

1st World Congress on Health and Martial Arts in Interdisciplinary Approach, HMA 2015

Flexibility measured by Fingertips-to-Floor test among groups practicing yoga, Brazilian jujitsu, tricking and tai chi in comparison to non-active group

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Abstract

Background & Study Aim: Flexibility is considered as significant component human physical activity, defined as ability to perform high amplitude movements conditioned by functional-anatomical factors. Paper aim is the knowledge about flexibility level among physically active people in comparison to sedentary one and confirming the following hypotheses: the youngest one have better flexibility than the oldest in non-active group. Physical activity in which stretching techniques play an essential role, have positive influence on flexibility.

Material & methods: Ninety-six men between ages 22-69 were examined. Sixteen research objects were divided to four practicing groups; *tricking*, *Brazilian jujitsu*, *yoga*, *tai chi* and Non-active group consisting 80 people. As an evaluation method of the flexibility FTF (*Fingertips-to-Floor*) test was used before and after training in sequence of four consecutive weeks.

Results: In case of non-active people physical decrease of flexibility was noticed. The biggest decreasing values were observed between the youngest to the second test subject group and in case of the oldest group. In case of any physical activity group, improvement of flexibility was recorded after the training, which was the biggest in the *tai chi* group. Despite advanced age, the biggest difference in result occurred in *yoga* and *tai chi* to respect of non-active group.

Conclusion: The results of our experiment indicate that flexibility measured with FTF test demonstrate decreasing tendency with age. Physically active people have better flexibility. The biggest results are shown in *tai chi* and *yoga* group that corresponds with dominance of stretching practice.

Keywords: body elasticity • martial arts • non-apparatus test • physical activity • sport activity • stretching

Published online: 17 September 2015

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Contributors: Henryk Knapik conceived the study design. Henryk Knapik, Andrzej Szuszkiewicz, Szczepan D Mateja, Grzegorz Rzetecki, Agata Niewiadomska-Matula collected the data. Henryk Knapik, Szczepan D Mateja, Grzegorz Rzetecki analysed the data. Henryk Knapik, Andrzej Szuszkiewicz, Szczepan D Mateja, Grzegorz Rzetecki prepared the manuscript. Henryk Knapik, Andrzej Szuszkiewicz secured the funding.

Funding: PRO-EKO-NATURA & Akademia Wing Chun Kung Fu „Biały Smok”

Conflict of interest: Authors have declared that no competing interest exists

Ethical approval: approved by the Local Ethical Committee

Provenance and peer review: Under responsibility of HMA Congress

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Cite it: Knapik H, Szuszkiewicz A, Mateja SzD, Rzetecki G, Niewiadomska-Matula A. Flexibility measured by Fingertips-to-Floor test among groups practicing yoga, Brazilian jujitsu, tricking and tai chi in comparison to non-active group. In: Kalina RM (ed.) Proceedings of the 1st World Congress on Health and Martial Arts in Interdisciplinary Approach, HMA 2015, 17–19 September 2015, Czestochowa, Poland. Warsaw: Archives of Budo; 2015. p. 135–138

INTRODUCTION

Flexibility (movement range in joints) is acknowledged as essential and important component of human physical activity. Being defined as ability to perform high amplitude movements and is conditioned by functional-anatomical factors. Movements range depends on shape articular surface, their distance from rotation axis, skeletal limitation, ligament elasticity along with joint capsule, length together with elasticity of tendons, as well as the antagonist muscles extending over particular joint. On flexibility also influence the excited state of central nervous system [1]. As well as in all sport disciplines, as in the martial art, crucial role play stretching exercises [5]. The aim of this study was to investigate the effect of practicing various forms of physical activity on flexibility, compared to those not engaged in any physical activity including sport disciplines and leading sedentary lifestyle.

The aim of the paper is to investigate flexibility level among physically active people in comparison to sedentary one and confirming the following hypotheses: the youngest one have better flexibility than the oldest. Positive influence on flexibility play a significant role using stretching techniques in physical activity. The aim of the study is also to confirm the following hypotheses:

The youngest one have better flexibility than the oldest in non-active group.

Physical activity in which stretching techniques play an essential role, have positive influence on flexibility.

MATERIAL AND METHODS

The study consisted in using non-apparatus test (*Fingertips-to-floor test*) [1-4] which determines the mobility and flexibility entire spine as well as its individual segments, hip joints, ankle joint and mobility of the pelvis [1].

PARTICIPANTS

The research material was a group consisting 96 men in age range between 22 to 69 years old. The main object of study included four groups of people exercising; *tricking* (age; 22, 23, 23, 25), *Brazilian jujitsu* (age; 26, 28, 30, 34), *yoga* (age; 42, 47, 50, 57) and *tai chi* (age; 60, 65, 66, 69) in various ages, of 4 people in each group. Control group consisted of 80 individuals declaring themselves as non-active and leading a sedentary lifestyle was purposely selected in a way that 5 non-active individual of the same age were matched

with one practitioner, since there are no standard values for that test and published data refers to people in age range from 18 up to 51 years without specifying the trend results correlated with age [1,4] Individuals were examined within four consecutive weeks, right before (Test 1) and after training (Test 2)

INCLUSION CRITERIA

At least three years of practice in the above-mentioned physical activity.

THE EXCLUSION CRITERIA

In study groups – practice other types of physical activity (sports).

For all tested – surgical procedures in the spine and joints, spine and joints ailment furthermore lower limb muscle injuries in the last 6 months. In control group – practice of any regular physical activity.

The tests were carried out at the club “Gracie Barra” in Sosowiec, in the gym AWF Katowice, in the sport center “Bazantowo” and *Wing Chun Academy* in Cracow. The research was conducted from November 2014 to March 2015. Each training group was tested in four consecutive weeks.

FTF test is not only the most popular test evaluating flexibility, but also a clinical test for assessing inter alia bending of the spine, which is used in healthy individuals and patients.

This test consist of measuring the distance from the longest fingertip to the edge of the platform. The subject is standing on 30 cm high platform with feet joined together, then performs maximum down flexion with straight knees and is asked to touch the edge of the platform, where at the end of flexion measuring being done. The edge threshold corresponds to the level 0, results below that level were positive, and negative above it. [2, 3]

RESULTS

Results presented in table and figure 1 shows that the values obtained in the test by non-active group in average age of 23.25 years are the highest and are 8.35 cm. In the next age group (29.5 years) test result shows the greatest tendency to decline by 6.9 cm. In the next age group decline is now only 2.5 cm. Further significant reduction in test results observed in individuals in the oldest age group (65 years), which is 4.10 cm reaching its lowest level –5.05 cm. Analyzing the results obtained by people

who practice different types of physical activity is stated by better results compared to those non-active. The smallest result difference exists between non-active and *tricking* trainees after training maximally amounts to 2.78 cm. In another group B that practices *Brazilian jujitsu* test results are higher than in A group of 6,37 cm and difference in relation to non-active people is 16.05 cm. *Yoga*, C group achieve even better results in comparison to non-actives, the difference is 20.01 cm. The best results are achieved by *tai chi* practitioners 19.06 cm, where non-active group amount to -5.05 cm, and so the difference reach up to 24.3 cm. It should be noted that the results obtained after training (Test 2) are higher in all groups. The smallest difference (0.63 cm) was observed in the case of the youngest people practicing *Tricking*, however the biggest difference states for practicing *tai chi* (5.25 cm) who are at the same time the oldest training group.

DISCUSSION

Stretching techniques (also auto stretching) are important elements exercises of yoga, in other groups are the key elements of the warm-up and training, and thus flexibility [5]. Stretching exercises improve range of motion in the joints, which has been proven in many scientific studied [6-8].

Physical activity has positive effect on the flexibility of the human body. Performed flexibility studies measured with FTF test made on a group of 155 healthy volunteers aged from 18 to 51 years have shown that people who are physically active (aged 19-46 years) had better flexibility($x = 10.56$) than physically inactive people (aged 18-51 years) for which the values were on average 6.29 [4]. Studies involved both men and women, the results were analyzed together without correlation trend with age, which does not allow for identification of normative values.

Table 1. Average values of age and results in FTF test in examined groups.

| Average Age | Non active group | Group | Test 1 | Test 2 | $\Delta(T1,T2)$ | $\Delta(NAG,T1)$ | $\Delta(NAG,T2)$ |
|-------------|------------------|-------|--------|--------|-----------------|------------------|------------------|
| 23.25 | 8.35 | A | 10.50 | 11.13 | 0.63 | 2.15 | 2.78 |
| 29.50 | 1.45 | B | 14.63 | 17.50 | 2.87 | 13.18 | 16.05 |
| 49.00 | -0.95 | C | 17.44 | 19.06 | 1.62 | 18.39 | 20.01 |
| 65.00 | -5.05 | D | 14.00 | 19.25 | 5.25 | 19.05 | 24.3 |

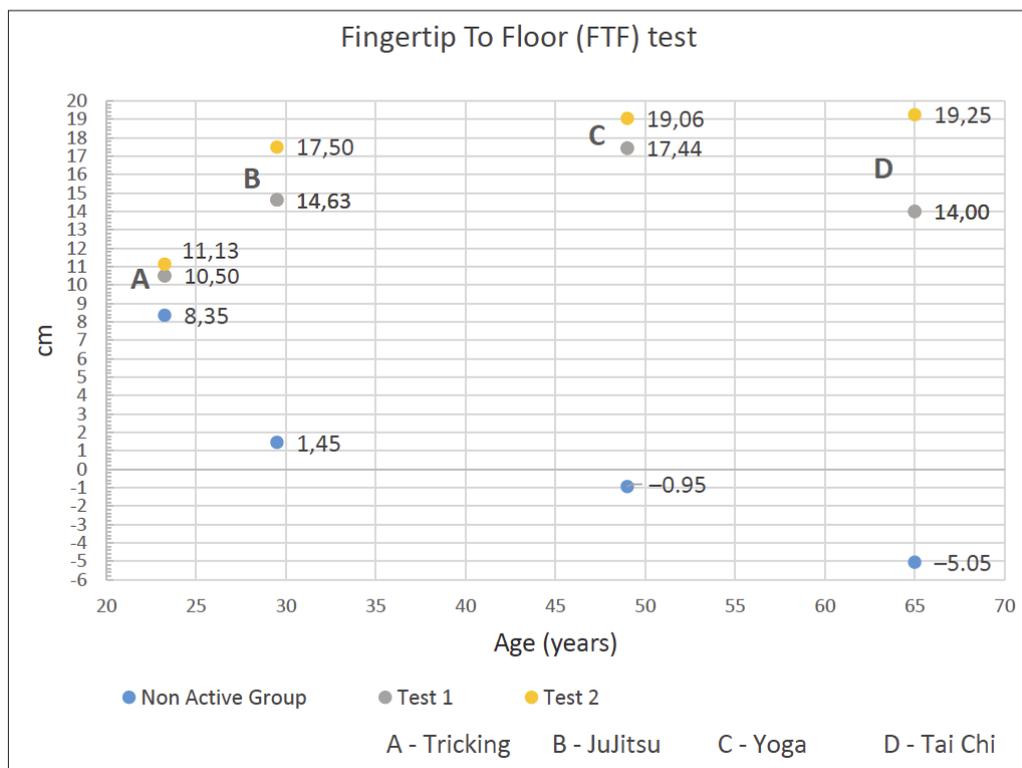


Figure 1. Chart of average values of age and results in FTF test in examined groups.

It is not entirely clear how the individual structure of bio kinematical chain affect the flexibility of the human body. A study by Li et al. [9] have shown that the flexibility test results depend on the mobility in the hip joints and lumbar spine.

Much more detailing research on the impact of various structures on the flexibility have been done by Kuszewski, Knapik, Saulicz et al. [1], studying 190 people between the ages of 18 to 51 years, have shown that the FTF test results correlate with the mobility of the upper ($r = 0.79$) and lower ($r = 0.70$) level of lumbar spine. In addition, there was a significant correlation with the results of both hip joints flexion ($r = 0.34$ and $r = 0.36$), straighten hocks ($r = 0.33$ and $r = 0.25$) and significant negative correlation with the shortening of hamstrings ($r = -0.67$ for both limbs) [1].

This allows to conclude that TFT test is not only a quick and simple test, but also is a reliable way to assess the movement ability of the lower spine, pelvis and lower extremities and thus it is a good indicator of the flexibility [1]. Research Guissard and Duchateau showed a decrease in the stiffness of the tissue after use of stretching exercises [10]. Hence the

conclusion that stretching decrease the risk of injury and musculoskeletal disorders [11,12].

However stretching exercises should not be used with mobility restrictions in the joints resulting from abnormal anatomy structure, damage to tendons and muscles and also pain in the joints resulting from excessive compression. On the other hand, excessive mobility sometimes may suggest hypermobility of the joints and then usage of stretching techniques is not recommended.

The biggest increases during the training are observed in the case of people practicing *thai chi* on the one hand indicate the possibility of obtaining excellent results using this technique, but on the other hand are confirming the fact stated by Magnusson et al. about impermanence effects of stretching methods [8].

CONCLUSION

The results of our experiment indicate that flexibility measured with FTF test demonstrate decreasing tendency with age. Physically active people have better flexibility. The biggest results are shown in *tai chi* and *yoga* group that corresponds with dominance of stretching practice.

REFERENCES

1. Kuszewski M, Knapik H, Saulicz E, et al. The suitability of the „toe-touch” test for functional testing in physiotherapy. *Fizjoterapia Polska* 2004; 4(4): 378-384
2. Perret C, et al Validity, reliability, and responsiveness of the fingertip-to-floor test. *Arch Phys Med Rehabil* 200; 82(11):1566-70
3. Kalina RM. Applying non-apparatus and quasi-apparatus tests in a widely understood concept of health promotion – an example of flexibility measurement and assessment. *Arch Budo* 2012; 8(3): 125-132
4. Kuszewski M, Saulicz E, Gnat R, K et al. Influence of physical activity on the level of flexibility measured of the „toe touch” test. *Annales Universitatis Mariae Curie-Skłodowska. Sectio D, LX, XVI, 2005: 273: 216-219*
5. Kuszewski M, Knapik H. Stretching mięśniowy – rola i znaczenie. *Zeszyty Naukowe Beskidzkiej Wyższej Szkoły Turystyki w Żywcu. Fizjoterapia* 2005: 1(3): 91-96 [In Polish]
6. Bandy WD, Irion JM, Briggler M. The effect of time and frequency of static stretching on flexibility of the hamstring muscle. *Physical Therapy* 1997; Oct. 77(10): 1090-1096
7. Nelson AG, Kokkonen J. Acute ballistic muscle stretching inhibits maximal strength performance. *Research Quarterly for Exercise and Sport* 2001; Oct. 11(5): 260-265
8. Magnusson SP, Simonsen EB, Aagaard P et al. Biomechanical responses to repeated stretches in human hamstring muscle in vivo. *American Journal of sSports Medicine* 1996; 24: 622-628
9. Li Y, McClure PH, Pratt N. The effect of hamstring muscle stretching on standing posture and on lumbar and hip motion during forward bending. *Physical Therapy* 1996; 76(8): 836-849
10. Guissard N, Duchateau J. Effect of static training on neural and mechanical properties of the human plantar-flexor muscle. *Muscle & Nerve* 2004; 29(2): 248-255
11. Johnston CAM, Taunton JE, Lloyd-Smith DR. Preventing running injuries. *Canadian Family Physician* 2003; 49(9): 1101-1109
12. Frymoyer JW, Cats-Baril W. Predictors of low-back pain disability. *Clinical Orthopaedic* 1987; 221: 89-98