International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Impact of Brain Waves in Aggressive Behavior of Students

Prabir Chatterjee[1], Dr. Prachi Indurkar[2]

[1]Research Scholar, RNTU, Bhopal, MP, India
Email: *prabirdps01 [at]gmail.com*

[2]Associate Professor, RNTU, Bhopal, MP, India

Abstract: ***Actually, aggressiveness is very common term applicable for all age group but its grass root area is our children especially lower age group. Just after COVID-19 its intensity gradually increases among school children and competitive college going students which directly effect on their academic performance, mental & physical health as well as social interaction. Although number of precautionary measured have been incorporated by school and government to minimize their stress through counseling, "Pariksha pe charcha" etc. but every day there are hundreds of incidents of aggression, violence and miss happening are reporting in daily Newspaper. Here it is one experimental approach to overcome from aggression though stabilization of different Brain waves through intervention of some scientific Yogic techniques in different age group students. Research area: within two age group (dependent Variable) 1. School children-14-16 Years [DPS Ranchi] and 2. College students-18-22 Years [School of Yoga, Ranchi University] whereas independent variables are numbers of Yogic techniques. Methodology applies experimental and survey based. Sample consist of 8-10 students from each group and Yogic intervention given for each student individually but same technique for particular group for a period of 3 months (90 days) in regular basis. Aggression level measured at pre and post intervention through specific A-scale (Aggression Scale) proposed by Buss-Perry through BPAQ (Buss-Perry aggression Questionnaire) consist of 5 subscales each having specific dimension of aggression. Participant rate themselves on a scale 1 (Extremely uncharacterized of me) to 5 (Extremely characterized of me). Whereas status of different brain waves δ, θ, α, β, and γ are measured through EEG at pre and post intervention. Such measurement is very sensitive work where during collection of data and during intervention seriously considered ethical, confidentiality, potential impact as well as social issues. Before any intervention have been consulting mental health professional/ Neurologist as well as after obtained consent from parents and guardians. Additionally, ensured that the results are used constructively for intervention and support rather than punitive measures. Statistical analysis doing by Wilcoxon sign rank test. Result shows that after intervention of some specific Yogic techniques brain waves are significantly stabilized especially great change observed in case of alpha waves followed by level of aggression significantly decreased from pre to post intervention. Consultation & Helping hands: 1) Sample collection [Pre and Post intervention] from B. Sc and M. Sc Students [18-22Years] of School of Yoga, Ranchi University, Ranchi, Jharkhand. 2) Brain Waves measurement through EEG by Certified Laboratory [First Point Diagnostic Centre, Opp-RIMS, Medical Chowk, Bariyatu, Ranchi]. 3) For Medical Suggestion and Guide by Dr. Suhash Tetarway, Director, Harmu Haspatal, Ranchi. 4) Statistical analysis checked by Prof. Rakesh Mishra, St. Xavier College, Ranchi. 5) For Yogic Intervention-Associate Prof. Manoj Soni, School of Yoga, Ranchi University.***

Keywords: Brain waves, Aggression, A-Scale, EEG, BPAQ, Wilcoxon sign rank test, Yogic intervention, dependent variable and independent variable.

1. Preface

This article is one of the mile stone of research "Chances of Mental deviation in attempting samadhista". After publishing "Impact of Gamma Brain waves in path of Sadhana/ Samadhi" it is another important observation in the dynamic landscape of educational Psychology, understanding the intricate interplay between cognitive processes and behavioral outcomes is of paramount importance. This article searches about fascinating realm of the "Impact of Brain waves on Aggressive behavior of Students" exploring a novel avenue that coordinate Neuroscience with ancient Yogic science and Yogic techniques. This research endeavors to unravel the correlation between Brain waves and Aggressive tendencies among students and it's after effect on academic performance and on their social life aged 17-22 years, employing A-Scale (Aggression Scale) as proposed by Buss-Perry through BPAQ (Buss-Perry Aggression Questionnaire), Statistical analysis by the use of Wilcoxon Signed-rank test and EEG (Electro encephalograph).

The Journey begins with A-Scaling methodology, followed by the meticulous grouping of students based on age. Subsequently, study delves into the precise measurement of various brain waves using Electroencephalography (EEG) within a standard authorized laboratory setting followed by statistical analysis for accuracy through Wilcoxon Signed-rank test. This scientific exploration provides a foundation for understanding the neural underpinning of aggressive behavior in young adults and ultimately provide the means of controlling.

The heart of this research lies in a comprehensive three-months (90Days) intervention program, Employing diverse Yogic Techniques, such as Sukhsma Bayam, Cleansing practices and Pranayama (Including Anulom Vilom, Nadi Sodhan, KapalBhanti and Bhramari), the study seeks to harness the transformative power of these ancient practices on the participant's mental states. The continuous engagement with these techniques aims to bring about positive shifts in their cognitive and emotional landscapes.

The post-intervention is marked by a through measurement of brain waves, allowing for a nuanced comparative analysis with pre-intervention results. The outcomes are then meticulously correlated with the overarching thesis theme: how brain waves serve as a pivotal factor in the journey

towards Sadhana and Samadhi. Furthermore, the study explores the potential clinical applications of these findings in the treatment of various mental disorders, offering a promising avenue for therapeutic interventions.

As we embark on this exploration, the preface sets the stage for a comprehensive understanding of the research's scope and significance, integrating the BPAQ's A-Scale and statistical rigor of the Wilcoxon signed-rank test. Beyond shedding light on the impact of brain waves on aggressive behavior, this work aspires to inspire further enquiry into the intricate relationship between neuroscience, Yogic practices and the holistic well-being of individuals. This study not only contributes to the academic discourse but also holds the promise of fostering a more harmonious and balanced approach to mental health and education as well as path of sadhana and Samadhi.

2. Objective

Although primary objective is to find out cause of mental deviation and chances in attempting Samadhi but same time during my journey numbers of situation is directly related to my research. One of the important factors is Aggression which already mention in our ancient texts. Ancient texts identify non-violence, tranquility, compassion, gentleness, modesty, tolerance as divine traits whereas Aggression, arrogance, wrath, rudeness, insensitiveness to other pain as demoniac traits. Patanjali Yoga sutra explain 9 + 5 obstacles or hindrances for mental deviation in 1.30 & 1.31 verses.

"vyadhistyanasanshayapramadalasyaviratibhrantidarshanalabdhabhoomikatvanavasthitatvanichittavikshepastentarayah"-1.30

Vyadhi (Disease), Satyan (mental laziness), Shanshay (doubt), Pramad (calmness), Alasya (cessation), false perception, non-attaining concentration, and falling away from the state when obtained, are the obstructing distractions.

*"duhkha daurmanasy anggamejayatva shvasa prashvaa vikshepasahabhuvah"*1.31

Dukha (Grief), Daurmanasy (mental distress), tremor of the body and irregular breathing, accompany non-retention of concentration.

He explains prevention in 1.32
"tatpratishedhartham ekatattvabhyasah"-1.32

For prevention and cure is only depend on continuous practices.
"atha yoganushasanam"-1.1 & *"yogashchittavrittinirodhah" 1.2*

So here every hindrance can be prevented through yoga and primary objective is to analyze the potentiality of Yogic intervention in different aspects of life especially here it is on the level of Aggression of students.

3. Methodology Apply

For Analysis:
1) A-Scale through BPAQ [Buss-Perry Aggression Questionnaires]
2) Hypothesis Testing through
   a) Parametric Test through Z-Test
   b) Non-Parametric Test [Tests for Homogeneity] through Wilcoxon Rank Signed Test.
3) EEG For measurement of Brain waves.

For Intervention:

1) Yogic Techniques:

S. No.	Yogic Technique		Age Group (Yrs)	Periods [3Months]	Duration
1.	Sukhsma Bayam		14-17 & 18-22	Morning & Evening	15-30mins.
2.	Cleansing Techniques [Neti & Kunjan]		14-17 & 18-22	Weekly (Morning)	1Hr.
3.	OM Chanting		Both Groups	Evening	5mins.
4.	PRANAYAM	Anulom Vilom	14-17 Years	Morning & Evening	15 mins.
		Nadi Sodhan	18-22Years	Morning & Evening	15mins.
		Kapal Bhati	Both groups	Only morning	15mins.
		Bhramari	14-17 Years.	Only Evening	10mins.

4. Observation

Human Brain waves are the continuously generated electrochemical impulses inside of the brain. Such Electrical patterns can be measured by the use of Electroencephalogram (EEG). There are different types of brain waves, categorized into frequency bands. Here's a comparative analysis of the brain waves in a normal healthy person, a meditated person, and a very aggressive person.

Brain Waves Type	Frequency range	Normal Healthy Person	Person Meditated/ Yogic Intervened.	Very aggressive/ Pre intervention
Delta	0.5-4Hz	Present during deep sleep, restorative processes	Enhanced during deep meditation and deep sleep	Elevated during high-stress, anger, or extreme aggression
Theta	4-8Hz	Associated with deep relaxation, daydreaming	Increased during meditation and creative states	Elevated during frustration, anxiety, or intense anger
Alpha	8-13Hz	Relaxed, calm state, idle thinking	Increased during meditation, relaxed focus	Reduced, unless in a deceptive calm state before aggressive outburst
Beta	13-30Hz	Alert, active, focused thinking	Reduced during meditation, deep relaxation	Highly elevated during intense concentration, anger, or aggression

Gamma	30-40Hz	Higher cognitive functioning, perception	Enhanced during advanced meditation states	Increased during extreme focus, hyperactivity, or intense emotional states

In some cases, research suggests that regular practice of meditation or specific breathing exercises may lead to changes in brain wave patterns. For example, increased theta and alpha wave activity and decreased beta wave activity have been reported in some studies.

Comparative EEG Record Pre-Intervention and Post Intervention (after 3 Months): Following lab test measurement done in a standard Lab in Ranchi and PG Dept. School of Yoga, Ranchi University, Ranchi.

Individual Analysis [Age group 18-22Years]:

Brain Waves Type	Early Morning		Mid day		Evening	
	Pre intervention	Post Intervention	Pre Intervention	Post Intervention	Pre Intervention	Post Intervention
Delta	1.3-3.5Hz	1.3-3.2Hz	2-4Hz	1.8-3.8Hz	1.5-3Hz	1.2-2.8Hz
Theta	3.5-7.5Hz	3.2-7Hz	5-8Hz	4.5-8Hz	3-6Hz	2.5-5.5Hz
Alpha	8-12Hz	8-12.5Hz	9-13Hz	9-14Hz	8-11Hz	8-11.5Hz
Beta	13-28Hz	12-26Hz	15-30Hz	14-28Hz	14-28Hz	13-26Hz
Gamma	30-40Hz	29-39Hz	32-42Hz	31-40Hz	30-40Hz	29-38Hz

The individual may experience subtle shifts in their brain wave patterns, characterized by potential decreases in beta frequencies, increases in alpha and theta frequencies, and overall greater coherence in the different bands, particularly during relaxation times.

Brain Waves Type	Frequency range	Pre-Intervention	Post Intervention
Delta	0.5-4Hz	Moderate presence during sleep, rest	Potential improvement in deep restorative sleep, enhanced relaxation
Theta	4-8Hz	Present during relaxation, daydreaming	Increased during meditation, improved focus, enhanced creativity
Alpha	8-13Hz	Varied based on stress levels	Increased during calm states, improved relaxation, enhanced mental clarity
Beta	13-30Hz	Variable based on daily activities	Potential decrease in stress-related beta activity, improved focus
Gamma	30-40 +Hz	Variable, influenced by cognitive tasks	Potential enhancement in cognitive functions, increased perceptual clarity

Hypothesis Testing [Statistical analysis]

Parametric Test [Z-Test/ T-Test]:
Age group-18-22 Years [Male]-AG or Aggression Score [BPAQ]:

S. No.	Name of Students	Pre-intervention AG Score [55]	Post Intervention AG Score [55]	Change
1	Mausam Arman	36/55	30	-6
2	Gautam Kr. Sharma	46/55	40	-6
3	Niraj Oraon	44/55	40	-4
4	Srijan Shubh	38/55	32	-6
5	Rishikesh Tiwari	43/55	35	-8
6	Ravikant	41/55	36	-5
7	Kundan Kumar	42/55	35	-7
8	Suraj Kumar	46/55	40	-6

Pre Intervention Analysis:
Mean= 42, Median= 42.5, Mode = 46, Standard deviation

$$\sigma = \sqrt{\frac{\sum\left(X_i - \bar{X}\right)^2}{N-1}} \approx 3.587$$

Post Intervention Analysis:

Mean $\left(\bar{X}\right) = 36$ Median = 42, Standard Deviation

$$\sigma = \sqrt{\frac{\sum\left(X_i - \bar{X}\right)^2}{N-1}} \approx 3.623$$

$$Z\,Value = \frac{42-36}{\sqrt{\frac{(3.587)^2}{8} + \frac{(3.623)^2}{8}}} = \frac{6}{\sqrt{\frac{12.865}{8}}} = \frac{6}{\sqrt{1.608}} \approx 4.733$$

$Hypothesis\ Testing: p\ value = 0.05\ (threshold)$
$H_0 = Null\ hypothesis\ where\ p\ value\ is\ less\ than\ 0.05\ i.e.\ pre\ \&\ post\ int\ e\ rvention\ is\ equal\ or\ no\ change$
$H_1 = Alternative\ hypothesis\ where\ p\ value\ either\ equal\ to\ 0.05\ or > 0.05$
$Here\ p\ value\ is > 0.05\ so\ null\ hypothes\ is\ H_0\ is\ rejected\ where\ as\ alternative\ hypothes\ is\ H_1\ is\ accepted$

Hypothesis Testing Through Non Parametric Test

Wilcoxon Rank Signed Test:
(B)Age group-18-22 Years [Female]

S. No.	Name of Students	Pre-intervention AG Score [55]	Post Intervention AG Score [55]	$d = x - y$ / $y - x$	$\|d\|$	R
1.	Suman Kumari	41/55	35/55	-6	6	4
2.	Neha Gupta	38/55	34/55	-4	4	2.5
3.	Dalmani Yadav	43/55	40/55	-3	3	1
4.	Archana Kumari	34/55	34/55	0	0	x
5.	Rukmani Kumari	38/55	30/55	-8	8	5
6.	Jyotsna Mahto	53/55	40/55	-13	13	6
7.	Ruchi Kumari	28/55	28/55	0	0	x
8.	Simran Kumari	44/55	40/55	-4	4	2.5

$$R^{+} = 4 + 2.5 + 1 + 5 + 6 + 2.5 = 21$$

$$n = Total\ no.of\ Samples = 6,\ Mean = \frac{n(n+1)}{4} = \frac{6(6+1)}{4} = 10.5$$

$$\sigma = \sqrt{\frac{n(n+1)(2n+1)}{24}} = \sqrt{\frac{6(6+1)(2\times 6+1)}{24}} = \sqrt{\frac{42\times 13}{24}} = \sqrt{\frac{546}{24}} = \sqrt{22.75} = 4.769$$

$$Z = \frac{|R - Mean|}{S\tan dard\ deviation(\sigma)} = \frac{|21 - 10.5|}{4.769} = \frac{10.5}{4.769} = 2.20$$

$$We\ know\ Z_{0.05} = 1.96,\quad Z_{0.01} = 2.58$$

$$So\ Here\ Z_{tab} < Z_{cal}\ \&$$

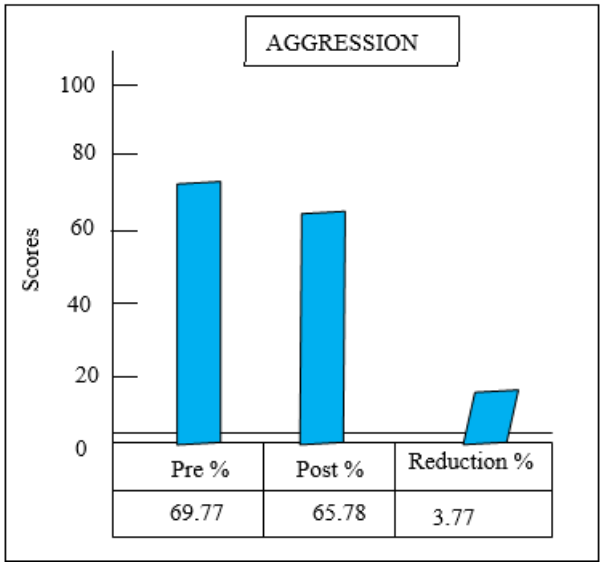
$$H_0 = Null\ hypothesis rejected where$$

$$H_a = Alternative\ hypothesis is\ accepted.$$

Wilcoxon Signed-Rank Test revealed a statistically significant reduction in the level of aggression of the participants in the yogic intervention programme,

Z = 2.20, here P> 0.05 (Sig.2 tailed). Hence, we reject the H0. It is observed from the results that yogic intervention reduced the aggression level of students. Therefore, null hypothesis is rejected.

Pre intervention AG % = 69.77, post intervention AG % = 65.78



5. Conclusion

The study delving into the impact of brain waves on aggressive behavior among students and the efficacy of yogic techniques in its management reveals compelling insights. Aggression among students is a multifaceted issue influenced by various factors, including neurological patterns, environmental stressors, and social dynamics.

Through the examination of brain wave patterns associated with aggression, it becomes evident that specific states, such as increased beta waves and decreased alpha waves, correlate with heightened aggression levels. These findings underline the intricate interplay between brain activity and behavioral tendencies, highlighting the need for targeted interventions to address aggressive behavior effectively.

Yogic techniques emerge as a promising avenue for mitigating aggressive tendencies among students. The practice of yoga encompasses diverse tools, including asanas, pranayama, meditation, and mindfulness, which holistically engage the mind, body, and spirit. By fostering self-awareness, emotional regulation, and empathy, yoga equips students with invaluable skills to navigate challenging situations and cultivate harmonious relationships.

Moreover, the incorporation of yogic practices into educational settings offers numerous benefits beyond aggression management. It promotes overall well-being, enhances cognitive functioning, and fosters a positive school climate conducive to learning and personal growth.

In conclusion, the integration of yogic techniques holds immense potential in addressing the complex issue of aggressive behavior among students. By harnessing the power of neuroscience and ancient wisdom, educators and mental health professionals can collaboratively implement evidence-based strategies to nurture a generation of emotionally intelligent and resilient individuals capable of contributing positively to society. Further research and comprehensive implementation efforts are warranted to maximize the transformative impact of yogic interventions in educational contexts.

References

[1] Patanjali's Yoga sutra by Swami Vivekananda
[2] Klimesch W. EEG alpha and theta oscillations reflect cognitive and memory performance: a review and analysis. *Brain Res Rev*. 1999. April; 29 (2-3): 137-296.
[3] Verrusio W, Ettorre E, Vicenzini E, Vanacore N, Cacciafesta M, Mecarelli O. The Mozart effect: a quantitative EEG study. *Conscious Cogn*. 2015. September; 35: 150-5
[4] Weierstall R., Elbert T. The Appetitive Aggression Scale-development of an instrument for the assessment of human's attraction to violence. *Eur. J. Psychotraumatol*. 2011; 2: 8430. doi: 10.3402/ejpt. v2i0.8430.
[5] Goodwin N. L., Nilsson S. R. O., Golden S. A. Rage Against the Machine: Advancing the study of aggression ethology via machine learning. *Psychopharmacology*. 2020; 237: 2569-2588. doi: 10.1007/s00213-020-05577-x.
[6] Beiderbeck D. I., Reber S. O., Havasi A., Bredewold R., Veenema A. H., Neumann I. D. High and abnormal forms of aggression in rats with extremes in trait anxiety—Involvement of the dopamine system in the nucleus accumbens. *Psychoneuroendocrinology*. 2012; 37: 1969-1980. doi: 10.1016/j. psyneuen.2012.04.011.
[7] Bhik-Ghanie, R. (2019, July). Pranayama Yoga: Measuring Brainwaves via EEG. In Proceedings of the 13th International RAIS Conference on Social Sciences and Humanities (pp. 311-316). Scientia Moralitas Research Institute
[8] Bhik-Ghanie, R. (2019, July). Pranayama Yoga: Measuring Brainwaves via EEG. In Proceedings of the 13th International RAIS Conference on Social Sciences and Humanities (pp. 311-316). ScientiaMoralitas Research Institute
[9] Bhik-Ghanie, R. (2019, July). Pranayama Yoga: Measuring Brainwaves via EEG. In Proceedings of the 13th International RAIS Conference on Social Sciences and Humanities (pp. 311-316). ScientiaMoralitas Research Institute
[10] Dandge, M. R. (2014) A comparative study of Impact of Yoga practice on adjustment and Aggression of Urban and rural teenagers.
[11] Ganpat, T. S., Dash, S., & Ramarao, N. H. (2014). Yoga therapy for promoting emotional sensitivity in University Students. Journal of education and health promotion, 3.
[12] Godse, A. S., Shejwal, B. R., & Godse, A. A. (2015). Effect of Surya Namaskar on relaxation among college students with high stress in Pune India. International Journal of Yoga 8 (1), 15.
[13] Torgutalp, S. S. (2018). Effect of Yoga principles (Asana, Pranayama, and Meditation)on Brain waves. SporHekimligiDergisi, 53 (2), 089-093.
[14] Krishna Rao, P. V. (1995). Yoga: Its scientific and applied aspects. Journal of Indian Psychology, 13 (2), 1-12.