

Effect of sensory diet through outdoor play on functional behaviour in children with ADHD

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Abstract

Introduction : Children with ADHD characterised with inattention, hyperactive & impulsive behaviour due to such character their functional behaviour is disturbed. Providing sensory integration along with sensory diet is one of the treatment of choice of these children. Many researcher have stated that outdoor play provides opportunities to explore the natural world, interact with peers & engaged in active play. Therefore in this study attempt has been taken to establish the influence of outdoor play combined with sensory diet on functional behaviour in children with ADHD.

Methodology : Randomly twenty eight subjects aged 6-12 years were selected by screening with sensory profile and ADHD rating scale. The subjects were divided into two groups with equal no of subjects conveniently in a random order. The baseline data of functional behaviour assessment done by using Weiss Functional Impairment Rating Scale (WFIRS). The subjects of experimental was provided sensory diet through outdoor play along with SI intervention and the subjects of control group were provided SI intervention only. The total duration of the treatment was two months. The post intervention data were collected at the end of the treatment session.

Result : The statistical result are suggestive of sensory diet based outdoor play with SI intervention as an effective therapeutic procedure in developing functional behaviour in children with ADHD.

Conclusion : From the results it can be concluded that sensory diet combined with outdoor play is an effective intervention to enhance functional behaviour in children with ADHD.

Introduction

Attention-Deficit Hyperactivity Disorder (ADHD) consists of a persistent pattern of inattention and/or hyperactive and impulsive behaviour that is more severe than expected in children of that age and level of development(Kaplan).

To meet DSM-IV-TR criteria for ADHD, impairment from inattention and/or hyperactivity-impulsivity must be present in atleast two settings and interfere with developmentally appropriate functioning, socially and in extracurricular activities(NirajAhuja).

Studies said that sensory processing problems in children with ADHD are more common than children without ADHD(yochman A2006,Ornay A2006,co-occurrence of developmental delays among preschool children with ADHD.Dev med child neurology;48;483-488).

Sensory processing is a neurological process in which our bodies notice, respond and use sensory information (Dunn 2001).

Sensory processing disorder (SPD)is otherwise known as sensory integration disorder that affects interpretation of sensory information.

Children with ADHD,have problems interacting effectively in the everyday environvent due toSPD.Toomuch,too little sensory information may cause poor motor coordination, incessant movement,inattention& impulsive behaviour which leads to overall functional impairment in family,school, life skills, social activities, risky activities and unable to develop self concept(Kranowitz 2005). It appears that ADHD has a profound impact on quality of life(QOL) in terms of functional task irrespective of national & cultural boundaries(Preussetal 2006).

Sensory integration intervention(SI intervention) helps in the process of taking in the sensory information& sorting it for functional use(Dr.Jean Ayres).In case of typical children it contributes to the development of self regulation by which the nervous system can able to attain ,maintain

& change level of arousal or alertness which is essential for the development of abilities like attention to task, impulse control, frustration tolerance, balance of emotional reaction (E. Yack, S. Sutton, P. Aquilla, 1998) which is affected in children with ADHD.

Sensory diet is a prescribed combination of activities & environment with sensory stimulation that meet an individual's sensory needs with the goal of maintaining a calm, alert state. If the sensory diet is properly designed and implemented, it can help prevent many challenging behaviours, including self-stimulatory and self-abusive behaviours. A child can feel less anxious when they feel more comfortable and control (Ellen Yack, Shireley Sutton, 1998). It enable the child to success in activities of daily living & occupations, improve quality of life.

According to development theories children develop social, cognitive, language and motor skills through play. Studies have shown that play, follows a sequential progression while facilitating neuromuscular, sensory, cognitive and social emotional development. At the same time play allows for exploration and interaction with the environment (Barron, 1991, Bundy & Fisher, 1991). Thus failure in play may interfere with adult competency (Jane Clifford O'Brien, the Occupational Therapy Journal of Research, Vol-21, 2001) & hence is an integral part of intervention strategy used for children with ADHD. Studies said that in children with ADHD outdoor play provides important opportunities to explore the natural world, interact with peers, engage in vigorous physical activity & learn about our environment (September 2007 zero to three).

A large number of researchers supported the implementation of SI therapy, scheduled sensory diet or both on attention to task in children with ADHD (Beth Pfeiffer, Amy Henry, Stephanie Miller, Suzie Witherell AJOT MAY/JUNE 2008).

Therefore in this study attempt has been made for ADHD children and to find out sensory diet as treatment media through outdoor play on functional behaviour in children with ADHD.

Methodology

The study was conducted, between June 2011 to Dec 2011 at SVNIRTAR.

Study design

Pre-test and post- test experimental design.

Subjects and setting

A total number of 28 attention deficit hyperactive disorder subjects were randomly selected for the study. All the subjects were recruited from pediatric section, SVNIRTAR, over a period of 6 months.

Inclusion criteria

- Age group between 6 to 12 years of both sexes
- Characterize attention deficit hyperactive disorder

Exclusion criteria

- Mental retardation
- Other congenital developmental disorders
- Epilepsy
- visual and/ or hearing impairment.

Instrumentation

Short Sensory Profile was used to develop the individualized sensory diet based on the sensory processing disorder of the client.

Weiss Functional Impairment Rating Scale (WFIRS) score were used as outcome measure.

ADHD rating scale was used to screen out ADHD children.

Procedure

Those who fulfilled the inclusion criteria were selected for the study and who were willing to participate were invited to join the study and were asked to sign the consent form. The selection of subject was done through convenient sampling then randomly allocated into two groups. Both group was allotted with 14 children.

Group A- Experimental Group

Group B- Control Group

Children of both groups were assessed by general occupational therapy evaluation format (Evaluation format is given in appendix). Both groups had baseline assessment done by using short sensory profile and Weiss functional impairment rating scale (WFIRS). Those children who are under experimental group have provided with protocol type 1 which is sensory diet through outdoor play along with SI intervention and control group have provided with protocol type 2 which is SI intervention only. This session has been carried out in the morning period. Sensory diet through outdoor play activities consisting of all the tactile, proprioceptive vestibular, visual, auditory and olfactory senses. Activities like paw prints, tactile road, mummy wrap, old lady sally, ringa ringa roses, London bridge is falling down, kicking colourful bottles with stick, gentle rough house activities, hold up the trees, peanut hunting in the grass, paper plate dance etc. are carried out everyday. All the subjects of both groups are undergone for two months of intervention. At the end of two months the post test data were calculated by using WFIRS.

Result

The result was analyzed by using Mann-Whitney U test which can simply compares the results from each group to see if they differ significantly. Calculating the Mann-Whitney U test U value comes 36.

The result reveals that the p value is less than 0.01 therefore it can be claimed that the results are significant. Therefore our null hypothesis can be rejected & experimental hypothesis supported. Although the hypothesis did not predict whether



Table-1 : Shows the U value

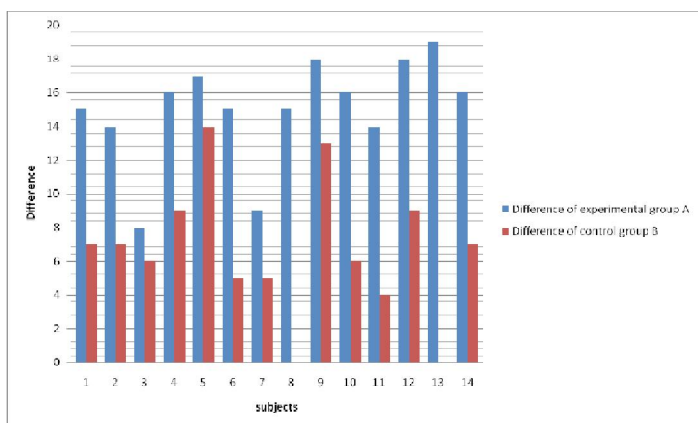
Condition	No.of subjects	Mean difference	Rank total	U value
A	14	15	265	36
B	14	6.58	89.5	

Table-1 : Shows mean of pre & post score of functional behavior of both groups

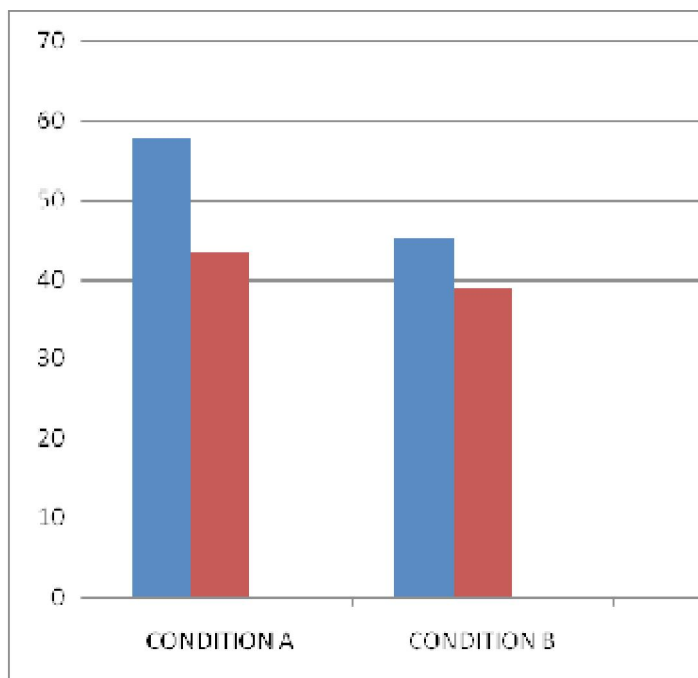
Condition	Mean of Pretest	Mean of Posttest
A	57.9	43.5
B	45.2	39

thee sensory diet through outdoor play along with SI intervention can have a better effect on the functional behavior in children with ADHD as compare to SI interventiononly. It is useful to compare the mean from each condition to see which protocol in fact more successful. The mean scores for condition A & condition B are 15 & 6.58 respectively which shows protocol for condition A is more effective.

Graph 1
Shows pre and post difference of all the subjects in both the Groups



Graph 2
Shows mean of pre test and post values of Condition A and Condition B



Discussion

The purpose of the study was to determine whether sensory diet along with sensory integration therapy would exhibit greater improvement in functional behavior of children with attention deficit hyperactive disorder (ADHD) than who received the sensory integration therapy alone. From the above study it has been found that sensory diet through outdoor play along with SI therapy have better effect on the functional behavior of children

with ADHD. The above statement has been substantiated by the studies of (Wilbarger, 1995; Zuckerman, 1994) which states that sensory diet is based on the principal that individuals require a certain quality and quantity of sensory experiences to be skillful, adaptive, and organized in their daily lives.

The above result is also supported by a large body of research (Kendal et al 1991; Ornstien&Sobel, 1987) supports the idea that specific sensory experience influence the function, structure, and neurochemistry of the brain. Repeated or sustained input has been shown to result in lasting change in brain function (Field, 1995; Greenough et al, 1987; Greenough& Black, 1992; Morgan, 1997; Schanberg& Field, 1998). Sensory integration therapy and sensory diet share the common basic principles like addressing a central nervous system dysfunction and offering neurological explanation, utilizing the CNS processing theories to describe the treatment process and producing the adaptive response in treatment. It can be said that both sensory integration therapy and sensory diet addresses adaptive responses at lower and higher level. A mismatch between an individual's need and his or her sensory diet can have wide- ranging effects such as prolonged or severe deprivation can result in impaired cognitive, social, and emotional development (Cemerck&Daunhaur, 1997; Goldberger, 1993). Conversely, exposure to selectively applied and enriched sensory input has been shown to have beneficial effects on development and health (Field, 1995, 1998). Ayres(1972, 1979) highlighted the important functions that somatosensory and vestibular process serve in development, skill, or more global adaptation such as change in arousal state (Kandal et al., 1991; Wilbarger & Wilbarger 1991). Roods (1962) described the importance of timing on the application of sensation and she conceptualized sensation as having "latency effects" i.e. influencing the nervous system for certain period of time. Activity or sensory experiences may need to be repeated frequently, particularly if a level of adaptation or state must be maintained over time.

Sensory integration therapy was designed to treat children with learning disorder and sensory integration dysfunction or sensory processing disorder. It was Ayres (1972) who developed the sensory integration and defined sensory integration as "the neurological process that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment. Intervention of sensory integration therapy is mainly child- directed which means the child needs to act on his or her environment to produce the adaptive responses.

Functional behavior in experimental group is improved may be due to control of hyperactivity & impulsivity through exposure of outdoor play as this statement is substantially supported by Taylor and Kuo who states that the children diagnosed with ADHD, which is characterized by deficits in concentration and impulse control, might also benefit from "green time."

In a study published in 2004, they analyzed data from a national Internet-based survey of parents of children formally diagnosed with ADHD show milder symptoms immediately afterward activities conducted in outdoor settings compared to activities

in other settings. However statistical analysis was not obtained (Bundy 1991, Neumann, 1971).

The improvement of functional behavior in experimental group may also be due to improvement in proportion of time to which child was engaged in outdoor play and also the improvement in the degree to which the child is concentrating on the activity or playmates, and improvement in skills with which the child actively changes the requirement or complexity of the task in order to vary the challenge or degree of novelty.

According to Western Kentucky University keeping children inside for most of the day leads to less active play and more structured, adult-directed activity. Outdoor play provides important opportunities to explore the natural world and learn about our environment. Very young children explore through their senses, and the outdoors presents a new world of sights, sounds, smells, and tactile experiences.

The higher improvement in the experimental group than the control group in spite of same duration of treatment for both the groups could be because of the adequate amount of tactile, proprioception and vestibular input which develops the self organization and self regulation and leads to improvement in functional behavior.

Conclusion

Children with ADHD have sensory processing deficit which disturbs their arousal level, self organization and self regulation is a established fact. Sensory diet through outdoor play allows the child to develop his cognition, emotions, and motor skills are also a well known fact. However it has been observed that children with ADHD are commonly faced impairment in quality of life (QoL) in terms of their physical, psychological, and social functioning. This study made an attempt to improve the functional behavior in ADHD children by providing S.I. Therapy and sensory diet through outdoor play. From the results and discussion it suggests that the experimental hypothesis was accepted. The subjects in the experimental have shown improvement in functional behavior in family, school, life skills, self concept, social activities, risky activities resulting improvement in their QOL. Therefore it can be concluded that sensory diet through outdoor play along with S.I. intervention will be helpful for ADHD children in developing their overall aspect.

Limitations

- Small sample size makes it difficult to generalize this finding.
- Population sample was only confined to ADHD children.
- The study duration was also short.
- Individual component of WFIRS was not statistically analyzed.

Recommendations

- Future efforts need to examine the effectiveness of Sensory integration therapy with sensory diet on a larger sample.
- Additional studies of long term benefits of sensory integration

therapy with sensory diet on sensory processing disorder and other functional disabilities are warranted.

- Individual component of WFIRS can be analyzed.

References

1. Talay-Ongan, Wood Ahn et al, Sensory Processing Difficulties, Behavioural Problems, and Parental Stress in a Clinical Population of Young Children, Springer, 2012.
2. Andrea Faber Taylor, Frances e. kuo and William c. Sullivan, views of nature and self-discipline: evidence from inner city children. *Journal of Environmental Psychology*, 2002;22:49-63.
3. Aston-Jones, Rajkowski, & Cohen, Role of Locus Coeruleus in Attention and Behavioural Flexibility, *Society of Biological Psychiatry*. 1999;27.
4. Ayres, Wilbarger & Wilbarger, Toward a Consensus in Terminology in Sensory Integration Theory and Practice: Part 2: Sensory Integration Patterns of Function and Dysfunction, *the American Occupational Therapy Association*, 2000;6: 23.
5. Beth Pfeiffer, Amy Henry, Stephanie Miller, Suzie Witherell *AJOT*, 2008;6.
6. Barkley & Murphy, Kaplan, Sadock, & Grebb, Attention deficit hyperactivity disorder and sensory modulation disorder: A comparison of behaviour and physiology, *Appears in Research in Developmental Disabilities* (2012);33 :804-818.
7. Edelson SM, Edelson MG, Kerr DC, Grandin T. Behavioural and physiological effects of deep pressure on children with autism: a pilot study evaluating the efficacy of Grandin's Hug Machine. *AJOT*. 1999; 53(2):145-52.
8. Calming Effects of Deep Touch Pressure in Patients with Autistic Disorder, College Students, and Animals. *Journal of Child and Adolescent Psychopharmacology*. Spring 1992, 2(1): 63-72.
9. Carissa J. Cascio, Somatosensory processing in neurodevelopmental disorders, *J Neurodevelopmental Disord*, 2010 2:62-69.
10. David Coghill, Marina Danckaerts, Edmund Sonuga-Barke, Joseph Sergeant, and the ADHD European Guidelines Group, Practitioner Review: Quality of life in child mental health – conceptual challenges and practical choices, *Journal of Child Psychology and Psychiatry*, 2009;50: 544-561.
11. Dunn W, Bennet D. Pattern of sensory processing in children with ADHD. *Occup Ther J Res*. 2002;22:4-15.
12. Dunn, W. (2001). The sensations of everyday life: Empirical, theoretical, and pragmatic considerations, 2001 Eleanor Clarke Slagle lecture. *American Journal of Occupational Therapy*, 55, 608-620.
13. Elliot, Friston, & Dolan, Ernst, Bolla, & Mouratidis, The neural basis of risk ratings: Evidence from a functional magnetic resonance imaging (fMRI) study, *Neuropsychologia*, 2007;45:3242-3250.
14. Fedewa, A. L., & Erwin, H. E. Stability balls and students with attention and hyperactivity concerns: Implications for on-task and in-seat behaviour. *American Journal of Occupational Therapy*, 65, 393-399. doi: 10.5014/ajot.2011.000554.
15. Halperin, Matier, Bedi, Sharma, & Newcorn, 1992, Specificity of inattention, impulsivity, and hyperactivity to the diagnosis of attention-deficit hyperactivity disorder, *J Am Acad Child Adolesc Psychiatry*. 1992;31(2):190-6.
16. *Journal of Attention Disorders Online First*, published on Children with Attention Deficits Concentrate Better after Walk in the Park. August 25, 2008.
17. Kane, A., Luiselli, J., Dearorn, S. & Young, N). Wearing a Weighted vest as Intervention for Children with Autism and Pervasive Developmental Disorder. *The Scientific Review of Mental Health Practice*, 2004; 3(2).

18. Kristan Harris, Denise Reid, The influence of virtual reality play on children's motivation, *Canadian Journal Of Occupational Therapy*, February 2005; 7(1)
19. Lerch, & Sharp, Steinhausen, Shaw et al, Longitudinal mapping of cortical thickness and clinical outcome in children and adolescents with attention-deficit/hyperactivity disorder, *Arch Gen Psychiatry*. 2006; 63(5):540-9.
20. Marina Danckaerts, Edmund J.S. Sonuga-Barke, Tobias Banaschewski, Jan Buitelaar, The quality of life of children with attention deficit/hyperactivity disorder: a systematic review, 2009 ; 7(26).
21. Mulligan, Shelley Classroom strategies used by teachers of students with attention deficit hyperactivity disorder. *Physical & Occupational Therapy in Pediatrics*, 2001; 20, 25-44.
22. Williams & Shellenberger, Oetter et al. Model of Practice, *British Journal of Occupational Therapy* September 2007; 70(9).
23. Pfeiffer, B., Henry, A., Miller, S., & Witherell, S. The effectiveness of Disc 'O' Sit cushions on attention to task in second-grade students with attention difficulties. *American Journal of Occupational Therapy*, 2008; 62, 274-281.
24. Reynolds and Lane, and Carter, Ben-Sasson, and Briggs-Gowan Sensory Overresponsivity and Anxiety in Typically Developing Children and Children with Autism and Attention Deficit Hyperactivity Disorder: Cause or Coexistence? *American Journal of Occupational Therapy*, 2011; 66, 595-603.
25. Roseann C. Schaaf, Lucy Jane Miller, Duncan Seawell, Shannon O'Keefe, 2003, Children With Disturbances in Sensory Processing: A Pilot Study Examining the Role of the Parasympathetic Nervous System, *American Journal of Occupational Therapy*, 57, 442-449.
26. Schilling, D.L., Washington, K., Billingsley, F.F., & Deitz J, Classroom seating for children with attention deficit hyperactivity disorder: Therapy balls versus chairs. *American Journal of Occupational Therapy*, 2003; 57, 534-541
27. Wilbarger, P.. Planning a "sensory diet": Application of sensory processing theory during the first year of life. *Zero to Three*, 1984; 5:7-12.
28. Winnie Dunn, The Sensations of Everyday Life: Empirical, Theoretical, and Pragmatic Considerations, *American Journal of Occupational Therapy*, 55, 608-620.
29. Winter (Environmental Education, The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children, *Early Childhood Education Journal*, 2001; 29(2).

Bibliography

1. Ahuja N. Child Psychiatry. A Short Textbook of Psychiatry, Sixth edition, 2006; 176-177
2. Anita C. Bundy, Shelly J. Lane, Elizabeth A. Murray, Sensory integration: Theory and Practice, Second Edition.
3. Carolyn M Hicks, research methods for clinical therapists, 165-168, 265-266.
4. David Poolak, Neurodiversity in higher education, 2005, 172.
5. E. Yack, S. Sutton, P. Aquilla, Building bridges through sensory integration, 1998: 18-61.
6. Michele Gentile. Functional Visual Behaviour in Children, 2nd Edition.
7. Kaplan and Sadock's comprehensive Textbook of psychiatry, Ninth edition; 3560.
8. Kranowitz, C. The Out-Of-Sync Child. New York: Perigee, 1998
9. Jason Mathison. Sensory Processing in Children with ADHD: A Classroom Study and Rational Item Analysis, PCOM Psychology Dissertations, 2012.
10. Susan Spitzer, Susanne Smith Roley, S. Essie Jacobs, Mary L. Schneider et al, Sensory Integration for Divergent Population, 89-106.

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