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RESEARCH OF THE EFFECTS OF FOOT SIZES ON QUICKNESS AND AGILITY PERFORMANCE IN SEDENTARY WOMEN

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Abstract:
In this study, it was aimed to research the effect of foot sole measurements on quickness and agility in sedentary women aged 14-16 years. Eighty women living in Gaziantep city center and leading a sedentary lifestyle participated in the study voluntarily. In measuring the foot length and comb width of the subjects, the soles of the feet were placed on a clean paper and the sensitivity was measured with a 0.01 m stadiometer (SECA, Germany) in accordance with the desired measurement technique. Illinois agility test is used to measure the agility values of the subjects. 5 meter quickness test was used. As a result of the statistical analysis of the data obtained from the study; It was observed that the differences in foot sole dimensions had an effect on the quickness and agility performance values. It is thought that individuals with longer and wider soles may have more developed balance skills due to the pressure distribution on the soles of their feet, and this may positively affect the values of quickness and agility.

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Keywords: women, quickness, agility

1. Introduction

Since the past, quickness and agility have been an important motor feature in sportive performance, and in recent years, many studies have been made that contribute to science on these issues. Quickness is a series of frequently repetitive activities, in a row or in different directions at varying speeds. As an example; It is a player who is exposed to move in different directions by the order of any coach, and a player acting in defense puts pressure on all players by acting backwards (Young et al., 2006).

Quickness can be explained as the ability of athletes to keep their speed under control. Athletes who are able to do this can change direction within a certain balance frame, with little casualties, without any possible loss. When defining an athlete, a football coach can express his statements very quickly or very quickly, but what do these terms mean? Therefore, we can define quickness as a capability that accelerates in a specified direction and reacts in a specified time (forward, backward, towards the beginning, laterally or vertically) (Moreno, 1995).

Individual promptness is generally explained by genetics. However, contrary to issues such as height, which will not be different, speed and quickness can be improved with training. Athletes require training to improve their speed and strength. If athletes need quickness, they should be encouraged to work with such games to improve their quickness. This is the only way to improve athletes' quickness (Moreno, 1995).

It is a sporting skill that expresses opinions in many ways about the development, evaluation and measurement of the concept of agility and has been studied so far. Studies on agility from the past to the present have included situations that include such issues as performing movements quickly, stopping suddenly, restarting, and changing direction (Chelladurai, 1976; Kirby, 1971; Zemkova, 2016). Speed for agility is the work done today. He states that force and direction shifts are very important in cognitive elements in situations such as intuition, visual scanning and decision making, as well as physical properties (Armstrong & Greig 2018; Zemkova, 2016). Some sports denote a reaction to an opponent, the ball or the action of your own team player. Agility is accepted as an important component of athletic performance and it is explained that it is important for success (Greig & Naylor, 2017; Young & Farrow, 2006).

The expression of agility is evaluated on the basis of broad boundaries specific to the sport and contains different meanings for various sports branches. According to the needs of the sports branch, agility expressions can be used in specific situations that are suitable for the desired movement styles (Greig & Naylor, 2017). This resulted in various differences of opinion about which training methods should be used and which components of agility should be composed entirely (Sheppard & Young, 2006; Turner, 2011; Young & Farrow, 2006).

The foot, which is an organ that enables individuals to move from one point to another, is also considered an indicator of health. Because our feet keep our body in balance by forming postural reflexes. In addition, they are very important in the

anatomical coordination of the bone, muscles and joints that make up its structure and in motor functions such as walking and running. With this study, we aimed to add the results to science by investigating the relationship between foot measurements and quickness and agility in sedentary women in a controlled and meticulous manner.

2. Material and Methods

Eighty women residing in Gaziantep city center and leading a sedentary lifestyle participated in the study voluntarily. 24 hours before starting the study, the subjects were informed about the study and were asked to prepare for the study to be carried out, and they were asked to wear clothes as required by this study. The tests used in the study were carried out by using the necessary tools and equipment in the Indoor Sports Hall and by resting the participants of the test. Care was taken for the subjects participating in the study to be selected by individuals whose age, height, weight and body mass index values were close to each other.

In addition, the subjects selected for our study were selected from healthy individuals without anatomical disorders by determining the lower and upper limits of foot sole and foot comb measurements.

2.1. Height

The height of the test subjects without shoes, holding their breath, standing upright on a flat ground with their heels and toes adjacent to a standing position, and a stadiometer (SECA, Germany) with a sensitivity of 0.01 m, is suitable for the desired measurement technique. Measured in format.

2.2. Body weight

It was taken at 09:00 in the morning to get full results from weight measurements, assuming that the individuals who participated in the study did not fill their saturation levels in the morning. While taking weight measurements, care was taken to ensure that the subjects were wearing no shoes and sportswear (tracksuits and t-shirts), and the sensitivity was measured with an electronic scale (SECA, Germany) with a 0.1 kg sensitivity in accordance with the desired measurement technique.

2.3. Body Mass Index Calculation (BMI)

The body mass index of the subjects was calculated by dividing the body weight in kilograms by the square of the height in meters with the formula accepted by the World Health Organization.

Body Mass Index (BMI) = Body Weight (kg.) / Square of height (m2).

2.4. Foot Sole Length Measurement

The feet were placed on a clean sheet of paper. A pencil was held perpendicular to the paper (at a 90 degree angle) and circumscribed around the feet. The distance between the

backmost point of the heel and the tip of the toe was measured with a shoemaker tape measure and the length was measured with a stadiometer (SECA, Germany) with a degree of precision of 0.01 m in accordance with the desired measurement technique (M. E. B Megep, 2013).

2.5. Foot Comb Width Measurement

The comb width of the subjects was measured with a stadiometer (SECA, Germany) with a precision degree of 0.01 m, from the toes of the first (thumb) toe to the metatarsal, and the distance between the extremities of the fifth (little finger) toe joining the metatarsal.

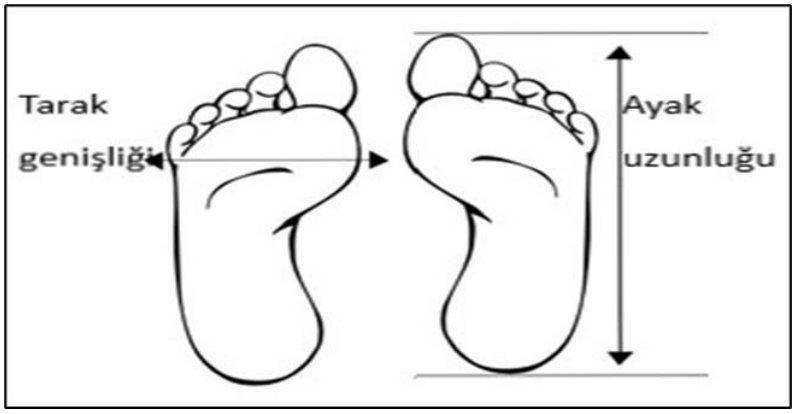

Figure 1

2.6. Agility Test

Agility test measurement Illinois test was performed. Illinois test is a track of 5 meters wide and 10 meters long and consists of 8 slaloms. All subjects were informed in detail about the course. A photocell has been placed at the exit and end of the track. The subjects were kept in the push-up position on the starting line for a maximum of 3 seconds and the subject started the course with the ready-exit command and until the end of the course, efforts were made to prevent the subjects from decreasing their performance with the supports such as go, continue, stop, faster. Each subject was given 3 attempts. The measurements were written in seconds and the best grade obtained after 3 trials was recorded.

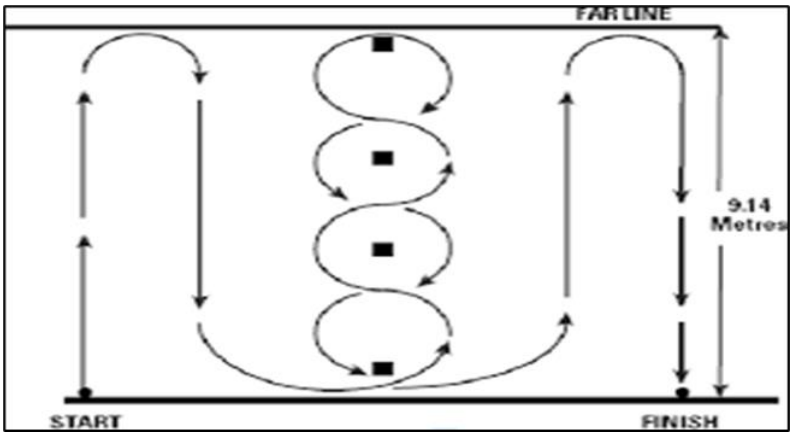

Figure 2

2.7. Quickness Test

In the speed test measurement, the test distance is determined as 5 meters. The track consists of 4 slaloms, two at the beginning and two at the end. One photocell is placed at the exit and at the end. The person to be tested is brought to the place where he will exit by calling his name. Subjects were not allowed to step from behind and were allowed to stand in a running position with one foot straight back and the other in the front, with the knee bent. After the subjects are kept in this position for a maximum of 3 seconds, they are given the command ready and exit and start running at maximum speed. Each subject was given 3 attempts. The measurements were written in seconds and the best grade obtained after 3 trials was recorded.

2.8. Statistical Analysis

All data obtained in the study were analyzed in the SPSS 20.0 software package program. Whether the data showed normal distribution was done by Kolmogorov-Smirnov test and since the given showed normal distribution, One-way Anova test, which is a one-way analysis of variance, was used to determine the difference between groups. As a result of the comparisons, Tukey HSD method, one of the Post Hoc multiple comparison tests, was used to determine among which groups the difference occurred. In this study, the significance level was taken as 0.05.

3. Findings

Table 1: Descriptive statistical values of the subjects

Variables	Foot sole length 19.0 to 20.0 cm The toe comb width 8.0 to 8.5 cm	Foot sole length 20.1 to 21.0 cm The toe comb width 8.6 to 9.0 cm	Foot sole length 21.1 to 22.0 cm The toe comb width 9.1 to 9.5 cm	Foot sole length 22.1 to 23.0 cm The toe comb width 9.6 to 10.0 cm
N	20	20	20	20
Percent (%)	25	25	25	25

When we examine Table 1, the number and percentage values of the groups participating in the study are discussed is observed.

Table 2: Grouping the subjects according to their feet

Variables	Foot sole length 19.0 to 20.0 cm The toe comb width 8.0 to 8.5 cm	Foot sole length 20.1 to 21.0 cm The toe comb width 8.6 to 9.0 cm	Foot sole length 21.1 to 22.0 cm The toe comb width 9.1 to 9.5 cm	Foot sole length 22.1 to 23.0 cm The toe comb width 9.6 to 10.0 cm
Group	1st Group	2nd Group	3rd Group	4th Group
N (number)	20	20	20	20

When we examine Table 2, it is observed that the grouping table according to foot sole and foot comb measurements of the subjects participating in the research is discussed.

Table 3: Descriptive statistical values for the soles of the subjects

Variables	Foot Base Length Foot Comb Width			
	19,0 with 20,0 cm 8,0 with 8,5 cm	**20,1 with 21,0 cm 8,6 with 9,0 cm**	**21,1 with 22,0 cm 9,1 with 9,5 cm**	**22,1 with 23,0 cm 9,6 with 10,0 cm**
	Average ± SS	Average ± SS	Average ± SS	Average ± SS
Age (years)	15,3± 0,87	15,5± 0,97	15,4± 1,01	15,8± 1,87
Height (cm)	159,8± 2,65	160,1± 2,32	160,4± 1,89	160,7± 1,99
Weight (kg)	56,75± 3,01	56,81± 2,87	56,29± 3,19	56,11± 3,11
BMI (kg / m2)	22,22± 2,01	22,16± 2,65	21,87± 1,99	21,72± 2,13

When we examine Table 3, it is observed that average values of age, height, weight and body mass index of the subjects are considered according to foot sole length and foot comb width.

Table 4: Comparison of the physical parameters of the subjects according to the size of their feet

Variables	Foot sole length Comb width of foot	Average	Standard deviation	F	P	Difference
Age (years)	19,0 cm with 20,0 cm 8,0 cm with 8,5 cm	15,3	0,87	0,129	0,935	
	20,1cm with 21,0 cm 8,6 cm with 9,0 cm	15,5	0,97			
	21,1 cm with 22,0 cm 9,1 cm with 9,5 cm	15,4	1,01			
	22,1cm with 23,0 cm 9,6 cm with 10,0 cm	15,8	1,87			
Height (cm)	19,0 cm with 20,0 cm 8,0 cm with 8,5 cm	159,8	2,65	0,165	0,869	
	20,1cm with 21,0 cm 8,6 cm with 9,0 cm	160,1	2,32			
	21,1 cm with 22,0 cm 9,1 cm with 9,5 cm	160,4	1,89			
	22,1cm with 23,0 cm 9,6 cm with 10,0 cm	160,7	1,99			
Weight (kg)	19,0 cm with 20,0 cm 8,0 cm with 8,5 cm	56,75	3,01	0,129	0,902	
	20,1cm with 21,0 cm 8,6 cm with 9,0 cm	56,81	2,87			
	21,1 cm with 22,0 cm 9,1 cm with 9,5 cm	56,29	3,19			
	22,1cm with 23,0 cm 9,6 cm with 10,0 cm	56,11	3,11			
BMI (kg / m2)	19,0 cm with 20,0 cm 8,0 cm with 8,5 cm	22,22	2,01	0,623	0,579	
	20,1cm with 21,0 cm 8,6 cm with 9,0 cm	22,26	2,65			
	21,1 cm with 22,0 cm 9,1 cm with 9,5 cm	21,87	1,99			
	22,1cm with 23,0 cm 9,6 cm with 10,0 cm	21,72	2,13			

*p<0.05 significance level

When we examine Table 4, it was found that age, height, weight and body mass index values of all groups classified according to foot sole length and foot comb width were close to each other and there was no statistically significant difference between them (p> 0.05).

Table 5: Comparison of the physical parameters of the subjects with their quickness and agility degrees

Variables	Foot sole length Comb width of foot	Average	Standard deviation	F	P	Difference
Quickness (sn)	19,0 cm with 20,0 cm 8,0 cm with 8,5 cm	1,33	0,06	6,746	0.000*	1-3 1-4
	20,1cm with 21,0 cm 8,6 cm with 9,0 cm	1,29	0,04			
	21,1 cm with 22,0 cm 9,1 cm with 9,5 cm	1,25	0,05			
	22,1cm with 23,0 cm 9,6 cm with 10,0 cm	1,24	0,08			
Agility (sn)	19,0 cm with 20,0 cm 8,0 cm with 8,5 cm	22,7	2,13	4,521	0.000*	1-3 1-4
	20,1cm with 21,0 cm 8,6 cm with 9,0 cm	22,0	2,01			
	21,1 cm with 22,0 cm 9,1 cm with 9,5 cm	21,5	1,65			
	22,1cm with 23,0 cm 9,6 cm with 10,0 cm	21,4	1,91			

*p<0.05 significance level

When we examine Table 5 In comparison of the quickness performance values of the groups according to foot sole length and comb width; a statistically significant difference was found between groups 1 and 3 in favor of the third group (p <0.05). In addition, as a result of the statistical evaluation, a statistically significant difference (p <0.05) was found between groups 1 and 4 in favor of group 4; there were no statistically significant differences in the comparison of the quickness performances of the other groups with each other (p> 0.05).

4. Discussion and Conclusion

In this study, the quickness and agility performances of sedentary women with different foot sole measurements were examined. In addition to being important for the balance of our body and our movements, feet are our organs that are flexible in terms of anatomical and physiological features, mobile and active in all sports branches. The normal anatomical structure of our feet is important both for sports activities and for our ability to move from one point to another.

Anatomical deformities that occur in our feet can cause negativity in terms of both our mobility and our sportive performance. Since the soles and foot comb measurements of individuals in the same age group but with different body mass index will also differ,

and we think that this difference will reflect negatively on our results, care was taken to ensure that the subjects participating in our study did not differ in age, height, weight, body mass index values.

At the end of our work; In comparing the quickness performance values of the groups classified according to foot sole length and foot comb width measurements with each other; A statistically positive significance was found between the quickness values of groups 1 and 3 and 4, in favor of groups 3 and 4. In addition, in the comparison of the agility performance values of the groups classified according to their foot measurements with each other; As in quickness, a statistically positive significance was found between the quickness values of groups no 1 and groups 3 and 4 in favor of groups 3 and 4.

In our study, it was found that the values of quickness and agility differ in the values related to the surface area that the sole of the foot touches, and the individuals with longer and wider foot combs have better quickness and agility values due to the pressure distribution on the feet. The motor activities that we use in many sports activities such as running, jumping and walking always depend on the physiological functions of the feet. Here, too, it always seems to be an advantage to have feet that are anatomically correct. In addition, it is known that proprioceptive information coming from muscle spindle, cutaneous receptors and joint receptors in maintaining balance is an important part of motor control. In a study, it was observed that proprioception training applied to subjects had positive effects on agility (Taşkın & Bicer, 2015).

It has been reported that the pressure applied to the foot in sportive activities affects the resistance, strength, coordination and flexibility of the foot, and also causes an increase or decrease in the optimum performance (Wong et al, 2007). For example, as a result of having a foot comb width that is far below the standard, our shoes will not be able to grasp our feet from the sides and will negatively affect our performance. This mobility in the shoes will not only affect our balance performance, but also constitute a huge risk factor for serious injuries. (Ateş et al., 2017; Fullam et al., 2014).

Studies have revealed that there are differences in the pressure areas on the sole of the foot during walking (Chen et al; 1994). In a study where 15 people were conducted on slippery and non-slippery ground; Pressure changes in the sole of the foot were examined and the peak pressure increased by 30% in the big toe and 34% in the lateral toes, and the peak pressure in the heel decreased by 20% to 24% (Fong et al; 2008). Pressure change in the sole of the foot creates significant effects on balance. Because there is a strong relationship between weakness in balance and the weakening of sensory functions of lower members as a result of excessive shaking of our body in the pressure changes that occur (Lord et al, 1992). Balance control is a complex process that provides an appropriate motor response by taking and integrating sensory inputs (Ferdjallah et al., 2002). Balance is an important feature in terms of the development of motor systems and their superior performance. Cote et al. (2005) reported that dynamic balance and postural control are very important factors in sports activities and daily physical activities.

In this context, it is important for an athlete to have a high level of balance, in order to exhibit his optimum performance more easily in his branch. As a result, we can say

that the foot sole and comb measurements, which affect the balance ability of athletes, are an important factor in the athletes' speed and agility performance.

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