

EFFECTIVENESS OF YOGA ON STATIC VISUAL ACUITY AND CONCENTRATION AMONG MALE ADOLESCENT RECURVE ARCHERS

P Karthika¹, S Selvalakshmi²

¹PhD Scholar, Department of yoga, Tamil Nadu Physical Education and Sports University, Chennai,

²Associate Professor, Department of Yoga, Tamil Nadu Physical Education and Sports University, Chennai.

Email: karthikap405@gmail.com.

Abstract

The objective of this study was to examine the effectiveness of yoga on the static visual acuity and concentration of male adolescent recurve archers. The experimental and control groups were both investigated. Twenty archers were divided into two groups: ten were allotted to the experimental group, while the remaining ten were assigned to the control group. The participants varied in age from 14 to 17 years old. The yoga intervention was administered to only the experimental group, and static visual acuity and concentration were measured before and after the yoga intervention. The static visual acuity and concentration were evaluated using the snellen chart and concentration grid test, which is a reliable instrument and test for determining the appropriate variable. Using analysis of covariance, the gathered information was statistically examined. Male adolescent recurve archers' static visual acuity and concentration were significantly enhanced following sixteen weeks of yoga practice.

Keywords: Yoga, Archers, visual acuity, concentration, Adolescents, Sports

Introduction

Archery is a sport that involves using a bow to shoot arrows at a target (Paterson, 1985). The goal of archery is to hit the center of the target, which is typically marked with rings of different colors and point values. Archery has a long history, dating back to ancient times when it was used for hunting and warfare. Today, archery is primarily practiced as a recreational and competitive sport. Archery is enjoyed by people of all ages and skill levels, and is a popular sport around the world (Mishra, 2022). It is also an Olympic sport, with both individual and team events, with events for both men and women. The basic equipment for archery includes a bow and arrows. Bows come in a variety of types, including traditional bows, recurve bows, and compound bows. Arrows are typically made of lightweight materials such as carbon fiber or aluminum, and are designed to be aerodynamic for accurate flight. There are several different types of archery, including traditional archery, which uses a simple bow and arrow, and modern archery, which uses more advanced equipment such as compound bows and sights. Archery competitions can take many forms, including individual and team events. Competitors shoot arrows at targets placed at varying distances, and the goal is to hit the center of the target, which is worth the most points (Archery association of India, updated: March 2022). Archery requires a great deal of skill and focus, patience, hand eye coordination, as well as physical strength and stamina (Musa et al., 2019; Strydom, B. 2010). It is also a mentally challenging sport, as archers must maintain their concentration and composure while shooting under pressure. Visual acuity is an important aspect for archers, as it directly affects their ability to aim and hit targets accurately. Visual acuity refers to the clarity or sharpness of vision, which is measured using an eye chart and expressed as a fraction (e.g. 20/20). According to Grosvenor (2007), "visual acuity is defined as the eye's resolving power or its capacity to perceive two distinct objects as distinct". Visual acuity is also called as foveal visual acuity and can vary between every individuals based on lighting, distance, charts, and letter size (Zimmerman et al., 2011). More often the static visual acuity is measured. Based on Carlson (1984) study, some visual abilities are more essential in archery, similarly, Gardner and Sherman (1995) mentioned that visual acuity, visual adaptability, eye-hand coordination, and central-peripheral awareness are important parameters for better archery performance. In archery, visual acuity is particularly important for aiming and judging distances. Aiming involves aligning the bow, arrow, and target, which

requires good depth perception and spatial awareness. Judging distances accurately is also crucial, as it helps archers adjust their aim and select the appropriate arrow for the target. People with poor visual acuity may have difficulty with archery, as they may struggle to see the target clearly or judge distances accurately. However, corrective measures such as glasses, contact lenses, or corrective surgery can help improve visual acuity and allow individuals to participate in archery. It is important for archers to have regular eye exams to ensure that their vision is optimal for the sport. Other visual factors that can impact archery performance include depth perception, contrast sensitivity, and peripheral vision. Archers should also take care to protect their eyes from the sun and glare, as well as from injury caused by flying arrows or other objects. Archery can be a great sport for adolescents as it can help to develop focus, discipline, and confidence. The prevalence of archery among adolescents varies depending on factors such as geographic location, access to equipment and facilities, and cultural attitudes towards the sport. According to a survey conducted by the Archery Trade Association, the number of youth participants in archery programs has increased in recent years. The popularity of archery among adolescents may also be influenced by cultural factors, such as the popularity of archery in movies, TV shows, and video games. While there is no definitive data on the prevalence of archery among adolescents worldwide, it is clear that the popularity of the sport has been growing, and that there are many opportunities for young people to get involved in archery in a safe and supportive environment.

Yoga has been found to promote various health benefits. It helps to improve vagal modulation and decrease the sympathetic activity of the autonomic nervous system, which helps to regulate the heart rate and reduce sympathetic activity (Aggarwala, & Dhingra, 2017; Carrillo et al., 2011). Young adults benefit greatly from yoga because it helps them become more responsible, patient, focused, and disciplined. According to the findings of the study, yoga aids in breathing, flexibility, strength, confidence, energy level, balance, concentration, endurance, injury prevention, and quick recovery from strenuous exercise. Stable yoga practice increases physical performance and well-being by enhancing physical, physiological and psychological parameters (Bintari et al., 2021; Karthika & Selvalakshmi¹, 2020; Karthika², 2020). Additionally, many researchers proved that there may be a direct link between yoga and an improvement in the fundamentals of athletic performance (Harrelson and Swann, 2003). To the best of the researchers' awareness, just three research articles have examined the effect of Yoga practice on archery performance. Previous research proved that certain yoga practices may help to reduce eye strain, relax the eye muscles, and promote eye health (Bianchi, & Bellen, 2020; Gupta, & Aparna, 2020). Incorporating yoga practices into their training regimen can help archers to improve their visual acuity, concentration, and overall performance on the range. This study focused on intervention of yoga on static visual acuity and concentration among male adolescent recurve archers.

Purpose of the Study

The purpose of this study was to find out the intervention of yoga on static visual acuity and concentration among male adolescent recurve archers.

Hypothesis

It was hypothesized that sixteen weeks yoga intervention would have a significant effect on static visual acuity and concentration among male adolescent recurve archers.

Methodology

The purpose of this study was to investigate the effectiveness of sixteen-week yoga intervention on the static visual acuity and concentration of male adolescent recurve archers. Twenty individuals were selected from archery organizations throughout Chennai. Athletes were asked to provide information about them, including their gender, age, level of archery competition, previous competitive experience, etc. This particular research endeavour was centred on the experimental group and the control group. Both the experimental and control groups were consisted of ten archers. Only subjects in the experimental group participated in the yoga intervention four times per week for four months. The yogic practices lasted one hour and included different asana, pranayama, preparatory eye exercises, trataka sequences, as well as nyasa. The control group participated in none of these activities.

Table I- Yoga Intervention Program

S. No	Vinyasa yoga Sequence	Rounds	Practice methods
-------	-----------------------	--------	------------------

1	Prayer	-	-
2	Conscious breathing	6	-
3	Tadasanam	6	Dyn
4	Bhagiratasanam	6	Dyn
5	Virabhadrasanan and Parsvau ttanasanam sequence	3 /Each side	Dyn
6	Jumping sequence (Vasistasanam)	6	Stay- 1br
7	Utkatasanam	6	Dyn
	Rest (Free In and Free Ex)	-	-
8	Dvipadapitham	6	stay1,2,&3br- 2t
9	Sarvangasanam	2	Stay-6 br
	Rest	-	-
10	Bhujangasanam	4	Dyn
11	apanasanam	2	Dyn
	Rest (Free In and Free Ex)	-	-
12	Urdhva dhanurasanam	2	* stay 6 br
	Rest (Free In and Free Ex)	-	-
13	Apanasanam to Urdhva prsrta padasanam	6	Dyn
	Rest (Free In and Free Ex)	-	-
14	Navasanam	2	*stay-4br
	Rest (Free In and Free Ex)	-	-
15	Pascimatanasanam	6	Dyn
16	Vajrasanam forward bend sequence	6	Dyn
	Rest (Free In and Free Ex)	-	-
17	Sitali	6	IN-H-EX-H
18	Nadi suddhi	6	IN-H-EX-H
	Rest	-	-
19	Preparatory eye practices- Palming, Blinking,Circular movements and Horizontal, vertical, diagonal movements	4	-
20	Trataka (Using Ghee lamp)	5	-
	Rest	-	-
21	Nyasam with mantra	4	-
	Rest	-	-
22	Closing Prayer	-	-

This study monitored the static visual acuity and concentration of the participants. The snellen chart and concentration grid were determined to be the most precise tools for monitoring the relevant parameters. The evaluations were performed three times, and the highest possible score was chosen. Before and after the sessions, readings were collected as the pre- and post-test. Analysis of covariance was utilized to perform statistical analysis on the obtained data.

Results and Discussion

Table – II Results of Analysis of Covariance on Right eye visual acuity

Test	EXP. Gr	CG	SV	SS	df	MS	F
Pre test	1.75	1.68	Between	0.02	1	0.025	0.14
			Within	3.16	18	0.18	
Post test	2.30	1.61	Between	2.39	1	2.39	23.55
			Within	1.83	18	0.10	
Adjusted	2.28	1.63	Between	2.10	1	2.10	49.40
			Within	0.723	17	0.04	

Table F ratio of 4.20 with (1, 28) degrees of freedom

*Significant at 0.05 level

Adjusted post-test means F = 49.40, which is larger than the required F = 4.45 at the 0.05 level of significance. Statistical testing using ANCOVA showed a notable difference in right eye visual acuity between the two groups.

Figure –1 showing the mean values of Right eye visual acuity

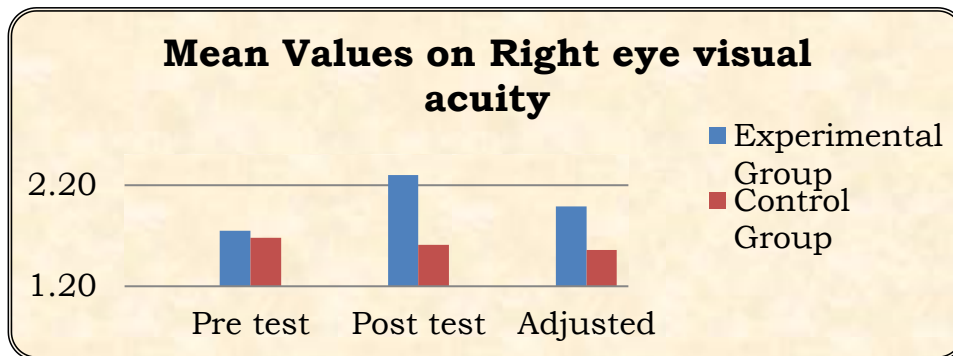


Table – III Results of Analysis of Covariance on left eye visual acuity

Test	EXP. Gr	CG	SV	SS	df	MS	F
Pre test	1.56	1.51	Between	0.01	1	0.011	0.10
			Within	1.89	18	0.11	
Post test	2.01	1.53	Between	1.16	1	1.16	7.76
			Within	2.68	18	0.15	
Adjusted	1.99	1.56	Between	0.92	1	0.92	31.45
			Within	0.498	17	0.03	

Table F ratio of 4.20 with (1, 17) degrees of freedom *Significant at 0.05 level

Adjusted post-test means $F = 31.45$, which is larger than the required $F = 4.45$ at the 0.05 level of significance. Statistical testing using ANCOVA showed a notable difference in left eye visual acuity between the two groups.

Figure –2 showing the mean values of left eye visual acuity

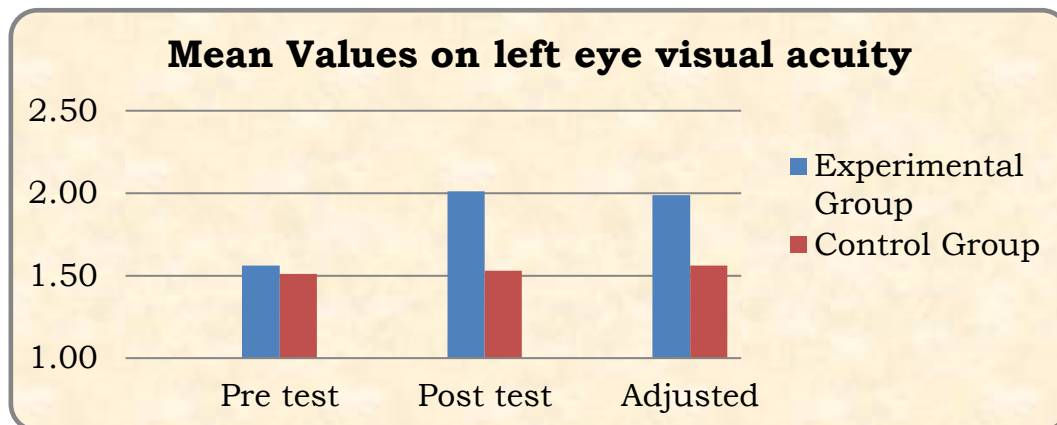
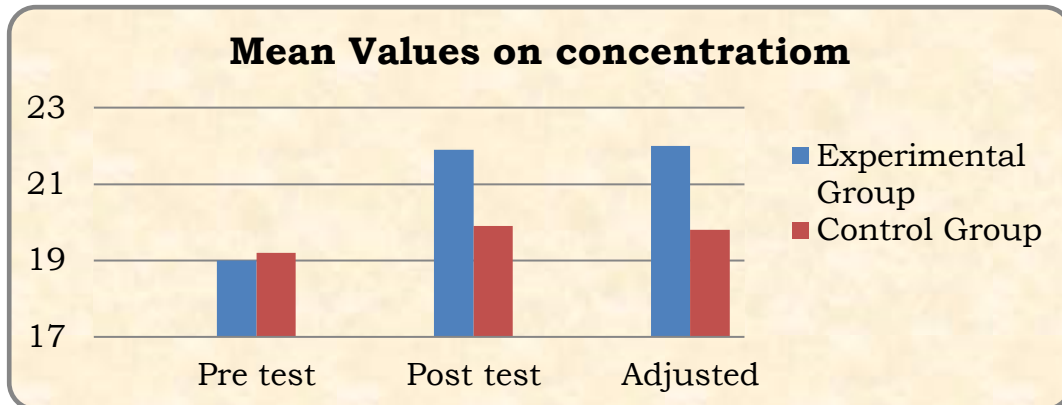


Table – IV Results of Analysis of Covariance on concentration

Test	EXP. Gr	CG	SV	SS	df	MS	F
Pre test	19.00	19.20	Between	0.20	1	0.200	0.02
			Within	189.60	18	10.53	
Post test	21.90	19.90	Between	20.00	1	20.00	1.90
			Within	189.80	18	10.54	
Adjusted	22.00	19.80	Between	24.05	1	24.05	37.69
			Within	10.846	17	0.64	

Adjusted post-test means $F = 37.69$, which is larger than the required $F = 4.45$ at the 0.05 level of significance. Statistical testing using ANCOVA showed a notable difference in concentration between the two groups.

Figure –3 showing the mean values on concentration



Archers need good vision to aim and strike their targets. Archers need good depth perception, peripheral vision, and colour vision to effectively judge target distance, direction, and angle. Archers must concentrate on the target and shoot accurately. They need good vision to see little details and movements. Additionally, visual acuity is essential for archers because it enables them to make necessary adjustments to their aim. Archers must be able to identify and adjust for any changes in illumination, wind, or other variables that may affect their aim. Visual acuity is essential for archers because it enables them to aim and shoot accurately, readjust their aim when required, and consistently strike the target. Gosewade et al., (2016) found that medical students might increase their visual acuity with eight weeks of pranayama and eye exercises. Several yoga asanas improve physical function. Yoga improves eye health by increasing blood circulation and nourishment. Muliani, (2017) concluded that practicing yoga eye exercises for 1 hour twice a day for 8 weeks decrease extra ocular muscle fatigue and increase visual clarity. Gupta & Aparna (2020) concluded six weeks of yoga improves eye tiredness.

Similarly, Archers must concentrate to hit targets accurately and consistently. Even a short shift in concentration may cause missed shots in archery. Archers must focus for long durations, particularly during tournaments. They must be able to ignore distractions and concentrate. In addition, archers must be able to visualize and implement their shots precisely. This requires a high degree of concentration and mental focus, as even the slightest deviation from the intended form or motion can have a significant effect on the trajectory of the arrow. Concentration is vital for archers because it allows them to shoot with precision and accuracy, and helps them to maintain consistency over time. By developing their concentration skills, archers can improve their performance and achieve greater success in their sport. The increase in concentration in the yoga group is similar with the findings of Graham, (2022), who found that yoga training significantly increased concentration among school going children. According to Viji et al., (2021), one month of super brain yoga has no effect on children's concentration and memory after four weeks of practice; this is because four weeks of yoga are insufficient to produce the desired results. However, Kauts and Sharma (2012) discovered that a seven-week yoga module consisting of yoga asanas, pranayama, meditation, prayer, and a value orientation program improves adolescents' concentration. According to Tiwari (2015), four weeks of yoga training substantially improves the concentration of school students. According to Jois and D'Souza (2018), three months of superbrain yoga substantially improve school students' concentration, memory, and confidence. Both groups (yoga and control) exhibited an increase in visual acuity and concentration among male adolescent recurve archers. Since there are definitive evidence that practicing yoga can improve visual acuity, certain yoga practices may help to reduce eye strain, relax the eye muscles, and promote eye health (Kumar, & Deol, 2016). Several yoga practices such as preparatory eye exercises like palming, blinking, and focusing on distant objects, eye rotation can help to relax and strengthen the eye muscles (Desai et al., 2020). Trataka is a yoga practice that involves gazing at a candle flame or other object to improve concentration and focus. This practice

may help to strengthen the eye muscles and improve visual acuity over time (Sherlee, & David, 2020). The sarvangasana is a yoga pose that may help to improve circulation to the head and eyes, reduce tension in the neck and shoulders, and promote relaxation. This pose may also help to relieve eye strain and improve visual acuity. Adhomukha svanasana can help improve circulation to the head and eyes. As vinyasa yoga always coordinated with breath, it helps improve concentration and focus (Nagaraj et al., 2019). Inverted postures and balancing postures along with breath coordination improves concentration by bringing awareness on the postures. This is beneficial for archers who must maintain mental focus while aiming and shooting their bow. The control group, however, did not show any improvement. Again, the intervention of yoga was shown by substantially greater visual acuity and concentration in the yoga group compared to the control group.

Conclusion

Sixteen weeks Yogic intervention had an impact on improving handgrip strength among male adolescent recurve archers.

Reference

1. Aggarwala, J., & Dhingra, M. (2017). Effects of autonomic control on performance of archers: A comparative study on novice and experienced archers. *International Journal of Biomedical Research*, 8(4), 182-186.
2. Kumar, N., & Deol, N. S. (2016). Effect of selected yogic exercise on females visual acuity. *Methodology*, 1.
3. Gupta, S. K., & Aparna, S. (2020). Effect of Yoga Ocular Exercises on Fatigue. *International journal of yoga*, 13(1), 76–79. https://doi.org/10.4103/ijoy.IJOY_26_19
4. Desai, R., Palekar, T., Patel, D., Rath, M., Joshi, R., & Shah, A. (2020). Effects of yogic eye exercises for myopia among students. *Journal of Dental Research and Review*, 7(5), 69.
5. Gardner, J.J., & Sherman, A. (1995). *Vision requirements in sport*. In: DFC Loran and CJ MacEwen, Eds. Sports Vision. London: Butterworth-Heinemann, pp22-36.
6. Elliott, D. B., Yang, K. C., & Whitaker, D. (1995). Visual acuity changes throughout adulthood in normal, healthy eyes: seeing beyond 6/6. *Optometry and vision science : official publication of the American Academy of Optometry*, 72(3), 186–191. <https://doi.org/10.1097/00006324-199503000-00006>.
7. Zimmerman, A. B., Lust, K. L., & Bullimore, M. A. (2011). Visual acuity and contrast sensitivity testing for sports vision. *Eye & contact lens*, 37(3), 153–159. <https://doi.org/10.1097/ICL.0b013e31820d12f4>.
8. Carlson, N. J. (Ed.). (1984). *Sports vision guidebook*. The American Optometric Association: Sports Vision Section 1984 1 1-11.
9. Carrillo, A.E., Christodoulou, V.X., Koutedakis, Y. and Flouris, A.D. (2011) Autonomic Nervous System Modulation during an Archery Competition in Novice and Experienced Adolescent Archers. *Journal of Sports Sciences*, 29, 913-917. <https://doi.org/10.1080/02640414.2011.568514>.
10. Desikachar T. (1995). *The Heart of Yoga: Developing a Personal Practice*. Rochester, VT: Inner Traditions International.
11. Grosvenor, T. P. (2007). *Primary care optometry*. Elsevier Health Sciences. 4th Edition. Oxford: Butterworth Heinemann.
12. Buys, H. (2008). *The development of norms and protocols in sports vision evaluations*. Masters Thesis, Rand Afrikaans University, University of Johannesburg (South Africa).
13. Nagaraj, G. P., Manjunatha, S. K., & Eshwara, K. A. (2019). Effect of yoga on attention concentration and cardio-vascular endurance of secondary school volleyball players. *Int J Physiol Nutr Phys Educ*, 4, 96-7.
14. Strydom, B. (2010). The role of vision and visual skills in archery. *African Vision and Eye Health*, 69(1), 21-28
15. FITA, (2014). FITA Coach's manual psychology module intermediate level. Fédération Internationale de Tir à l'Arc (now The World Archery Federation) Available at: www.fcta.cat/download.php?Document=211 [Accessed 4 April 2015]

16. Paterson W.F (1985. March 1), Encyclopedia of Archery, St Martins Pr, ISBN-10 0312245858, ISBN-13: 978-0312245856.
17. Gosewade, N., Drugkar, A., & Shende, V. (2016). Effect of pranayama and eye exercises on visual acuity of medical students: a case control study. *International Journal of Contemporary Medical Research*, 3(4), 1133-1136.
18. Musa, R. M., Majeed, A. P. A., Taha, Z., Chang, S. W., Nasir, A. F. A., & Abdullah, M. R. (2019). A machine learning approach of predicting high potential archers by means of physical fitness indicators. *PLoS One*, 14(1).
19. Mishra, A (Updated: 2022, February 15). The Evolution of Archery Game - All you need to know. Kreedon.
https://www.kreedon.com/all-about-archery-sport/#Benefits_of_Archery_Sport.
20. Karthika¹, M. P., & Selvalakshmi, S. Study Of E-Learning Yoga Protocol On Depression, Anxiety And Stress Among College Students During Covid-19 Pandemic Crisis. *E-Pedagogy for the Digital Age*, 198.
21. Karthika², P. (2020). Influence of yoga intervention on assertiveness among under graduate students. *Int J Physiol Nutr Phys Educ*, 4(1), 804-6.
22. Bianchi, T., & Bellen, R. (2020). Immediate effects of eye yogic exercises on morphoscopic visual acuity. *Yoga Mimamsa*, 52(1), 5.
23. Graham, M.(2022). Effect of Yoga Nidra on Reducing Stress, Increasing Attention, Changing Behavior and Increasing Happiness of School Students. *Journal of Innovation and Social Science Research*. 09(04).49.
24. Sherlee, J. I., & David, A. (2020). Effectiveness of yogic visual concentration (Trataka) on cognitive performance and anxiety among adolescents. *Journal of complementary and integrative medicine*, 17(3).
25. Gupta, S. K., & Aparna, S. (2020). Effect of yoga ocular exercises on eye fatigue. *International Journal of Yoga*, 13(1), 76.
26. Landers, D. M., Petruzzello, S. J., Salazar, W., Crews, D. J., Kubitz, K. A., Gannon, T. L., & Han, M. (1991). The influence of electrocortical biofeedback on performance in pre-elite archers. *Medicine and science in sports and exercise*, 23(1), 123–129.
27. Muliani, S.Ked, M.Biomed, Muliani (2017) *Literature Review Yoga Eye Exercise Effect on Visual Acuity*. International Journal of Science and Research (IJSR), 6 (12). ISSN 2319-7064
28. Tiwari, R. K. (2015). Benefits of Yoga Practices on High school student* s memory and concentration in relation to Examination stress. *International Journal of Yoga and Allied Science*, 4(2), 79-81.
29. Jois, S. N., & D'Souza, L. (2018). The effectiveness of superbrain yoga on concentration, memory and confidence in school students. *Indian Journal of Traditional Knowledge* Vol. 17(4), 741-744
30. Viji, V. S., Subbulakshmi, S. and Devi, L. U. (2021) "Effect of Super Brain Yoga on Concentration and Memory in Children in a Selected Private School, Kelambakkam, Kanchipuram Dt, Tamilnadu, India", *Journal of Pharmaceutical Research International*, 33(56A), pp. 141–149. doi: 10.9734/jpri/2021/v33i56A33896.
31. Kauts, A., & Sharma, N. (2012). Effect of yoga on concentration and memory in relation to stress. *ZENITH international journal of multidisciplinary research*, 2(5), 1-14.