International Journal of Humanities and Social Science Invention (IJHSSI)
ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714
www.ijhssi.org ||Volume 10 Issue 12 Ser. II ||December, 2021 || PP. 01-05

Cognitive Benefits of Mindfulness Meditation among Adolescents

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ABSTRACT: *The aim of the present study was to assess the effect of mindfulness meditation on cognitive abilities such as working memory, shifting attention and executive functioning in adolescents. Thirty-five adolescents with the age ranging from 12 to 18 years were selected using a purposive sampling method. They were divided into two groups: control group (n=18; Female=10; Male=8) and experimental group (n=17; Female=11; Male=6). The study followed a pretest-posttest research design where all participants were assessed using standardized psychological tests before and after the intervention. The experimental group was given a 30 minutes intervention that included mindfulness meditation along with relaxation exercises for 10 days consecutively. The findings suggest that the short-term practice of mindfulness meditation can be used to enhance cognitive functions in adolescents. The findings have implications for future research as attention, working memory, and executive function are cognitive activities that affect our day to day thinking, learning, planning, and decision making. Later these abilities translate to real world accomplishment and improvement in quality of life.*

KEYWORDS: *Mindfulness meditation, working memory, shifting attention, executive functioning*.

Date of Submission: 08-12-2021 Date of Acceptance: 23-12-2021

I. INTRODUCTION

Meditation is a technique that involves focusing the mind on a particular object, thought or activity, to achieve a state of mental and emotional calm. It is a state of mental silence. The English term meditation is derived from the Latin word 'meditatio', meaning "to think, contemplate, devise, ponder". Hundreds of studies on meditation have been conducted since the 1950s. However, clinical psychology and psychiatry have developed meditation techniques for numerous psychological conditions that were initiated after the 1970s.Mindfulness meditation involves open monitoring of oneself and the environment. Here the attention is not focused on any one specific object but rather one lets attention flow freely without judgment or attachment. One simply observes the thoughts, perception, and senses that one experiences. Mindfulness means being present in the moment i.e., here-and-now awareness of the experience. Kabat-Zinn (2003) defined mindfulness as awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally. It's about knowing what is on your mind. It liberates from the worries of past and future and lets one live fully in the present.

Mindfulness practice is employed in psychology to alleviate many mental and physical conditions, such as reducing depression, stress, and anxiety. It is also helpful in treating drug addiction. Several mindfulness-based interventions, such as the Mindfulness-Based Stress Reduction, have since been developed for clinical and empirical research. Black, Milam, & Sussman (2009) did a systematic review of sixteen empirical studies for the health-related effects of meditative practices among children and youth aged 6 to 18 years in school, clinic, and community settings. It was found to be an effective intervention in the treatingvariousphysiological, psychosocial, and behavioral issues. According to Fisher (2006) meditation has been proven among children to be a means for stilling the mind, encouraging mindfulness, and providing optimum conditions for generative thinking and reflection.Bei Bei et al. (2012) conducted a pilot study on adolescent participants and showed significant improvement on objective sleep onset latency, sleep efficiency and total sleep time after practicing mindfulness-based intervention. Patricia, Broderick and Metz (2011) gave a pilot trial of learning to breathe, a mindfulness curriculum for adolescents created for a classroom setting. The results suggested promising role of mindfulness in enhancing adolescents' emotion regulation skills as well as theirwell-being. Another study by Semple (2010) showed significant improvements in sustained attention following mindfulness meditation. Tang, Hölzel and Posner (2015) also showed that mindfulness practice enhances attention. Hurk, Giommi, and Gielen (2010) investigated attentional processing in relation to mindfulness meditation on participants 20 years old. Better orienting and executive attention were observed in

the mindfulness meditation practicing group. Furthermore, extensive mindfulness meditation appeared to be related to a reduction of the errors for responses with the same reaction time. These results provide new insights into differences in attentional processing related to mindfulness meditation and suggest the possibility of increasing the efficiency in attentional processing by extensive mental training. Moore and Malinowski (2008) investigated the link between meditation, self-reported mindfulness, and cognitive flexibility as well as other attentional functions and found their positive correlation among meditators as compared tonon-meditators.

Fadel Zeidanaet al. (2010) observed that brief meditation training, that included only four sessions, affected cognition and mood. Intervention proved effective at improving mood, reducing fatigue and anxiety, and increasing mindfulness. Moreover, it significantly improved visuo-spatial processing, working memory, and executive functioning of the participants. It suggested that 4-daymeditation training could enhance the ability to sustain attention, like that of long-term meditators. Quach, Jastrowski and Alexander (2015) gave the first study to provide support for the benefits of short-term mindfulness practice, specifically mindfulness meditation, in improving working memory capacity in adolescents. The results highlight the potential role of the mindfulness-based interventions in improving cognitive function among adolescents. Many studies suggest that mindfulness meditation training leads to development of focused attention with significant improvements in selective and executive attention as well as working memory capacity and some executive functions.

The present study

The present study was conducted with the aim to study the effects of short-term practice of meditation in daily routine on cognitive abilities, especially attention, working memory and executive function among adolescents. The practice of mindfulness has been proven to be very effective in enhancing attention. Existing studies and literature have extensively explored the role of meditation in various directions for adults and old age people, but literature is scarce when it comes to studies on children and adolescents. Adolescence is an age when events, people, and things easily distract one from his/her work. The present study was done to fill the existing lacuna in knowledge in this field. Any positive outcome of the study could be used to promote the practice of meditation among adolescents and implementation of the subject as a part of curriculum in schools with the hope that this would enhance cognitive and academic performance.

Objectives

The general objective of this study is to investigate the effect of mindfulness meditation on cognitive functions among adolescents

Hypothesis

Hypothesis 1: Mindfulness meditation will enhance shifting attentionamong adolescents
Hypothesis 2: Mindfulness meditation will enhance executive functionamong adolescents
Hypothesis 3: Mindfulness meditation will enhance working memoryamong adolescents

II. METHOD

Participants of the Study

Thirty-five adolescents with the age ranging from 12 to 18 years studying in 8^{th} to 12^{th} standard were selected using a purposive sampling method. They were divided into two groups: control group (n=18; Female=10; Male=8) who received no intervention and experimental group (n=17; Female=11; Male=6) were given 10 days intervention. The participants were given group-based intervention. The study followed a pretest-posttest research design where all participants were assessed using standardized psychological tests before and after the intervention. The experimental group was given a 30-minute intervention that included mindfulness meditation along with relaxation exercises for 10 days consecutively

Research Design

It is a pretest and posttest experimental design where both control and experimental group were assessed before and after the intervention. Mindfulness training was used as an independent variable. The effect of mindfulness training was studied on shifting attention, executive function and working memory. Non-parametric tests such as the Mann-Whitney U test and Wilcoxon Signed rank test were done for identifying differences between the training group and control group.

Instruments Used

Wechsler Intelligence Scale for Children (WISC-IV): The Wechsler Intelligence Scale for Children (WISC) was developed by David Wechsler in 2003 to assess working memory. It is individually administered and used for children between the ages of 6 and 16. There are five complementary subtests that enable measuring related cognitive abilities which are relevant to identify assess and specific learning disabilities, in

particular dyslexia and dyscalculia. We used the Working Memory Index (WMI), its subset of digit span in the scale.

The trail making test (TMT): It is a brief paper and pencil based neuropsychological test. The TMT is a standard component of the Halstead-Reitan Battery developed by Halstead in 1947 which measures cognitive dysfunction. Part A assesses the efficiency of visual scanning and psychomotor speed. In contrast, Part B assesses executive control, specifically, flexibility of thinking and working memory. The assessment of, mainly, shifting attention and executive functioning was done using Trail Making Test.

Procedure

Thirty-five adolescents (12-18 years) studying in 8^{th} to 12^{th} standard were selected using a purposive sampling method. They were divided into two groups: control group (n=18; Female=10; Male=8) who received no intervention and experimental group (n=17; Female=11; Male=6) were given group-based intervention for 10 days. A baseline assessment on cognitive skills namely attention, executive function and working memory was done using standardized psychological tests before starting the intervention. The intervention was a short-term 10-days mindfulness meditation training program. The intervention was given to the experimenter group for 30-minutes each day out of which initial 5-10 minutes were meant for relaxation and breathing exercises and afterwards meditation for approximately 20 minutes. However, no such intervention was given to the control group. Relaxation technique was guided by the experimenter along with a trained and experienced professional, and mindfulness meditation was given using existing authentic audio commentaries such as Guided Mindfulness Meditation by Jon Kabat-Zinn. To eliminate boredom, 3 different meditation audio commentaries were used such that each was played for 3-4 days. Participants were divided into smaller groups (6-7 people) according to their suitability. However, their time for meditation was kept nearly the same hour every day to enhance its effectiveness. The post-test assessment was done just after the intervention. Later, the data was quantitatively analyzed.

III. RESULT

The data collected from the participants were analyzed using statistical methods. Analysis was done to match the score of the experimental and control group with each other and to individually compare the two groups in order to evaluate the effectiveness of the intervention. The results obtained are depicted in the tables below.

Table 1 Baseline Measures of Experimental Group and Control Group on Cognitive Skills

	Control Group		**Experimental Group**			
Measures	**M**	**SD**	**M**	**SD**	**U value**	**p**
Shifting attention	31.94	12.85	36.82	15.82	117.5	.12
Executive Function	56.17	15.51	58.59	16.55	136.5	.30
Working Memory	21.32	3.29	22.76	4.24	128	.21

Table 1 reveals no significant differences in shifting attention, executive function and working memory between the experimental and control group, indicating both groups were matched in terms of their cognitive abilities before the intervention.

Table 2 Effect of Cognitive Training on Reading Skills

		Pretest		**Posttest**		
Measures		**M**	**SD**	**M**	**SD**	**W**
Shifting attention	E	36.82	15.82	21.06	5.77	**23.0****
	C	31.94	12.85	31.33	12.90	1.24
Executive Function	E	58.59	16.55	45.53	16.85	**24.0****
	C	56.17	15.51	55.38	15.33	1.17
Working Memory	E	22.76	4.24	24.76	4.12	**10.5****
	C	21.32	3.29	21.44	2.95	0.33

Note. E=Experimental group, C=control group, *p<0.05, **p<0.01; W values<.05 are in boldface.

As shown in Table 2, the results of Wilcoxon Signed Rank Test reveal significant differences in shifting attention, executive function, and working memory between the experimental and control group, indicating a favorable outcome of the intervention in bringing about a positive change in cognitive functions measured in the study.

IV. DISCUSSION

The aim of the present study was to assess the effect of mindfulness meditation on cognitive abilities such as working memory, shifting attention and executive functioning in adolescents. Mindfulness meditation involves being here-and-now in the present moment with awareness. The focus is not to be maintained on any one specific object, rather attention has to be let flow freely without judgment or attachment. This practice has been clinically proven to be effective in psychological treatments.The findings of the present study showed there was significant improvement in all the cognitive abilities namely attention, executive functioning and working memory of the participants who practiced mindfulness meditation than the non-meditation group when assessed on the standardized measures. The obtained results are similar to various existing studies results. This findings aligns with that of Chambers, Yee Lo, and Allen (2007) who found that intensive short period mindfulness meditation training on cognitive and affective functions resulted in significant improvements in self-reported mindfulness, symptoms of depression, and performance of working memory and sustained attention. A similar finding was also reported by Moore and Malinowski (2009) who investigated the link between meditation, self-reported mindfulness, and cognitive flexibility as well as other attentional functions and observed mindfulness to be intimately linked with enhancement of attention and cognitive flexibility. Quach, Jastrowski and Alexander (2015) also reported the effectiveness of mindfulness meditation intervention on working memory capacity in adolescents by comparing with another group practicing Hatha yoga. This study provides support for the short-term mindfulness meditation practice especially in improving working memory in adolescents. A five day meditation practice with an integrative body–mind training method showed statistically significantly better attention and control of stress compared with relaxation training (Tang, Ma, Wang, et al.:2007).

The results mentioned above suggest a possible explanation of the changes that might occur in the human brain while practicing mindfulness meditation. Tang, Holzel and Posner (2015) found that several changes occur in brain structure related to mindfulness meditation. Changes in activity as well as structure of the anterior cingulate cortex region, associated with attention, shown in response to mindfulness meditation, are most consistently reported. Pagnoni and Cekic (2007) observed how the regular practice of meditation put a restraint on the age-related gray matter volume decline. It also reduced the decline in cognitive functions associated with normal aging. Lazar et al. (2006) reported several changes in the prefrontal cortex and right interior insula as these regions thickened in experimental group than their counterparts. These results were obtained after a long-term meditation practice.

The practice of mindfulness meditation has daily life implications. It helps in maintaining peace within oneself and feeling more relaxed. Regular practice of meditation enhances work efficiency and performance. In workplace behavior, mindfulness is found to be positively correlated with individual job performance (Dane: 2011). Also, it is shown that mindfulness has a positive effect on team performance (Cleirigh& Greaney: 2015). The practice of meditation is now widely used in clinical settings to deal with psychological issues. Several studies show that there is a decrease in perceived stress (Ruocco&Direkoglu: 2013) and negative emotions (Roche et al.: 2014) after practicing mediation. A series of studies have shown that mindfulness training can not only bring about the change of state, but also continue to change one's personality (Cahn & Polich: 2006). The results suggest that adolescents should be given the practice of meditation, especially mindfulness type of meditation to enhance their cognitive abilities such as attention and memory. These cognitive activities affect our day to day thinking, learning, planning, and decision making. This further enhances the academic performance, creativity, and daily task performance. Later these abilities lead to real world accomplishment and improvement in quality of life.

Limitation of the study is that more difficult tasks should have been employed to avoid ceiling effects and to detect potential specific benefits of mindfulness practice for these cognitive skills. The intervention program could have been given for a longer duration on larger sample size. Follow up assessment could have been done to see the long term effect of the mindfulness meditation practice among adolescents.

V. CONCLUSION

In conclusion,it can be referred that practicing mindfulness meditation is intimately linked to improvements of cognitive functions such as shifting attention, executive functioning and working memory. Attention, working memory and executive functioning are cognitive abilities that are related to each other that enhance an individual's performance in everyday life. Thus, it would be beneficial to practice regularly for better health and wellbeing.This research develops the curiosity of exploring effects of mindfulness meditation on other aspects of adolescents such as affect, relationships, emotional intelligence, decision-making.

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Dr. SandhyaraniHawbam, et. al. "Cognitive Benefits of Mindfulness Meditation among Adolescents." *International Journal of Humanities and Social Science Invention (IJHSSI)*, vol. 10(12), 2021, pp 01-05. Journal DOI- 10.35629/7722