



EFFECT OF YOGA ON QUALITY OF LIFE AND SUSTAINED ATTENTION IN HEARING AND SPEECH IMPAIRED CHILDREN – A PILOT STUDY

Clinical psychology

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ABSTRACT

Childhood deafness can become a cause of psycho-intellectual and social developmental disorders in children due to challenges in interacting with their surroundings. Most deaf children have shown poorer attention sustenance and quality of life compared to normal hearing children. Studies analyzing effect of yoga practices on quality of life and sustained attention in general population, have been promising. This study aimed to ascertain the effect of Yoga on Quality of Life and Sustained Attention in Hearing and Speech Impaired Children. 30 Children (16 boys, 14 girls) in the age group 12 to 17 years (Mean Age $\pm$ SD: 14 $\pm$ 2) with hearing loss $>$ 80 dB in better hearing ear, studying in a special school for the deaf and mute, were subjected to a 15 days yoga intervention. The hourly intervention included *Sukshma Vyāyāma*, *Suryanamaskāra*, *Āsana*, *Prāṇāyāma*, Chanting and *Dhyāna*. Six Letter Cancellation and Digit Letter Substitution tests were used to assess Sustained Attention; and Youth Quality of Life Instrument - Short Form (YQOL-SF) to assess Quality of life. Pre-Post data analysis showed an increase in SLCT mean net score by 58 % ($p < 0.0001$) and DLST mean net score by 30 % ($p < 0.0001$); YQOL score increased by 13 % ($p < 0.0001$) post intervention. The study showed that a short term integrated days yoga intervention had a significant effect on enhancing the Sustained Attention and Quality of Life in Hearing and Speech Impaired Children.

KEYWORDS

Hearing Impaired Children, Quality of Life, Sustained Attention, Yoga

Introduction

Yoga entails holistic development of physical, mental and spiritual aspects of our being. It has garnered acceptance and merit worldwide owing to its preventive, curative and rehabilitative potential that is backed by adequate research. While there have been plentiful studies showing the astonishing benefits of yoga in maintenance and improvement of physiological and psychological health among all age groups in healthy individuals, studies have also shown improvement in the diseased population. There is however a huge gap in the research domain focussing on utilization of Yoga in bettering the lives of the disabled. The present research intends to further the work along these lines in the hearing and speech impaired children. Disability comes with its own set of challenges. Other than the apparent disability, there is a detrimental impact on their social, psychological and intellectual status.^[1] Childhood deafness can become a cause of psycho-intellectual and social developmental disorders in children because of the challenges in interacting with their surroundings.^[1] It largely impacts their Quality of Life^[2] which encompasses a person's health and wellness, social participation and satisfaction with functional daily living. Most deaf children have also been found to lag in academic performance and standards against normal hearing children of their chronological age.^[3] They have shown poorer attention sustenance along with behavioural difficulties compared to normal hearing children.^[4, 5] Sustained attention is essential for cognitive development and learning, and largely impacts academic performance. Studies analyzing the effect of different aspects of Yoga including cleansing techniques, physical postures, breathing practices, relaxation techniques and meditation on quality of life^[6-11] and sustained attention^[12-14] in general population, have been promising. The aim of the present study is to ascertain the effect of Yoga on Quality of Life and Sustained Attention in Hearing and Speech Impaired Children.

Materials and methods

In this study, a single group pre-post experimental design was chosen as the researchers attempted to test the effectiveness of Integrated yoga practices. The study was approved by the ethics committee of the

institution, Lakulish yoga university, located in Ahmedabad, Gujarat, India. The study was carried out at Shree K. S. Dedhiya Muk-badhir vidhyamandir, Ahmedabad, a special school for the deaf and mute, owing to the availability of the desired population and adequate sample size and the consent of the head of the institute. Written consent from the School Authority was sought to carry out the study. 30 Children (16 boys and 14 girls) fit in the inclusion criteria; in the age group of 12 to 17 years (Mean Age $\pm$ SD: 14 $\pm$ 2) with hearing loss greater than 80 dB in the better hearing ear. Exclusion criteria constituted other physical or mental challenges, chronic ailments and any injury that would restrict the practice of yoga.

Intervention

Two weeks of Integrated yoga intervention for one hour a day. The intervention included *Sukshma Vyāyāma* (loosening practices), *Suryanamaskāra* (sun salutations), *Āsana* (physical postures), *Prāṇāyāma* (breathing practices), Chanting and *Dhyāna* (meditation); along with *Krīdā Yoga* (yogic games) every three days. As part of meditation, the subjects were given the practice of *Dhāranā* – concentrating on the symbols of *viśudhā* chakra and *ājñā* chakra (individually) for 1 minute and then visualizing them at the throat centre and eyebrow centre respectively with eyes closed for 2 minutes.^[15] *Krīdā Yoga* was included as an element of fun for the children to enhance their interest in yoga. Studies have shown positive effects of *Krīdā Yoga* on children.^[16] Laughter yoga was also introduced to help them shed their inhibitions of speech, and set foundation for developing spoken language in them. The researchers carried out the intervention. Basic sign language was learnt to be able to communicate major concepts. The mode of instruction was visual demonstration of the practices by one researcher along with parallel instructions on breathing and count via sign language by the other. Later on, visual placards were also used depicting the posture and the associated element that the name of the *āsana* was based on. This helped to convey the intention of the *āsana* and easier association. Guided relaxation was not possible with these children. They were simply guided into *śavāsana* (the corpse posture) and *makarāsana* with guidelines on relaxation beforehand.

Outcome measures**Cancellation and substitution tasks**

Six Letter Cancellation and Digit Letter Substitution tests were used to assess Sustained Attention. They are standard measures of attention span, checked for reliability and validity across all age groups; [17] also for Indian population. [18] The SLCT test comprises a worksheet of randomized English alphabet arranged in 22 rows and 14 columns. Six target letters are mentioned. Subjects are to cancel as many target alphabet as possible in 90 seconds. The DLST – Digit Letter Substitution test worksheet has 12 rows × 8 columns with random digits 1-9 put in the rows leaving the succeeding row empty. A key is provided at the top, pairing the digits 1-9 with letters of the alphabet. Subjects have to substitute as many target digits as possible with letters in the vacant row in 90 seconds.

Quality of life

Quality of life was measured using Youth Quality of Life Instrument - Short Form (YQOL-SF). It is a standard questionnaire to assess quality of life, checked for reliability and validity across all age groups. [19] The Youth Quality of Life Instrument - Short Form (YQOL-SF) quantifies the general quality of life in youth (11-18 years) with and without chronic conditions and disabilities. The short form includes 15 perceptual items measuring the domains of sense of self, social relationships, environment, and general quality of life.

DATA ANALYSIS

The data taken on the last day and on the first day of the Integrated Yoga intervention were compared with t-test and wilcoxon signed rank test for paired using SPSS version 16.0.

Results

A total of 30 subjects were participated in the study 30 subjects completed the study, which was conducted at the end of fifteen days of integrated yoga intervention.

SLCT: Six Letter Cancellation Test

After 15 days of Integrated Yoga intervention it showed that 55% highly significant increase ($P < 0.000$, Wilcoxon Signed Ranks Test) in total score on SLCT. Similarly, there was 58% highly significant increase ($P = 0.000$, Wilcoxon Signed Ranks Test) in Net score. However, there was 29% decrease in wrongly cancellation score which was significant ($P = 0.000$, Wilcoxon Signed Ranks Test) [Table 1].

Table-1: SLCT Changes after 15 days of Integrated Yoga practice

Variables - SLCT	Mean $\pm$ SD		(▲) % Increase (▼) % Decrease	P-value
	Pre	Post		
Total Score for Cancellation	19.4 $\pm$ 9.2	30.1 $\pm$ 9.9	▲55	<0.000***
Score for Wrong Cancellation	0.7 $\pm$ 1.5	0.5 $\pm$ 0.9	▼29	<0.000***
Net Score for Cancellation	18.7 $\pm$ 8.7	29.6 $\pm$ 9.7	▲58	<0.000***

*significant at $P < 0.05$, ** significant at $P < 0.01$, ***significant at $P < 0.00$ (Wilcoxon Signed Ranks Test) SLCT: Six Letter Cancellation Test.

DLST: Digit letter substitution test

After 15 days of Integrated yoga intervention it showed that 28% significant increase ($P < 0.000$, paired samples t-test) in total score on DLST. Similarly, there was 30% significant increase ($P = 0.000$, paired samples t-test) in Net score. However, there was 71% decrease in wrongly substitution score which was highly significant ($P = 0.000$, paired samples t-test) [Table 2].

Table-2: DLST Changes after 15 days of Integrated Yoga practice

Variables - DLST	Mean $\pm$ SD		(▲) % Increase (▼) % Decrease	P-value
	Pre	Post		
Total Score for Substitution	35.7 $\pm$ 16.4	45.6 $\pm$ 17.6	▲28	<0.000***
Score for Wrong Substitution	0.7 $\pm$ 1.6	0.2 $\pm$ 0.5	▼71	<0.000***
Net Score for Substitution	35 $\pm$ 15.9	45.5 $\pm$ 17.5	▲30	<0.000***

*significant at $P < 0.05$, ** significant at $P < 0.01$, ***significant at $P < 0.00$ (paired sample test) DLST: Digit letter substitution test.

YQOL-SF: Youth Quality of Life Instrument - Short Form.

After 15 days of Integrated yoga intervention it showed that 13% significant increase in quality of life ($P < 0.000$, Wilcoxon Signed Ranks Test) in total score on YQOL-SF. [Table 3].

Table-3: YQOL-SF Changes after 15 days of Integrated Yoga practice

Variable – YQOL -SF	Mean $\pm$ SD		% Change	P-value
	Pre	Post		
Total Score	193 $\pm$ 14.3	219 $\pm$ 16.8	▲13	<0.001**

*significant at $P < 0.05$, ** significant at $P < 0.01$, ***significant at $P < 0.00$ (Wilcoxon Signed Ranks Test) YQOL-SF: Youth Quality of Life Instrument - Short Form.

Discussion:

There is no established scientific evidence so far depicting the effect of yoga on Sustained Attention in Hearing and Speech impaired children. The noted increase in sustained attention in this study is however in coherence with the previous studies showing increase in sustained attention in normal hearing children even after a short term integrated yoga intervention. [13, 14, 20, 21] However, most short term intervention studies have had an integrated yoga module used, where the children are a part of a yoga camp or training course that have Yoga activities spread all through the day. The current study while had an integrated set of practices, was only scheduled for an hour a day. The actions/activities/routine followed in the rest of the time was not modulated. This suggests that even an hour of dedicated practice can avail massive benefits in a span of 15 days. Cancellation tasks require sustained attention along with visual scanning and activation and inhibition of rapid responses. Substitution tasks additionally assess psychomotor speed, and speed of information processing. [22, 23] As reported by Rangan R. et al [24] in their discussion, the significant increase in net score suggests that the yoga practice improves functioning of the right frontoparietal cortex mediating sustained attention. Similarly, the significant increase in total score suggests there is improvement in the areas of frontal association that is responsible for the cognitive function guiding motor skills. [25] Decrease in wrong cancellations and substitutions suggests improvement in functions in the orbitofrontal area of the prefrontal cortex, which is hypothesized to mediate distraction avoidance. [26] The practice schedule covered a host of practices. Studies on effects of these practices individually have also reported increase in SA – *Suryanamaskar*, [20] *Āsana*, [13] *Kapālbhāti*, [27] *Nādi śodhan*, [12] *Meditation* [28,29] and *Chanting*. [30] The increase in the score of YQOL-SF demonstrating improvement in quality of life is consistent with the results of the studies performed on the children with other disabilities [31] and chronic ailments. [32,33] Resonance of the sounds while chanting *A, U and MA*, even though they may not be able to hear, has a positive impact on the body and mind, enabling improved attention and quality of life. [30] Om chanting reduces activity in the limbic system which is the portion of the brain associated with stress. [34] The children appeared to be more channelized and calmer after the practice of *Dhāranā*. They were able to concentrate and focus better in class. They became less aggressive and irritable, indicating an improved psychological balance, a key parameter of quality of life. The yogic practices being both “calming” and “stimulating” entail normalization of physiological and psychological functions. [35] All these practices shift attention from past or future to the present. They train the mind to surmount distractions and be focussed on the task at hand. Emotions [36] and stress that formulate the pillars of Quality of Life, largely impact the ability to concentrate as well. [37] Positive mood has been associated with greater behavioural displays of attention. Yoga reduces anxiety, [36] improves stress response mechanism and has a positive impact on general mood and well being, thus also improving performance on tasks requiring sustained attention. [12] The subjects in the study were academically behind by 3.4 ± 2 years as compared to their normal hearing peers. Lack in classroom participation and poor attention span along with a general disinterest, lack of aspiration and poor self esteem was reported by the teachers and care-givers. The reported increase in attention span and quality of life opens up newer possibilities for these children. Along with benefitting them academically, the Yoga practices can bring about an all-round development in them if made a part of their routine. [38] It would help to include Yoga as part of curriculum in schools and training facilities/ care homes for the hearing impaired children.

Conclusion

The study showed that a 15 days integrated yoga intervention had a significant effect on the Sustained Attention and Quality of Life in Hearing and Speech Impaired Children. The results of this study are very promising. A study with longer duration of intervention, larger sample size and a control group would further validate the results. This is a pilot study and can provide a substantial base for conducting future trials to establish effects of integrated yoga practices in the hearing and speech disabled population. We encourage that more studies be taken up and a definitive protocol be set up.

REFERENCES:

- Davidson J, Hyde ML, Alberti PW. Epidemiologic pattern in childhood hearing loss. *Int J Pediatr Otorhinolaryngol*. 1989; 17:239-266.
- Roland L, Fischer C, Tran K, Rachakonda T, Kallogjeri D, Lieu J. Quality of life in children with hearing impairment: systematic review and meta-analysis. *Otolaryngology-head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery*. 2016;155(2):208-219.
- Rajendran V, Roy FG. Comparison of health related quality of life of primary school deaf children with and without motor impairment. *Italian Journal of Pediatrics*. 2010;36:75.
- Barker DH, Quittner AL, Fink NE, Eisenberg LS, Tobey EA, Niparko JK, & The CDaCI Investigative Team. Predicting behavior problems in deaf and hearing children: The influences of language, attention, and parent-child communication. *Development and Psychopathology*. 2009; 21(2), 373-392.
- Teresa V, Mitchell & Alexandra L, Quittner. Multimethod study of attention and behavior problems in hearing-impaired children. *Journal of Clinical Child Psychology*. 2010;25(1), 83-96.
- Keerthi GS, Pal P, Pal GK, Sahoo JP, Sridhar MG, Balachander J. Effect of 12 Weeks of Yoga Therapy on Quality of Life and Indian Diabetes Risk Score in Normotensive Indian Young Adult Prediabetics and Diabetics: Randomized Control Trial. *Journal of Clinical and Diagnostic Research : JCDR*. 2017;11(9), 10-14.
- Annapoorna K, Latha K, Bhat S M, Bhandary P V. Effect of Yoga Therapy on Psychological well-being and Quality of Life in Anxiety Disorder. *International Journal of Yoga and Allied Sciences*. 2(2), 2278-5159
- Sodhi C, Singh S, Bery A. Assessment of the quality of life in patients with bronchial asthma, before and after yoga: a randomised trial.. *Iranian Journal of Allergy, Asthma and Immunology* 2014;13(1):55-60.
- Garg S, Ramya CS, Shankar V, Kutty K. Efficacy of short-term Yoga therapy program on quality of life in patients with psychosomatic ailments. *Indian J Psychiatry* 2015;57:78-80.
- Tim Gard, Narayan Brach, Britta K, Hölzel, Jessica J, Noggle, Lisa A, Conboy & Sara W, Lazar. Effects of a yoga-based intervention for young adults on quality of life and perceived stress: The potential mediating roles of mindfulness and self-compassion, *The Journal of Positive Psychology*. 2012;7(3), 165-175.
- Hadi N, Hadi N. Effects of hath yoga on well being in healthy adults in Shiraj, Islamic republic of Iran. *East Mediterr Health J*. 2007;13:829-37.
- Telles S, Raghuraj P, Maharana S, Nagendra HR. Immediate effect of three yoga breathing techniques on performance on a letter cancellation task. *Percept Mot Skills*. 2007;104:1289-96.
- Misra VK, Misra N, Kumar D. Effect of yoga on performance of digit-letter substitution test and six letter cancellation test in early and middle adolescent. *World Journal of Pharmacy and Pharmaceutical Sciences*. 2016, 5(5). 2278-4357
- Sethi JK, Nagendra HR, Sham Ganpat T. Yoga improves attention and self-esteem in underprivileged girl student. *Journal of Education and Health Promotion*. 2013;2:55.
- Saraswati Raman, V N Phadke, Sahaj Yoga – an Experiential treatise (AuthorHouse UK, 2014)
- Datta Ram Poli, Krida Yoga. Vivekananda Kendra Prakashan Trust, Chennai, 1996.
- Uttl B, Pilkenton-Taylor C. Letter cancellation performance across the adult life span. *Clinical Neuropsychology*. 2001;15, 521-530.
- Natu MV, Agarwal AK. Testing of stimulant effects of coffee on the psychomotor performance: An exercise in clinical pharmacology. *Indian J Physiol Pharmacol*. 1997;29:114.
- Ayala NC, Edwards TC, Patrick DL. (2014) Youth Quality of Life Instruments. In: Michalos A.C. (eds) *Encyclopedia of Quality of Life and Well-Being Research*. Springer, Dordrecht
- Vineet Kumar Sharma, Jayashree Acharya. Effect of 12-weeks training of mantras and breathing in surya namaskar on performance of six letter cancellation task. *International Journal of Yoga, Physiotherapy and Physical Education*. 2017; 2(3), 41-44.
- Rangan R, Nagendra HR, Bhatt R. Effect of yogic education system and modern education system on sustained attention. *International Journal of Yoga*. 2009; 2(1), 35-38.
- Lezak MD. 3rd ed. New York: Oxford U.P.; 1995. *Neuropsychological Assessment*.
- Van Hoof JJ, Jørgens-Kosterman BJ, Sabbe BG, Zitman FG, Hulstijn W. Differentiation of cognitive and motor slowing in the Digit Symbol Test (DST): Differences between depression and schizophrenia. *J Psychiatr Res*. 1998;32:99-103.
- Rueckert I, Graffman J. Sustained attention deficits space in patients with right frontal lesions. *Neuro Psychologia*. 1996;36:953-63.
- Fuster JM. 2nd ed. New York: Raven Press; 1989. *The prefrontal cortex anatomy, physiology and neurophysiology of the frontal lobe*
- Rao LS, Subbakrishna DK, Gopukumar K. The national institute of mental health and neurosciences; 2004. *Nimhans Neuro-psychology battery-2004 manual*.
- Khemka SS, Nagendra HR, Nagarathna R. Immediate effect of stimulation in comparison to relaxation in healthy volunteers. *Indian J Tradit Knowl*. 2010;9:606-10.
- Michaels RR, Huber MJ, McCann DS. Evaluation of transcendental meditation as a method of reducing stress. *Science*. 1976;192:1242-4.
- Wallace RK, Mills PJ, Orme-Johnson DW, Dillbeck MC, Jacobe E. Modification of the paired H reflex through the transcendental meditation and TM-Sidhi program. *Exp Neurol*. 1983;79:77-86.
- Nagendra HR. Bangalore: Swamy Vivekananda Yoga Prakashana; 2005. *Mind sound resonance technique (MSRT)*
- Uma K, Nagendra HR, Nagarathna R, Vaidehi S, Seethalakshmi R. The integrated approach of yoga: A therapeutic tool for mentally retarded children: A one-year controlled study. *Journal of mental deficiency research*. 1989; 33 (Pt5). 415-21.
- Beheshtipoor N, Bagheri S, Hashemi F, Zare N, Karimi M. The Effect of Yoga on the Quality of Life in the Children and Adolescents with Haemophilia. *International Journal of Community Based Nursing and Midwifery*. 2015;3(2):150-155.
- Kuttner L, Chambers CT, Hardial J, Israel DM, Jacobson K, Evans K. A randomized trial of yoga for adolescents with irritable bowel syndrome. *Pain Research & Management : The Journal of the Canadian Pain Society*. 2006;11(4):217-224.
- Kalyani BG, Venkatasubramanian G, Arasappa R, et al. Neurohemodynamic correlates of "OM" chanting: A pilot functional magnetic resonance imaging study. *International Journal of Yoga*. 2011;4(1):3-6.
- Galantino ML, Galbavy R, Quinn L. Therapeutic effects of yoga for children: a systematic review of the literature. *Pediatr Phys Ther*. 2008 Spring;20(1):66-80.
- Wallace RK, Benson H, Wilson AF. A wakeful hypo metabolic physiologic state. *Am J Physiol*. 1971;221:795-9.
- Saltz E. Manifest anxiety: Have we missed the data? *Psychol Rev*. 1970;77:568-73.
- Bethany Butzer, Denise Bury, Shirley Telles, Sat Bir S. Implementing yoga within the school curriculum: a scientific rationale for improving social-emotional learning and positive student outcomes. *Journal of Children's Services*. 2016; 11(1):324.