Study of Flexibility, Agility and Reaction Time in Circus Artists

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Research Article

Abstract: Do circus artists have better flexibility and agility than general population? The study was carried out in 30 Circus Artists and 30 age matched controls. Flexibility was assessed using Sit and reach test and Shoulder and Wrist Elevation test; Agility using Burpee's squat test, Side step test, Shuttle Run test and Reaction time using Reaction time apparatus.Data was analyzed using Unpaired T Test. It was observed that flexibility, agility were significantly more and reaction time was significantly less in Circus Artists as compared to their age matched controls. If the children are picked at a younger age and trained properly their inherent capabilities can be developed in a fruitful way. Thus **"Catch them Young"** should be our aim.

Key words: Flexibility, Agility, Reaction time, Circus Artists

Introduction: The poor performance of Indian athletes and sportsmen at the International competition has been of great concern especially to coaches, physical educationist and sports scientists. Efforts have been made to improve the standards of our sportsmen since long, however little success has so far been achieved in this respect.

Normally a person starts taking part in a game or event without proper guidance. A scientific criterion of selection is rarely a basis for such selection process. It is thus a sheer chance that his choice of the sport may be suitable to his inherent capabilities. Therefore the failure to become a champion in most of the cases is inevitable. Thus there is an urgent need to search those who are endowed with such natural talent which forms the basis of performance in a game[1].

Hence in view of above, this study, "**Study of Flexibility, Agility and Reaction Time in Circus Artists**" is undertaken which will scientifically contribute in selection and training of potential sportspersons and will be the foundation for future studies in this regard.

Aims and Objective:

1. To study flexibility and agility in circus artists.
2. To determine whole body reaction time of circus artists.
3. To compare the results obtained with age and sex matched controls.
4. To give suggestions, if any.

Materials and Methods:

The present study was carried out in the Department of Exercise and Sports Physiology, at

 Dr. Vaishampayan Memorial Govt. Medical College, Solapur (Maharashtra).

The study was carried out in 30 circus artists (15 males and 15 females) performing various motor skills.

The control group was consisted of 30 age and sex matched students of Dr.V.M.Govt.Medical College, Solapur, which included undergraduate students, interns and residents.

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Exclusion Criteria

The following circus artists were excluded from the present study:

1. Who had a past history of major respiratory or cardiovascular illness.
2. Who were injured while performing various motor skills.

Following physiological parameters were assessed in the study and control groups.

A) FLEXIBILITY:

"Flexibility is the ability of an individual to move the body and its parts through as wide a range of motion as possible without undue strain to the articulations and muscle attachments"[2].

Flexibility provides higher degree of freedom and ease of movement and gives greater safety from injury.

a)   Modified sit and reach test :

This test is used to measure the development of hip and back flexion as well as extension of the hamstring muscles of the legs.

A measuring tape was stuck on floor and a line perpendicular to the tape at 15 inches was marked on the floor. After sufficient warm-up, the subject was asked to sit down and line up his heels with the near edge of perpendicular line with the tape in between the two heels and slide his seat back beyond the zero end of the tape. An assistant stood and braced his toes against the subject's heels as he stretched forward so that his heels should not slip over the perpendicular line. Also, two assistants held subject's knees in locked position. Then, the subject was asked to stretch forwards slowly and steadily without jerks, keeping his knees locked and heels not more than 5 inches apart and to touch the fingertips of both hands as many inches down the stick as possible[2]. The best of three trials measured to the nearest quarter of an inch was the test score of the subject.

b)   Shoulder and Wrist elevation test :

This test is used to develop shoulder and wrist flexibility.

Since it is difficult to elevate the shoulders in this test without extending the wrists, the movements of these two joints are combined for the score.

Subject is asked to assume a prone (facedown) position with the arms straight and to grasp a yardstick about shoulder width apart and then asked to raise the stick upward as high as possible while keeping the chin on the floor and elbows straight. As the subject raises his hands and reaches the highest point, an assistant in front of the subject measures the distance from floor and the midpoint between the two hands of the subject.

This distance is subtracted from the arm length of the subject which is measured from acromian process to the middle fingertip (as the arm hangs down).

B) AGILITY:

"Agility is defined as the physical ability which enables an individual to rapidly change body position and direction in a precise manner"[2]

a)   Burpee's Test (or Squat Thrust):

The objective was to measure the rapidity by which body position can be changed. Equipment needed for this test was stop watch.

From a standing position, the subject was asked to bend at the knees and waist and place the hands on the floor in front of the feet. Then, he was asked to thrust his legs backwards to a front leaning rest position and then to return to the squat position and finally to rise to a standing position.

From the signal "GO" the subject was asked to repeat this movement as rapidly as possible until the command "STOP" was given. The test was scored in terms of number of parts executed in 10 seconds. Squatting and placing the hands on one floor was **one** part, thrusting

the legs to the rear was **two**, returning to the squat rest position was **three** and returning to the standing position was **fourth**.
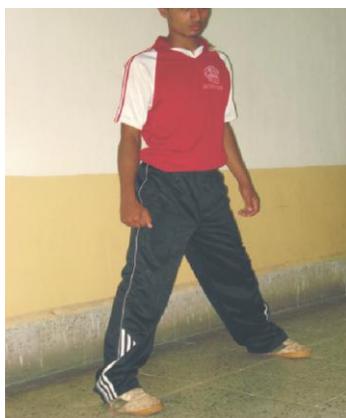
The correct number of repetitions executed by the subject in 10 seconds were recorded.

b) Shuttle run test:

This test was measured to measure the agility in running and changing direction. The equipment required for

this test was a measuring tape and a stop watch.

Starting and finishing lines were marked with a distance of 30 feet in between them. The subject was asked to start from behind the starting line on a signal "Go" and stopwatch was started at this moment. Then the subject was asked to run the finishing line and then to return the starting line.

The subject was asked to repeat the process and when he crossed starting line, stopwatch was stopped and time in seconds was noted.

Two trials of this test were taken with rest in between them and the shortest time for completing the test was recorded as the subject's score.

c) Side Step Test :

A horizontal line of 4 feet was marked on the floor which was divided into 2 equal parts with center line. A 1-foot tick mark should be placed between the center line and each outside line.

From the standing position, the subject was asked to astride the center line. The subject side stepped on the order "go" to the right until his foot had touched or crossed the outside line. He then side stepped to the left until his left foot had touched or crossed the outside line to the left. He was asked to repeat these movements as rapidly as possible for 10 sec.

Scoring : Each trip from the center line across a marker counts as one. For example, moving to the right the performer crosses a tick mark for one point, the outside marker for two, back across the tick mark for three, across the center mark for four, across the left tick mark for five,

across the outside marker for six and so on until he hears the signal to stop at the end of 10 Sec[2].

C) REACTION TIME

Speed of movement and quick reactions are prized qualities in sports. Reaction time is one of the factors of great significance in competitive sports, especially in team games.

    i)   Reaction time proper : It is defined as the interval of time between the presentation of the stimulus and the initiation of response.

    ii)   Movement time : It starts where reaction times ends. It is the time that elapses between the beginning of a movement and its completion.

    iii)   Response time : It is the total time that elapses from the onset of the stimulus until the act is completed. It is a combination of reaction time and movement time.

a)   Whole Body Reaction Time :

The whole body reaction time apparatus was used for determining the time taken by the subject to move his body in various directions in response to visual stimuli.

The apparatus is designed by Anand Agencies, Pune and it consists of following parts:

- A display box with arrows in four directions (Up, Down, Left and Right). The arrow will blink when appropriate switch is pressed.
- Stepping boxes in four directions placed a step away from the center stepping box on which the subject stands.
- Two digital chronoscopes which will measure time in seconds.

After familiarizing the subject with the instrument and after repeated practice, the subject was asked to move a step immediately in response to blinking of the arrow on the display box in appropriate direction from the central stepping box on which the subject was standing.

The time taken to lift the leg in response to stimulus and the time taken to keep the leg in appropriate direction was measured with the help of digital chronoscopes. Thus time taken by the subject to initiate an action and to complete the action was found out. The time between the onset of stimulus and to initiate the action was reaction time proper and the total time from the onset of the stimulus to completion of the action was the response time. The difference between the reaction time proper and response time was the movement time. In this way reaction time proper, movement time and response time for all four directions were found out[3].

RESULTS:

Table No. 1

A) <u>FLEXIBILITY:</u>

Parameter	Circus Artists (Mean±SD	Controls (Mean±SD)	P Values	Significance
Modified sit and reach (cm)	23.75 ±4.45**	18.23 ±1.91	<0.01	HS
Shoulder and Wrist elevation test	13.8±1.53	11.6±1.82	p<0.05	S

S-Significant; HS-Highly Significant; NS-Not Significant

Table No.2

B) <u>AGILITY:</u>

Parameter	Circus Artists (Mean±SD	Controls (Mean±SD)	P Values	Significance
Burpee's Squat (no.)	17.38 ± 2.02*	14.46 ± 2.82	p<0.001	HS
Side Step (no.)	15.46 ± 2.01*	14.53 ± 1.94	p<0.01	HS
Shuttle run (sec.)	12 ± 1.44*	12.92 ± 2.25	<0.01	HS

S-Significant; HS-Highly Significant; NS-Not Significant.
** Advanced Intermediate   * Intermediate (According toJohnson and Nelson gradation of flexibility and agility

Table No.3

C) <u>REACTION TIME:</u> Whole body reaction time

		Controls	Circus Artists	Z VALUE	P VALUE	S/NS
REACTION TIME	FRONT	0.410+0.09	0.338+0.09	3.75	<0.01	S
	BACK	0.510+0.07	0.294+0.10	11.85	<0.01	S
	RIGHT	0.422+0.06	0.302+0.11	6.27	<0.01	S
	LEFT	0.432+0.1	0.322+0.10	5.20	<0.01	S
MOVEMENT TIME	FRONT	0.306+0.17	0.250+0.08	2.03	0.05	S
	BACK	0.350+0.20	0.266+0.08	2.71	<0.01	S
	RIGHT	0.432+0.13	0.222+0.08	8.99	<0.01	S
	LEFT	0.354+0.17	0.250+0.11	3.54	<0.01	S
RESPONSE TIME	FRONT	0.762+0.15	0.588+0.11	6.29	<0.01	S
	BACK	0.916+0.12	0.538+0.14	13.70	<0.01	S
	RIGHT	0.776+0.15	0.524+0.16	7.79	<0.01	S
	LEFT	0.764+0.15	0.572+0.16	6.03	<0.01	S

Discussion:

A) Flexibility:

Flexibility is the ability of an individual to move the body and its parts through as wide a range of motion as possible without undue strain to the articulations and muscle attachments[1].

Flexibility provides another dimension in performance that allows a higher degree of freedom and ease of movement coupled with some important implications for greater safety from injury.

Flexibility of certain joints does not necessarily indicate flexibility in other joints and there is no general flexibility test for total body flexibility. Flexibility is specific for a given joint and to a particular sport.[4]

We had used modified sit and reach test to assess flexibility of trunk and Shoulder and Wrist elevation test to assess shoulder and wrist flexibility. In our study mean trunk flexibility of Circus Artists was 23.75 " and that of controls 18.23 " and the difference was found to be statistically highly significant (P<0.01)

Shoulder and wrist flexibility of Circus Artists was 13.8" and that of controls 11.6" and the difference was found to be statistically significant (P<0.05)

B) AGILITY:

Agility the ability of an individual to rapidly change body position and direction in a precise manner.

In our study, we used Burpee test (Squat thrust), Shuttle run, Side step and for testing agility in Circus Artists and controls.

a)Burpee Test (squat thrust) :- In our study, mean score for Burpee test in Circus Artists was 17.38 and for controls it was 14.46 and the difference was statistically highly significant (P<0.001)

b) Side step Test :- In our study, mean score for side step was 15.46 and 14.53 for Circus Artists and controls respectively. The

difference between these was found to be statistically highly significant (P<0.01)

c) Shuttle run Test: In our study, mean score for Shuttle run Test was 12 and 12.92 for Circus Artists and controls respectively. The difference between these was found to be statistically highly significant (P<0.01)

C) REACTION TIME:

Whole body reaction time :- In whole body reaction time, we observed that there was highly significant decrease in reaction time for right, left and back direction between Circus Artists and controls. (P<0.01). We also oserved that there is a statistically significant difference between movement time and response time.

Children in circus watch senior artist performing motor skills and start practicing the motor abilities from a tender age. Thus flexibility, agility, motor co-ordination and reaction time are well developed in them. These artists if scientifically trained from the young age could represent in sports like gymnastics and judo karate which require better flexibility, agility and motor co-ordination.

CONCLUSION:

The circus artists had better values for flexibility and agility as compared to the controls because they start practicing motor skills from a very early age of 4-5 years. Also values of whole body reaction time show statistically significant differences in circus artists as compared to controls.

SUGGESTIONS:

In India there are many TRIBES who earn their livelihood by performing motor skills. Their children follow their parents. If these children are picked at a younger age and trained properly their inherent capabilities can be developed in a fruitful way. Selection of talent in this way will reduce the time and energy of the coaches and athletes in a more effective manner. Thus **"Catch them Young"** should be our aim.

Annexure 1:

Sit and Reach Test	
Men	**Level**
23 ¾" -Above	Advanced
21 $^{3/4}$ 23 $^{1/2}$"	Adv. Intermediate
18 $^{3/4}$ 21"	Intermediate
17-18 1/2"	Adv. Beginner
Below 16 ¾"	Beginner

Annexure 2:

Raw Score Norms for Burpee (Squat Thrust) tests	
College Men	**Level**
Scores	**Performance Category**
34 - Above	Advanced
29-33	Adv. Intermediate
17-28	Intermediate
16-Dec	Adv. Beginner
0-11	Beginner

Annexure 3:

Raw Score Norms for Side Step Test	
College Men	**Level**
Scores	**Performance Category**
30 - Above	Advanced
26 - 29	Adv. Intermediate
16 - 25	Intermediate
.12 - 15	Adv. Beginner
0 – 11	Beginner

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