



Effectiveness of Metacognitive Therapy in Behavioral-Emotional Problem, Cognitive-Emotional Regulation Strategies, and Mind Wandering of 9 to 13-Year-Old Children with ADHD: A Quasi-experimental Study

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Abstract

Background: Attention deficit hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders in school-aged children.

Objectives: This study assessed the effectiveness of metacognitive therapy in behavioral-emotional problems, cognitive-emotional regulation strategies, and mind wandering in children with ADHD.

Methods: This quasi-experimental study utilized a pretest-posttest design with a control group. The statistical population comprised all students referred to the West Health Center of Ahvaz in 2019. A sample of 45 patients was selected and randomly divided into intervention (MCT, n = 15) and control (n = 15) groups. The experimental group underwent eight sessions (90-minute sessions per week) of MCT, and the control group did not receive any intervention. The research instruments included the Cognitive-Emotional Regulation Questionnaire-children form (CERQ-K-P), Rutter Children Behavior Questionnaire (RCBQ), and Mind Wandering Questionnaire (MWQ). Multivariate analysis of covariance was used to analyze the data.

Results: The participants included 30 children aged 10.92 ± 2.02 years. In the experimental group, the average score of behavioral-emotional disorder changed from 30.78 to 24.14, cognitive-emotional regulation strategies from 58.34 to 69.43, and mental wandering from 78.18 to 85.14. In the control group, the average score of RCBQ changed from 29.17 to 30.58, CERQ-K-P from 54.5 to 52.34, and MWQ from 19.77 to 19.87. The MCT effectively reduced behavior-emotional problems and mind wandering and improved cognitive-emotional regulation strategies in children with ADHD ($P < 0.05$).

Conclusions: Metacognitive therapy improved behavioral-emotional problems, cognitive-emotional regulation strategies, and mind wandering in ADHD children. Therefore, metacognitive and psychiatric treatments are recommended for these patients.

Keywords: Attention Deficit Hyperactivity Disorder, Behavioral Problem, Emotional Regulation, Metacognitive, Mind Wandering

1. Background

Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental disorder affecting 5 - 6% of children (1). It is characterized by developmentally inappropriate and impairing levels of inattentive, hyperactive, and impulsive behaviors. The disorder is often accompanied by emotional lability and cognitive performance deficits (2). The emotional and behavioral problems can be classified as either “internalizing” (emotional disorders such as depression and anxiety) or “externalizing” (disruptive behaviors such as ADHD and CD) (3). The study of the comorbidity of behavioral and emotional disorders with hyperactivity and attention deficit has observed statistical

differences between ADHD, confrontational, and anxiety disorder (4).

When individuals with ADHD face emotionally charged situations, the deficits in inhibition lead to greater emotional reactivity or emotional dysregulation than those without ADHD. Dysregulated emotion is characterized by excessive and rapidly shifting emotions, often associated with irritable and aggressive behavior (5) and high rates of comorbid oppositional defiant disorder (6). In a recent review, the authors concluded that emotional dysregulation is highly prevalent in ADHD and, as a major contributor to impairment, is associated with deficits in the recognition and/or allocation of attention to emotional stimuli (7). Among various strategies individuals

habitually use to regulate their emotions, cognitive emotion regulation (CER) strategies refer to what individuals think to handle their emotions in response to eliciting events. The CER strategies can be viewed as the cognitive way of regulating arousing information emotionally (8).

Mind-wandering (MW) is a common everyday experience in which attention becomes disengaged from the immediate external environment and focused on internal trains of thought (9). Mind-wandering is a universal experience representing up to 50% of daily thinking time (10). While some forms of MW can benefit individuals (e.g., strategic thinking about a grant proposal while driving a car), other forms can be detrimental (e.g., spontaneous uncontrolled thoughts that interfere with tasks such as listening to a lecture). These 2 types of MW have been referred to as deliberate and spontaneous, respectively, and are thought to reflect a different balance of regulatory processes on self-generated internal thought (9). Spontaneous MW, detrimental to performance, has been proposed as a mechanism explaining many of the symptoms and impairments of ADHD (10).

It is necessary to have a treatment that aims to improve these defects and functional disorders in children with attention deficit hyperactivity disorder. Metacognition is based on fundamental theory (self-regulatory executive function). Based on the model of self-regulatory executive function and metacognition, the main reason for vulnerability to emotional disorders is a pattern of attention focused on extreme self, irrational beliefs, and specific reflection processes. This pattern is called cognitive-attention syndrome (11). Treatment of metacognition by altering cognitive-attention syndrome is done via increasing control over flexibility on attention (the ability to separate oneself from the rumination process), changing metacognitive beliefs (by distancing oneself from oneself, testing one's assessments, thoughts, and beliefs, and treating them as events that should be evaluated, not accepted as reality), and focusing on creating alternative ways of experiencing and coping with internal events (attention training techniques, detached mindfulness, and organizational skills training) (12).

Tavighi et al. suggest that metacognition was influential in treating adolescent mind warding (13). Research by Xu et al. suggests that mindfulness shifts attention from the inner world to the present world, which shows important implications for treating worry in anxious individuals (14). Self-organizational skills training in children with ADHD in the study of Abikoff et al. improved academic performance and oppositional defiant behavior of students as reported by parents (15).

2. Objectives

The present study aimed to investigate the effectiveness of the metacognitive intervention on behavioral-emotional problems, cognitive-emotional regulation strategies, and mind wandering in ADHD children aged 13-9 years.

3. Methods

3.1. Design and Participants

This semi-experimental study utilized a pretest-posttest design with a control group. The statistical population comprised all students referred to the West Health Center of Ahvaz in 2019. There were 45 children who received a score above 34 according to the Connors Questionnaire and were diagnosed with ADHD (no other psychiatric disorder) based on the SCL90 questionnaire and semi-structured clinical interviews with a psychologist and center physician. They met the demographic criteria (age of 9 to 13 years, lack of psychotherapy education in the past, having at least a diploma in parents, having an average economic and social status, no family problems (divorce and separation), and marital problems). The parents had no history of mental disorders, and the children did not use medications. Thirty people were randomly assigned to 2 groups of 15 people as the experimental and control groups. To observe ethical considerations and the rights of participants, both groups were separately justified that this is academic research and they can participate if they wish; therefore, they completed a written informed consent. In addition, they were assured that their information would be kept confidential.

3.2. Assessment Instrument

3.2.1. Cognitive-Emotional Regulation Questionnaire-Children Form

Garnefski et al. created this version from the original Cognitive-Emotional Regulation Questionnaire (CERQ-K-P) for use in the children population (16). It is a self-report tool with 36 items. Cognitive-Emotional Regulation Questionnaire-children form consists of 9 subscales. The 9 subscales evaluate cognitive strategies of self-blame, acceptance, rumination, positive refocus, visibility, catastrophe, and blame for others. Each subscale has 4 items. The results showed that Cronbach's alpha coefficients were psychologically desirable for all subscales in both sexes and all participants. Also, the correlation results in most items were higher than 0.4, showing that the subscales had satisfactory internal consistency. Also, the commonalities of the nine factors ranged from 0.42 to 0.74. In the present

study, Cronbach's alpha for the sample was 0.72 on CERQ-K-P (17).

3.2.2. Rutter Children Behavior Questionnaire for Parents and Teachers

Rutter developed the questionnaire in 1964 to evaluate behavior and distinguish between normal children and children with behavioral disorders and problems. It was revised in 1967. Form A is for parents, completed by the child's parent. It consists of 31 questions, of which 13 are related to the child's health and habits, and 18 are related to the child's behavioral and emotional problems. The teacher form has 30 questions and examines a child's behavioral problems at school (18). The scores of the questionnaire range between zero and 62 (18). The test-retest reliability was about 89% by Rutter (19). Adl reported 68% reliability through split-half and test-retest methods (19, 20). The validity of this questionnaire (percentage of agreement between the questionnaire and psychiatrist diagnosis) was significant at the level of 0.001, and the correlation was about 0.85. In the present study, Cronbach's alpha of 0.82 for the sample was obtained on Rutter Children Behavior Questionnaire (RCBQ).

3.2.3. Extreme Mind Wandering Scale

Mind wandering was measured using the newly created MEWS. This publication is the first report on this scale. The MEWS is a 15-item self-report measure reflecting MW in ADHD. Items were based on patient descriptions of MW in ADHD as previously described by Asherson (21). To investigate whether the scale could be shortened by dropping items 6, 10, and 14 without reducing its sensitivity and specificity, we repeated the ROC analysis, finding the shorter 12-item scale had a sensitivity of 0.89 and specificity of 0.90.

Internal consistency was high for all scales for both cases and controls ($\alpha > 0.78$). In convergent validity, the extreme mind wandering scale had a significant positive correlation between moderate-high spontaneous mind wandering with symptoms of hyperactivity and attention deficit ($r = 0.76$), attention deficit ($r = 0.76$), and hyperactivity ($r = 0.71$). In the present study, Cronbach's alpha for the sample on the Extreme Mind Wandering Questionnaire was 0.76. Moreover, its correlation coefficient in this study with the deliberate and spontaneous mind wandering questionnaire was 0.688 (21).

3.3. Intervention

The intervention group received ten 60-minute, weekly sessions of MCT training based on the treatment protocol of regulatory skills training for children with

ADHD (22) and metacognitive training interventions (attention training technique and detached mindfulness) (11). The first author, who had received specialized courses and workshops, conducted the intervention sessions. No treatment intervention was offered to the control group; they were placed on the waiting list. At the end of the study, to observe ethical considerations, the control group received a course in MCT. A summary of sessions is presented in Table 1.

Table 1. A Summary of MCT Training Sessions (11, 22)

Sessions	Content
Frist	Familiarity with parents and children and the need for teaching regulatory skills to children with attention deficit hyperactivity disorder
Second	Using social learning strategies to enhance skill development
Third	Implementing the behavior management methods and memorizing all of them, recording daily homework
Fourth	Assembling the tools needed for homework and managing
Fifth	Introducing a checklist of backpacks and other items
Sixth	Familiarity with time and calendar, time tracking for homework
Seventh	Planning for long-term assignments and avoiding distractions, planning for daily tasks
Eighth	Introduction to homework planning, equipment and time management, inclusion in the schedule, planning for long-term projects
Ninth	Familiarity with the skills (attention training technique and detached mindfulness) and practical practice in person
Tenth	Summarizing and review of homework and training and review of possible obstacles and completion of training

3.4. Data Analysis

Quantitative data were analyzed using the mean and standard deviation. Multivariate Analysis of Covariance (ANCOVA analysis in MANCOVA) was used to examine the effect of MCT on studied variables. Levine's test was used to check the assumptions of MANCOVA. Data were analyzed in SPSS 16.

4. Results

Two children dropped from the control group. The participants included 30 children aged 10.92 ± 2.02 years. Demographic variables of ADHD children and parents are presented in Table 2.

Table 3 presents descriptive data (mean and standard deviation) of behavioral-emotional problems, cognitive-emotional regulation strategies, and mind wandering. The results showed that the mean score of behavioral-emotional disorders changed from 30.78 to

Table 2. Demographic Variables of the Participants (n = 15 per Group)

Variables	MCT	Control
Child's age	10.2 ± 1.2	10.5 ± 1.5
Age of parents	29 ± 1.5	27 ± 2.1
Child education	4 ± 2	5 ± 2
Gender	7G and 8B	6G and 9B

24.14, cognitive-emotional regulation strategies from 18.85 to 24.07, and mind wandering from 18.78 to 14.85.

The homogeneity analysis of variances (Table 4) showed that the significance of Levene's test in the scores of behavioral-emotional problems (1.7), cognitive-emotional regulation strategies (3.7), and mind wandering (11.7) was greater than 0.05. Therefore, the homogeneity of variance (HOV) assumption was met in the studied groups.

Table 5 shows a significant difference between the experimental and control groups in terms of dependent variables at the level of $P < 0.000$, so it can be stated that there is a significant difference between the two groups in at least one of the dependent variables. The effect size coefficient shows that 36.5% of the difference between the two groups is related to the experimental intervention. The test power is 99.

To find this difference, we performed a one-way analysis of variance in MANKVA text, and the results are shown in Table 6. Metacognitive training caused a change in symptoms in the subjects of the experimental group compared to the control group. According to the table, 18% of the effect of metacognitive training was on reducing the variable of behavioral-emotional problems. After that, 21.9% and 28% of the effect size of metacognition training affected cognitive-emotional regulation strategies and mind wandering, respectively. The test powers were 53, 64, and 78, respectively.

5. Discussion

The results showed that metacognitive therapy significantly affected behavioral-emotional problems, cognitive-emotional regulation strategies, and mind wandering in ADHD children.

The present study indicates the significance of metacognitive therapy in behavioral-emotional problems in children with ADHD. These findings align with Capobianco et al. and Rees and van Koesveld on the effect of metacognitive knowledge education (22, 23). The findings of these researchers show that by applying metacognitive knowledge as a treatment method, progress can be observed in reducing various emotional and behavioral problems. It can be said that the main problem of ADHD

children is that they act before thinking. For this reason, they immediately regret their impulsive and hyperactive behavior (which may also lead to injury) and often try to compensate for their behavior. Metacognitive knowledge and experience is a supervisory process that helps them to think before acting and, through planning and behavioral management, to evaluate and identify their attention and accuracy to tasks such as education and interpersonal relationships (22).

The present study indicates the importance of metacognitive therapy in the cognitive-emotional regulation of children with ADHD. These findings align with Sar Golzaei, Janatadadi, and Arab, which expressed the effectiveness of metacognitive education in problem-solving, emotional regulation, emotional processing, impulsivity, and distraction of students with learning disabilities (24). Also, metacognitive and cognitive-behavioral therapy can effectively reduce anxiety and emotion regulation strategies in students referring to treatment clinics (25). Research by Michelle et al. in a pilot experiment showed that mindfulness meditation therapy (as part of metacognitive therapy) effectively affects the main symptoms of executive function and emotional regulation in hyperactive/attention deficit children (26). Metacognitive therapy alters cognitive-attention syndrome by increasing control, flexibility in attention, changing metacognitive beliefs, and creating alternative ways of experiencing and coping with internal events (attention training and mindfulness training techniques). It helps children with hyperactive/attention deficit disorder become aware of their maladaptive emotion regulation strategies and replace them with adaptive strategies.

The present study indicates the significance of metacognitive therapy on the mental confusion of ADHD children. These findings are consistent with Tavighi et al., who stated that metacognitive therapy enables adolescents to relate to mind wandering differently to separate themselves from mind wandering (13). Also, the research of Xu et al. showed that the significant effect of mindfulness is associated with a reduction of mind wandering in anxious students faced with tasks that require constant attention (14). Metacognitive therapy facilitates the underlying thinking styles, reduces irrelevant thoughts and jumps in students' thoughts, and reduces emotional and cognitive symptoms caused by mind wandering (12).

5.1. Conclusions

According to the present study, the MCT effectively reduced behavior-emotional problems and mind wandering and improved emotional-cognitive regulation in ADHD children. Counseling centers are recommended to apply

Table 3. Levin's Test of Homogeneity of Variance in the Dependent Variables

Dependent Variables	Df ₁	Df ₂	F	P
Behavior-emotional problems	1	28	1.762	0.195
Cognitive-emotional strategies	1	28	3.7	0.13
Mind wandering	1	28	11.73	.06

Table 4. Descriptive Findings Related to Pretest and Posttest of Experimental and Control Groups

Variable and Group	Mean	Standard deviation	Minimum	Maximum
Experimental Group				
Behavioral-emotional problems				
Pretest	30.78	4.7	23	41
Posttest	24.14	4.2	16	31
Cognitive-emotional strategies				
Pretest	18.85	3.71	12	25
Posttest	24.07	4.49	17	30
Mind wandering				
Pretest	18.78	3.06	15	26
Posttest	14.85	3.5	10	20
Control Group				
Behavioral-emotional problems				
Pretest	30.71	5.04	22	42
Posttest	30.85	5.11	22	42
Cognitive-emotional strategies				
Pretest	18.5	4.14	12	27
Posttest	18.21	4.00	12	26
Mind wandering				
Pretest	18.78	2.29	25	15
Posttest	18.78	2.13	24	13

Table 5. Results of Multivariate Analysis of Covariance on the Mean Posttest Scores of Behavioral-Emotional Problems, Cognitive-Emotional Regulation Strategies, and Mind Wandering of Experimental and Control Groups

Name of Test	Value	F Ratio	Degree of Freedom Hypotheses	Degree of Error	Level	Size of Test	Power Effect
Pilay effect group	0.635	12.185	3	21	0.00	36.58	0.99
Lambda Wilkes	0.635	12.185	3	21	0.00	36.58	0.99
Hoteling effect	0.635	12.185	3	21	0.00	36.58	0.99
Largest root on	0.635	12.185	3	21	0.00	36.58	0.99

Table 6. The Mean Posttest Scores of Dependent Variables of Experimental and Control Groups

Variable	Sum of Squares	Degree of Freedom	Mean of Squares	F	Level of Significance	Effect Size	Power Effect
Behavioral-emotional problems	184.503	1	184.5	4.641	0.043	0.18	0.538
Cognitive-emotional strategies	65.146	1	184.5	5.902	0.024	0.219	0.640
Mind wandering	76.304	1	184.5	8.308	0.009	0.28	0.78

MCT and consider its effectiveness in reducing behavior-emotional problems and mind wandering in children with ADHD. Therapists are also recommended to apply MCT in workshops to improve emotional-cognitive regulation in ADHD children. This treatment can be used for children in other age groups with attention deficit hyperactivity disorder and other disorders such as disobedience and conduct disorder. The limitations of the present study emerged in the sample selection due to specific inclusion criteria such as age range, level of education of parents, and children. The generalization of the results to people outside this range should be made with caution. Also, the limited sample size and the lack of sufficient time to follow the sample were the other limitations of the study. Such a study is suggested in another age range and sample size.

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Footnotes

Authors' Contribution: Z. D. M. conceived and designed the survey and drafted the manuscript. F. H. participated in designing the survey, performed parts of the statistical analysis, and helped to draft the manuscript. S. B. re-evaluated the clinical data, performed the statistical analysis, and revised the manuscript. Z. D. M. collected the clinical data, interpreted them, and revised the manuscript. F. H. re-analyzed the clinical and statistical data and revised the manuscript. All authors read and approved the final manuscript.

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Data Reproducibility: The data presented in this study are uploaded during submission as a supplementary file and are openly available for readers upon request.

Ethical Approval: This study is approved under the ethical approval code of IR.IAU.AHVZ.REC.1400.005 (link: ethics.research.ac.ir/EthicsProposalView.php?id=188463).

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