

*Monthly Multidisciplinary  
Research Journal*

*Review Of  
Research Journal*

---

Chief Editors

**Ashok Yakkaldevi**  
A R Burla College, India

**Ecaterina Patrascu**  
Spiru Haret University, Bucharest

**Kamani Perera**  
Regional Centre For Strategic Studies,  
Sri Lanka

Review Of Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

### Regional Editor

Dr. T. Manichander

### Advisory Board

Kamani Perera Regional Centre For Strategic Studies, Sri Lanka	Delia Serbescu Spiru Haret University, Bucharest, Romania	Mabel Miao Center for China and Globalization, China
Ecaterina Patrascu Spiru Haret University, Bucharest	Xiaohua Yang University of San Francisco, San Francisco	Ruth Wolf University Walla, Israel
Fabricio Moraes de Almeida Federal University of Rondonia, Brazil	Karina Xavier Massachusetts Institute of Technology (MIT), USA	Jie Hao University of Sydney, Australia
Anna Maria Constantinovici AL. I. Cuza University, Romania	May Hongmei Gao Kennesaw State University, USA	Pei-Shan Kao Andrea University of Essex, United Kingdom
Romona Mihaila Spiru Haret University, Romania	Marc Fetscherin Rollins College, USA	Loredana Bosca Spiru Haret University, Romania
	Liu Chen Beijing Foreign Studies University, China	Ilie Pinteau Spiru Haret University, Romania
Mahdi Moharrampour Islamic Azad University buinzahra Branch, Qazvin, Iran	Nimita Khanna Director, Isara Institute of Management, New Delhi	Govind P. Shinde Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai
Titus Pop PhD, Partium Christian University, Oradea, Romania	Salve R. N. Department of Sociology, Shivaji University, Kolhapur	Sonal Singh Vikram University, Ujjain
J. K. VIJAYAKUMAR King Abdullah University of Science & Technology, Saudi Arabia.	P. Malyadri Government Degree College, Tandur, A.P.	Jayashree Patil-Dake MBA Department of Badruka College Commerce and Arts Post Graduate Centre (BCCAPGC), Kachiguda, Hyderabad
George - Calin SERITAN Postdoctoral Researcher Faculty of Philosophy and Socio-Political Sciences Al. I. Cuza University, Iasi	S. D. Sindkhedkar PSGVP Mandal's Arts, Science and Commerce College, Shahada [ M.S. ]	Maj. Dr. S. Bakhtiar Choudhary Director, Hyderabad AP India.
REZA KAFIPOUR Shiraz University of Medical Sciences Shiraz, Iran	Anurag Misra DBS College, Kanpur	AR. SARAVANAKUMAR LAGAPPA UNIVERSITY, KARAIKUDI, TN
Rajendra Shendge Director, B.C.U.D. Solapur University, Solapur	C. D. Balaji Panimalar Engineering College, Chennai	V. MAHALAKSHMI Dean, Panimalar Engineering College
Awadhesh Kumar Shirotriya	Bhavana vivek patole PhD, Elphinstone college mumbai-32	S. KANNAN Ph.D , Annamalai University
	Awadhesh Kumar Shirotriya Secretary, Play India Play (Trust), Meerut (U.P.)	Kanwar Dinesh Singh Dept. English, Government Postgraduate College , solan

More.....

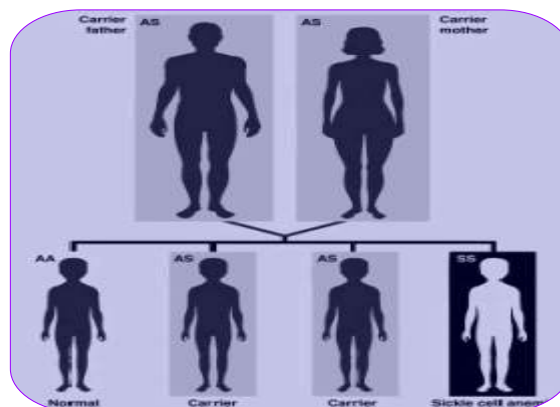


## DIFFERENCE IN THE CHARACTERISTICS OF CARDIO-RESPIRATORY FUNCTIONS IN PHYSICAL ACTIVITY PARTAKERS WITH SICKLE CELL TRAIT CARRIER

Sunil Kumar Bhoi<sup>1</sup>, Hrishikesh Patel<sup>2</sup>  
and Reeta Venugopal<sup>1</sup>

<sup>1</sup>School of Studies in Physical Education,  
Pt. Ravishankar Shukla University, Raipur.

<sup>2</sup>Department of Sports Sciences, Hawassa University,  
Ethiopia.



### ABSTRACT:

The cardio-respiratory fitness of sickle cell trait (SCT) individual is deviated than the apparently healthy individuals. Many studies have been conducted on consequences of SCT, but it is not yet precisely known the effect of regular participation in physical activity. To see the cardio-respiratory efficiency of SCT physically active individual total 1000 school going students were examined. Out of them 109 students were diagnosed as SCT carrier. Their pulmonary and cardiovascular efficiency were assessed with the help of respiratory rate (RR), heart rate (HR), peak expiratory flow rate (PEFR), hemoglobin (Hb) and 12 minutes run and walk test. In addition, maximum oxygen capacity ( $VO_{2max}$ ) was calculated as per formula prescribed by Cooper's test. Descriptive statistics, and comparative statistics "t" test was used to analyzed the data. Result of the present study showed insignificant difference in HR ( $p>0.05$ ), PFER ( $p>0.05$ ). The RR and Hb of control individual showed significantly ( $p<0.05$ ) better efficiency. In contrast, the aerobic capacity (12 min run and walk) and  $VO_{2max}$  of SCT showed significantly ( $p<0.05$ ) higher capacity than that of apparently healthy subjects. In conclusion, regular participation in moderate physical activity may reduce the consequences of SCT and may enhance the quality of life including healthy subjects. It is recommended to conduct more study on large sample to draw robust conclusions.

**KEYWORDS:** sickle cell trait, physical activity, respiratory rate, heart rate, peak expiratory flow rate, hemoglobin, 12 minutes run and walk, maximum oxygen capacity.

### INTRODUCTION

The oxygen delivering capacity to the active muscle cells of sickle cell trait individual is reduced. Sickle cell trait usually is not a disease conditions, as it has very mild deviations of hemoglobin. The oxygen-carrying capacity is determined by the concentration of hemoglobin in the blood, which affects the binding of oxygen in red blood cells. Sports persons do not experience any serious complications during physical activity. Any serious conditions such as morbidity or mortality in SCT may be the results of unsystematic training activity. The SCT individuals, physicians, and sports coaches should be aware of the potential risk or complications involved in SCT (ACSM, 2003). Regular and systematic moderate physical activity benefits the body in many ways. Those with sickle cell trait might find some added benefits such as longevity and fewer complications. Similar effects may be found in patients with sickle cell disease (ACSM, 2003).

In Chhattisgarh, the presence of sickle cell trait is diagnosed. Extensive clinical and basic science research

in SCT has been conducted. The roles of exercise /physical activity or sports performance in this population still remain unaddressed. An attempt is being made to determine the cardiovascular capacity of sports person with sickle cell trait.

## METHODOLOGY

### Subjects:

At the beginning total one thousands (1000) healthy players (Aged 12 – 18 Years) from the different schools of Chhattisgarh were included for hemoglobin screening in the present study. All the students were regular student coming school daily but alien to Sickle cell disease. They were regular partakers of moderately physical activity and participated in school level competitions. Of those only 109 were screened sickle trait carriers subjects and they were selected for the further study.

### Written Consent of the players:

All one hundred nine (109) Sickle Cell Trait subjects (SCT group) and one hundred with normal hemoglobin subjects (control group) participated in this study after giving their informed consent.

### Variables of the study

The pulmonary and cardiovascular efficiency were assessed with the help of respiratory rate (RR), heart rate (HR), peak expiratory flow rate (PEFR), hemoglobin (Hb) and 12 minutes run and walk test. In addition, maximum oxygen capacity ( $VO_{2max}$ ) was calculated as per formula prescribed by Cooper (1968).

### Cooper 12 minute run and walk test

Cooper 12 minute run and walk test is an accepted test to evaluate the aerobic fitness. Marking cones were placed around the track to aid in measuring distance covered by the subjects. Subjects were asked to run for 12 minute, walking was allowed and participants were encouraged enough to push themselves as hard as they can and total distance covered was measured and recorded.

Table 1: showing the norms prescribed (for adults male) by test

Rating	Distance in meters
Excellent	>2700m
Good	2300 – 2700m
Average	1900 – 2300m
Below Average	1500 – 1900m
Poor	<1500

### Maximum oxygen capacity ( $VO_{2max}$ )

$VO_{2max}$  is the ability of the subject to consume oxygen during maximal activity. the following formula was applied to estimate the maximum oxygen capacity.

$$\bullet VO_{2max} = (22.351 \times \text{kilometers}) - 11.288$$

**Validity:** Cooper (1968) reported a correlation of 0.90 between  $VO_{2max}$  and distance covered in 12 minute walk/run test.

### Statistical analysis

Microsoft Office – Excel 2007 was used for all type of statistical analysis. The analysis was done by using the inbuilt formulas and functions of MS-excel. Descriptive statistics, and comparative statistics “t” test was used to analyzed the data.

## Results

**Table: 2 Comparison of Physiological parameters HR, RR, PEFR and Hb between SCT and Non-sports persons in all subjects**

Variable	SCT		Control		t- test	
	Mean $\pm$ SE	SD	Mean $\pm$ SE	SD	t value	p value
HR	77.75 $\pm$ 0.59	6.16	76.88 $\pm$ 0.32	3.22	1.77	0.078767
RR	19.26 $\pm$ 0.12	1.24	18.83 $\pm$ 0.09	0.89	2.89	0.00426
PEFR	365.6 $\pm$ 3.73	38.86	371.87 $\pm$ 8.42	85.04	0.70	0.487378
HB	10.77 $\pm$ 0.07	0.65	10.57 $\pm$ 0.06	0.57	2.42	0.016496

**Table: 3 Comparison of 12 minute run and  $VO_{2max}$  between SCT and Non-sports persons**

Variable	SCT		Control		t-test	
	Mean $\pm$ SE	SD	Mean $\pm$ SE	SD	t- value	p - value
12 Min. Run	2322.64 $\pm$ 43.17	1.24	2011.17 $\pm$ 60.63	612.28	4.23	0.01
VO <sub>2</sub>	40.48 $\pm$ 1	38.86	33.48 $\pm$ 1.35	13.61	4.21	0.01

Table 2 illustrates the characteristics and comparison of the pulmonary variables namely Heart Rate (HR), Respiratory Rate (RR), Peak Expiratory Flow Rate (PEFR), and Hemoglobin of sports persons with sickle cell trait (SCT) and apparently healthy human subjects. The average HR of the sports persons with SCT was 77.75  $\pm$  0.59 and the average HR of apparently healthy human subjects was 76.88  $\pm$  0.32. The SCT subjects showed greater SD which indicates greater inter-individual difference.

Comparative statistics "t" test was performed to test the difference in HR between the SCT and apparently healthy human subjects. The result (table 2) revealed that there was no significant difference ( $p > 0.05$ ) between HR of SCT and Apparently healthy subjects.

### RESPIRATORY RATE

The average of RR was obtained and their means are shown in table 2. The result indicated inter-individual differences in RR in SCT group. The t-test was used to test difference in RR between SCT and control group (table 2). Results showed a statistically significant ( $p < 0.05$ ) difference in the means of the RR the control group showed statistically significant lower RR

### PEAK EXPIRATORY FLOW RATE

Inter-individual variation as well as variation between the groups in average of PEFR was not witnessed in the study. Result of t-test clearly indicate a statistically insignificant ( $p > 0.05$ ) difference in mean of PEFR in the study.

### Hemoglobin (Hb)

Variation at group level (table 2) in the mean of Hb was observed in the study. The average spread for Hb was 10.45g to 10.91g in SCT subjects and 10.16g to 10.87g in control subjects. The effect of regular participation in physical activity can clearly been seen in the Hb of SCT subjects, the average of Hb was higher in SCT group.

The t-test was also performed to test difference in Hb between SCT and control subjects (table 2). Results showed a statistically significant ( $p < 0.05$ ) difference in the means of the Hb in the study. Statistically significant higher Hb was witnessed in physically active SCT group.

### 12 Minute run and walk

Table 3 shows Mean  $\pm$  SE and SD of 12 min run and walk. At group level the average distance was significantly higher in SCT regular physical activity partakers groups. A statistically significant ( $p < 0.05$  from t-test) difference was documented for distance run between the group (table 3). The mean distance run was significantly higher in SCT group than the control group.

## VO<sub>2max</sub>

The maximum aerobic capacity was computed for each SCT and healthy subjects. Table 3 shows Mean  $\pm$  SE of maximum aerobic capacity for SCT and healthy subjects. Statistically significant ( $p < 0.05$  from t-test) difference is documented for maximum aerobic capacity between the group (table 3). The mean maximum aerobic capacity was significantly higher in SCT group than the control group.

## DISCUSSION

Sickle cell trait, the condition characterized by the presence of HbAS, was witnessed in approximately 10.9% (109) out of 1000 samples of the present study. In India, most of the individuals affected are unaware of their status.

In the present study pulmonary (cardio-respiratory) variables, such as Heart Rate (HR), Respiratory Rate (RR), peak expiratory flow rate (PEFR), Hemoglobin (Hb), 12 – minute Run and Walk, VO<sub>2max</sub>, were examined. The result of the study documented peak flow rate, was significantly lower in all SCT group under study. In contrast the hemoglobin content was found to be higher in Sports person with SCT as compare to control.

In line with the result of the present study Kramer et.al., (1978) and Eichner,(1986) reported that individuals with SCT have no deficiencies in growth or development, no risk for cardiovascular accident, no evidence of low physical performance or higher risk for perioperative complication, and have normal life expectancy.

In spite of lower pulmonary volume of PEFR, sportsperson with SCT have shown significantly higher performances in 12 minute run and walk test, SCT groups score was in good performance category whereas control group fell in average category. The studied regular activity partakers subjects showed better cardio-respiratory efficiency. This part of result must be given cognizance, and it should be realized that participation in moderate physical activities is of vital importance for persons with SCT. Digs (1984) demonstrated Haemoglobinopathy concerned with risk factor during physical activities, with sickle cell formation compromising O<sub>2</sub> delivery particularly in extreme conditions for example strenuous exercise carried out at an altitude, that pursue a low level of O<sub>2</sub> and severe lactic acidosis in the arterial blood. Predominantly, however, clinical symptoms are moderate or absent (Alpert et.al. 1982) and several studies failed to confirm that SCT is a risk factor or even a disadvantage for sports activities (Gallais et.al, 1987; Boutros, 1980). Chirico et.al.(2012) have reported improved oxidative stress and nitric oxide response is improved in exercise trained SCT subjects, and suggested that physical activity could be a viable method of controlling the oxidative stress, which could have a beneficial effect because its involvement in endothelial dysfunction and subsequent vascular impairment in hemoglobin S carriers. Martineaud et al. (2002) also supported the concept of positive effect of exercise for individual with SCT and reported no difference in the performance capabilities of well trained subjects with SCT and those without it. SCT subjects had no effect on the subject's performance during exhausting exercise, at least when its duration did not exceed half an hour. It was suggests that certain adaptation processes developed by regular participation in training may operate in sportsmen SCT during high-intensity exercise. Further in a study Physically active life style in SCT carriers may decrease endothelial activation and may limit the risk of vascular adhesion events in the microcirculation (Aufradet et.al.; 2010). Similarly Messonnier et.al. (2012) reported moderate sub-maximal exercise is safe from biochemical point of view for sportsman with SCT.

Furthermore, Cozal et.al. (1992) suggested that SCT could affect exercise performance as well as recovery without medical complications (Green et.al. 1971). We can state that subjects with SCT may participate in sports competitions similarly to subjects with normal Hb AA. Therefore, the persons with SCT should be encouraged for usual physical activities and competitions, eventual successes or failures will depend on all other factors which. There are still scopes to understand various aspects of effect of training in person with SCT, for which continuous research is needed in this area.

## REFERENCES

1. Alpert BS, Flood NL, Strong WB, Blair JR, Walpert JB, Levy AL (1982). Responses to exercise in children with sickle cell trait. Am J Dis Child 136: 1002–1004.

2. American College of Sports Medicine (ACSM's) (2003). Exercise Management for the people with Chronic Disease and Disabilities (3rd edition)"; American College of Sports Medicine
3. Aufradet, E.; Monchanin, G.; Oyonno-Engle, S.; Feasson, L.M.; Francina, A.; Bezin, L.; Serpero, L.D.; Gozal, D.; Dodogba, M.; Wouassi, D.; Banimbeck, V.; Djoda, B.; Woussi, D.; Banimbeck, V.; Djoda, B.; Thiret, P.; and Martin, C. (2010). Habitual Physical Activity and Endothelial Activation in Sickle Cell Trait Carriers. American College of Sports Medicine. 1987-1994.
4. Boutros-Toni F, Dasso Y, Fréminet A, Leclerc C, Poyart C. (1980). Réactions cardiorespiratoires et métaboliques / un exercice sous-maximal de sujets africains porteurs du trait drépanocytaire. *Nouv Rev Fr Hématol* 22: 37–45.
5. Chirico EN, Martin C, Faès C, Féasson L, Oyono-Enguélé S, Aufradet E, Dubouchaud H, Francina A, Canet-Soulas E, Thiriet P, Messonnier L, Pialoux V. (2012). Exercise training blunts oxidative stress in sickle cell trait carriers. *J Appl Physiol*. 112(9):1445-53.
6. Cooper, K. H. (1968) A means of assessing maximal oxygen uptake. *Journal of the American Medical Association*. 203:201-204.
7. Diggs LW (1984). The sickle cell trait in relation to the training and assignment of duties in the armed forces. *Aviat Space Environ Med* 55: 487–492.
8. Eichner ER (1986). Sickle cell trait, exercise and attitude. *Phys Sports Medicine*. 14(1):144
9. Green RL, Hunstman RG, Serjeant GR. (1971). The sickle cell and altitude. *Br Med J*. 1971; 4: 593–595.
10. Kramer MS, Rooks Y, Pearson HA (1978). Growth and development in children with sickle cell trait: a prospective study of matched pairs. *N Eng. J. Med*. 299 (13):686
11. Laurent Messonnier, Abdoulaye Samb, Julien Tripette, Bertin Doubi Gogh, Gylna Loko, Niama Diop Sall, LÃ©onard FÃ©asson, Olivier Hue, Sandrine Lamothe, Pascal Bogui, Philippe Connes (2012). Moderate endurance exercise is not a risk for rhabdomyolysis or renal failure in sickle cell trait carriers. *Clinical Hemorheology and Microcirculation: Volume 51*, 193-202.
12. Le Gallais D, Lonsdorfer J, Buguet A (1987). Aptitude physique des porteurs du trait drépanocytaire. *Sci et Sports*: 2: 269–277.
13. Martineaup, J.P.; Samb, A.; Gueyel, L.; Seck, D.; Badji, L., and Cisse, F. (2002). Exercise Performance in Young Subjects With Sickle Cell Disease. *Scripta Medica (BRNO) – 75* (2): 111-117.

# Publish Research Article

## International Level Multidisciplinary Research Journal For All Subjects

Dear Sir/Mam,

We invite unpublished Research Paper, Summary of Research Project, Theses, Books and Books Review for publication, you will be pleased to know that our journals are

### Associated and Indexed, India

- ★ Directory Of Research Journal Indexing
- ★ International Scientific Journal Consortium Scientific
- ★ OPEN J-GATE

### Associated and Indexed, USA

- DOAJ
- EBSCO
- Crossref DOI
- Index Copernicus
- Publication Index
- Academic Journal Database
- Contemporary Research Index
- Academic Paper Database
- Digital Journals Database
- Current Index to Scholarly Journals
- Elite Scientific Journal Archive
- Directory Of Academic Resources
- Scholar Journal Index
- Recent Science Index
- Scientific Resources Database

Review Of Research Journal  
258/34 Raviwar Peth Solapur-  
413005, Maharashtra  
Contact-9595359435

E-Mail-ayisrj@yahoo.in/ayisrj2011@gmail.com