Proceeding

8th INSHS International Christmas Sport Scientific Conference, 5-7 December 2013. International Network of Sport and Health Science. Szombathely, Hungary

The relationship between relative sitting height and flexibility in the Czech adult population

EDUARD HRAZDÍRA ,PAVEL GRASGRUBER AND MARTIN SEBERA

Faculty of Sport Studies, Masaryk University Brno, Czech Republic

ABSTRACT

Hrazdíra, E., Grasgruber, P. & Sebera, M. (2014). The relationship between relative sitting height and flexibility in the Czech adult population. *J. Hum. Sport Exerc., 9*(Proc1), pp.S445-S448. The aim of this research was to describe the relationship between the level of flexibility (sit-and-reach test) and relative sitting height (sitting height/body height ratio). The survey was conducted between 2011-13 in 1370 individuals (739 women and 631 men) divided into 6 age groups: 18-29 (n=451), 30-39 (n=310), 40-49 (n=248), 50-59 (n=147) 60-69 (n=164) and 70+ years (n=50). Flexibility was measured using the sit-and-reach test, according to the methodology of Eurofit (3 attempts, only the best one was recorded). The values of relative sitting height were computed from the ratio between sitting height and total body height. he results showed that there is a significant correlation between the examined variables (r = 0.213), i.e. a proportionally longer trunk and shorter legs may have an impact on the result of sit-and-reach test, but the correlation is low (r2 = 0.045). This finding indicated that the result in the sit-and-reach test can be influenced by more factors than only by pure flexibility. **Key words**: SIT AND REACH, DEPENDENCE, SITTING HEIGHT.

Corresponding author. Faculty of Sport Studies, Masaryk University Brno, Czech Republic.
E-mail: hrazdira@fsps.muni.cz
8th INSHS International Christmas Sport Scientific Conference, 5-7 December 2013. International Network of Sport and Health Science. Szombathely, Hungary.
JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

doi:10.14198/jhse.2014.9.Proc1.31

INTRODUCTION

The testing of flexibility has been an important tool for the evaluation of physical development and motor performance for a very long time. There are individuals, who maintain their level of flexibility with minimal effort and conversely, there are others, who experience increasing tension during physical activity and a subsequent tendency towards muscle (tendon) shortening (Sedláček et al., 2008). Leaving aside intentional training, flexibility is primarily determined by an individual's lifestyle (an active or passive approach to sports activities) and genetic predispositions. According to Dobrý & Semiginovsky (1988), the range of movement is limited by the articular capsule (47%), muscle (41%), tendon (10%) and the skin (2%). However, results in the testing of flexibility can also be influenced by anthropometric characteristics, which belong to physical factors determined by genetics.

In 1952 Wells and Dillon were among the first ones, who tested flexibility via the "sit-and-reach test" and dealt with it in their article "The sit and reach. A test of back and leg flexibility". This test basically measures the flexibility of the lower back and the hamstring muscles (on the back side of the thigh). During our project „Physical activity in the Czech republic", we used this test for a fundamental assessment of flexibility, with standards based on the test battery Eurofit, whose methodology dates to 1995 (Moravec et al., 2002) and in Central Europe, it is used until today. Within this project, we also measured basic physical and proportional characteristics (body height, arm span, sitting height).

The aim of this research was to describe the relationship between relative sitting height (sitting height/body height ratio) and the level of flexibility (measured by the sit-and-reach test) in Czech adults. This comparison would determine, if body proportions can skew results in this test in a significant way.

MATERIAL AND METHODS

The survey was conducted between 2011-2013 in 1370 individuals (739 women and 631 men) divided into 6 age groups: 18-29 (n=451), 30-39 (n=310), 40-49 (n=248), 50-59 (n=147), 60-69 (n=164) and 70+ years (n=50). As already mentioned, flexibility was measured using the sit-and-reach test, according to the methodology of Eurofit (3 attempts, only the best one was recorded). Body height and sitting height were measured on a specially constructed mechanical device that guaranteed maximal precision. The position of the body was always upright. The values of relative sitting height were computed from the ratio between sitting height and total body height.

Table 1. *The number of measured individuals in each age category*

Age category	Age groups	Sex	N
1	18-29	men	241
	18-29	women	210
2	30-39	men	147
	30-39	women	163
3	40-49	men	108
	40-49	women	140

4	50-59	men	53
	50-59	women	94
5	60-69	men	60
	60-69	women	104
6	>70	men	22
	>70	women	28

RESULTS

Table 2. *Results of the measurements according to age and gender: sitting height, relative sitting height (RSH) and the sit-and-reach test*

Age groups	Sex	Sitting height (cm) Mean	Sitting height (cm) Std.Err.	RSH (%) Mean	RSH (%) Std.Err.	Sit and Reach (cm) Mean	Sit and Reach (cm) Std.Err.	N
18-29	men	95.3332	0.22145	0.526037	0.00085	10.10747	0.577383	241
18-29	women	90.06048	0.237233	0.533127	0.00091	13.91857	0.618533	210
30-39	men	94.42721	0.283548	0.524023	0.00109	7.15714	0.739289	147
30-39	women	89.28528	0.269272	0.53312	0.00104	12.96994	0.702067	163
40-49	men	94.03519	0.330806	0.525366	0.00128	6.35926	0.862503	108
40-49	women	89.23571	0.29055	0.531935	0.00112	12.83857	0.757545	140
50-59	men	93.04528	0.472223	0.526481	0.00182	5.1717	1.231217	53
50-59	women	87.45	0.354585	0.532454	0.00137	9.97021	0.924504	94
60-69	men	91.98833	0.443822	0.523429	0.00171	0.61667	1.15717	60
60-69	women	86.02692	0.337107	0.531093	0.0013	10.33077	0.878933	104
>70	men	88.21818	0.732949	0.521033	0.00283	-6.27727	1.911003	22
>70	women	83.45357	0.649689	0.524887	0.0025	6.37857	1.693923	28

Table 3. *Summary results of all measurements (n=1370) and mutual correlations between variables Correlations marked by red color are significant at p < 0,05*

Variable	Means	Std. Dev.	Correlations (r-values)		
			Sitting height (cm)	RSH (%)	Sit and Reach (cm)
Sitting height (cm)	91.1434	4.69451	1	0.05642	-0.0205
RSH (%)	0.52892	0.01375	0.05642	1	0.21365
Sit and Reach (cm)	9.76088	9.75093	-0.0205	0.21365	1

DISCUSSION

The range of sitting height in men was between 88,2 - 95,3 cm and decreased with age, which must be attributed to both the secular trend of body height increase and an age-related compression of intervertebral discs. Similarly, the range in women was 83,5 - 90,1 cm and decreased with age as well. Relative sitting height (RSH) was approximately 0,6 - 0,9% smaller in men (except the oldest age category,

where it reached only 0,4%). This reflects relatively longer legs in men. In the youngest age category 18-29 years, RSH was 52,6% in men and 53,3% in women, and gradually decreased down to 52,1% and 52,5% in 70+ year olds. Performances in the sit-and-reach test were better in women than in men, and the age-related decrease was steeper in men (from 10,1 to -6,3 cm in men, and from 13,9 to 6,4 cm in women). Differences between gender within age categories were always statistically significant, except 50-59 and 70+ year olds in RSH, and 50-59 year olds in the sit-and-reach test.

The mutual statistical comparison of all three variables (summary results including both genders and all age categories) showed that the performance in the sit-and-reach test significantly correlated with RSH ($p<0.05$), but this relationship was rather weak ($r = 0.213$). This means that people with a relatively longer trunk and relatively shorter legs tend to have a superior performance in the sit-and-reach test. RSH slightly correlated with sitting height as well ($r=0,056$; $p<0.05$). The lack of any correlation between sitting height and the performance in the sit-and-reach test may seem surprising at first glance, but it is in accordance with our previous observations indicating a very strong, negative relationship between body height and RSH. In other words, the advantage of an absolutely longer trunk (higher sitting height) in taller people is largely offset by their relatively longer legs.

CONCLUSION

The results show that there is a significant correlation between the result in the sit-and-reach test and relative sitting height, which suggests that the combination of a proportionally longer trunk with proportionally shorter legs may have a beneficial impact. However, the explanatory power is quite low. Despite that, we can demonstrate that results in the sit-and-reach test, interpreted as the flexibility of hamstrings and the lower back, are influenced by a wider spectrum of factors than only by pure flexibility. For example, the literature further documents a relationship with hip joint mobility, hamstring strength and other variables unrelated to the hamstring flexibility.

SOURCE OF FUNDING FOR THE STUDY

The project "Creating a research team for the purpose of determining the level of physical activity (inactivity) in selected age groups of the population of men and women in the Czech Republic" (CZ.1.07/2.3.00/20.0044) is financed by the European Social Fund and the state budget of the Czech Republic.

REFERENCES

1. Dobrý, L. & Semiginovský, B. (1988). Sportovní hry: výkon a trénink. *Vyd.1. Praha: Olympia,* 197 s.
2. Jones, C.J., Rikli, R.E., MAX, J. & Noffal, G. (1998). The reliability and validity of a chair sit-and-reach test as a measure of hamstring flexibility in older adults. *Res Q Exercise Sport, 69(4),* pp.338-343.
3. Moravec, R., Kampmiller, T. & Sedláček, J. (2002). EUROFIT: physique and motor fitness of the slovak school youth. *2. vyd. Bratislava: Slovak Scientific Society for Physical Education and Sports,* 180 s.
4. Sedláček, J., Antala, B., a Kol. (2008). Hodnotenie telesného rozvoja a motorickej výkonnosti v procese kurikulárnej transformáte výchovy a vzdelávania. *Vyd. 1 Bratislava: ABL Print,* 138 s.

