

Hip Structure and Exercise

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SUMMARY

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In this study, thirty female and thirty-three male subject were classified based on their hip-indexes under antropometric criteria. The range of movement (ROM) measurements were carried out in all cases. After the first ROM measurement, an exercise program was implemented to improve hip-joint ROM of the subject. Following this exercise period, second set of measurements were taken.

Considering the arithmetical averages of ROM values, for both male and female subjects, in most of the measurements, large-hip category members had higher ROM values compared to slim-hip category members. The ligaments of the hip joints prevent and control some motions. It is our opinion that those with larger hips have a longer ligaments in comparison to those with slim-hips. Longer ligaments, thus, enables us to do a wide range of activities. Both in men and women, there are significant differences among HI, EKS and BEKS parameters ($p < 0.05$).

Another result derived from this study is that, the ROM values could be improved by exercise. Specifically, female subjects react better to exercise compared to male subjects. In men; has shown a meaningful increase in FLK parameters statistically ($p < 0.05$). In women; has shown a meaningful increase in FLK, BFLK and ABD parameters statistically ($p < 0.05$). Considering the hip-categories; male large-hip category members and female slim-hip category members gave a better response to exercise compared to the other category members.

We conclude that the hip-structure is important for ROM. But, it is not very likely to conclude that hip-structure (hip-index, in other words) by itself affects the ROM, directly.

Key words: ROM, strength, hip-index, exercise.

INTRODUCTION

ROM is very important for some sports (7,11,13). Therefore, the ROM must be a main criteria for the selection on some sport branches in early age. Thereby, the factors are very important that affect the ROM. Within the scope of this study, the relationship between the hip-structure and the ROM were elaborated and the different response schemes of the subject belonging to different hip-index categories were evaluated.

MATERIAL AND METHODS

In this study, thirty female and thirty-three male subjects-whose ages are in between 18 and 21- were classified based on their hip-indexes under the criteria that is mentioned below. For whom hip index is less than 15,9 cm belongs to slim-hip category and greater than 18 cm belongs to large hip category. Accordingly, the category sizes are:

For female group; slim-hip and large hip categories

both, 15 subjects contain, for male group; slim-hip category contains 18 and large-hip category contains 15 subject. For physical specifications; length, width, perimeter and skin-foldness values were measured. Tallness was measured with stadiometer. Perimeter was measured by a steelbelt on trochanteric perimeter zone. Width was measured by hook-end caliper on bitrochanteric width and iliac width. Skin-foldness was measured by a Holtain skinfoldness caliper on biceps, triceps, supscapula and suprailiac. All subjects were the students of the physical education department of Kocaeli university.

As a consequence of physical specification measurement only HI (hip-index) was considered. $HI = (\text{Iliac width} / \text{tallness}) \times 100$. Body-fat-ratio was calculated by using the skin-foldness measurements. Durning-Womersly methodology and Siri formulation were implemented for body-fat-ratio calculations (12). A digital electronic fleximeter apparatus was used for ROM measurements. They were sampled from the dominant side of the subjects on a gymnastic table. Measurements were taken from seven zones such as; hip flexion with strec-

hed leg (FLK), hip flexion with bended leg (BFLK), hip extension with stretched leg (EKS), hip extension with bended leg (BEKS), hip abduction (ABD), hip external rotation (ERT), hip internal rotation (IRT). The measurements were carried out at the same time of the day (in the afternoon 3pm-4pm). In addition, the temperature of the place was kept at the same degree (21°C). The subjects did not have injured joints, muscles and the restrictions of any clothes or equipment. The general warm-up was performed before the ROM measurement.

After the first ROM measurements, an exercise program was implemented to improve hip-joint ROM of the subjects. This exercise period was four-months long as four-days per week and one-hour per day. The exercise consist of 10 min of active warm-up following 40 min hip-joint ROM exercise. The assistant applied the static-active flexibility method to the 7 different direction. Following the exercise period, second set of measurements were taken. All data were examined and evaluated by using Mann - Whitney U test.

DISCUSSION

Subjects were more or less at the same age. A negative correlation was reported between age and ROM on various research papers published so far (4,6,10). In this study, however, due to the fact that the age-scale is quite narrow, such judgement could not be made. Some researches suggest that there is a negative correlation between body-fat ratio and ROM (1). However, no such correlation was observed between body-

fat-ratio and ROM within the framework of this study. This result might be caused by the similar body-fat-ratios of the subjects. Besides, the lack of correlation between body-fat-ratio and ROM provided a better and unbiased correlation environment between hip-index and ROM. Coming to gender differences; female subjects had greater body-fat-ratios compared to male objects ($p < 0.05$).

In this study, female subjects had larger hip-index values compared to male subjects ($p < 0.05$). As females have higher hip-index values, as well as higher ROM values (2,4,8,9). This may be related to the hormonal differences between males and females. In this study, as well as the ones presented in several sources, female subjects had higher ROM values compared to male subjects (in all categories $p < 0.05$). In addition, ROM is affected by the following factors. Internal influences: the type of joint, previous injured muscle, joint or connective tissue, bone structure, the temperature of joint and muscle etc. External influences: the temperature of place, age, gender, the time of day etc (3,5,10). All these factors were taken notice and eliminated (above mentioned in material-method section).

Considering the arithmetical averages of ROM values, for both male and female subjects, in most of the measurements, large-hip category members had higher ROM values compared to slim-hip category members (see table 1-2). The ligaments of the hip joints prevent and control some motions. It is our opinion that those with larger hips have a longer ligaments in comparison to those with slim-hips. Longer ligaments, thus, enables us to do a wide range of activities. Although signi-

Table 1. The arithmetical averages of ROM values for male.

	slim-hip		large-hip	
	first flexe.	sec. flexe	first flexe.	Sec. flexe
FLK	116,00± 12,38	119,5± 11,74	122,53± 9,12	137,13± 11,49
BFLK	134,00± 11,00	140,22± 9,88	140,26± 9,16	149,59± 13,08
EKS	33,05± 6,82	37,9± 9,04	40,40± 9,79	46,20± 9,96
BEKS	28,38± 8,31	30,99± 9,56	32,93± 9,13	40,90± 9,27
ERT	44,27± 7,02	49,21± 5,60	43,53± 8,55	48,13± 8,84
IRT	37,22± 7,02	43,66± 5,60	36,93± 8,55	40,39± 8,84
ABD	79,16± 8,52	84,66± 10,47	83,73± 11,83	90,36± 14,73
YAG	9,83± 3,25	9,14± 4,26	9,96± 2,28	9,43± 4,15

Table 2. The arithmetical averages of ROM values for female

	slim-hip		large-hip	
	first flexe.	sec. flexe	first flexe.	Sec. flexe
FLK	130,53± 12,72	135,22± 11,74	133,33± 15,85	147,06± 12,52
BFLK	154,13± 7,80	161,99± 4,55	157,46± 9,81	161,26± 9,36
EKS	40,13± 8,74	47,06± 8,95	47,66± 9,20	55,39± 11,10
BEKS	28,26± 8,52	33,52± 13,35	37,93± 10,29	44,66± 9,67
ERT	49,06± 9,88	55,39± 8,96	49,53± 7,69	54,26± 9,03
IRT	48,40± 7,80	54,86± 9,40	44,40± 8,91	50,06± 8,72
ABD	94,66± 8,97	106,06± 8,08	96,86± 9,86	101,86± 10,49
YAG	23,00± 4,19	21,26± 4,24	24,00± 3,05	22,00± 4,69

Table 3. The statistical analysis values for male

	U	P
FLK	99,00	0,202
BFLK	88,50	0,093
EKS	70,50	0,018*
BEKS	79,00	0,044*
ABD	108,00	0,343
IRT	131,00	0,901
ERT	131,50	0,901
YAG	118,5	0,556

Table 4. The statistical analysis values for female

	U	P
FLK	105,50	0,870
BFLK	79,00	0,174
EKS	61,50	0,033*
BEKS	53,50	0,013*
ABD	99,00	0,595
IRT	80,00	0,187
ERT	91,00	0,389

Table 5. The statistical analysis exercise values for male

	U	P
FLK	37,50	0,000*
BFLK	92,00	0,126
EKS	98,50	0,190
BEKS	93,00	0,135
ABD	92,50	0,126
IRT	97,50	0,178
ERT	126,00	0,762

Table 6. The statistical analysis exercise values for female

	U	P
FLK	59,50	0,026*
BFLK	51,00	0,010*
EKS	80,00	0,187
BEKS	81,00	0,202
ABD	63,00	0,041*
IRT	92,50	0,412
ERT	93,00	0,436

ficant differences were found between different category groups (on arithmetical averages basis), same significance could not be observed by statistical analysis, except for some values (see table 3-4). Both in men and womans, there are significant differences among HI,

EKS and BEKS parameters ($p < 0.05$).

Another result derived from this study is that, the ROM values could be improved by exercise. Improvement in ROM values observed in both male and female subjects after a period of regular exercise this improvement was observed. Specifically, female subjects react better to exercise compared to male subjects. In men; has shwn a meaningfull increase in FLK parameters statistically ($p < 0.05$). In womans; has shown a meaningfull increase in FLK, BFLK and ABD parameters statistically ($p < 0.05$). Considering the hip-categories: male large-hip category members and female slim-hip category members gave a better response to exercise compared to the other category members (see table 1-2).

We conclude that the hip-structure is important for ROM. But, it is not very likely to conclude that hip-structure (hip-index, in other words) by itself affects the ROM, directly.

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