

Immediate effect of meditation in children on performance in a letter cancellation task

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Abstract: Usually effect of meditation has been studied on adult population. Meditation treatment effects among youth are relatively unknown. There are growing tendency of anxious and Attention deficit hyperactive disorder in present generation. The present study was designed to compare a meditation session and an outdoor Mental play session and their effects in the level of concentration and anxiety in a group of 34 children participating in a International Youth Yoga Retreat. There were 17 participants in meditation (1) and outdoor mental play (2) session. Group Intervention (1) (M age = 11.82 yr., SD = 2.43) and Group Intervention (2) (M age = 12.59 yr., SD = 2.90). Assessments were done before and after every intervention in the two consecutive days that the experiment last, on December 2011. There were two categories of assessments; (i) six-letter cancellation task (SLCT), and (ii) anxiety assessment using visual analog scale (VAS). The level of attention in the meditation intervention is increased by 5.14 ($p < 0.006$) and in play group it increase by 3.17 ($p < 0.096$). The mean stress decrease in the meditation group was 1.36 ($p < 0.019$); in the play group it was only 0.05 ($p < 0.93$). The difference between the groups was significant at the 0.01 level of significance. Anxiety and stress reduction for children and adolescents is often approached by assessing and reducing a multiplicity of external causal factors. This study indicates that yoga relaxation and meditation practices hold considerable promise for increasing children's' resilience from within.

Keywords: cancellation task, meditation, anxiety, children

Introduction

Meditation practice can be explained as the deliberate self-regulation of attention in the present moment and typically comprises concentration, relaxation, altered states of consciousness, suspension of logical thought, and maintenance of a self-observing attitude (Craven, 1989). Meditation has also been defined as a practice that emphasizes maintaining alertness and expanding self-awareness with an increased sense of integration and cohesiveness (Snaith, 1998). The effects of meditation have been studied mostly in adult populations. Meditation treatment effects among youth are relatively unknown.

Over the past quarter of a century, the scientific interest in meditation has grown significantly (Murphy, 1997), existing all over the world many scientific journals and research institutions dedicated to the study of meditation and its effects on health. However in meditation research still exist many fields to be explored more deeply; one of them is the meditation research on children. The psycho physiological processes attributed to meditation practice have been documented in adult studies, and although it is yet unknown if these same processes occur in youth, similar process may exist for children (Black, 2009). Although more than 800 studies have investigated the therapeutic effects of meditation practices,

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the vast majority of these studies were among adults (Ospina, 2007). Largely, interventions and research have been undertaken in adult populations, although there is now increasing interest in applications with children and adolescents, with a small body of research literature emerging (Burke, 2010)

In the children there is a growing tendency to be anxious and distractible. The National Institute of Mental Health from U.S. Department of Health and Human Services (2012) classify the Attention deficit hyperactivity disorder (ADHD) as one of the most common childhood disorders with a lifetime prevalence of 9% of 13 to 18 years old. In the same publication they refer that the symptoms of ADHD include difficulty of staying focused and paying attention, difficulty controlling behaviour, and hyperactivity. Studies conducted on different yogic practices like asana, pranayama and meditations reveals that these techniques can be used as an intervention to enhance memory and concentration (Ghaligi, 2006). Anxiety is defined by Sigmund Freud as “something felt,” an emotional state that included feelings of apprehension, tension, nervousness, and worry accompanied by physiological arousal (Spielberger, 2010) Extensive research studies have shown that meditation and practices such as progressive relaxation significantly reduce both acute and chronic anxiety (Murphy, 1999). Kratter (1982) conducted a study of the use of meditation in the treatment of attention deficit disorder with hyperactivity in children. The results of the study support the contention that meditation can be an effective intervention in the treatment of children diagnosed as having an Attention Deficit Disorder with Hyperactivity. Several studies have demonstrated that practicing yoga techniques reduces anxiety (Telles, 2009). A study conducted with school-age children examined the use of meditation. The results indicated that compared to a guidance group and a no-treatment control group, children who practiced meditation became more field independent, and less test anxious (Linden, 1973). Contemporary studies interpret meditation success in reducing anxiety with clinical terms such as lowered arousal of the sympathetic system or the reduction of cognitive dissonance (Murphy, 1999). At the moment we’ve found some scientific publications related to the diagnosis and measurement of the lack of attention, however to our knowledge this is the first experiment that has integrated the measurement of anxiety and attention in one children research.

The present study was designed to compare a meditation session and an outdoor play session and their effects in the level of concentration and anxiety in a group of 34 children participating in a International Youth Yoga Retreat.

Method

Participants

The participants were a group of 34 children of both sexes, coming from 7 different countries. Who were attending a one week International Youth Yoga Retreat in a local Ashram in north India. The participants were assigned to two groups: Group Intervention 1 (M age = 11.82 yr., SD = 2.43) and Group Intervention 2 (M age = 12.59 yr., SD = 2.90) the study took place in the fifth and sixth day of the yoga retreat. Most of the participants had a good understanding of the English language, however the English was the mother-tongue of only 15% of the total participants. The parents of the participants signed the research consent prior to the start of the study.

Design

The first step in this project involved meeting the parents of the children to explain the purpose, objectives and methodology of the research project. A sample sheet of the Six Letter Cancellation Task (SLCT) different to the test was given to the parents in order to make them understand and experiment the test methodology and later on explain to their children how to perform the task. Because some of the parents could not come to the earlier meeting, the next day, before start the intervention we explained to

the children how to do the SLCT and gave them a trial test with only 4 lines of the SLCT to be sure of their understanding of the task. The 34 participants were randomized to two groups. The two groups (N = 17, each) were designated as Group Intervention 1 and Group Intervention 2 by a volunteer who had no role in the trial.

Assessment

Assessments were done before and after every intervention in the two consecutive days that the experiment last, on December 2011. There were two categories of assessments; 1) six-letter cancellation task (SLCT), and 2) anxiety assessment using visual analog scale (VAS).

Six-Letter Cancellation Task (SLCT)

The six-letter cancellation task consisted of a test worksheet that specified the six target letters to be cancelled and had a 'working section' that consisted of letters of the alphabet arranged randomly in 14 rows and 22 columns. The participants were asked to cancel as many of the six target letters as possible in the specified time of 90 seconds.

Each cancelled letter was scored as 1 irrespective of whether it was correctly or incorrectly cancelled. The total number of cancellations and errors (wrong cancellations) was counted. Net scores were calculated by deducing the number of errors from total cancellation. As this test was administered before and immediately after the intervention, to avoid the test-retest effects, parallel worksheets were prepared for each session by changing the target letters and the sequence of letters in the working section (Kumar, 2009).

Visual Analog Scale (VAS)

Visual analog scale (VAS) were designed for assess the participants anxiety as indicators of emotional distress. The analog scale was a 10 centimetre long doubly anchored scale, with one end (score = 10) of the scale indicating the highest intensity of a feeling anxiety, while the other end (score = 0) indicated the lowest intensity of feeling of anxiety. Participants were instructed to place a vertical mark on the horizontal line to indicate the level of their feelings. The score of the level of anxiety was obtained by measuring the distance in millimetres from the end of the line where the score was '0' up to the mark made by the subjects.

It was decided to use visual analog scale as it was easier to get accurate responses in a short period of time, after the application of the SLCT. However, it is recognized that using visual analog scales instead of validated questionnaires is a limitation of the study.

Both assessments were made at the beginning and at the end of the 15 minutes intervention which consisted in the practice of meditation or an outdoor play, depending on the group to which the participants were assigned. Both tests (six-letter cancellation task and stress analog test) were distributed separately in order to avoid confusion. First we asked the children to do the SLCT, allotted time was 90 seconds, and later we asked them to measure their level of stress or anxiety with the use of a VAS.

Interventions

This was a crossover self-control study. The Group Intervention 1 did meditation on the first day and the outdoor play in the second day, for the Group Intervention 2, the order was reversed. The experiment took place at the same hour of two consecutive days.

Meditation session

The participants remained in the same room where the test has been made, then for fifteen minutes, with the guidance of an experienced meditation master from the Yoga Himalayan Tradition; participants were asked to sit on the floor in around the master, close their eyes and bring their attention to the space that the body occupied. They were taught to breathe diaphragmatically with a minimum of jerks and pauses and movement in the chest. Breathing as smoothly as possible, they were led through a progressive relaxation exercise that last 10 minutes. Then they were led to meditation with the indication of paying attention to the touch of the breath inside the nostrils, and bring their attention to the base of the nose between the two nostrils.

The Yoga Himalayan Tradition is an unbroken stream of spiritual knowledge flowing from the great sages of the Himalayan Monasteries. The Himalayan Meditation was technique, created by Swami Rama of the Himalayas.

Outdoor play session

The participants were asked to leave the room for a recreational activity outdoors. This activity was of the same duration as the meditation sequence. The children sat in a circle in the field, so that everyone could see one another. Random seating was used without regard to age, sex, nationality or race. The children were asked to say their names, ages, nationalities and to tell their favourite foods and animals. It was a copycat and a memory game. One by one, each made a sound and a movement with the hands, arms, mouth or face and everyone copied all the previous sounds and gestures in the order in which they happened, adding their own new movements and sounds at the end. At the very end, all participants were asked to repeat together the previous sounds and motions in correct sequence.

Result

Data were analysed using statistical package (SPSS version 18). The data of both groups were assessed with tests of normality.

Table 1. Total score, scores for stress score in an SLCT pre and post the Meditation and Play sessions. Values are in group mean and standard deviation

	Meditation group		Play group	
	Pre	Post	Pre	Post
Total score for cancellation	(24.52±10.93)	29.66±10.35)*	(22.45±9.94)	25.62±9.62)@
Total score for stress level	(3.7±3.31)	2.34±2.44)**	(3.42±3.10)	3.48±3.38)#

* $P < 0.006$, ANOVA with SPSS, Show total scores differ significantly between meditation and play group; ($F=5.14$, $P < 0.006$)

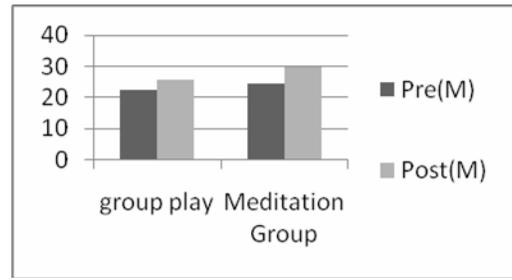
@ $P < 0.096$, ANOVA with ($F=3.17$, $P < 0.096$)

** $P < 0.019$, ANOVA with SPSS; ($F=1.36$, $P < 0.019$)

$P < 0.05$, ANOVA with SPSS; ($F=0.93$, $P < 0.05$)

Attention test (Six letter cancellation test)

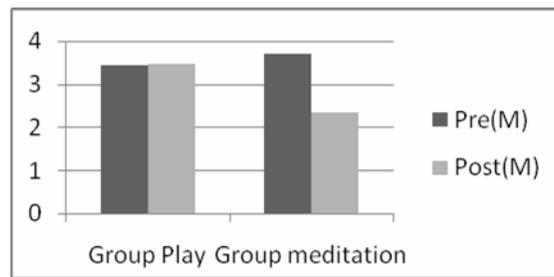
In the meditation intervention there was a significant increase in attention after fifteen minutes of meditation. Whereas there was no significant increase in the outdoor play intervention. As we can see in graph number 1, the level of attention in the meditation intervention is increased by 5.14 ($p < 0.006$) and in play group it increase by 3.17 ($p < 0.096$).



Graph 1

Anxiety level of participants

There is also a significant decrease in anxiety level after fifteen minutes of meditation compared to fifteen minutes of outdoor play. The mean stress decrease in the meditation group was 1.36 ($p < 0.019$); in the play group it was only 0.05 ($p < 0.93$). The difference between the groups was significant at the 0.01 level of significance.



Graph 2

Discussion

In the present study a group of 34 children, randomized divided in two groups were exposed to 2 different activities: 1. meditation and 2. outdoor play during an International Youth Yoga Retreat in a local Ashram in north India. The results of this study reveal that following the meditation session and the outdoor play session, the participants increased their attention in both cases; however the difference in the meditation group was much larger and was statistically significant whereas the difference in the play group was not; and the findings regarding the stress level test indicate significant decreases in stress only in the meditation group.

The mechanism by which yoga breathing may be reducing anxiety and increasing feelings of wellbeing is not known (Telles, 2010), the creation of a relaxed environment with non-stressing stimuli lends to relaxation. Relaxed attention can also permit more flexible psychological and behavioural responses to internal and external cues, possibly through a restructuring of frontal brain regions associated with self-regulation (Black, 2009) Concentration lends to stability, to one's capacity to observe fearful thoughts and feelings in a non-reactive way. Coupled with mindfulness, concentration gives rise to a non-discursive, non-analytical, direct experience of the object of attention. (Kabat-Zinn, 1992)

Letter Cancellation Task assesses selective attention and concentration (Utti, Pilketon Taylor, 2001) the six letter cancellation test require visual selectivity and repetitive motor response. They assess selective, focused and sustained attention, visual scanning and activation and inhibition of rapid responses, helping isolate major components of performance like detection, perception, recognition, processing and integration (Sushil, 2010) These paper and pencil tests require visual selectivity at fast speed on a motor response task. Visual scanning and activation, and inhibition of rapid responses are also necessary to the successful performance of cancellation task. With the addition of the motor component, these tasks call upon a set of functions similar to those relevant to other complex tests of attention (Ghaligi, 2006)

Since the results of this study reveal that following the meditation session the participants increased their level of attention compared to the outdoor play. We can probably attribute the difference to the increased attention and awareness afforded by experiencing a quiet and calm state of mind in the attention task. Based on these results it would also be interesting to study the effect of a soft voice, speaking from meditation, in the creation of a field effect that draws people in the same space into a more focused and aware state. Since the intervention took place during a yoga retreat, these children may have had some training in associating meditation with lower levels of stress. It would be interesting to add a control group of children who had no experience in meditation.

Three major self-regulatory strategies - meditation, relaxation and biofeedback - are currently used in clinical practice for the treatment of anxiety. Research suggests that all the three play a role in reducing both physiological and psychological components of anxiety (Kabat-Zinn, 1992). Schwartz (1978) conducted a study related to the differential effects of a somatic (physical exercise) and a cognitive (meditation) relaxation procedure. Using a dual component scale which separately assesses cognitive and somatic anxiety. Founding that meditators report less cognitive and more somatic anxiety than exercisers and, conversely, exercisers report less somatic and more cognitive anxiety than meditators.

Slow and deep breathing is known to increase the parasympathetic tone and is associated with a calm mental state (Kaushik, 2005) and reduction of stress and anxiety. This assumption was confirmed in the present study; however in this research we didn't measure the effect of the outdoor play in the reduction of the somatic anxiety. The authors recognise the importance this kind of measurement for future researches.

Experimental evidences clearly indicate that meditation may have a therapeutically potential (Walsh, 1979). The results of this experiment encourage the development of more research to understand the multiple ways and the psycho-physiological mechanisms which have been used in the different meditative techniques since hundreds of years ago.

The small sample size is a serious limitation of the study. Despite this limitation the present findings suggest that there is considerable promise in studying the therapeutic effect of meditation in children. Unfortunately there is a lack of scientific information in this field. Although more than 800 studies have investigated the therapeutic effects of meditation practices, the vast majority of these studies were among adults (Ospina, 2007)

Conclusions

The capacity to be calm and relaxed can be improved even with a brief meditation program that can help the children to have the experience of different states of mind, reduce their levels of anxiety and have better performance in a range of activities. As meditation interventions become more widely implemented among youth in schools, hospitals, clinics, and community settings, empirical evidence is needed to support and guide these programming efforts (Black, 2009)

Anxiety and stress reduction for children and adolescents is often approached by assessing and reducing a multiplicity of external causal factors. This study indicates that yoga relaxation and meditation practices hold considerable promise for increasing children's resilience from within.

References:

1. Attention Deficit Hyperactivity Disorder (ADHD). National Institute of Mental Health. U.S. Department of Health and Human Services. http://www.nimh.nih.gov/statistics/1ADHD_CHILD.shtml
2. Black, D. (2009). Joel Milam and Steve Sussman. Sitting-Meditation Interventions Among Youth: A Review of Treatment Efficacy. *Pediatrics*;124;e532; originally published online August 24.
3. Burke, C.A. (2010). Mindfulness-Based Approaches with Children and Adolescents: A Preliminary Review of Current Research, Emergent Field. *Journal of Child Family Studies* 19:133-144
4. Craven, J.L. (1989). Meditation and psychotherapy. *Can J Psychiatry*;34(7):648-653
5. Ghaligi, S., Nagendra, H.R., Bhatt, R. (2006). Effects of Vedic chanting on memory and sustained attention. *Indian Journal of Traditional Knowledge*. Vol. 5(2) pp. 177-180
6. Kabat-Zinn, J., Massion, A.O., Kristeller, J., Peterson, L.G., Fletcher, K.E., Pbert, L., Lenderking, WR., Santorelli, S.F. (1992). Effectiveness of a Meditation-Based Stress Reduction Program in the Treatment of Anxiety Disorders. *American Journal of Psychiatry*, 149:7
7. Kaushik, R., Kaushik, R.M., Mahajan, S.K., Rajesh, V. (2005) : Biofeedback assisted diaphragmatic breathing and systematic relaxation versus propranolol in long term prophylaxis of migraine. *Complement Ther Med*,13, p.165-174.
8. Kaushik, R. M., Kaushik, R., Mahajan, S. K., Rajesh, V. (2006). Effects of mental relaxation and slow breathing in essential hypertension. *Complementary Therapies in Medicine*, 14, 120-126.
9. Kratter, J. (1982). *The use of meditation in the treatment of attention deficit disorder with hyperactivity*. Peninsula Counseling Center N.Y.
10. Kumar, S., Telles, S. (2009). Meditative states based on Yoga texts and their effects on performance of a letter-cancellation task. *Perceptual Motor Skills*, 3, p.1-11
11. Linden, W. (1973). Practicing of meditation by school children and their levels of field dependence-independence, test anxiety, and reading achievement. *Journal of Consulting and Clinical Psychology*, 41, p.139 – 143.
12. Murphy M., Donovan S. (1999). *The physical and Psychological effects of meditation. A review of contemporary research with a comprehensive bibliography. 1931 – 1996*. Institute of Noetic Science.
13. Ospina, M.B., Bond, K., Karkhaneh, M., Tjosvold, L., Vandermeer, B., Liang, Y., Bialy, L., Hooton, N., Buscemi, N., Dryden, D.M., Klassen, T.P. (2007). Meditation practices for health: state of the research. *Evid Rep Technol Assess (Full Rep)*.(155),p.1-263
14. Schwartz, G., Davidson, R., Goleman, D. (1978). Patterning of Cognitive and Somatic Processes in the Self-Regulation of Anxiety: Effects of Meditation versus Exercise. *Psychosomatic Medicine* 40(4).
15. Snaith, P. (1998). Meditation and psychotherapy. *Br J Psychiatry*;173, p.193-195
16. Spielberger, C. D. (2010). State-Trait Anxiety Inventory. *Corsini Encyclopedia of Psychology*.
17. Sushil,S.K., Nagendra, H.R., Nagarathna, R. (2010). Immediate effect of stimulation in comparison to relaxation in healthy volunteers. *Indian Journal of Traditional Knowledge*. (9)3. p. 606-610
18. Telles, S., Singh, N., Joshi, M., Balkrishna, A. (2010). Post traumatic stress symptoms and heart rate variability in Bihar flood survivors following yoga: a randomized controlled study. *BMC Psychiatry*, 10:18.
19. Telles, S., Gaur, V., Balkrishna, A. (2009). A Effect of a yoga practice session and yoga theory on state anxiety. *Perceptual and Motor Skills*, 109, 3, 1-7.
20. Utti, B., Pilketon-Taylor, C. (2001). Letter Cancellation performance across the adult life span. *Clinical Neuropsychology*, 15, p.521-530
21. Walsh, R. (1979). Meditation Research: An Introduction and review. *Journal of Transpersonal Psychology*, 11(2).