# COMPARISON OF CORE STRENGTH AND BALANCE IN SPEED SKATERS VS ARTISTIC SKATERS

***KANCHAN MUSMADE[1], PRAJAKTA SAHASRABUDHE[2]***

1. *Intern ,Sancheti Institute College of Physiotherapy, Shivajinagar, Pune, Maharashtra*
2. *Associate Professor, Sancheti Institute College of Physiotherapy, Thube Park, Shivajinagar, Pune, Maharashtra*

***ABSTRACT***

***Background: Skating has been gaining popularity in Asian countries, and there are incidence of injuries noted due to falls. Since there are few established studies on skating and its association with fitness parameters like balance and core strength, this pilot study was mainly aimed to compare core strength and balance in both the types skating.***

***Objectives: The study was aimed to assess the core strength and dynamic balance between artistic and speed skaters and also to compare the two components in these 2 types of skating.***

***Materials and methods: 30 professional skaters were selected- 15 speed and 15 artistic skaters. Assessment of core was done using pressure biofeedback and balance was assessed using Star excursion balance test (SEBT).***

***Results: Analysis was done using unpaired T test for comparison of core strength between the 2 groups that revealed statistically insignificant results (p >0.05). Unpaired T test done for balance revealed better balance in speed skaters for medial component of SEBT for right leg than artistic skaters(p<0.05).***

***Conclusion: The study concluded that core strength is equal in speed and artistic skaters however medial component of right leg of SEBT was found to be better in speed skaters.***

***KEYWORDS: speed skating; artistic skating; star excursion balance test; core strength***

## INTRODUCTION

Roller skating is travelling or moving on roller skates. There are two types of roller skating event – artistic roller skating and speed roller skating. Artistic roller skating is done on quads (on 4 wheels placed in rectangular manner) which consists of figure skating jumps, spins, and footwork into a program of 2 to 4 minutes set to music[1]. It consists of various jumps like mapes or axel and are graded according to their rotations for example double axel or triplemapes[2]. Speed skating is racing in a counterclockwise manner on inline (4 wheels in a line) or quads skates around a 400 meter oval rink consisting of two 100m corners[3].

Balance is an integral part of roller skating sport. Balance is defined as the way of maintaining the line of gravity of a body within the base of support with the help of feedback from visual, vestibular, somatosensory structures[4]. Speed skaters and artistic skaters require a great sense of balance and postural control for executing proper skating techniques[5,6]. For maintaining good balance and postural control, good core strength is required[7].

Core stability and strengthening has become a very important part of training program in almost all sports[8]. It is important to strengthen the core since it acts as a foundation for the muscles of the lower extremity to produce effective force. Lack of strengthening of core could lead to abnormal mechanical landing during the jumps[9]. The motions and skills of speed skating and holding dynamic postures of artistic skating cannot be performed by a single muscle group and requires harmonious working of many muscle groups at time, its kinematic chain being with the center of core muscle-group which mainly takes part in the stabilizing and supporting function of controlling different postures and movements.

Thus focus on core strengthening and balance is extremely important as it helps them to hold skating positions and skills which will help in better performance and reduce the risk of falling thus preventing injuries[10].

As there is dearth of literature in these two forms of skating related to balance and core strength, studying these two forms of skating makes it important.

The main aim and objective of this study was to assess and compare core strength and balance between speed and artistic skaters. For assessing core strength pressure biofeedback was used and for balance star excursion balance test was used. In this study professional asymptomatic players were taken between the age of 13 to 25 years, skating for more than 3 years and who had no history of musculoskeletal injuries since the past 6 months were recruited. Hockey players, roll ball skaters and ice skaters were excluded.

For Correspondence:
Dr. Prajakta Sahasrabudhe
Associate Professor
Sancheti Institute College of Physiotherapy, Pune, India
Mobile number – 9930677920
Email: docashokshyam@gmail.com

***AIM***

To study core strength and balance in speed skaters and artistic skaters

***OBJECTIVES***

1) To assess core strength and balance in speed skaters vs. artistic skaters
2) To compare strength and balance in speed skaters vs. artistic skaters

## METHODOLOGY

This is an observational study. Sampling technique used was purposive sampling. After Institutional Ethical Committee approval, informed written consent was taken from 30 skaters (15 speed and 15 artistic) fulfilling the selection criteria. In this study professional asymptomatic players were taken between the age of 13 to 25 years, skating for more than 3 years and who had no history of musculoskeletal injuries since the past 6 months. Hockey players, roll ball skaters and ice skaters were excluded. Assessment of core was done using pressure biofeedback method and balance was assessed using Star excursion balance test. Statistical analysis was done using unpaired t test for comparison of two groups. The purpose of this study was explained to the coach and parents (in case of minors) the players and written informed consent was obtained prior to the testing. The subject were selected according to the inclusion and exclusion criteria. The assessment included –

- Core strength assessment
- Balance assessment

Core strength assessment: Subjects were made to lie on their back with knees bent to 90 degrees and BP cuff was placed under the posterior superior iliac spine. BP cuff was inflated to 40 mmHg. The subject were asked to squeeze/pull their stomach in and breathe normally. As the subjects performed the maneuver, the rise in the mercury was noted. And accordingly the core strength of the subjects was graded. The subjects were told to increase the pressure by 10 mmHg the therapist instructed to, "Start", and to maintain the state for 5 seconds[11].

Balance assessment: Balance was assessed with the help of star excursion balance test. Star excursion balance is a series of single-limb squats using the nonstance limb to reach maximally to touch a point along 1 of 8 designated lines on the ground. The lines are arranged in a grid that extends from a center point and are 45° from one another. Each reaching direction offers different challenges and requires combinations of sagittal, frontal, and transverse movements. The reaching directions are named in orientation to the stance limb as anterior, anteromedial, anterolateral, medial, lateral, posterior, posteromedial, and poster lateral. The goal of the task is to have the individual establish a stable base of support on the stance limb in the middle of the testing grid and maintain it through a maximal reach excursion in 1 of the prescribed directions. While standing on a single limb, the participant reaches as far as possible with the reaching limb along each reaching line; lightly touches the line with the most distal portion of the reaching foot without shifting weight to or coming to rest on this foot of the reaching limb; and then returns the reaching limb to the beginning position in the center of the grid, reassuming a bilateral stance (If the individual touches heavily or comes to rest at the touch-down point, has to make contact with the ground with the reaching foot to maintain balance, or lifts or shifts any part of the foot of the stance limb during the trial, the trial is not considered complete[12].

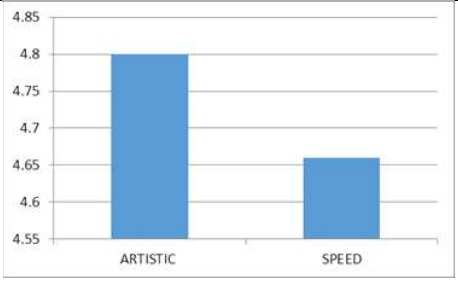
## RESULTS

**TABLE 1: BETWEEN GROUPS SUBJECT DEMOGRAPHIC DATA**

| | artistic skaters | speed skaters |
|---|---|---|
| Sample size [N=30] | n=15 (F-11,M-4) | n=15 (F-7,M-8) |
| Age (mean ± SD) | 17.4 ±3.26 | 18.2 ±3.8 |

**TABLE 2: INTRA GROUP ANALYSIS**

| | Artistic skaters mean±SD | Speed Skaters mean±SD | p value |
|---|---|---|---|
| Core strength | | | |
| both groups | VALUE?? | VALUE?? | 0.82 |
| SEBT | | | |
| Anterior right | 75.9+ 8.15 | 77.86+11.24 | 0.56 |
| anterior left | 80.0.+12.9 | 81.5+9.63 | |
| Anteromedial right | 88.86+12.26 | 82.53+8.65 | 0.11 |
| Anteromedial left | 89.52+10.82 | 82.53+8.65 | 0.29 |
| Medial right | 73.62+15.31 | 87.16+12.93 | 0.014 |
| Medial left | 76.9+17.85 | 80.06+15.97 | 0.61 |
| Posteromedial right | 95.08+15.32 | 93.9+16.93 | 0.84 |
| Posteromedial left | 84.26+15.22 | 86.76+16.15 | 0.32 |
| posterior right | 85.53+16.86 | 90.7+13.93 | 0.36 |
| posterior left | 4.26+15.22 | 90.53+16.49 | o.28 |
| posterolateral right | 83.56+16.54 | 83.86+11.85 | 0.95 |
| posterolateral left | 91.92+17.94 | 91.1+17.62 | 0.85 |
| lateral right | 68.5+12.83 | 72.13+10.88 | 0.41 |
| lateral left | 74.9+16.35 | 86.26+14.39 | 0.05 |
| anterolateral right | 89.32+11.25 | 85.46+13.3 | 0.39 |
| anterolateral left | 92.06+17.7 | 88.73+14.11 | 0.57 |




**GRAPH 1: COMPARISON OF CORE STRENGTH IN SPEED AND ARTISTIC SKATERS**

## DISCUSSION

This was study done in order to compare core strength and balance between speed skaters and artistic skaters.

In this study it was seen that the mean difference of core strength was better in artistic skaters than speed skaters but statistical results were insignificant. Comparable core strength values in speed and artistic skaters could be due to training effect of continuous skating on unstable base of support, similar training strength and balance drills in both the groups resulting in good core strength (≥6) in both the groups[13]. Zhang Shan-bin in his study has stated that applying core strengthening exercises would improve the skaters performance[14].

The small change in mean difference of core strength was favoring artistic skaters. This could be attributed to lots of jumps or spins and perturbations involved in the artistic skating technique. In artistic skating there are technical jumps and spins which require good core strength to control jump landings and to hold the spin position for longer time[2]. Whereas speed skating is just racing in a counterclockwise manner on inline or quads skates around a 400 meter oval rink[3].

Roller skating requires the highest level of dynamic balance. Therefore improving balance is an important factor. In similar studies done, Astrid zech in his study stated that balance training was effective in improving postural sway and functional balance when compared with untrained control participants[15]. Previous studies have shown that developing good core has been shown to improve balance[13]. In speed skaters the medial component of SEBT was found to be better than artistic skaters which can be attributed to the cross over technique performed by speed skaters which is similar to medial component of SEBT. Cross over technique is performed while turning around the corners by lifting right leg over the other or vice –versa. A skater performs this technique around 6 to 7 times as he/she moves thru the 180 degrees of 100 meter corner[3]. Proper cross-over technique is important to achieve top performance in speed skating[3]. Thus according to the results seen in this study, the values of speed and artistic skating were found to be comparable.

## CLINICAL APPLICATION

This study can be used as a reference for further studies related to roller skating.

## CONCLUSION

The study concluded that core strength is equal in speed and artistic skaters however medial component of right leg of SEBT was found to be better in speed skaters.

## ACKNOWLEDGEMENTS

We thank for the support from Dr. Rachana Dabadghav (Assistant professor and Research co coordinator at Sancheti Institute College of Physiotherapy) and Dr. Ashok Shyam (M S Ortho, Research officer at Sancheti Institute of Orthopedics and Rehabilitation) for their guidance. The authors also wish to acknowledge all the participants for their cooperation during the process of assessment and for permitting us to conduct the study.

## REFERENCES

1. Poe CM, O'Bryant HS, Laws DE. Off-Ice Resistance and Plyometric Training for Singles Figure Skaters. Strength & Conditioning Journal. 1994 Jun 1;16(3):68-76.
2. Pantoja PD, Mello A, Liedtke GV, Kanitz AC, Cadore EL, Pinto SS, Alberton CL, Kruel LF. Neuromuscular Responses of Elite Skaters During Different Roller Figure Skating Jumps. Journal of human kinetics. 2014 Jun 1;41(1):23-32.
3. Godbout A, Boyd JE. Corrective sonic feedback for speed skating: a case study. InProceedings of the 16th international conference on auditory display 2010 Jun (pp. 23-30).
4. Hrysomallis C. Balance ability and athletic performance. Sports medicine. 2011 Mar 1;41(3):221-32.
5. WANG ML, YANG LJ, ZHANG XL. Discussion of Training the Juvenile Speed Skaters' Support ability for balance [J]. China Winter Sports. 2008;3:004.
6. Grewal GS, Baisch R, Lee-Eng J, Wu S, Jarrett B, Humble N, Najafi B. Effect of Custom Foot Insoles on Postural Stability in Figure Skaters While on Ice. Journal of sport rehabilitation. 2015 Feb.
7. Rivera CE. Core and Lumbopelvic Stabilization in Runners. Physical Medicine and Rehabilitation Clinics of North America. 2016 Feb 29;27(1):319-37.
8. Bliss LS, Teeple P. Core stability: the centerpiece of any training program. Current sports medicine reports. 2005 May 1;4(3):179-83.
9. Willardson JM. Core stability training:

applications to sports conditioning programs. The Journal of Strength & Conditioning Research. 2007 Aug 1;21(3):979-85.
10. LV SH, WANG XW. Value of the Core Strength Training for the Teen-Age Speed Skaters [J]. China Winter Sports. 2011;6:002.
11. Jung DE, Kim K, Lee SK. Comparison of muscle activities using a pressure biofeedback unit during abdominal muscle training performed by normal adults in the standing and supine positions. Journal of physical therapy science. 2014;26(2):191-3.
12. Gribble PA, Hertel J, Plisky P. Using the Star Excursion Balance Test to assess dynamic postural-control deficits and outcomes in lower extremity injury: a literature and systematic review. Journal of athletic training. 2012 May;47(3):339-57.
13. Willardson JM. Core stability training: applications to sports conditioning programs. The Journal of Strength & Conditioning Research. 2007 Aug 1;21(3):979-85.
14. ZHANG SB, WANG X, LU Y. Application of the Core Strength Training in Roller Skating [J]. China Winter Sports. 2010;1:012.
15. Zech A, Hübscher M, Vogt L, Banzer W, Hänsel F, Pfeifer K. Balance training for neuromuscular control and performance enhancement: a systematic review. Journal of athletic training. 2010 Jul;45(4):392-403.