, analysis showed that; It was seen more frequently in women and the rate of hypermobility in volleyball branch was higher than other branches. On the other hand, it was found that the level of hypermobility had no effect on the sport injury history of the young athletes.

**Contribution/Originality:** This study is one of very few studies which have investigated the relationship between hypermobility and sport injury. The data obtained from this study will be a source for future studies.

### 1. INTRODUCTION

Hypermobility or general joint laxity is defined as a condition in which most of the synovial joints of an individual (free-motion joints commonly found in the human body) have a series of movements beyond normal limits (Ansell, 1972). In other words, joint hypermobility is an inherited condition that is characterized by an abnormally increased joint range of motion, i.e. small and large joints, far beyond normal range, taking into account the individual's age, sex and ethnicity (Russek, 1999). Hypermobility due to its hereditary aspect; Connective tissue proteins, which are a common feature of hereditary connective tissue disorders and typically include Ehlers-Danlos syndrome (connective tissue disease that affects collagen structure and function), Marfan syndrome (abnormal connective tissue), glass bone disease, and benign joint hypermobility syndrome. It can also be defined as a group of genetic disorders affecting the matrix (Hakim & Grahame, 2003; Simpson, 2006). However, another reason for individuals with joint hypermobility is the prevalence of joint laxity because there is no musculoskeletal pain or rheumatological disease (Russek, 1999; Simpson, 2006). In contrast, joint hypermobility can also be frequently seen

in healthy individuals without any complaints (Simpson, 2006) show significant differences in terms of race, gender and age. The incidence is 5% in the healthy adult population (Dequeker, 2001) and generally varies between 10% and 15%; Although it is more common among Asians and Africans compared to the white race (Beighton, Grahame, & Bird, 1989) it is three times more common in women than men (Beighton, Grahame, & Bird, 1983; Larsson, Baum, & Mudholkar, 1987) although it is frequently encountered in childhood; the probability of occurrence decreases with increasing age (Beighton., Solomon, & Soskolne, 1973).

Joint hypermobility is not actually a medical problem, it can even be an advantage in some cases. Because having flexible joints caused by the presence of hypermobility provides flexibility in individuals at every moment of daily life, especially in various sports branches, so that individuals with hypermobility can do the movements that many people cannot. Joint hypermobility becomes a medical problem with the emergence of symptoms responsible for joint hypermobility such as pain and weakness in a person (Grahame, 2010). The connective tissues being loose and fragile indicate hypermobility and as a result of injury easily indicate a medical condition and as a result, the syndrome occurs. In the absence of systemic rheumatological diseases such as Joint Hypermobility Syndrome, rheumatoid arthritis or systemic lupus, Joint hypermobility accompanies many complaints outside the musculoskeletal system and musculoskeletal system (Baeza-Velasco, Ge'ly-Nargeot, Vilarrasa, Fenetrier, & Bravo, 2011).

Research findings on joint hypermobility risk of sports injury are not clear. There are studies indicating that joint hypermobility increases the risk of injury in contact sports, as well as in non-contact sports, there are findings indicating that the athletes have a positive effect on skill performance due to increased flexibility (Baeza-Velasco et al., 2011). While previous studies have focused on the adult population sample, there is a need for findings of hypermobility and injury in athletes of development age and in different branches. For this reason, this study was carried out to examine the frequency of hypermobility and injury in different branch athletes in the adolescent period.

## 2. METHODS

### 2.1. Participants

A total of 256 athletes (204 boys, 52 girls), in basketball, volleyball, football, athletics, swimming branches, who have been doing sports in for at least two years and have an average age of  $15.7 \pm 7.6$  years, participated in the study voluntarily. In the selection of athletes, sampling was chosen from the known universe according to the 0.95 confidence interval (Bartlett, Kotrlik, & Higgins, 2001).

### 2.2. Ethical Permission

This study was approved by Çanakkale Onsekiz Mart University Faculty of Medicine Human Research Ethics Committee with the decision numbered 19-09 dated 31.10.2018. In addition, athletes and their parents signed voluntary consent forms stating that they voluntarily participated in the study.

### 2.3. Data Collection Tools

#### 2.3.1. Determination of Hypermobility Level

Beighton diagnostic criteria were used to determine the state of hypermobility. Joint range of motion (EHA) measurements included in the Beighton diagnostic criterion were made by goniometer. In Beighton diagnostic criteria, thumb, 5th metacarpal, elbow and knee joints and spinal flexibility were evaluated over 9 points. The scores from the Beighton scoring were evaluated in three categories. It is classified as "non-hypermobility" between 0-2 points, "intermediate hypermobility" between 3-4 points and "advanced hypermobility" between 5-9 points (Beighton. et al., 1973).

#### 2.4. Sport Injury History Form

The injury history was obtained by applying the questionnaire form prepared by the researcher by examining similar studies in the literature. The questionnaire form consists of 12 items in which demographic information and injury history are questioned.

### 3. STATISTICAL ANALYSIS

The data in the study were analyzed in SPSS program. The mean and standard deviation values were used for hypermobility and injury data according to the branches by defining hypermobility scoring and injury survey responses as percent (%) and frequency (n). The Chi-square test was used for the relationship between hypermobility and injury, and the findings were considered significant at  $p < 0.05$ .

### 4. RESULT

**Table-1.** Demographic variables of participants (mean $\pm$ sd).

Variables	Female (n:52)	Male (n:204)	Total (n:246)
Age (year)	15,9 $\pm$ 1,1	15,7 $\pm$ 0,8	15,7 $\pm$ 7,6
Sport age (year)	4,6 $\pm$ 1,8	5,1 $\pm$ 2,3	4,9 $\pm$ 2,2
Body height (cm)	170,5 $\pm$ 7,6	175,3 $\pm$ 7,4	174,3 $\pm$ 7,6
Body weight (kg)	59,1 $\pm$ 7,9	63,9 $\pm$ 10,2	63,1 $\pm$ 10,1
BMI (kg/m <sup>2</sup> )	20,3 $\pm$ 2,4	20,7 $\pm$ 2,4	20,6 $\pm$ 2,4

Note: Data are presented as mean  $\pm$  sd.

The Table 1 showed that the average of BMI of the athletes participating in the study was  $20.6 \pm 2.4$  kg / m<sup>2</sup>, while the average age of age and sports age was  $15.7 \pm 7.6$  years and  $4.9 \pm 2.2$  years. In terms of gender, it is understood that they have similar descriptive features.

**Table-2.** Hypermobility prevalence according to branch (n/(%)).

Branches	n	Non Hypermobile	Intermediate hypermobile	Advanced hypermobile.
Football	149	74/(28,9)	50/(19,5)	25/(9,7)
Basketball	28	11/(4,2)	10/(3,9)	7/(2,7)
Volleyball	32	12/(4,6)	8/(3,1)	12/(4,6)
Swimming	28	10/(3,9)	16/(6,2)	2/(0,7)
Athleticism	19	7/(2,7)	8/(3,1)	4/( 1,5)
Total	256	114/(44,5)	92/(35,9)	50/(19,5)

Note: Data are presented as: number of person(n) and percentage (%).

According to Table 2, 44.5% of the athletes participating in the study were in the non-hypermobility group, 35.9% were in the mid-level hypermobile and 19.5% were in the advanced level. When analyzed according to the branches, it was determined that the advanced hypermobile rate was highest in the Volleyball branch (n: 12 / 37.5%).

**Table-3.** Hypermobility prevalence of gender (n/(%)).

Gender	n	Non Hypermobile	Intermediate hypermobile	Advanced hypermobile.
Female	52	16/(6,3)	14/(5,5)	22/(8,6)
Male	204	98/(38,2)	78/(30,4)	28/(10,9)
Total	256	114/(44,5)	92/(35,9)	50/(19,5)

Note: Data are presented as: number of person(n) and percentage (%).

The findings of the hypermobility rates according to the gender of the athletes participating in the study are shown in Table 3. When the table was examined, it was determined that the rate of advanced hypermobility was higher in women than in men (female n: 22 / 42.3%; male n: 28 / 13.7%).

**Table-4.** Relation with hypermobility and sport injury (n/(%)).

Hypermobility level	Injured before?			$\chi^2$	df	p
	Yes	No	Total			
Non hypermobile	60/(23,4)	54/(21,1)	114/(44,5)	4,545	2	0,103
Intermediate hypermobile	56/(21,8)	36/(14,1)	92/(35,9)			
Advanced hypermobile	35/(13,6)	15/(5,8)	50/(19,5)			
Total	151/(59,0)	105/(41,0)	256/(100,0)			

Note: Data are presented as: number of person(n) and percentage (%).

The findings showing the relationship between the athletes' injury and hypermobility levels were shown in [Table 4](#). When the table was examined, there was no relation between the injury status of the athletes and the levels of hypermobility as a result of the Chi-Square analysis ( $p = 0.103$ ).

**Table-5.** Relation with branch and sport injury (n/(%)).

Branches	Hypermobility level				$\chi^2$	df	p
	Non Hypermobile	Intermediate hypermobile	Advanced hypermobile	Total			
Football	44/47,8	30/32,6	18/19,6	92/100,0	11,396	8	0,180
Basketball	5/27,8	8/44,4	5/27,8	18/100,0			
Volleyball	6/30,0	7/35,0	7/35,0	20/100,0			
Swimming	4/26,7	9/60,0	2/13,3	15/100,0			
Athleticism	1/16,7	2/33,3	3/50,0	6/100,0			
Total	60/39,7	56/37,1	35/23,2	151/100,0			

Note: Data are presented as: number of person(n) , percentage (%) ,  $\chi^2$ : chi square P: significant level

The relation of injury and hypermobility of athletes participating in the study is shown in [Table 5](#). According to this; As a result of Chi-Square analysis, which is looking for a relation with the level of hypermobility of 151 athletes who suffered injury, there was no relation between injury and hypermobility according to the branches.

## 5. DISCUSSION

This study aimed to investigate the effectiveness of hypermobility and sports injury among young athletes. Study showed that, while 44.5% of the athletes were in the non-hypermobile group, 35.9% were found to be in the middle-level hypermobile and 19.5% in the advanced-level hypermobile group. According to the branches, it was determined that the rate of hypermobility was highest in the Volleyball branch (37.5%). Looking at previous studies, researchers have come up with different findings. [Nathan, Davies, and Swaine \(2018\)](#) reported that 26% of the participants were Hypermobile and hypermobility was most common in hockey and running (31.6% and 30.8%, respectively). In addition it was reported that hypermobility prevalence is 43% for adolescent netball players ([Smith, Damodaran, Swaminathan, Campbell, & Barnsley, 2005](#)). According to gender, it is noticed that 42% of women were highest prevalence of hypermobile ([Nathan et al., 2018](#)). Recent study has similar findings that women was higher hypermobility prevalence (42.3%). Some studies in the field also reported that girls are more likely to be hypermobile than boys ([Seçkin et al., 2005](#); [Yıldırım et al., 2005](#)). Contrary to these findings, it was reported there was not any significant relationship between hypermobility and gender ([Uz, 2013](#)).

Studies have cited various findings about the frequency of sports injuries. Recent study found that it was 59,0%. [Nathan et al. \(2018\)](#) noticed that the rate was 64%. In addition ([Smith et al., 2005](#)) reported that , it was 35%.

When the findings showing the relationship between the injury status of the athletes participating in the study and their hypermobility levels were examined, no relation was found between the injury status of the athletes and the hypermobility levels ( $p = 0.103$ ). When the findings regarding the examination of the relationship between injury and hypermobility according to the branches were examined, the relationship between the injury and hypermobility between the branches was not found ( $p = 0.180$ ). [Nathan et al. \(2018\)](#) in their study of hypermobility and sports injury, [Konopinski, Graham, Johnson, and Jones \(2016\)](#) in their study with professional footballers,

although the average of training and competition injury of hypermobile players is higher than non-hypermobile players, this difference is not significant. However, Konopinski., Jones, and Johnson (2012) show that the footballers with hypermobility that they did with elite professional football players (English premier league) have significantly higher levels of injury in training and competition than those without hypermobility. Again (Smith et al., 2005) found a significant relationship between hypermobility and injury life tendency in their study with young netball players. Again, in his study with volleyball players, Uluöz and Kozanoğlu (2009) found a significant relationship between volleyball players' injury and hypermobility. Decoster, Bernier, Lindsay, and Vailas (1999) evaluated the injuries of athletes with and without hyperbola in a different perspective on the training / competition time in their study on athletes in American national college teams. The risk of injury of athletes with high hypermobility was higher, although not significant compared to those without hypermobility. Bertram and Thompson (2005) found that women with high hypermobility had a significantly higher frequency of injury than women without hypermobility in their study on young women participating in physical activity. Consequently, in some of the studies available in the literature, there was a significant relationship between hypermobility and sport injury while others did not. It can be said that the differences between the sample group, sports branch difference and other factors.

## 6. CONCLUSION

In the results of study; the advanced hypermobility rate was found to be 19.5%. It was determined that it appeared more frequently in women and the rate of hypermobility in the volleyball branch was higher than in other branches. It was determined that there was no relationship between the level of hypermobility and sport injury. In addition, there was no relation between hypermobility and sport injury according to the branches. Based on these results; It can be said that low rate of joint hypermobility that may occur in athletes in adolescent period is not a factor that can lead to sports injury. In addition, it may be useful to inform coaches that avoiding overloads and movements that require contact as much as possible is effective strategy to prevent sport injury.

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## REFERENCES

- Ansell, B. (1972). Hypermobility of joints. In modern trends in orthopaedic, Ed. A.G. Apley (pp. 25-39). New York: Appleton-Century-Crofts.
- Baeza-Velasco, C., Ge'ly-Nargeot, M., Vilarrasa, A., Fenetrier, C., & Bravo, J. (2011). Association between psychopathological factors and joint hypermobility syndrome in a group of undergraduates from a French university. *The International Journal of Psychiatry in Medicine*, 41(2), 187-201. Available at: <https://doi.org/10.2190/pm.41.2.g>.
- Bartlett, J., Kotrlík, J., & Higgins, C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, 19(1), 43-50
- Beighton, P., Grahame, R., & Bird, H. (1983). *Hypermobility of joints*. New York: Springer Verlag.
- Beighton, P., Grahame, R., & Bird, H. (1989). *Hypermobility of joints* (2nd ed.). London (UK): Springer-Verlag.
- Beighton, P., Solomon, L., & Soskolne, C. (1973). Articular mobility in an African population. *Annals of The Rheumatic Disease*, 32(5), 413-418. Available at: <https://doi.org/10.1136/ard.32.5.413>.
- Bertram, S. C., & Thompson, G. A. (2005). Joint hypermobility: Association with musculoskeletal injuries in young adult females. *Journal of Women's Health Physical Therapy*, 29(2), 7-10. Available at: <https://doi.org/10.1097/01274882-200529020-00002>.

- Decoster, L. C., Bernier, J. N., Lindsay, R. H., & Vailas, J. C. (1999). Generalized joint hypermobility and its relationship to injury patterns among NCAA lacrosse players. *Journal of Athletic Training, 34*(2), 99-105.
- Dequeker, J. (2001). Benign familial hypermobility syndrome and trendelenburg sign in a painting the three graces by Peter Paul Rubens (1577–1640). *Annals of the Rheumatic Diseases, 60*(9), 894-895.
- Grahame, R. (2010). What is joint hypermobility syndrome? In: Hakim A, Keer R, Grahame R, editors. *Hypermobility, fibromyalgia and chronic pain* (pp. 19-33). London: Churchill Livingstone Elsevier.
- Hakim, A., & Grahame, R. (2003). A simple questionnaire to detect hypermobility: An adjunct to the assessment of patients with diffuse musculoskeletal pain. *International Journal of Clinical Practice, 57*(3), 163-166.
- Konopinski, M., Graham, I., Johnson, M. I., & Jones, G. (2016). The effect of hypermobility on the incidence of injury in professional football: A multi-site cohort study. *Physical Therapy in Sport, 21*, 7-13. Available at: <https://doi.org/10.1016/j.ptsp.2015.12.006>.
- Konopinski, M. D., Jones, G. J., & Johnson, M. I. (2012). The effect of hypermobility on the incidence of injuries in elite-level professional soccer players: A cohort study. *The American Journal of Sports Medicine, 40*(4), 763-769. Available at: <https://doi.org/10.1177/0363546511430198>.
- Larsson, L.-G., Baum, J., & Mudholkar, G. S. (1987). Hypermobility: Features and differential incidence between the sexes. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology, 30*(12), 1426-1430. Available at: <https://doi.org/10.1002/art.1780301216>.
- Nathan, J. A., Davies, K., & Swaine, I. (2018). Hypermobility and sports injury. *BMJ Open Sport & Exercise Medicine, 4*(1), 1-6. Available at: <https://doi.org/10.1136/bmjsem-2018-000366>.
- Russek, L. (1999). Hypermobility syndrome. *Physical Therapy in Sport, 79*(6), 591-599.
- Seçkin, Ü., Tur, B. S., Yılmaz, Ö., Yağcı, İ., Bodur, H., & Arasil, T. (2005). The prevalence of joint hypermobility among high school students. *Rheumatology International, 25*(4), 260-263. Available at: <https://doi.org/10.1007/s00296-003-0434-9>.
- Simpson, M. R. (2006). Benign joint hypermobility syndrome: Evaluation, diagnosis, and management. *The Journal of the American Osteopathic Association, 106*(9), 531-536.
- Smith, R., Damodaran, A., Swaminathan, S., Campbell, R., & Barnsley, L. (2005). Hypermobility and sports injuries in junior netball players. *British Journal of Sports Medicine, 39*(9), 628-631. Available at: <https://doi.org/10.1136/bjsem.2004.015271>.
- Uluöz, E., & Kozanoğlu, M. (2009). The relationship between joint hypermobility and sports injuries in female volleyball players. *Journal of Sports Science and Medicine, 8*(suplement 11), 1-198.
- Uz, K. (2013). *Bone mineral density and hypermobility in Taekwon-do athletes*. Mersin University (Master Thesis).
- Yıldırım, Y., Yılmaz, S., Ayhan, E., Saygi, S., Yanaral, F., Zubarioğlu, U. A., & Arısoy, N. (2005). The frequency of joint hypermobility in healthy school children. *Turkish Archives of Pediatrics, 40*(2), 83-86.

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