

Efficacy of Mindful- based Intervention on Behaviour Regulation Index of Executive Functions among Students with Inattention

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Abstract

Background: The objective of the present study is to explore the effectiveness of mindful-based practices on behaviour regulation index (BRI) of executive functions among students with inattention.

Material and Method: This study employed pre-test post-test method with the control group research design. Students with inattention were identified by administering Conners 3 rating scale, – Self-Report form, Teacher Form and Parent Form – and randomly assigned to experimental and control groups of 40 students each. After pre-testing of the BRI of both groups using Behaviour Rating Inventory of Executive Function – BRIEF2 teacher, parent and self-report forms – the experimental group was given mindful-based practice sessions of 45 minutes duration, for thrice a week lasting for eight weeks. Data obtained from the respondents in the post-test and follow up phases - after 1st, 3rd and 6th months of the completion of the intervention programme were analyzed by repeated measures ANOVA.

Result: Results revealed that 8-week intervention programme of mindful-based practices elicited a reduction in mean T score of BRI from base line to immediately after intervention programme and the reduced mean scores were retained over a follow-up period of six months. But the students in the control group retained the same mean scores of BRI over the entire period of study. Analysis of data obtained from both teacher and parent forms confirmed the results.

Conclusion: Mindful-based intervention is an effective method in reducing BRI among students with inattention.

Keywords: Mindful-based Intervention, Inattention, Executive Functions, Behaviour Regulation Index (BRI).

Introduction

Learning is a process of acquiring modifications in existing knowledge, skills, habits, or tendencies through experience, practice, or exercise. For attaining mastery level learning outcome the students need to focus their attention on their studies, complete tasks despite the many distractions, and inhibit impulsive thinking and behaviour. Attention is the behavioural and cognitive process of selectively concentrating on a discrete aspect of information.⁽¹⁾ The concept of inattention refers to excessive problems with distractibility and chronic difficulties in organizing tasks and activities, attending to details, following instructions and completing tasks, and undertaking tasks that require sustained mental efforts.⁽²⁾

Executive function (EF) refers to interrelated neurocognitive processes, which are essential for a child's appropriate academic, behavioural and social functioning.⁽³⁾ Ahmed and Miller defined executive function as "higher-order cognitive processes involved in goal-oriented behaviour, such as planning and sequencing".⁽⁴⁾ One aspect of executive function is Behaviour Regulation Index (BRI), a key component of EF- represents a child's ability to plan, regulate and monitor behaviour effectively in response to changing situations.

Kabat-Zinn defines mindfulness as, paying attention in a particular way: on purpose, in the present moment, and non-judgmentally.⁽⁵⁾ Mindfulness-based Approaches refers to the range of programmes and strategies aimed

at the development of mindfulness like mindfulness meditations and mindfulness-based interventions.⁽⁶⁾

School places constant demands on students, including increased requirements for planning, prioritizing and time management, what is referred as "executive functioning".⁽⁷⁾ Students with inattention lack sustained, executive, and selective attention.⁽⁸⁾ According to Napoli et al, the key features of mindfulness include a focus on the breath, paying attention to the events occurring within one's mind and body, and bearing witness to one's own experience.⁽⁹⁾ Currently, little is known about the relative contribution of inattention to executive functions of students. There are only few studies on executive function difficulties faced by adolescent students having inattention and on how mindfulness enhances executive functions.⁽¹⁰⁾ Hence the investigator in the present study intends to find out the efficacy of Mindful-based practices on BRI of executive functions among students with inattention.

Research Methodology

The present study is an experimental study with pre-test-post-test control-group design. 80 students from a group of 300 who scored ≥ 70 on inattention subscale of the Conners 3- teacher, parent, and self-Rating Scales were randomly assigned to experimental and control group of 40 each. Both groups were pre-tested for BRI. Mindful based intervention programme was imparted to the experimental group followed by the post-test for BRI.

Tools

1. Inattention subscale of Conners 3 Short versions- Teacher, Parent, and Self Report Rating Scales were used to screen students with inattention. These scales were purchased from the publisher and translated and standardized on Indian population.
2. Behaviour Rating Inventory of Executive Function (BRIEF2) teacher, parent and self-report forms were used to assess Behaviour Regulation index (BRI).⁽¹²⁾ This study measures BRI as the total scores obtained by summing up inhibit and self- monitor scales of BRIEF2. These scales were purchased from the publisher and translated and standardized on Indian population.
3. Mindful- based intervention strategy package developed by the investigators.

The objectives of study

1. To screen students for inattention using inattention subscale of Conners 3 short versions- teacher, parent, and self-report rating scales
2. To compare the mean scores of inattention among control and experimental group students before the intervention programme
3. To compare the mean scores of BRI of control and experimental group students (based on teacher, parent and self-report forms – BRIEF 2) before the intervention programme
4. To compare the mean scores of BRI of control and experimental group students (based on teacher, parent and self-report forms – BRIEF 2) immediately after the intervention programme
5. To compare the mean scores of BRI of control and experimental group students during the follow up phases of 1st, 3rd, and 6th months after the completion of 8 week intervention programme

The Hypotheses formulated:

H₁: There is no significant difference in the mean scores of inattention of control and experimental group students before the intervention programme

H₂: There is no significant difference in the mean scores of BRI of control and experimental group students before the intervention programme

H₃: There is significant difference in the mean scores of BRI of control and experimental group students immediately after the intervention programme

H₄: There is significant difference in the mean scores of BRI of control and experimental group students during the follow up phases of 1st, 3rd, and 6th months after the completion of intervention programme.

Population and Sample

The students of 13-16 age group studying in standards V111 and 1X of St. Ephrem's Higher

Secondary School, Mannanam, Kottayam constitute the target population of the study and 80 students of the same category- both boys and girls form the sample.

Data Collection

The experimental group was subjected to mindful-based practices of eight weeks consisting of mindful awareness of body, five skillful habits to cultivate for the body, mindful awareness of body sensations, five skillful habits to cultivate sensation, mindful awareness of thoughts, five skillful habits to cultivate thoughts, mindful awareness of emotions, five skillful habits to cultivate emotions, mindful awareness of interactions, five skillful habits to cultivate loving kindness, integrating mindfulness in everyday life and events calendar. The data was collected in three phases; pretest phase - before the intervention formed the baseline, post-test phase - immediately after intervention and follow up phases- after one, three and six months of withdrawal of the intervention. The data obtained from the respondents were scored and analyzed using appropriate statistical techniques such as percentage analysis, mean, standard deviation, independent sample t-test and repeated measures of ANOVA to draw meaningful inferences on the effect of the intervention.

Ethical issues

The study was conducted in volunteered respondents; informed consent from the parents and assent from the students were obtained. The respondents were assured of confidentiality.

Results and Discussion

Assessment of the Level of Inattention among Students

On the basis of T scores obtained in the Conners 3-teacher, parent, and self-rating scales 34.3% of the students fall in the category of very elevated, 16.7% in elevated, 15.3% in high average and 33.7% students are in the category of average level of inattention. (The cut of T scores for the very elevated range is ≥ 70 ; elevated is 65-69; high average is 60-64; average is 40-59).

Comparison of Inattention among Control and Experimental Group Students before the Intervention Programme

The results of the independent sample t test indicated that there is no significant difference in the mean T scores of control and experimental group students based on inattention sub-scale of the Conners 3-teacher (t value = .142; $P > 0.05$), parent (t value = .067; $P > 0.05$), and self-forms (t value = .420; $P > 0.05$).

Table 1: Comparison of the mean T scores in the Inattention of Control and Experimental Group Students (df=78)

T score	Group	Mean	SD	t-test for Equality of Means	
				T	Sig.
Teacher Form	Experimental	77.55	3.748	.142	.888
	Control	77.68	4.135		
Parent Form	Experimental	78.25	7.114	.067	.947
	Control	78.35	6.241		
Self-form	Experimental	76.48	5.496	.420	.676
	Control	75.98	5.147		

Hence the Hypothesis H₁ which states that “There is no significant difference in the mean scores of inattention of control and experimental group students before the intervention programme” is accepted.

Comparison of BRI of Control and Experimental Group Students before the Intervention Programme

The results of the independent sample t test clearly indicated that there is no significant difference in the mean scores of BRI of control and experimental group students based on teacher, (t value = .091; P>0.05) parent, (t value = .236; P>0.05), and self (t value = .147; P>0.05) report forms – BRIEF 2 before the intervention programme.

Table 2: Comparison of the Pre-test BRI T Scores of Control and Experimental Group Students (df=78)

Pre-test ERI T score	Group	Mean	S D	t-test for Equality of Means	
				T	Sig.
Teacher form	Experimental	58.98	4.246	.091	.927
	Control	59.08	5.460		
Parent form	Experimental	59.03	5.284	.236	.814
	Control	59.30	5.135		
Self-form	Experimental	61.05	8.092	.147	.883
	Control	60.80	7.039		

Hence the Hypothesis H₂ which states that “There is no significant difference in the mean scores of BRI of control and experimental group students before the intervention programme” is accepted. The mean pre-test BRI T scores of control and experimental group students based on teacher, parent, and self-report forms were at mildly elevated level.

The results of the independent sample t test indicated that there is significant difference in the mean scores of BRI of control and experimental group students

based on teacher, (t value = 2.655; P< 0.01), parent (t value = 2.808; P< 0.01) report forms – BRIEF 2 immediately after the intervention programme. However t value = 1.678 (P>0.05) based on selfreport forms – BRIEF 2 indicated that there is no significant difference in the mean scores of BRI of control and experimental group students immediately after the intervention programme.

Comparison of the Post-test Mean T Scores of BRI of Control and Experimental Group Students

Table 3: Comparison of the Post-test BRI T Scores of Control and Experimental Group Students (df=78)

Post-test ERI T score	Group	Mean	S D	t-test for Equality of Means	
				T	Sig.
Teacher form	Experimental	56.25	4.049	2.655	.010
	Control	59.13	5.525		
Parent form	Experimental	55.25	5.485	2.808	.006
	Control	58.60	5.183		
Self-form	Experimental	57.15	5.767	1.678	.097
	Control	59.60	7.210		

The mean post-test BRI T scores of control group students based on teacher, parent and selfreport forms – BRIEF 2 were at mildly elevated level as in pre-test. Whereas post-test BRI T scores of experimental group students based on teacher, parent and selfreport forms –

BRIEF 2 were reduced from mildly elevated to not elevated average level.

Comparison of BRI of Control and Experimental Group Students during Follow up Phases

Table 4: Comparison of the Mean BRI T Scores of Experimental and Control Group Students across the Five Phases of Testing

Group Time	Mean BRI T score					
	Teacher Form		Parent Form		Self-Form	
	E	C	E	C	E	C
Pre test	58.97	59.08	59.03	59.30	61.05	60.80
Post test	56.25	59.13	55.25	58.60	57.15	59.60
1 st month	56.10	59.15	54.95	58.73	57.48	60.75
3 rd month	56.10	58.85	55.15	59.00	57.65	60.53
6 th month	55.73	58.90	54.90	58.35	57.13	60.53

Table 5: Results of Repeated Measures of ANOVA for the Mean BRI T Scores of Experimental and Control Group Students after Correcting the Degrees of Freedom Using Greenhouse-Geisser Estimates of Sphericity across the Five Phases of Testing

	BRI T Scores	Source	Df	F	Sig.	Partial Eta Squared
Experimental Group	Teacher Form	time	2.228	24.689	.000	.388
		Error (time)		86.893		
	Parent Form	time	2.841	96.739	.000	.713
		Error (time)		110.792		
	Self-Form	time	1.639	18.445	.000	.321
		Error (time)		63.923		
Control Group	Teacher Form	time	2.828	.586	.616	.015
		Error (time)		110.302		
	Parent Form	time	2.470	4.810	.006	.110
		Error (time)		96.312		
	Self-Form	time	1.455	1.430	.246	.035
		Error (time)		56.750		

The repeated measures ANOVA of BRI of experimental Group with a Greenhouse-Geisser correction determined that mean BRI T score differed statistically significant between time five level points (F(2.228, 86.893) = 24.689, P< 0.01) with effect size $\eta^2=.388$ in teacher forms; (F(2.841, 110.792) = 96.739, P< 0.01) with effect size $\eta^2=.713$ in parent forms; and (F(1.639, 63.923) = 18.445, P< 0.01) with effect size

$\eta^2=.321$ in self-report forms. Where as in control group the repeated measures ANOVA of BRI with a Greenhouse-Geisser correction determined that mean BRI T score is not differed statistically significant between time points (F(2.828, 110.302) =.586, P>0.05) in teacher forms; (F(2.470, 96.312) = 4.810, P>0.05) in parent forms; and (F(1.455, 56.750) = 1.430, P>0.05) in self report forms

Table 6: Post hoc test using Bonferroni correction between the Mean BRI T Scores of Experimental Group Students at the pre-test (time1), post-test (time 2), 1st (time 3), 3rd (time 4), and 6th (times5), months

(I) time	(J) time	Teacher Form		Parent Form		Self-Report	
		(I-J)	Sig.	(I-J)	Sig.	(I-J)	Sig.
Pre-test	Post-test	2.725*	.000	3.775*	.000	3.900*	.000
	1 st Month	2.875*	.000	4.075*	.000	3.575*	.000
	3 rd Month	2.875*	.000	3.875*	.000	3.400*	.000
	6 th Month	3.250*	.000	4.125*	.000	3.925*	.000
Post- test	1 st Month	.150	.110	.300	.262	-.325	.323
	3 rd Month	.150	.421	.100	.675	-.500	.153
	6 th Month	.525	.261	.350	.128	.025	.962

*The mean difference is significant at the .05level.

Post hoc tests using the Bonferroni correction revealed that 8-week intervention programme of mindful-based practices elicited a reduction in mean BRI T score from base line (mean = 58.97) to immediately after intervention programmes (mean = 56.25) which was statistically significant ($P < 0.01$). The experimental group's mean BRI T score at follow-ups such as First month (mean = 56.10, $P > 0.05$) Third month (mean = 56.10, $P > 0.05$) and Sixth month (mean = 55.73; $P > 0.05$) did not significantly differ from scores in the post-test. Thus, the findings demonstrate that students in the

experimental group retained the reduction in mean BRI T score over a follow-up period of six months. The control group's mean BRI T score at follow-up phases did not significantly differ from scores in the base line and post-test. The students in the control group retained the same mean BRI T score over the entire period of study. Hence the Hypothesis H₄ which states that "There is significant difference in the mean scores of BRI of control and experimental group students during the follow up phases of 1st, 3rd, and 6th months after the completion of intervention programme" is accepted.



Fig. 1. Comparison of the Mean BRI T Scores of Experimental and Control Group Students across the Five Phases of Testing

Discussion

Research shows that executive functions develop slowly in many children with inattention. These functions operate as the "brain's CEO," helping to manage and regulate behavior. They play an important role in performing many tasks necessary for academic success. Heeren et al suggest that mindfulness practice improves performance on a variety of measures of self-regulation stress and mood disturbance.⁽¹³⁾ The BRI represents a child's ability to regulate and monitor behaviour effectively. It is composed of inhibit and self-monitor scales. Inhibit is controlling impulse and approximately stopping one's own behaviour at the proper time.⁽¹²⁾ In the present study the inhibit scale assessed inhibitory control (i.e., the ability to inhibit, resist or not act on an impulse), including the ability to stop one's on behaviour at the appropriate time. The study addressed inhibition activity (e.g., "Is fidgety") verbalizations (e.g., "Talks at the wrong time") impulse (e.g., "Does not think before doing (is impulsive)", and overall behaviour (e.g., "Get

out of control more than friends"). Children who do not inhibit impulse well may display high level of physical activity, inappropriate physical responses to others, a tendency to interrupt and disrupt group activities, and a general failure to look before leaping.

Self-monitoring is the capacity to observe and evaluate one's own behaviour as others experience it and includes an understanding of one's own strengths and weaknesses, awareness of one's own effectiveness the problem solving, and the ability to monitor other important outcomes.⁽¹²⁾ This study measured self-monitor i.e., awareness of the impact of one's on behaviour on other place and outcomes. Children with poor self-monitoring capacities may not realize when they are annoying others, may have unrealistic notions about own abilities, and may struggle to learn from their mistakes. The study assessed self-monitoring abilities related to the effect of one's behaviour on others (e.g., "does not realize that certain actions bother others") and a more general ability to understand one's own strengths

and weaknesses (e.g., “I have a poor understanding of my own strength and weaknesses”; “I try things that are too difficult or too easy for me”).

Appropriate behaviour regulation is likely to be a precursor to appropriate cognitive regulation.⁽¹⁴⁾ Children who are unable to inhibit impulse and monitor their impact on others and their surroundings are likely to have difficulty with several aspect of cognitive regulation. Brown and Ryan identify consciousness, with its attributes of awareness and attention, as a core characteristic of mindfulness.⁽¹⁵⁾ Meiklejohn found that mindfulness interventions are helpful to improve students’ capacities for self-regulation of emotions and enhance cognitive functioning, including executive function, working memory and attention focus, and to affect physiological response which could improve behaviour and academic achievement in school.⁽¹⁶⁾ The present study revealed that 8-week intervention programme of mindfulness-based practices elicited a reduction in mean BRI T score from mildly elevated level to not elevated average level and retained the reduction in mean BRI T score over a follow-up period of six months. Increased mindful attention to daily activities, including academic activities, can lead to increased self-monitoring and self-regulation of attention, which can lead to an increase in task completion.

Limitations of the Study

1. Major limitation of the study is its small sample size. A larger sample would have made the results more generalisable.
2. The demographic factors such as gender and age group have not been taken into account in the study.

Conclusion

The present study regarding the efficacy of the mindfulness-based intervention on BRI among students with inattention has revealed that intervention programme has increased the behaviour regulation including in responses to changing situations. The outcomes assessed prove that there are reliable improvements in various aspects of BRI such as inhibit and self- monitor of students with inattention. Hence Mindful-based intervention can be an effective method in reducing BRI of executive functions among school students with inattention.

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