Attention Deficit Hyperkinetic Disorder- A report on improving the Quality of Life with a new mode of therapy

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 **ABSTRACT**

Attention deficit hyperkinetic disorder (ADHD) is a life disability. It can be one reason for academic and school difficulties. ADHD can also lead to emotional or behavioural problems, difficulties with peer relationships, and family stress. Unrecognized and untreated, this disorder will interfere greatly with all aspects of the individual’s life; hence treatment interventions are to be considered at each phase of the individual’s life. Pranayama which includes a rhythmic breathing process has established itself as a part of a self- development program which helps stress management. Scientific studies have revealed the overall outcome of Yoga and meditation as an efficient process with increased connectivity in the different regions of the brain depending on the duration of the practice. Seeing and experiencing the benefits of these processes in adults, has inspired the therapists to try this method on children to rule out the cause of attention deficits in schools and in their homes. In this context, the application of slow rhythmic breathing techniques, and a combination of yoga and meditation can be used as a treatment alternative to lifelong medication in the treatment of ADHD is proposed in this article. This article also focusses on the supportive role of proper nutrition and diet in alleviating the symptoms of ADHD. The overall wellbeing with the advocacy of the techniques and measures which can prove beneficial in the long run has an effect on improving the quality of life of children with ADHD.

Key Words: ADHD, rhythmic breathing, yoga, peer relationships, stress management, self-development, nutrition, quality of life

 **सार**

अटेंशन डेफिसिट हाइपरकिनेटिक डिसऑर्डर (एडीएचडी) एक जीवन विकलांगता है। यह अकादमिक और स्कूल की कठिनाइयों का एक कारण हो सकता है। एडीएचडी भावनात्मक या व्यवहार संबंधी समस्याओं, सहकर्मी संबंधों में कठिनाइयों और पारिवारिक तनाव को भी जन्म दे सकता है। अपरिचित और अनुपचारित, यह विकार व्यक्ति के जीवन के सभी पहलुओं में बहुत हस्तक्षेप करेगा; इसलिए व्यक्ति के जीवन के प्रत्येक चरण में उपचार हस्तक्षेपों पर विचार किया जाना चाहिए। प्राणायाम जिसमें एक लयबद्ध सांस लेने की प्रक्रिया शामिल है, ने खुद को एक आत्म-विकास कार्यक्रम के एक भाग के रूप में स्थापित किया है जो तनाव प्रबंधन में मदद करता है। वैज्ञानिक अध्ययनों ने योग और ध्यान के समग्र परिणाम को अभ्यास की अवधि के आधार पर मस्तिष्क के विभिन्न क्षेत्रों में बढ़ी हुई कनेक्टिविटी के साथ एक कुशल प्रक्रिया के रूप में प्रकट किया है। वयस्कों में इन प्रक्रियाओं के लाभों को देखने और अनुभव करने से, चिकित्सकों ने स्कूलों और उनके घरों में ध्यान की कमी के कारण को दूर करने के लिए बच्चों पर इस पद्धति को आजमाने के लिए प्रेरित किया है। इस संदर्भ में, एडीएचडी के उपचार में धीमी लयबद्ध साँस लेने की तकनीक, और योग और ध्यान के संयोजन का उपयोग आजीवन दवा के उपचार के विकल्प के रूप में किया जा सकता है, इस लेख में प्रस्तावित है। यह लेख एडीएचडी के लक्षणों को कम करने में उचित पोषण और आहार की सहायक भूमिका पर भी ध्यान केंद्रित करता है। तकनीकों और उपायों की वकालत के साथ समग्र भलाई जो लंबे समय में फायदेमंद साबित हो सकती है, एडीएचडी वाले बच्चों के जीवन की गुणवत्ता में सुधार पर प्रभाव पड़ता है।

मुख्य शब्द: एडीएचडी, लयबद्ध श्वास, योग, सहकर्मी संबंध, तनाव प्रबंधन, आत्म-विकास, जीवन की गुणवत्ता

**I.INTRODUCTION**

 School is the lifework of children and adolescents. Thus, anything that interferes with mastery and success in school will cause stress for the student and his or her family. ADHD can be one reason for academic and school difficulties. ADHD can also lead to emotional or behavioural problems, difficulties with peer relationships, and family stress. Unrecognized and untreated, this disorder will interfere greatly with all aspects of the individual’s life[1,2]. Discussions of ADHD seem to be everywhere. We read about it in newspapers and magazines. We hear and see about it in television. Parents and teachers frequently suggest that a child has ADHD. Several neurologically based disorders are frequently found in individuals who have ADHD.

 From 30%-40% of children or adolescents also have a learning disability. Other related difficulties include anxiety disorders, depression, anger regulation problems, obsessive compulsive disorder and tic disorder. Studies show that ADHD affects 3-5% of school age children and is more prevalent among boys. The ratio in the studies vary between B:G=2:1 to 10:1. Boys are more likely than girls to express their frustration by being aggressive or antisocial. These behaviours are more disruptive. Data suggest that girls display attentional problems that are less intrusive and with fewer aggressive symptoms[3,4]. ADHD is a life disability. Hyperactivity, distractibility, and /or impulsivity are not just school problems. They are life problems. These behaviours interfere with the student’s possibility for classroom learning. They also interfere with family life, peer interactions, and successful participation in sports and other activities. The concept of ADHD being a life disability is important when treatment is considered. If the clinician were to treat the ADHD during school hours and months only, the individual might do well in school but continue to have behavioural problems at home with friends. Therefore, treatment interventions are to be considered at each phase of the individual’s life[1,2].

 The slow rhythmic breathing process,can be portrayed as a self-development program which helps stress management and can be effectively used in the treatment of depression in adults. Scientific studies have revealed the overall outcome of Yoga combined with breathing exercises to be more efficient processing with increased connectivity in the different regions of the brain depending on the duration of the practice. The benefits of the measures, can be introduced in the children by the therapists to rule out the cause of attention deficits in schools and in their work places. The wide application of the workouts in children with ADHD can be extended to their adolescence and adulthood. The ability to continue the processes lifelong relieves a particular child from the adverse effects of lifelong medication. Hence is the need to know about the deep thought provoking exercises and the places where it can prove beneficial from the treatment point of view[5].

**II.NEUROLOGICAL CONCEPTS REALTING TO THIS DISORDER**

 Although the exact cause is unknown, for many children, something affects the brain early in development, often during the first months in utero. When this happens, it is unlikely that only one area of the brain is involved. Several areas might be involved. Even though at birth,the brain has every neuron it will ever have; the brain is immature.As it matures it grows constantly by having new neurons activated and put into operation. If the area of developing brain is not stimulated, an apparent pruning process decreases the number of cells and connections disintegrate. In normal children the maturation spurts takes place throughout childhood , adolescence and early childhood. However, the halting of maturation results in a disorder known as attention deficit disorder or ADHD [6,7]. Some studies suggest that children affected with ADHD have a 3-4 percent shrinkage of the brain, and while it may affect the entire brain documented are the frontal lobes, temporal grey matter, caudate nucleus and cerebellum as the affected areas; particularly the white matter volume seems to be abnormally small. Hence the children with ADHD are less mature as compared to their peers as there is a delay in white matter maturation. There is no evidence that medications have an impact on brain maturation. In ADHD, the brain structures are smaller as compared to a normal child’s brain.

 Evidence from different research resources have suggested that there is a possibility that ADHD may run in families and may have genetic roots. At birth, a baby’s brain contains 100 billion nerve cells (neurons) about as many neurons as there are stars in the Milky way. Also in place are 1 trillion glial cells that protect and nourish the neurons. Research suggests,that the brain layout circuits influence every function, including vision and language. The neural activities are no longer spontaneous but driven by a flood of sensory experiences that have to take a rough blueprint and progressively refine it.A child’s brain suffers if deprived of a stimulating environment. Children who do not play much or are detached from societal interactions develop brains that are 20-30 times smaller than normal for their age. Rich and stimulating experiences result in more synapses per neuron.Nature is the dominating factor during this phase when the baby is in the mother’s womb, but nurture plays a vital role[8,9]. The neurological disorders associated with ADHD are mainly cortical dysfunction, language functions , motor functions, learning functions and executive functions. The regulatory dysfunctions are anxiety disorders, mood disorders, anger control disorder, obsessive compulsive disorder,and tic disorder.

 The areas of the brain that appear to be involved in ADHD include the frontal cortex, the limbic system, the basal ganglia, and the ventricular activating system. Multiple systems interact within these parts of the brain. Most individuals with ADHD develop emotional, social and family problems because of the difficulties, frustration and failures they experience. These problems are referred to as “secondary” to emphasize that they are the consequence and not the cause of academic disability. The most frequent patterns seen are learning disabilities, ADHD, secondary emotional, social and family problems[6.7].

**III.ETIOLOGY OF ADHD**

 The possible issue of ADHD and learning disorders shows a familial pattern. Studies suggest that as many as 50% of children and adolescent with ADHD inherit a pattern of brain functioning . Recent findings suggest a possible connection between environmental toxins and the increased incidence of developmental learning and behavioral problems. Adoption of children and adolescents have increased the incidence of ADHD five times higher than would be expected. Nature is the dominating factor during the development phase of the child when the baby is in the mother’s womb, but nurture plays a vital role[8,9,10].

 Knowledge is expanding about chemical activities related to the development of brain. These chemicals control brain and behavioral interactions. Specific chemical messages, called neuroendocrines, travel to the brain through fetal development. Each neuroendocrine binds with a particular cell or cell group that has the correct receptor site for the specific message. This binding results in growth of these cells. Each day different sites are stimulated to grow in a precisely orchestrated , complex process, slowly weaving together the network of nerves that make up the human brain.With ADHD, the suspected endocrine mediator is thought to be norepinephrine; however it might be one of its precursors, dopa or dopamine. Any deficiency of either of these neurotransmitters at any site within this complex system of the brain might result in hyperactivity, inattention, and /or impulsivity[4,6]. Metabolites are chemicals seen naturally within the body. Toxins are chemicals present in the body that are not there naturally. The presence of toxins in the blood and brain while in utero, namely alcohol and lead during the early months of life and throughout childhood can result in brain dysfunction or brain damage [11,12]. Depending on the amount of toxin present, the stage of development during which it is present and the length of time it is present, the result could be mental retardation, ADHD, learning disabilities, or milder forms of academic difficulty. No specific studies have related ADHD to either high or low levels of these metabolites. During pregnancy substance or alcohol abuse in the mother can produce learning disabilities, ADHD and impulse problems as the child grow up[13]. The wiring process of the brain development which weaves neurons into integral circuits are affected by substance or alcohol use during pregnancy[14,15].

 Among the other possible factors studies have shown a consistent relationship between ADHD and variables such as birth order, number of siblings , number of family moves , mother’s age, mother’s educational level and father’s educational level.Interestingly, cultural, bilingual or socioeconomic factors do not play much role in the processing problems of the brain [16]. Questions that can be raised are: Could the message to the brain resulting in a learning disability disorder be influenced or altered resulting in a brain that functions differently? Could this explain ADHD or learning disabilities? Might certain drugs or other chemicals interfere with the biochemical messenger process, resulting in miswiring or the absence of brain growth for that particular unit of time when this messenger should have been active or might environmental toxins be one of the causes for this neuroendocrine disruption?

**IV. QUALITY OF LIFE INDEX IN ADHD**

Quality of Life (QOL) is an important measure in the practice of ‘health promoting’ science. The ADHD affected children have compromised quality of life index due to unaligned physical, psychological and social aspects of life. QOL is a patient reported quality which may be difficult to assess in young children due to lack of communication skills. This characteristic is aggravated in children with ADHD due to their internal state and inability to concentrate. Due to lack of engagement in daily activities the general sense of well being is often in need of adjustment(Figure1).To begin with ADHD results in underachievement in the different levels of education, problems in peer-relationships causing family discord , with increasing age there are evidences of delinquent activity [17] and in later life there can be substance abuse [18] and reduced workforce culminating into antisocial activities.

 With the new mode of therapy suggested in this study, the feeling of well-being with yogic breathing, meditation and associated psychosocial approaches may reduce the global impairment levels attributing peace and calmness in the ADHD affected children and adolescents. In comparison, stimulant medications may precipitate a variety of side-effects that jeopardizes the QOLof the affected children further. Future lines of investigation may be required to establish the contemporary advanced therapy in improving the quality of life for ADHD in children and adolescents [19].



Figure 1: Significance of Quality of Life (QOL) index in ADHD affected children and adolescents.

**V. NEW AVENUES OF RESEARCH**

 Evidence has shown that rhythmic drive has significant antidepressant effects in adults. It has been found to be of immense benefit in treatments of melancholia and dysthmia. Yoga, breathing exercises and meditation has established itself as a traditional approach for gaining attention and concentration. The yoga research group at NIMHANS, Bangalore[20]. India has conducted clinical trials of yoga and meditation in depression, in relation to medications like imipramine , in adults [4]. Studies have been published about definite benefits in treating ADHD through meditation (a presentation held on September 9, 1998 by the National Institutes of Health, Bethesda, Maryland on benefits of yoga in life) [21]. Mechanisms of therapeutic action of these exercises to provoke concentration in conduct disorder(CD) , attention deficit hyperactivity disorder(ADHD)and oppositional defiant disorder(ODD) in children also merit investigation. ADHD symptomatology is inherited and influenced by genetic, specific , environmental and contrast effects. Being a multifactorial disease , ADHD needs a compact and comprehensive therapeutic strategy [22]. In this article endeavors are made to satisfactorily to prove that combined therapy has beneficial effects in psychopathological disorders like ADHD affecting children.

 From studies performed in adult subjects, it can be predicted that significant improvement in the impaired motor-response inhibition common to all ADHD patients will result from yoga-breathing -meditation process [23]. Special emphasis on the group activity involvement, has shown to improve the overt behavior as well as improvement in brain activity, and performance measures in a group of children with a group of normal controls [24,25]. The response in ADHD children with increasing reflex therapy through yoga should be manifested as a significant improvement in the behavior and mood of the child on continuous practice. The health related quality of life index improves markedly, in general. Hence the attributes of ADHD symptomatology of additive genetic, specific environmental , and contrast effects need a comprehensive therapic strategy. The contemplative effects are helpful in diminishing the additive factors to a great extent through social interactions. The breathing techniques have significant antiprotective effects on aggression and anger [26], particularly, the reactive aggression in boys.From the biomedical point of view it is essentially hyperventilation with demonstrable effects on brain function which are responsible for the adaptation seen as benefits in treatment protocol. The “relaxation response” brought about through practice has been found to lengthen REM sleep latency and slow wave sleep. The objective changes , associated with therapeutic effects have been found to have a response rate of 68%,which further suggests that this release of life forces produces more than a placebo effect [27,28, 29].

 It has been of particular emphasis that stress responsivity is highly increased in children with externalizing behavioral disorders. Patterns of lower autonomic nervous system and hypothalamic pituitary adrenal axis (HPA) activity has been found in children with ADHD, backing the hypothesis that there is an involvement of a dysregulation of the central noradrenergic networks [30, 31]. With sustained therapy significant decrease has been found in levels of stress, heart rate and skin conductance level.Significant reduction in cortisol level has been seen following the sessions at around three weeks.The therapy group has shown very little alterations of the norepinephrine levels with a reactive improvement of event related potentials(ERPs),which are significantly affected in children with hyperkinetic disorders [5]. The adjuvant therapy of refining reflexes with medications should be able to be effective in attention deficit response within a period of one month. However, the severity of genetic malfunction in ADHD [32] has not predicted a differential response to the therapy as yet.

The Yoga process in children can be modulated with the practice of a form of exercise with rhythmic breathing termed as pranayama, followed by chanting and breathing exercise which is cyclical and rhythmic.The children are thereafter advised to undergo a regular practice for atleast one month to manifest the beneficial results. These excitatory forms of pranayama are similar to the gamma frequency band of neuroactivity. The gamma band is hypothesized to reflect synchrony of neural assemblies involved in integration of perceptions of various features of an object within a sensory modality in normal human beings. Chanting shows marked effects on synchronization , and increased variability in respiratory signals , cardiovascular rhythms and cerebral blood flow velocity. This indicates that sympathetic and parasympathetic(vagal) outflow are synchronized, also resulting in rhythmic fluctuation of heart rate and cerebral blood flow with improved heart rate variability and reflex baroreceptor sensitivity. During the rhythmic breathing states there would be an alpha rhythm to quieten the executive pathways in the frontal cortex, pathways involved in planning anticipation, worry and the carrying out of plans of action. The rapid breathing and resulting increased stimulation can diminish the earlier neurobiological insults or abnormalities which activates the fundamental developmental processes resulting in a reexperiencing of trauma symptoms.The repeated sequence of hyperventilation performed gives the patient a sense of control and mastery and an opportunity to learn self soothing.Thus the skillful use of breath can transform one’s emotional state, thereby avoiding harmful physiological changes. Thus the combined effect provides a “corrective emotional experience” for healing (Figure 2).

 Studies of yoga breathing and chanting have shown improved memory and attention with increased mental alertness in the context of physiological relaxation. In the processes there are aspects of group therapy and attitudinal changes as how to live life and deal with stress. The training facilitates changes in the perspectives of a child by increasing awareness and early management of emotions through regular practice of pranayama,breathing and chanting together known as contemplative workout through regular practice [33]. The child develops the habits of sharing, to work and play in harmony, to express oneself and to feel comfortable in a diverse group of people. There have been definite benefits to enhance the creative skills , improvement of memory and concentration in normal children. Application of this procedure will be useful in eliminating the fear, anxiety, and depression in an ADHD child, thereby helping in achieving academic pursuits with an integrated happy, healthy, and well adjusted life.



Figure2: A new mode of therapy in Attention Deficit Hyperkinetic Disorder

**VI. CONCLUSION**

 In summary, establishing the cycle of yoga and pranayama, slow rhythmic breathing followed by meditation as a single sequence can be proposed as one of the therapeutic processes in attention deficit disorder. Although the idea seems to be encouraging however, definite clinical trials are necessary to demonstrate the efficacy of this therapy against a placebo treatment to derive the desired standard in clinical trials. Other clinical questions in this respect are: I) Is the response a good alternative in place of drugs for acute management of ADHD? II) Is the regular practice of this technique effective in reducing the effects of societal problems, thereby improving the surrounding environment permanently, causing an indirect therapeutic benefit to the ADHD patient? III) Does this form of alternative treatment of ADHD has an impact on the Quality of Life(QOL) determinants? The questions, once answered satisfactorily through experimental evidences and clinical trials will bring to light the therapeutic mechanism of release of life forces techniques to action in attention deficit disorders and other learning disorders in children.

 **REFERENCES**

1.Wender PH, The Hyperactive Child, Adolescent, and Adult.: Attention Deficit Disorder Through the Lifespan, Oxford University Press, 1987, Chapter-2,pg 13-18.

2.Wender PH, Wender EH, The Hyperactive Child and the Learning Disabled Child, 1978, Chapter 2, pg-10-13.

3. Silver LB, Attention Deficit/ Hyperactivity Disorder: A clinical guide to diagnosis and treatment for Mental Health Professionals, 3rd edition, American Psychiatric association, 2004 Ch-1,pg3-4.

4. Silver LB, Attention-Deficit Hyperactivity Disorder: A clinical guide to diagnosis and treatment, 1992, Chapter-4, pg-37-38.

5. Brown RP.; Yogic Breathing and Meditation; When the Thalamus Quiets the Cortex and Rouses the Limbic System; Proceedings of Science of Breath, 2002, pg12-14.

6. American Psychiatric Association: Diagnostic and Statistical manual of Mental Disorders, 2nd edition. Washington DC, American Psychiatric Association ,1994.

7. Brown TE, Attention –Deficit Disorders and Combordities in Children , Adolescents, and Adults. Washington DC, American Psychiatric Publishing, 2000.

8. Adams RD, Victor Maurice, Principles of Neurology 4th edition. 1993, ch-28, pg457-460.

9. Green berg LM, Waldman ID: Developmental normative data on the test of Variables of attention(TOVA) . J. Child Psychol Psychiatry.1993, 34: 1019-1030, 1993.

10. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text revision. Washington DC, American Psychiatric Association, 2000.

11. Chung DD, Pinson MR, Bhenderu LS, Lai MS, Patel RA, Miranda RC. Toxic and Teratogenic Effects of Prenatal Alcohol Exposure on Fetal Development, Adolescence, and Adulthood. *Int J Mol Sci*. 2021, 22(16):8785.

12. Sanders T, Liu Y, Buchner V, Tchounwou PB. Neurotoxic effects and biomarkers of lead exposure: a review. Rev Environ Health. 2009,24(1):15-45.

13. Eilertsen EM, Gjerde LC, Reichborn-Kjennerud T, et al. Maternal alcohol use during pregnancy and offspring attention-deficit hyperactivity disorder (ADHD): a prospective sibling control study. Int J Epidemiol. 2017,46(5):1633-1640.

14. National Academy of Sciences: Scientific frontiers in Developmental Toxicolgy and Risk assessment, Washington DC, National Academy of Sciences, 2000a.

15. National Academy of Sciences: Toxicological Effects of Methyl mercury. Washington, DC, National Academy of Sciences, 2000b.

16. Barkley RA, Attention –Deficit Hyperactivity Disorder: A handbook for Diagnosis and Treatment, The Gulford Press.1990, ch-5, 130-147.

17. Satterfield J, Swanson J, Schell A, Lee F. Prediction of antisocial behavior in attention-deficit hyperactivity disorder boys from aggression/defiance scores.1994, 33:185–190.

18. Biederman J, Wilens TE, Mick E, Faraone SV, Spencer T. Does attention-deficit hyperactivity disorder impact the developmental course of drug and alcohol abuse and dependence? Biol Psychiatry*.*1998, 44:269–273.

19. Danckaerts, M., Sonuga-Barke, E. J., Banaschewski, T., Buitelaar, J., Döpfner, M., Hollis, C., Santosh, P., Rothenberger, A., Sergeant, J., Steinhausen, H. C., Taylor, E., Zuddas, A., & Coghill, D. The quality of life of children with attention deficit/hyperactivity disorder: a systematic review. European child & adolescentpsychiatry.2010, 19(2), 83–105.

20. Yoga Research Group. Treating depression with Sudarshan Kriya Yoga(SKY).,Department of Health Education, National Institute of Mental Health and Neurosciences, Bangalore-560029, India, 1995.

21. Greenberg PE, Stiglin LE, Finkelstein SN. The economic burden of depression, J. Clin. Psychiatry.1993,544:405-418,1993.

22. Silver LB, Attention Deficit Hyperactivity Disorder, second edition, chapter 4, pg-27-38, 1999. Silver LB, Attention Deficit Hyperactivity Disorder, second edition.1999 ch-15, pg 84-204.

23. Telles S, Hanumanthaiah B, Nagarathna R, Nagendra HR. Improvement in static motor performance following yogic training of school children. Perceptual Motor Skills. 1993, 76:1264-1266.

24. Naga Venkatesha Murthy PJ, Gangadhar BN, Janakiramaiah N, Subbakrishna DK; Normalization of P300 Amplitude Following Treatment in Dysthmia. Biol Psychiatry.1997, 42:740-743.

25. Nagavenkatesha Murthy PJ, Gangadhar BN, Janakiramaiah N, Subbakrishna DK; P300 amplitude and antidepressant response to Sudarshan Kriya Yoga (SKY) . Journal of Affective Disorders.1998. 50: 45-48.

26. Deepak KK, The Role of Autonomic Nervous System in Rapid Breathing Practices, Proceedings Science of Breath, 2002.

27. Jevning R, Wallace RK, Beidebach M. The physiology of meditation: A review. a wakeful hypometabolic integration response. Neuroscience and Behavioral Reviews.1992, 16: 415-24.

28. Wallace R.K., A wakeful hypometabolic physiologic state . Am J. Physiology.1971, 221(3); 795-799.

29. Vangala Rohini, Therapeutic relevance of Sudarshan Kriya Yoga (SKY) and its Components in Major Depressive Disorder. MD thesis dissertation, NIMHANS, Bangalore, India,2000.

30. Anastopoulos AD, Barkley RA, Biological factors in attention deficit –hyperactivity disorder. Behavior Therapist.1988, 11, 47-53.

31. Kinsbourne M, Blaw M, Rapin ,I; The mechanism of hyperactivity. Topics in Child neurology.1977. pg 289-306.

32. McMahon RJ, Genetic etiology in the hyperactive child syndrome: A critical review. American journal of Orthopsychiatry.1980, 50, 145-150

33. Vedamurthachar A, ., Effects of Sudarshan Kriya on Alcohol Dependent patients, Proceedings of Science of Breath.2002, pg 38-39.

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**CONFLICT OF INTEREST**

The author hereby declares no conflict of interest

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