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Effect of Active Static Stretching Exercises on the Shoulder Girdle Muscles of Adolescents

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Abstract

The study investigated the effects of active static stretching exercises on the shoulder girdle muscles of adolescents. The participants were apparently healthy students from Bakare Disu Memorial High School, Agege, Lagos State, Nigeria. Age ranged from 12-18 years. The study adopted randomized pretest posttest research design. Simple random sampling technique and fish bowl method with replacement were used in selecting the participants. The participants signed the Informed consent form. The participants were subjected to active static stretching exercises lasting forty 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 and analysis of covariance (ANCOVA). There was significant difference in the active static stretch of male ($t=11.451$, $df=20$, $p<0.05$) and female ($t=14.141$, df, $p>0.05$) adolescents respectively. Comparatively, there was insignificant difference ($F1.37=1.197$, $p>0.05$) in the active static stretch of male and female adolescents. It is concluded that active static stretch has effect on the flexibility of shoulder girdle muscles of male and female adolescents. It is suggested that adolescents should take part in stretching exercises, two to three times a week to enhance the range of motion of the shoulder joint of adolescents for active performance in physical activities.

Background to the Study

Static stretching involves slowly moving to desired positions of body parts, holding them for 15 to 30 seconds, and then slowly releasing them. This method of stretching does not activate the stretch reflex (automatic or reflexive contraction of a muscle being stretched), so the muscle is essentially stretched without opposition. It results in little or no muscle soreness, has a low incidence of injury, requires little energy and can be done alone. For these reasons, static stretching is the preferred system for increasing flexibility (David, Michael and Frank, 2003). Adequate shoulder girdle flexibility is crucial to independently perform activities of daily living, such as, eating, self-care, typing, carrying and manipulating skills and good performance in sporting activities. To achieve successful performance of these activities, a full range of motion at the shoulder joint is required in activities such as throwing, shooting and dribbling in basketball, service, digging and spiking in volleyball, throwing and goalkeeping in soccer and in performing gymnastics activities. For effective performance of these activities and good performance in sporting activities, a full range of motion at the joints is required. Flexibility of the joint at the hip and shoulder girdle of the participants regularly in a stretching programme is a sine qua non for improving flexibility which is required for carrying out activities for daily life. These activities can only be effectively carried out when all the joints and muscles of the body are flexible.

When the body is flexible, the risk of neck pain, upper-back pain and lower-back pain are reduced to the barest minimum. This is achieved through flexibility programmes that are planned, deliberate and regularly performed sets of exercises designed to progressively increase the range of motion of a joint or series of joints (Alter, 1996). Due to inactivity and sedentary lifestyle and the use of automation and cybernation, most of adults and youths lose flexibility because muscles and other soft tissues in their body lose elasticity as a result of inactivity. This affects their performance in sporting activities. Inflexible muscles around the joint limit range of movement, eventually inhibiting activities of daily life. Lack of flexibility in the shoulders can affect performance in sporting activities. Light muscles may also contribute to joint deterioration by subjecting the bones to excessive pressure causing pain and abnormalities in joint lubrication.

Flexibility can be improved by exercises that promote elasticity of the soft tissues. Exercises such as Neck stretches, Shoulder stretch, Chest stretch, back stretch, Groin stretch, shoulder hyperextension stretch, shoulder rotation stretch (Werner and Sharon, 2007; David, Michael and Frank, 2003).The participants sat for too long in their classrooms for academic work without taking part in exercises. These sedentary lifestyles causes back pain and postural defects like scoliosis due to excessive bending when writing notes in their classrooms, therefore, the need to carry out this study on the effect of active static stretching on the shoulder girdle of Adolescents.

The shoulder region includes the axilla or armpit, the scapula region or parts around the shoulder blade and the pectoral or breast region on the front of the chest. The scapula or shoulder blade and the clavicle or collar bone are the bones of the upper limb girdle, they

both form the shoulder girdle. They articulate with each other at the acromioclavicular joint, but their only articulation with other parts of the skeleton is where the clavicle articulates with the upper end of the sternum at the sternoclavicular joint. The mobile scapula is otherwise held in position entirely by muscles (Koshi, 2017).

The arm articulates with the scapula at the shoulder joint while the forearm, its bones, the radius and ulna articulates with the humerus at the elbow joint and with each other proximally and initially at the corresponding radio-ulnar joints. Movements of the shoulder girdle and the articulating bones are made possible with the attachment of muscles at the shoulder region, the arm and the forearm. These muscles must be strengthened and flexible before activities of daily living and better performance in sporting activities can be achieved. One of the ways the muscles can be made flexible through stretching exercises (Koshi, 2017; William, 2003; David, Michael and Frank, 2003).

Stretching is a form of physical exercise in which a specific muscle or tendon (or muscle group) is deliberately fixed or stretched in order to improve the muscle`s felt elasticity and achieve comfortable muscle tone. The result is a feeling of increased muscle control, flexibility and range of motion. Stretching is also used therapeutically to alleviate muscle cramps (William, 2003).

David, Michael and Frank (2003) stated the benefits of stretching exercises as reduction of stress and tension, muscle relaxation, improved fitness, posture and symmentry, relief of muscle cramps, relief of muscle soreness, prevention of injury, reduced frequency of injury, return to full range of motion after injury and that stretching exercises improve flexibility. These laudable benefits of stretching are achieved by the actions of muscle spindles and Golgi tendon organ as opined by David, Michael and Frank (2003). When muscles are stretched, their muscle spindles send volley sensory impulses to the brain, informing it that the muscles are being subjected to stretch. The brain sent back impulses to the muscles through the motor nerve which causes them to contract reflexively, thus resisting the stretch. The Golgi tendon organ responds to change in length and tension when a muscle is stretched statistically and the position is held for at least 6 seconds by sending a volley of signals to the brain through the spinal cord, this causes the antagonist muscle (the muscle being stretched) to relax reflexively. This is a protective mechanism which allows the muscle to stretch through relaxation as the Golgi tendon organ nullifies or overrides the signals of the muscle spindle. This allow muscles to lengthen and stretch with minimal chance of injury when stretching positions are held for at least 6 seconds and preferably for 15 to 30 seconds (David, Michael and Frank, 2003).

ACSM (2000) stated the guidelines for safe and effective static stretching as follows; warm up for a few minutes before stretching by walking, slow jogging, doing light calisthemics 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 the work out; this produces

the greatest benefit 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.

Daniel, Michael and Frank (2003) submitted that young people are more flexible than adults because tendons lose their elasticity with age. Inactivity may play a greater role than the aging process in the loss of flexibility because muscles and other soft tissues lose elasticity when not used. On gender (Esan, 2019; Robergs, 1997) observed that women tend to be more flexible than men because the hormones that permit women`s tissues to stretch during the child birth process facilitates all body stretching. Decoster *et al* (2005) opined that in general, stretching training allows flexibility and mobility gains as well as performance enhancement.

Statement of the problem

The participants are not taking part in regular physical activities. They sat for too long in their classrooms for academic work such as, writing notes, listening to their teachers during teaching and learning situations and other curricular activities. These sedentary lifestyles made the participants experience neck pain, upper-back pain, lower back pain and postural defects like scoliosis due to excessive bending when writing notes in their classrooms. These activities are not effective in enhancing range of motion of the shoulder girdle and in preventing the pains caused by the sedentary lifestyles of sitting for long periods which leads to a loss of flexibility and the back pains. Therefore, the need to investigate the effect of static active stretching exercises on the shoulder girdle muscles of adolescents.

Purpose of the study

The purpose of the study is to determine the effect of eight weeks active static stretching programme on the shoulder girdle of Senior Secondary School students.

Research Hypotheses

1. There would be no significant difference in the shoulder girdle 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 shoulder girdle 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 shoulder gridle muscle of male and female Secondary School students after eight weeks of active static stretching training programme.

Materials and Methods

The participants of this study consisted of apparently healthy adolescents (21 males and 19 females) of BakareDisu Memorial High School, Agege, Lagos. The participants age range from 12 – 18 years. The participants were selected through a simple random

sampling technique and 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. All participants were asked to sign the consent form and brief explanation about the protocol was given. After signing the consent form, eligible participants participated in the study. The participants took part in the pre and post-training measurements. The participants were exposed to the following active stretching shoulder girdle exercises for eight weeks: shoulder stretch, shoulder hyperextension stretch and shoulder rotation 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 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. 5 minutes of warm-up exercises, 30 minutes for the active static stretching and 5 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	5 mins	8-12 Reps max	4	4 mins	2
	Stretching exercises	20 mins				
3-8	Warm-up	5 mins	8-12 Reps max	4	4 mins	2
	Stretching exercises	30 mins				
	Cool down	5 mins				

Exercise Protocol

Shoulder Stretch

Place the right hand behind the neck. Grasp the right arm above the elbow with the left hand. Gently pull the elbow backwards. Hold for 15 to 30 seconds. Repeat the exercise with the opposite arm.

Shoulder Hyperextension Stretch

In twos, grasp your partner arms from behind by the wrist and slowly push them upward. Hold the final position for 15 to30 seconds. Repeat the exercise with the opposite arm.

Shoulder Rotation Stretch
With the aid of wood stick, place the stick behind the back and grasp the two ends using a reverse (thumb up) grip. Slowly bring the stick over the head, keeping the elbows straight. Repeat the exercise several times. For additional stretch, the hands are brought closer together.
Sources:

(1) David, Michael and Frank, (2003). Wellness Concept and Application. 137-138.
(2) WernerHoeger and Sharon Hoeger, (2007). Life Time Physical Fitness and Wellness. Pp. 236-25.

Post Experimental Measures
The shoulder Flexion test was carried out after the eight weeks static stretching training programme in the school hall. The participants warmed up for 5 minutes before the test was administered. After the warming up exercises, they were asked to assume a prone position with the arms fully extended with the chin in contact with floor throughout the exercise. Participants grasp the straight edge with both hands and raise it as high as possible from the floor against the measuring scale. The distance from the floor to the straight edge is measured as the height in centimeters. This assessment is carried out three times and the best height out of the three measurements 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 and ANCOVA was used to test for differences in Pre and Post-test measures of static active stretching of the shoulder girdle muscles of the participants. Level of significant was set at 0.05 alpha.

Results
Demographic data for male and female participants
Table 2: Demographic Data of Participants

Variables	N	Mean	SD
Age (years)	40	14.98	1.21
Height (cm)	40	155.45	0.61
Weight (kg)	40	44.66	5.28

Table 2 shows that the participants had a mean age of 14.98years, the participants had a mean height of 155.45cm and a mean weight of 44.66kg.

Hypothesis 1
There would be no significant difference in the shoulder girdle muscles of male Senior Secondary School students after eight weeks of active static stretching training programme.

Table 3: t-test showing the effect of active static stretching exercises on shoulder girdle flexibility of male adolescents in Bakare Disu Memorial High School, Agege, Lagos.

Variable	Measures	N	Mean	SD	Df	t	P
Pretest	1	21	44.29	8.96			
Posttest	2	21	51.52	6.67	20	11.451*	0.000

p<0.05

Measures: Pretest 1
Posttest 2

Table 3 shows that eight weeks of active static stretching exercises had significant effect on the shoulder girdle flexibility of male adolescents in Bakare Disu Memorial High School, Agege, Lagos. (t=11.451, df =20, p<0.05). Therefore, the null hypothesis is rejected. The effect of eight weeks active static stretching exercises on the shoulder girdle flexibility of male adolescents is further depicted in figure 1.

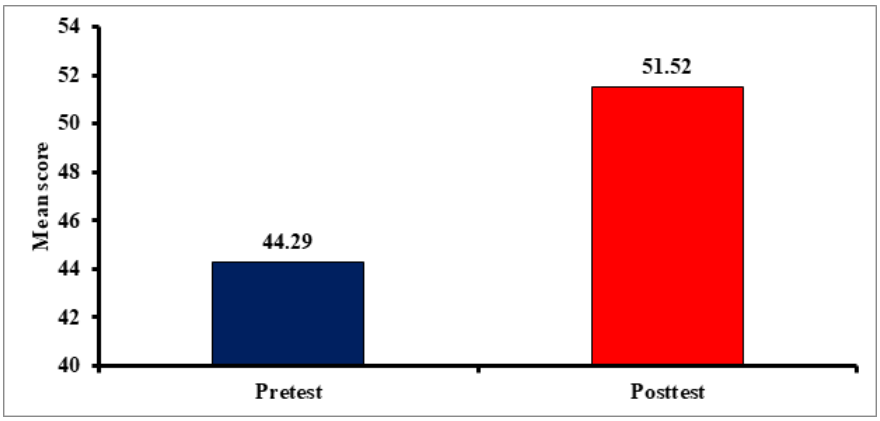

Figure 1: Effects of active static stretching exercises on shoulder girdle flexibility of male adolescents in BakareDisu Memorial High School, Agege, Lagos.

Hypothesis 2
There would be no significant difference in the shoulder girdle muscles of female Senior Secondary School students after eight weeks of active static stretching exercises training programme.

Table 4: t-test showing the effect of active static stretching exercises on shoulder girdle flexibility of female adolescents in Bakare Disu Memorial High School, Agege, Lagos.

Variable	Measures	N	Mean	SD	df	t	P
Pretest	1	19	40.26	4.57			
Posttest	2	19	49.37	3.92	18	14.141*	0.000

*p<0.05

Measures: Pretest 1
Posttest 2

Table 4 shows that eight weeks of active static stretching exercises had significant effect on the shoulder girdle flexibility of female adolescents in BakareDisu Memorial High School, Agege, Lagos (t=14.141, df=18, p<0.05). Therefore, the null hypothesis is rejected. The effect of eight weeks active static stretching exercises on the shoulder girdle flexibility of female adolescents is further depicted in figure 2

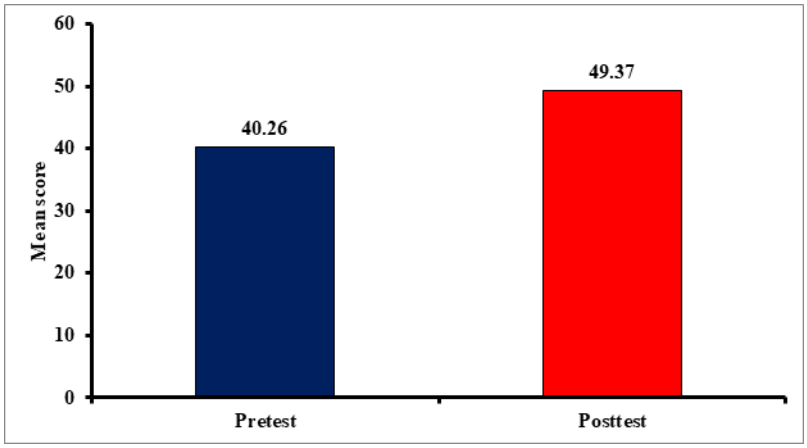

Figure 2: Effect of active static stretching exercises on shoulder girdle flexibility of female adolescents in Bakare Disu Memorial High School, Agege, Lagos.

Hypothesis 3

There would be no significant difference in the shoulder gridle muscle of male and female Secondary School students after eight weeks of active static stretching exercises training programme.

Table 5: ANCOVA showing the effect of eight weeks active static stretching exercises on shoulder girdle flexibility of male and female adolescents

Source	SS	df	MS	F	P
Corrected Model	1061.895	2	530.947	130.875	.000
Covariate(Pretest)	1015.554	1	1015.554	250.328	.000
Sex	4.854	1	4.854	1.197	.281
Error	150.105	37	4.057		
Total	10222.000	40			
Corrected Total	1212.000	39			

p>0.05

Table 5 shows that there is no significant difference between the shoulder girdle flexibility of male and female adolescents in Bakare Disu Memorial High School, Agege, Lagos after eight weeks of active static stretching exercises (F1.37 = 1.197, p>0.05). Therefore, the null hypothesis is not rejected. Shoulder girdle flexibility of male and female adolescents before and after eight weeks of active static stretching exercises is further depicted in figure 3.

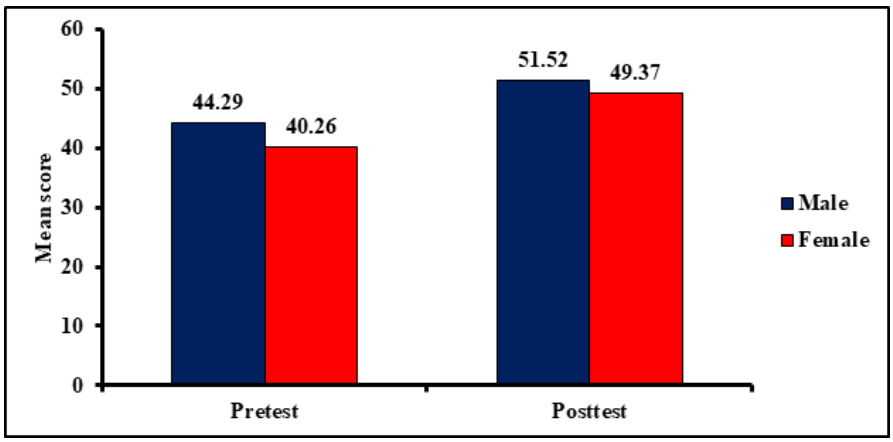

Figure 3: Effect of active static stretching exercises on shoulder girdle flexibility of male and female adolescents in Bakare Disu Memorial High School, Agege, Lagos.

Discussion

Tables 3, 4 and 5 show the analysis of t-test and Analysis of Covariance (ANCOVA) of the participants on active static stretching. The analysis of the t-test result shows there was significant effect in the pre and posttest shoulder girdle flexibility of male and female adolescents. The comparative effect of the training programme on the shoulder girdle flexibility of the participants shows no significant difference. Based on the findings of this study, the hypothesis which states there would be no significant difference in the active static stretching of the male shoulder girdle flexibility after eight weeks of training programme is rejected. Likewise, the hypothesis on the female shoulder girdle flexibility

is rejected. The hypothesis comparing the effect of the active static stretching on the shoulder girdle of the participants after eight weeks of the training programme is not rejected. The significant difference observed in male and female participants relatively was due to the effect of the active static stretching training programme based on gender. This is in line with the findings of (Esan, Daramola and Onwume, 2019; Ben, 2010; Ylien, 2009; Law, 2009 and Halbertsma, 1994) observed that static stretching increased Range of Motion (ROM).

The active static stretching exercises have no significant effect on the interaction effect of static training exercises on the shoulder girdle of the participants because they are within the same age bracket 12-18 years. At this age bracket, the muscles of the male and female participants are highly flexible at the shoulder girdle, no muscle stiffness, their muscles have higher stretch tolerance, normal flexibility and their tendons have not lost their elasticity (Esan, 2019; ACSM, 1998; Magnusson, 1998). Their age bracket is favored in terms of flexibility age-wise, the range of motion for most movements decline in the mid-twenties for men and women (ACSM, 1998). Also, the insignificant difference between the male and female participants in the experimental group was owing to the interaction effect of treatment between the groups. The effect of treatment used is the same for the experimental groups. This was corroborated by (Descheues and Kraemer, 2002) that the insignificant difference in the variables was owing to the effect of the active static stretching whereby the exercise stimulus is the same.

Conclusion and Recommendations

The findings of this study showed that eight weeks active static stretching exercises enhances flexibility of the shoulder girdle muscles of Adolescents, thereby increasing range of motion (ROM) at the shoulder girdle of the participants. Based on the findings of this study, it is recommended that further research should be carried out on the effect of passive static stretching on the shoulder girdle of Adolescents. Adolescents should participate in Active static stretching exercises 2 to 3 times in a week to promote their quality of life and sustainable active living.

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References

Alter, M. J. (1996). *Science of flexibility*, Champaign, III: Human Kinetics.

American College of Sports Medicine (1998). Positional stand on the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness and flexibility in adults. *Medicine and Science in Sports and Exercise*. 30(6), 975-991

American College of Sports Medicine (2000). *ACSM`s guidelines for exercise testing and prescription (6th ed.),* Philadelphia: Lippincott Williams and Wilkins.

Ben, M., & Harvey, L. A. (2010). Regular stretch does not increase muscle extensibility, a randomized controlled trial, *Scandinavian Journal of Medicine and Science in Sports*. 20(1), 136-144.

Chan, S. P., Hong, Y., & Robinson, P. D. (2001). Flexibility and passive resistance of the hamstrings of young adults using two different static stretching protocols, *Scandinavian journal of medicine and science in sports*. 11(2), 81-86.

David, J. A., Michael, H. H., & Frank, D. R. (2003). *Wellness: Care and applications. (5th ed),* McGrow-Hill Higher Education.

Decoster, L. C., Cleland, J., Altieri, C. & Russell, P. (2005). The effects of hamstring stretching on range of motion: A systematic literature review, *Journal of Orthopaedic Sports Physical Therapy*. 35(6), 377 – 87.

Deschenes, M. R. & Kraemer, W. J. (2002). Performance and physiologic adaptation to resistance training., *American Journal of Physical Medicine & Rehabilitation,* 81, 53 – 76.

Esan, J. A., Daramola, M. T., & Onwume, F. C. (2019). Effects of active static stretching on the Hip Flexor muscles of adolescents, *Education & Science Journal of Policy Review and Curriculum Development*. 9(2). 222-231.

Halbertsma, J. P., & Goeken, L. N. (1994). Stretching exercises: effect on passive extensibility and stiffness in short hamstrings of healthy subjects, *Archives of Physical Medicine and Rehabilitation.* 75(9), 976-978.

Koshi, R. (2017). *Cunninghann`s manual of practical anatomy, Upper and Lower limbs. (6th ed.*) Oxford University Press.

Law, R. Y., Harvey, L. A., Nicholas, M. K., Tonkin, L., De Souza, M., & Finniss, D. G. (2009). Stretch exercises increases tolerance to stretch in patients with chronic musculoskeletal pain: a randomized controlled trial, *Physical Therapy*. 89(10), 106-1026.

Magnusson, S. P. (2007). Passive properties of human skeletal muscle during stretch maneuvers, *Scandinavian Journal of Medicine and Science in Sports* 8(2). 2017.

Robergs, R. A., & Roberts, S. O. (1997). *Exercise physiology* St. Louis: Mosby.

Werner, W. K. H & Sharon, A. H (2007). Life time physical fitness and wellness, Thomson Learning Inc.

William, E. P. (2003). *Rehabilitation techniques for sports medicine and athletic training and laboratory manual,* McGraw-Hill Companies, T.H.E.

Ylien, J., Kankainen, T., Kautianen, H., Rezasoltani, A., Kuukanen, T., & Hakkinen. (2009). Effect of stretching on hamstring muscle compliance, *Journal of Rehabilitation Medicine*. *41*(1), 80-84.