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CONTENTS

CONTENTS

CONTENTS

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Effects of Active Static Stretching Exercises on the Hip Flexor Muscles of Adolescents

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Abstract

The study investigated the effects of active static stretching exercises on the hip flexor muscles of adolescents. The participants were sixty students of Elite Crop Senior Secondary School, Oshodi/Isolo Local Government area of Lagos state, Nigeria. Age ranged from 12-17 years. Simple random sampling technique, using a fish bowl method with replacement was used in selecting the participants. Informed consent forms were given to the participants. The participants were subjected to active static stretching exercises lasting thirty minutes, performed two times a week. Data were collected on the active static stretching test on the participants. The data collected were analyzed with descriptive statistics of mean, standard deviation and inferential statistics of t-test. There was significant difference in the active static stretch of male ($t = 8.191$, $p < 0.05$) and female ($t = 13.462$, $p < 0.05$) adolescents respectively. Comparatively, there was insignificant difference ($t = 0.083$, $p > 0.05$) in the active static stretch of male and female adolescents. It is concluded that active static stretch has effect on the flexibility of hip muscles of the male and female adolescents. It is recommended that adolescents should take part in stretching exercises, two to three times a week to enhance the flexibility of the hip joint and other joints in the body.

Keywords: *Active static stretching, Adolescents, Flexibility, Hip flexor muscles, Range of motion*

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Background to the Study

Statistic stretching involves slowly moving part of the bodies to desired positions, holding them for 15 to 30 seconds, and then slowly releasing them. Stretching exercises promote flexibility. Flexibility is one of the components of health-related fitness. This refers to the amount of motion around a joint. From a health standpoint, loss of joint flexibility often contributes to the postural problems, as a result an optimal amount of flexibility is necessary for normal body functioning and performance of activities of daily life.

Flexibility training promotes reduction of stress and tension, muscle relaxation, improved fitness, posture, and symmetry, relief of muscle cramps, prevention of injury, relief of muscle soreness, prevention of injury and return to full range of motion after an injury (David, Michael & Frank, 2003; ACSM, 1998).

With the merits of flexibility training, certain factors limit range of motion at the joints (flexibility). The factors include; the bony structure of joints, the amount of tissue (muscle and fat) around the joint adjacent to the joint, the elasticity of muscles, tendons and connective tissue and the skin (scar tissue from surgery or a laceration over a joint may limit movement). Other factors that affect flexibility are age, gender, level and type of physical activity. To corroborate this, Page (2012) submitted that range of motion (ROM) available in synovial joint (namely joint of the hip) between acetabulum and the head of femur, range of motion may be limited by two anatomical activities: Joints and Muscles. Joint restraints include, joint geometry and congruency, as well as capsuloligamentous structures that surrounds the joint. He stressed further that muscles provide both passive and active tension: Passive muscle tension is dependent on structural properties of the muscles and surrounding fascia, while dynamic muscle contraction provides active tension. Active tension results from the neuroreflexive properties of muscle.

Hip range of motion is used to determine changes in hamstring length. Young people are more flexible than the adults because tendons lose their elasticity with age. However, inactivity may play a greater role than the aging process in the loss of flexibility because muscles and other soft tissues loose elasticity when not used (Daniel, Michael &Frank, 2003). Active individuals are usually more flexible than inactive people (ACSM, 1998). Women tend to be more flexible than men because the hormones that permit women's tissue to stretch during the child birth process facilitate all body stretching (Robergs, 1997).

The range of motion for most movements begins to decline in the mid-20s for men and women (ACSM, 1998). On when to stretch, (Fredette, 2001& ACSM, 2000) submitted that stretching can be included in the warm-up prior to exercise and in the cool down following exercise and done on non-exercise days. Stretching prior to working out should occur only after the muscles have been warmed with about 5 to 10 minutes of such cardiovascular activities as brisk walking, slow jogging, riding a stationary bike, or similar activity (Fredette, 2001; ACSM, 2000). A gradual warm-up increases heart rate slowly and raise the temperature of muscles, tendons, and ligaments by increasing blood flow to these structures.

ACSM (2000) stated the guidelines that should be followed for safe and effective static stretching as follows: warm up for few minutes before stretching : by walking, slow jogging, doing light calisthenics, or doing some similar activity, stretch to the point of mild discomfort. Do not stretch to the point of pain. Hold each stretch for 10 to 30 seconds minimum. Do not hold your breath during a stretch; breathe rhythmically and continuously. Move slowly from position to position. Perform each stretch at least four times. Stretch after workout; this produces the greatest benefits because the muscles are warm and more amenable to stretching. ACSM (2000) suggested that stretching exercises should be performed five to six times per week.

Chan, Hong and Robinson, (2001) showed eight weeks of static stretching increased muscle extensibility; however, most static stretching training studies show an increase in ROM due to an increase in stretch tolerance (ability to withstand more stretching force), not extensibility (increased muscle length).

Ben (2010), Ylien (2009), Law (2009) & Halbertsma (1994) observed that static stretching is effective at increased ROM. The greatest change in ROM with a static stretch occurs between 15 and 30 seconds, Bendy (1994) & McHugh (1992). To corroborate this Ayala (2010); Cipriani (2003), Bendy (1997; 1994) suggested that 10 to 30 seconds is sufficient for increasing flexibility. (Curry 2009 & Beedle, 2007) observed that warm-up is effective in increasing ROM prior exercise.

Purpose of the Study

The purpose of the study is to determine the effect of eight weeks active static stretching programme on the hip flexor muscles of Junior Secondary School students.

Research Hypotheses

1. There would be no significant difference in the hip flexor muscles of male Senior Secondary School students after eight weeks of active static stretching training programme.
2. There would be no significant difference in the hip flexor muscles of female Senior Secondary School students after eight weeks of active static stretching training programme.
3. There would be no significant difference in the hip flexor muscles of male and female Senior Secondary School students after eight weeks of active static stretching training programme.

Materials and Methods

The participants for this study consisted of apparently healthy adolescents (30 males and 30 females) of Elite Crop Senior Secondary School, Oshodi/Isolo Local Government area of Lagos state, Nigeria. The participants age range from 12-17 years. They were selected through a simple random sampling technique using a fish bowl method with replacement. Pretest posttest research design was adopted for this study. The Ethics Committee of the Department of Human Kinetics and Health Education, University of Lagos, Akoka approved all study

procedures. The nature of the test and purpose of the study were explained to the participants, informed consent forms in which a short description of the investigation was written was given to them. The participants signed the informed consent forms before they participated in the study. The participants took part in the pre and post-training measurements.

The participants were exposed to the following active stretching exercises for eight weeks: Calf and Achilles Tendon Stretch, Quadriceps Stretch, Hamstring Stretch, Single-Knee-to-Chest Stretch, Double-Knee-to-Chest stretch and Groin Stretch.

These exercises were carried out 2 times per week on alternate days, under the supervision of the researchers and the trained assistants. Before the commencement of the training programme, pre-exercise observations of the participants were carried out. The training session began with warm-up activities. The active static stretching lasted 20 minutes and the cool down stretch 4 minutes. The duration of the active static stretch was increased to 40 minutes before the end of the programme. 6 minutes for warm-up exercises, 30 minutes for the active static stretching and 4 minutes for cool down activities. Exercise repetition lasted between 15-30 seconds, with 8 repetitions initially which was increased to 12 repetitions before the cessation of the training programme.

Table 1: Guidelines for the active Static Stretching-Training programme

Week	Exercise	Duration	Resistance	Sets	Rest Between Sets	Frequency (work out per week)
1-2	Warm-up	6 mins	8-12 Reps Max	4	4 mins	2
	Stretching exercises	20 mins				
3-8	Warm-up	6 mins	8-12 Reps max	4	4 mins	2
	Stretching exercises	30 mins				
	Cool down	4 mins				

Exercise Protocol

Calf and Achilles Tendon Stretch

Participants stand against the wall and stretch the heel downward alternating legs. Hold the stretch position for 15 to 30 seconds.

Hamstring Stretch

Each of the participants placed the sole of the left foot against the thigh of the extended right leg. Lean forward without bending the knee of the extended leg. Hold for 15 to 30 seconds and repeat with the other leg.

Single-Knee-to-Chest Stretch
Participants lie down flat with their back on the floor. Bend one leg at approximately 100 °and gradually pull the opposite leg toward the chest. Hold the final stretch for 15 to 30 seconds. Switch legs and repeat the exercise.

Double-Knee-to-Chest Stretch
Participants lie flat with their back on the floor and then curl up slowly into a fetal position. Hold this position for 15 to 30 seconds.

Groin Stretch
Participants place the soles of the feet together and lean forward. Hold for 15 to 30 seconds. This can also be done by placing the soles of the feet together, instead of leaning forward, participants push down gently on both knees and hold for 15 to 30 seconds.
Sources:

(1) Life Time Physical Fitness and Wellness. Werner, Hoeger and Hoeger (2007) Pp. 256-259
(2) Wellness Concepts and Applications. David, Michael and Frank (2003) Pp 137-138.

Post Experimental Measures
The sit-and-reach test was conducted after the eight weeks static stretching training programme in the school hall. The participants were asked to warm up for 5 minutes before the test was taken. After the warming up, they removed their shoes and sit with both feet flat against the end board of the box with legs fully extended and knees locked. Participants extend their arms forward, one hand on top of the other with fingertips perfectly even. Participants bend forward from the waist as far as possible while sliding the hands along the scale. Hold this position for 2 seconds. Participants perform three trials and the best scoreof the three trials was recorded as the final score for each of the participants.

Statistical Analysis
Descriptive statistics of mean, range and standard deviation was used to describe the data, while inferential statistics of t-test was used to test for differences in Pre and Post – test measures of static active stretching of the participants. Level of significant was set at 0.05alpha.

Results
Demographic data and static active stretching test of participants are stated as follows:

Table 2: Mean, Range, Standard deviation for anthropometric characteristics of participants

Variable	Sex	N	Range	Mean	Standard Deviation
Height	M	30	1.40-1.70	156.03	6.946
	F	30	1.45-1.65	154.37	5.474
Weight	M	30	32-60	50.00	5.960
	F	30	30-58	48.00	6.96
Age	M	30	12-19	14.87	2.097
	F	30	12-19	14.50	1.943

Table 1 shows the demographic data of participants with mean height of 156.03 for males, 154.37 for females, Standard deviation of 6.946 for males and Standard deviation of 5.474 for females, Mean weight of 50.00 for males, 48.00 for females and Standard deviation of 5.960 and 6.960 for males and females respectively.

Tables 3: t-test showing the effect of eight weeks of Active Static Stretching exercise programme on the hip flexor muscles of male adolescents.

Variable	Measures	N	Mean	SD	df	t	P
Hip flexor muscles	1	30	44.20	5.99	29	8.191	0.000
Hip flexor muscles	2	30	45.80	6.05			

$p<0.05$

Measures: Pretest 1
Posttest 2

Table 3 reveals that there is significant difference in hip flexor muscles of male adolescents after eight weeks of active stretching exercise programme ($t=8.191$, $p<0.05$). The null hypothesis is rejected. This implies that there is significant difference in hip flexor muscles of male adolescents after eight weeks of stretching exercise programme.

Table 4: t-test showing the effect of eight weeks of active stretching exercise programme on hip flexor muscles of female adolescents.

Variable	Measures	N	Mean	SD	df	t	P
Hip flexor muscles	1	30	44.30	6.34	29	13.462	0.000
Hip flexor muscles	2	30	45.67	6.42			

p<0.05

Measures: Pretest 1
Posttest 2

Table 3 reveals that there is significant difference in hip flexor muscles of female adolescents after eight weeks of active stretching exercise programme (t=13.462, p<0.05). The null hypothesis is rejected. This implies that there is significant difference in hip flexor muscles of female adolescents after eight weeks of active stretching exercise programme.

Table 5: t-test showing the effect of eight weeks of active stretching exercise programme on hip flexor muscles of male and female adolescents.

Variable	Measures	N	Mean	SD	df	t	P
Hip flexor muscles	1	30	45.80	6.05	58	0.083	0.934
Hip flexor muscles	2	30	45.67	6.42			

p>0.05

Measures: Pretest 1
Posttest 2

Table 4 reveals that there is no significant difference in the hip flexor muscle of male and female adolescent after eight weeks of active stretching exercise (t=0.083. p>0.05). The null hypothesis is not rejected. This implies that there is no significant difference in the hip flexor muscle of male and female adolescents after eight weeks of active stretching exercise.

Discussion

Tables 2, 3 and 4 show the analysis of t-test of the participants on active static stretching. The analysis of the t-test result shows there was significant difference in the pre and posttest active static stretching of the hip flexor muscles of the male and female participants while the interaction effect showed no significant difference in the hip flexor muscles of the male and female participants Based on the findings of this study, the hypothesis which states that there would be no significant difference in the active static stretching of male participants after eight weeks of the stretching exercise programme is rejected. Also, the hypothesis which states that there would be no significant difference in the active static stretching of female participants after eight weeks of the stretching exercise programme is rejected, while the hypothesis comparing the effect of the active static stretching after eight weeks of the

training programme on male and female participants is not rejected. The significant difference observed in male and female participants relatively were due to the effect of the active stretching training programme based on gender. The mean difference between pretest and posttest means, 1.60 for males and 1.37 for females was in line with literature in that females are more flexible than males, (Robergs, 1997) which results in the effect of the training programme more effective in males than females, who are more flexible physiologically than their male counterparts.

The insignificant effect of the training programme on male and female participants was due to the interaction effect of the training programme on their physiological make up and their age range between 12 – 17 years. Their tendons at this age range have not lost their elasticity. The participants are favoured in terms of flexibility age-wise, the range of motion for most movements decline in the mid. 20s for men and women (ACSM, 1998).

Conclusion and Recommendation

Based on the findings of this study, Active Static Stretching Exercises enhances flexibility of the hip flexors muscles of Adolescents, thereby increasing range of motion (ROM) at the hip of the participants. Effort should be made to carry out further research on the effect of Passive Static Stretching on the hip flexor muscles of Adolescents.

Acknowledgement

The authors wish to thank the Senior Secondary School students of Elite Crop Senior Secondary School, Oshodi/Isolo Local Government Area of Lagos State Nigeria for their participation in the study. The Principal and the sports master of the school are acknowledged for assisting the researchers during the intervention programme and data collection and to all who contributed to the study.

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