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Measurement of Normative Fitness Data among Adolescent Male Sub-Elite Mallakhamb Players

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Research Paper

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ABSTRACT

Background and Purpose: Mallakhamb an art, is a combination of Yoga, Gymnastics, and Martial Arts. The purpose of this study was to find the normative fitness data in sub elite adolescent Mallakhamb players in Mumbai and establish its correlation across the parameters.

Methodology: A total of 50 male adolescent Mallakhamb athletes in the age 12 to 18 years were screened as per the selection criteria. Their normative physical fitness data was assessed using Shoulder flexibility test, Sit and reach test, Push-up test, Single leg squat test, Hanging pike test, Handstand test, Flamingo test, Y balance test, Seated medicine ball throw test, Single leg triple hop test and body composition.

Results: It showed that mallakhamb athletes exhibited lower limb strength, static and dynamic balance and upper limb power were excellent and upper limb flexibility, strength were good, however core strength, upper limb balance were poor. Significant correlation was seen among SRT and HPT, SRT and FT; PUT and SMBTT4,

SMBTT2, HPT and HST. [1]

Conclusion: The study concludes that mallakhamb athletes need to emphasize on core and upper limb strength, upper limb balance to improve their athletic performance.

1. INTRODUCTION

Mallakhamb an art, is a combination of Yoga, Gymnastics, and Martial Arts. The terms malla which denotes a wrestler and khamba which means a pole forms 'Mallakhamb' and can therefore be translated to as "pole gymnastics". [1] "The mother sport of ancient India" is how it is regarded. The oldest and most scientific method of enhancing the body's speed, agility, suppleness, and health is mallakhamb. [2]

The origin of this ancient Indian sport can be traced to an earlier part of the 12th century. A mention of wrestlers exercising on wooden poles is found in the Manasholes, written by Chalukya in 1153 A.D, revived late in the 19th century by Balambhatta Dada Deodhar. Since 1981, different state associations of Mallakhamb affiliated to Mallakhamb Federation of India are organizing the National Mallakhamb championships in different age groups of boys, girls, men, and women. [2] There are different types of Mallakhamb: pole, rope, hanging, niradhar (without support), on a cane, on a floating platform, Mallakhamb with weapons, etc. [2] The player mounts over the pole where he performs numerous poses and postures, which cover various awkward twists, turns, hooks, grips, catches, and hanging positions. Besides these, several asana postures and acrobatic feats are also performed. A player performs a 90-second routine packed with intricate skill combinations as a panel of three judges assesses each competitor's speed, grace, and difficulty. This sport therefore demands a combination of flexibility, strength, agility, suppleness of body, concentration, quickness of reflexes, coordination of different muscles from the performers during training and competition.[5],[6],[7]

Physical fitness consists of both health-related and sports-related components. Athleticism in Mallakhamb players includes, body composition, muscle strength, power, flexibility, and balance. Body Composition measures the relative percentage of mass that is fat and fat free tissue. Strength is the muscles' ability to exert a maximum force on one occasion. Strength plays a vital role in this sport as the poses involve holding body weight as well as transitioning from 1 pose to another on extremities against

[1] SRT – Sit and reach Test, HPT – Hanging Pike Test, FT – Flamingo Test, PUT – Pushup Test, SMBTT – Seated Medicine Ball Throw Test, HST – Hand Stand Test.

gravity. Muscular endurance is the muscles' ability to continue to perform successfully against a sub maximal load. [8],[9]

ACSM has coined the terms 'muscular strength', 'muscular endurance' and 'muscular power' into one category termed 'Muscular fitness'. It is responsible for improving or maintaining bone mass, muscle mass, glucose tolerance, fat free mass and resting metabolic rate, musculotendinous integrity, which is related to a lower risk of injury.[10] Flexibility is the ability to move a joint through its complete range of motion. Maintaining adequate flexibility in all joints helps prevent injury; whereas if the joint is moved beyond its full range of motion, tissue injury can occur. These athletes require flexibility as the few poses that are performed require full mobility at multiple joints. [10]

Balance is the ability to keep the body's centre of gravity within the base of support when one is maintaining a static position, performing voluntary movements while performing Mallakhamb. Static balance is the ability to maintain a centre of gravity within the supporting base while standing or sitting, whereas dynamic balance refers to maintaining an upright posture when the centre of gravity and base of support is moving. [10]

Physical fitness screening concerning the demands in the sport of Mallakhamb can provide us data to identify the fit and the injury-prone amongst the athletes training for Mallakhamb. Without a reliable and valid field test for measuring athletes' physical abilities, fitness evaluation and training are often left to the tradition-driven ways of individual coaches.

With the consistent increase in the popularity of this sport and knowing the complexity and difficulty of the Mallakhamb elements being performed during competition, monitoring athletes' total physical fitness levels is of prime importance to prevent injuries. Therefore, this study aims to provide a baseline data of physical fitness parameters for the mallakhamb sport.

2. MATERIALS

Shoulder flexibility test (SFT) is used to assess shoulder flexibility, Sit and reach test (SRT) for flexibility of the hamstring and lower back, Push up test (PUT) for endurance of the upper body musculature, Hanging pike test (HPT) for abdominal strength, hip flexor strength, and flexibility as well as grip strength, Single leg squat test (SLST) for strength of the lower body, particularly the quadriceps and gluteal muscle groups and the hip stabilizer muscle, Handstand test (HST) for shoulder and upper extremity strength and balance, Flamingo test (FT) for ability to balance successfully on a single leg, Y

balance test (YBT) for physical performance, demonstrate functional symmetry and identify athletes at greater risk for lower extremity injury, Single-Leg Triple hop test (SLTHT) for performance difference between the healthy and affected leg, Seated medicine ball throw (SMBTT) for upper body explosive power, Body Mass Index for body composition and quantify the amount of tissue mass in an individual

3. METHODOLOGY

It is a Descriptive study on 50 male Mallakhamb players of age group 12 to 18 years of age who regularly practice Mallakhamb 3 days /week for at least 2 hours/ session for minimum of 1 year and competing for pole mallakhamb at district levels and above. The study excluded players with musculoskeletal pathology, history of, current systemic illness and lack of informed assent given by the subject or by parents/ legal Guardian. The Clinical Trial Registry of India Registration no.: CTRI/2021/12/039043.

4. PROCEDURE

The study commenced following approval by the Institutional Ethics Review Committee of Nanavati Max Super Speciality Hospital. 10 Mallakhamb academies of Mumbai were approached, subjects were selected from 7 academies. Permission was taken from the head of those academies to carry out the assessment in their setup. Then, subjects were selected based on selection criteria through convenience sampling method. Written informed consent was obtained. All the physical fitness tests were performed in academies to maintain familiarity with the ground and equipment. Subjects were asked to complete their regular coach-directed warm-up routines without regard to the requirements of any particular test. A trial round for each test was conducted.

5. RESULT AND DISCUSSION

A total of 50 male Mallakhamb athletes from 7 different academies participated in this study with a mean age of 15 ± 1.7 years and a mean BMI of 18.36 + 2.47532659 kg/m^2. 18 athletes competed at the district level, 24 of them competed at the state level and 8 of them competed at the national level Mallakhamb competition.

The Mallakhamb athletes presented with superior dynamic balance in lower limb 160.08% (Right) and 158.52% (Left); followed by 96.93% of power in lower limb with a mean of 72.6 ± 11.08 points on both legs. Dynamic balance is excellent with mean values of CRD being 160 (± 29.71) % for right and 158.52 (± 28.28) % for left. This can be attributed to 96.8% muscular fitness in lower limb, 77.07%

(Right) and 76.53% (Left) and static balance in lower limb with mean values of flamingo test grades being 3.44 ± 3.78 for right and 3.52 ± 3.56 for left and mean value of 51.66 ± 7.91 cm on sit and reach test demonstrating excellent flexibility in lower limb. Lower limb flexibility showed a positive correlation with core strength.

Whereas the upper extremity fitness tests showed excellent power in upper limb with 70% muscular fitness with a mean grade of 7.24 ± 2.58 points, (4 kg medicine ball) with a mean distance of 293.86 ± 73.03 cm and (2 kg medicine ball) with a mean distance of 365.22 ± 87.97 cm but only 60% of flexibility with a mean of 6.14 ± 1.44 points out of 10 and 12.2% balance in upper limb by the handstand grades with an average of 1.22 ± 0.82. This can be attributed to the poor core strength of 13.6% observed in the athletes with a mean grade of 1.36 ± 1.12 points. There is a positive correlation between upper limb balance and the core strength, these findings are consistent with a study by Aashima et al. [25] where core strengthening exercises enhanced flexibility.

Compared to other sports, Mallakhamb requires greater flexibility in both upper and lower extremity. Gross and Worrell [26] emphasized the importance of flexibility enhancement and reported that enhanced flexibility has a greater effect on the range of motion and decreases the risk of musculoskeletal injuries.

In a study on circus acrobats by Carlie Huberman et al. [24], upper limb strength is required to maintain poses on upper extremity, which could be compromised in case of hypermobility, which makes an athlete prone to injury. A positive correlation is seen in upper limb strength and power in mallakhamb players.

The Mallakhamb athletes exhibited poor body mass index, core strength and upper limb balance; good upper limb flexibility and upper limb strength; whereas strength, static, dynamic balance, power of lower limb and upper limb power were excellent.

Components	Mean	Standard Deviation
Height (cm)	158.6	10.60
Weight (kg)	46.672	46.672
Shoulder flexibility test Grade	6.14	1.44
Sit and reach (cm)	51.66	7.91
Push up test grade	7.24	2.58
Single leg squat test-Right Grade	72.6	11.08
Single leg squat test- Left Grade	72.6	11.08
Hanging pike test grade	1.36	1.12

Handstand test grade	1.22	0.82
Flamingo test-Right	3.44	3.78
Flamingo test- Left	3.52	3.56
Composite reach distance-Right (cm)	160.08	29.71
Composite reach distance-Left (cm)	158.52	28.28
Seated medicine ball throw test-4 kg (cm)	293.86	73.03
Seated medicine ball throw test- 2 kg (cm)	365.22	87.97
Limb Symmetry Index (%)	96.93	7.43
Body Mass Index (kg/m^2)	18.36	2.48

6. CONCLUSION

Normative data for the physical fitness components in Mallakhamb athletes can be used to guide medical professionals in the screening, evaluation, and treatment of this specialized athletic population. Utilizing baseline measures of the general population may not sufficiently prepare a Mallakhamb athlete for return to sport and may lead to an increased risk of injury/re-injury in this population. There is a positive correlation between lower limb flexibility and core strength; upper limb strength and power; and upper limb balance and core strength. Future studies should utilize this normative data for creating injury prevention screening tools and specifically assessing the factors that lead to injuries.

7. LIMITATIONS TO THE STUDY

Correlation between the physical fitness outcome measures and injuries was not evaluated.

8. FUTURE SCOPE OF STUDY

- To evaluate the relationship between physical fitness and injuries in this population and thus evaluate factors that make a Mallakhamb athlete prone to injury.
- To evaluate progress following an exercise prescription specific to the poor outcome measures and their long-term monitoring.
- To include functional training in their exercise regime to focus on each physical fitness parameter.

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