Comparison of Fitness of Skeletal Muscles in School Children of Urban and Rural Population

Authors
Dr Umakant Satapathy¹, Dr Niharika Panda², Dr. Sulata Mohapatra³

¹Associate Professor Physiology, Joint Director, Medical Education &Training, Odisha, India
²Associate Professor, Department of Radiotherapy, AHRCC, Cuttack, Odisha
³Associate Professor, Department of Physiology, VIMSAR, Burla, Odisha

Email: drsulatamohapatra@gmail.com  Mob No. +91 9437167990

Corresponding Author
Dr. Niharika Panda
N-3/462, IRC Village, Nayapalli, Bhubaneswar, Odisha, India 751015
Email: uksatapathy@yahoo.co.uk Mobile Number: 91-9437410842

ABSTRACT
Muscular fitness is one of the important parameter for assessing the physical fitness. Poor physical fitness attributes to different diseases like diabetes mellitus, hypertension, coronary artery disease and different cancers. The present study is aimed to determine the minimum muscular fitness of urban and rural school children by comparing the strength as well as flexibility of muscle. Two hundred school going boys (100 from urban and 100 from rural population) of age 11-14 years were taken for study. Kraus Weber test which is one of the best methods to assess the minimal fitness of a skeletal muscle is employed for assessment of muscle strength and flexibility. It is observed that rural group had more minimum muscle strength as compared to urban (rural 96% urban 88%) and also more flexibility (rural 88% urban 76%). The probable cause could be the sedentary life style in urban population due to advanced modernisation e.g. more TV, laptops and smart phones giving more pleasure rather than the outdoor games in school going boys. A further study taking a larger group can throw more light on the scenario of muscle strength and flexibility in rural and urban populations.

Keywords- Muscle Strength, Flexibility, Kraus-Weber test, Physical fitness, Rural & Urban school going children

Introduction
Muscular fitness is one of the important parameter for assessing the physical fitness. Poor physical fitness attributes to different diseases like diabetes mellitus, hypertension, coronary artery disease and different cancers. The different disorders of the vital systems like the respiratory system and the cardiovascular system as well as the other systems of human body can be prevented or controlled by maintaining a good physical fitness. Apart from the prevention of disorders of systems it also provides a level of mental wellbeing, emotionally balanced and less stressed conditions. The most common way of testing the fitness of a muscle is to test the strength of the muscle. Kraus Weber test is one of the best methods to assess the minimal fitness of a skeletal muscle. Muscular strength refers to the
The examiner while holding the chest down asks to raise legs without bending knees, and maintain for 10 seconds (for lower back muscles). Test – VI – The student stands erect with hands on his side and feet together. The examiner asks to bend down and touch the floor with fingers but without bending at knees and maintains for 10 seconds (for flexibility of back and hamstring muscles). The steps I to V of the Kraus-Weber test indicate the strength of the muscles where as the step VI indicates the flexibility around the joints. The observation was recorded as success or failure to perform the test. Statistical analysis was done by using the student’s t-test and chi Square test by using the Microsoft Excel.

Results
The comparison of age, height, weight and the BMI are placed in Table No.1.

**Table No 1** Comparison of age, height, weight and the BMI.

| Parameters       | Urban (100) | Rural (100) | P value |
|------------------|-------------|-------------|---------|
| Age (Completed years) |             |             |         |
| 11               | 25          | 25          |         |
| 12               | 25          | 25          |         |
| 13               | 25          | 25          |         |
| 14               | 25          | 25          |         |
| Mean Height      | 142.78±8.82 | 140.52±11.61| >0.05   |
| Mean Weight      | 42.62±11.23 | 31.85±8.92  | <0.05   |
| BMI              | 20.95±4.31  | 14.98±2.42  | <0.05   |

The result of different steps of Kraus-Weber test are shown in Table No. 2.

**Table. No 2** Comparison of result of different steps of the Kraus-Weber test for strength and flexibility.

| Steps | Urban | Rural | P value |
|-------|-------|-------|---------|
|       | Success | Failure | Success | Failure |         |
| I     | 92(92%) | 8(8%)   | 94(94%) | 6(6%)   | >0.05   |
| II    | 86(86%) | 14(14%) | 93(93%) | 7(7%)   | >0.05   |
| III   | 84(84%) | 16(16%) | 98(98%) | 2(2%)   | <0.05*  |
| IV    | 94(94%) | 6(6%)   | 98(98%) | 2(2%)   | >0.05   |
| V     | 84(84%) | 16(16%) | 97(97%) | 3(3%)   | <0.05*  |
| VI    | 76(76%) | 24(24%) | 88(88%) | 12(12%) | <0.05*  |

* significant
The comparison of overall strength and flexibility in terms of success in performing test or failure to perform a test is shown in Fig. 1.

**Table No 3 Comparison of overall muscular fitness.**

|        | Urban (100) | Rural (100) | P value |
|--------|-------------|-------------|---------|
| Success | 86%         | 94.67%      | <0.05   |
| Failure | 14%         | 5.33%       | <0.05   |

**Discussion**

The present study is conducted to ascertain the minimum muscular fitness in school going children of age 11 to 14. Singh et al., 2008\(^1\) quoted that physical fitness is an indicator of several components like endurance, flexibility, speed, strength, agility, body composition etc. A physically fit person looks better, feels better, and thinks better and so lives better. Similar studies are also conducted by Ishtiaq A Bhatt et al\(^2\), Kulkarni SD et al\(^3\) and Sambhu Prasad\(^4\). The age height and weight of the present study are similar to the above groups. In urban population 88% had minimum strength of muscles where as in rural population 96 % had minimum muscle strength (p>0.05). Similarly 76% of urban group and 88 % of rural group passed the Kraus-Weber step VI test (p<0.05) showing the flexibility strength. Though in individual tests of strength the rural group had more success rate the difference from urban group was not significant (p>0.05) but the flexibility in rural group is found to be significantly (p<0.05) more than urban group. Similar results are also found in other study groups. Gharote and Ganguly\(^5\) studied on a larger group of 374 school going children and reported a failure in 40.3%. But in his study on 250 children in 2000\(^6\), he observed only 20.8% failure rate. Babalola et al\(^7\) in 2008 studied on 200 school children and observed a failure in 48% of cases. Ishtiaq et al in 2013 had a study on 250 children and reported a 35.8% failure rate where as Kulkarni et al in 2010 observed a failure rate of 28.75%. Kraus H et al in 1953\(^8\) & 1954\(^9\) compared the muscle fitness between American and European children and observed a failure in test in 56.6% of American children. It is evident from the earlier and present study that the failure rate in different steps of Kraus- Weber test is in an increasing trend. This may be attributable to the increased sedentary habits with increased mental activity but less physical activity. One of the reasons of such activity is due to more advancement in information technology leading to more use of computers, smart phones and deriving maximum pleasure from them as compared to outdoor games which has led to decreased physical fitness.

**Conclusion**

Kraus-Weber test is a very simple and cheapest method to screen a community regarding the general muscle fitness. Muscle fitness as well as flexibility is seen more in rural school going male children in comparison to urban. The causative factors for such varied performance is seen is mostly due to difference in life style mostly in the recreation activities which is mostly outdoor type in rural population contrary to indulge in predominantly indoor type of games or physical activities in urban population. Early detection of less muscle strength and flexibility by such screening methods can prevent a predisposition to various organic and metabolic diseases even including cancers by advising proper and timely physical activity. Further study involving a larger group can throw more light in the scenario of muscle fitness and flexibility in school children.
No source of support or grant, declared.
No conflict of interest, declared.

References
1. Singh A, Bains J, Gill J.S. and Brar RS. Essentials of physical education. Kalyani Publishers, 2008; pp.278-282.
2. Ishtiaq Ahmad Bhat, Sakeena Bashir. Comparative study of minimal muscular fitness among rural and urban students of Kashmir. Internat. J. Phy Edu 2013;6(2): 91-94
3. Kulkarni SD, Desai HR, Sharma CS and Bhat PJ. Assessment of muscular fitness in school children using Kraus-Weber tests. Nat J of Integrated Res and Med. 2010; 1 (4) : 30-35.
4. Sambhu Prasad. A survey of minimum muscular strength on school children in Pune district. Int. J of Movement Education and Social Science. 2013; 2(2):60-62.
5. Gharote, ML, Ganguly SK. A survey of minimum muscular fitness of school children. Indian J. Med. Res. 1975; 63 (9):1242-1250.
6. Gharote, ML. Minimum muscular fitness in school children. Indian J Physio & Pharmacol. 2000; 44(4): 479-484.
7. Babola JF, Awolola OE et al. Reliability of Kraus-Weber exercise test as an evaluation tool in low back pain susceptibility among apparently healthy university students. African J for Phy Health Edu Recreation and Dance 2008; 14(2): 188-198.
8. Kraus, H and Hirschland RP Muscular fitness tests and health. J. Health Physical Edu. & Recreation. 1953; 24 (10) :17-19.
9. Kraus, H and Hirschland R. Minimum muscular fitness of the school children. Res. Quarterly. 1954; 25: 178-188.