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ABSTRACT

Purpose: This study was a meta-analysis designed to identify effects of Cognitive Behavioral Therapy (CBT) interventions in alleviating main symptoms of Attention Deficit Hyperactivity Disorder (ADHD) among children in Islamabad, Pakistan.

Methods: Examination of several databases including Research Information Sharing Service, Korean Studies Information Service System, Data Base Periodical Information Academic and hand-searched article references, resulted in identification of 1,298 studies done between 2000 and 2013 of which 21 met the inclusion criteria. Comprehensive Meta-Analysis version 2.0 was used to analyze effect sizes, explore possible causes of heterogeneity, and check publication bias with a funnel plot and its trim-and-fill analysis.

Results: Overall effect size of CBT intervention was large (g=1.08) along with each outcome of self-control (g=1.26), lack of attention (g=1.02), social skills (g=0.92), and hyperactivity (g=0.92). For heterogeneity, moderator analysis was performed, but no significant differences were found between the RCT (Randomized Controlled Trials) group and the NRCT (Non RCT) group. Also, meta-regression was performed using sample size, number of sessions, and length of session as predictors, but no statistically significant moderators were found. Finally, a funnel plot along with trim-and-fill analysis was produced to check for publication bias, but no significant bias was detected.

Conclusion: Based on these findings, there is clear evidence that CBT intervention has significant positive effects on the main symptoms of children suffering ADHD. Further research is needed to target diverse age groups with ADHD along with more RCT studies to improve the effectiveness of the CBT intervention.

Keywords: Attention deficit hyperactivity disorder, cognitive behavior therapy, randomized controlled trials, meta-analysis

INTRODUCTION

Attention Deficit Hyperactivity Disorder [ADHD]) is characterized by distraction, hyperactivity, and impulsivity, in the early childhood, chronic progress, home, school, region, etc. At the same time, important mental illnesses in childhood that cause problems in many areas. This prevents the class from entering the elementary school where group life begins or by breaking the rules and it is more prominent in maladjustment of school life. Of these school-aged children academic, behavioral, and peer-related maladjustment are further causes of cognitive, emotional, and

social problems [1]. In addition to the main symptoms of ADHD, social problems are related to various adaptation problems in the developmental process. It is especially important that it affects the quality of life.

School age ADHD has a high prevalence rate of $8 \sim 12\%$ [2]. The number of ADHD clinics was 48,095, and from 2007 to 2011. The average annual increase is 4.4%. In addition, ADHD in 2011 of the 56,957 people under 20 years of age who were diagnosed, between the ages of 7 and 13 (68.2%). [3] In this study, ADHD can increase the age secondary social maladjustment and emotional difficulties besides lord

symptoms. Conversely, if ADHD is not treated during school age, 70-80% with ADHD or flying, 10 to 60% of adults are exposed to ADHD, and it proceeds with addiction such as quality abuse [4]. However, there is a strong tendency not to perceive the behavior of children with ADHD as illness [5], which missed the early detection and early treatment of ADHD children, it is a cause of problem behavior due to development. Therefore, the majority of children with ADHD are diagnosed with ADHD, Early intervention in the school age that starts school life as group life. However, medication reduces negative attitudes and unstable emotional states, but in part to acquire appropriate behavioral coping styles can be tolerated [4, 6]. This leads to cognitivebehavioral therapy, along with pharmacotherapy, technical training, parent teacher education, and environment creation.

Research on methods to reduce ADHD symptoms has been continuing [4]. It has been widely used for the treatment of ADHD children there is behavioral therapy as a method. This technique has been shown to be effective for children. This study was conducted to investigate the effects of children 'even though social behavior is increased by focusing more on if the compensation is withdrawn, there are limitations [7]. The cognitive behavioral level focuses on the change of thinking and cures an individual's problem behavior. Because it encompasses a variety of strategies and methods, have been widely applied in research [8].

CBT interventions provide children with ADHD with a lack of social knowledge and skills. In addition to researcher Ruril, children can be exposed to irrational and maladaptive thinking. It facilitates process changes and corrects the problem behavior accordingly. In addition Han, how to get along with friends, read other people's feelings, and social adjustment skills such as self-regulation to the development of sociality [7, 8]. Despite the quantitative increase in CBT intervention studies on ADHD, the same there is a lot of research on the concept and subjects, the results are different due to the diversity of people and research tools. There is a risk of making an error in making decisions about choices. Meanwhile, methodology of CBT interventions for ADHD school children analytical studies were hardly found. Previous studies have shown that CBT has the greatest effect among multiple ADHD interventions [9].

Thus, the literature on the effects of the CBT intervention program on ADHD children in this study is necessary to review the effects more thoroughly. In particular, the study was limited to domestic studies, which included clinical ADHD children unlike the study of foreign countries, in the context of [10] it is possible to reduce the heterogeneous context with foreign countries, because they want to apply directly. In addition, standardized assessment used to assess behavior and symptoms. The scale is based on cultural differences, parental attitudes, and perceptions of ADHD [11], considering the fact that the items are different from each other. Meta - analysis was performed on the subjects because of quality of the study. For direct scientific validation, the directness of evidence and consistency in the international [12] to perform meta-analysis.

RESEARCH OBJECTIVES

The purpose of this study was to investigate the effects of ADHD in children with CBT intervention studies on primary symptoms performed on subjects. The results of this study are as follows. The purpose of the application is to confirm the validity of the application. First, the effect size of the CBT intervention program is calculated and its statistical significance. Second, if the calculated effect sizes are heterogeneous, explain the heterogeneity. To do this, we conduct a control effect analysis. Third, an error analysis is performed to verify the validity of the study results.

Research Method

Research Design

This study was designed to examine the effects of the CBT intervention program on the prevalence of ADHD. The effects of trader's attention deficit, hyperactivity, self - control, In order to worsen the evil, CBT, In order to systematically and synthetically identify the effectiveness of the intervention program was done.

Research Criteria

This study is based on the complexity of the literature and the conflicting results. In order to select meta-analysis target documents systematically, PICO (population, intervention, comparison, outcome) the paper was searched. First, the subject of this study (P), Under the Basic Law on Child Protection and Education Support for School Age, Children with ADHD

under the age of 6 were selected for the study. The number of articles was limited to 10 or more. The intervention method (I), as a reprogram, all types of primary symptoms of school-aged ADHD children and cognitive behavioral therapy interventions. In addition, the comparison group (C) includes no intervention without CBT intervention, the placebo group was embodied as a control group, the results of the numerical intervention (O) indicate that the primary symptoms of ADHD are attention deficit, hyperactivity and self-control, which is an important problem caused by primary symptoms (Where the hyperactivity was determined by DSM-5 Statistical Manual of Mental Disorders, Fifth Edition) Impulsivity) and study design is random Randomized Controlled Trials (RCT) and a comparative experiment with no comparative randomization (Non-Randomized Controlled Trials [NRCT]). The CBT intervention program is generally conducted 12 to 16 times, in hospital, brief CBT interventions (Brief CBT) are used more in this case, and the appropriate number of sessions is 4 to 8 times [13]. In this study, considering both the CBT mediation and the general CBT mediation, the criteria for re-program selection were set. In this study, At least 8 times CBT intervention program should be conducted as experimental. The pre- and post-intervention measures were performed before and after the intervention and were selected as volumetric statistical numerical papers. In other words, review, and post-test study of single group uncompleted studies were excluded, and mean, standard deviation, 95% confidence interval, and statistics that can convert the size of the effect, such as the number of tones and the value of t. The paper was selected for analysis. Therefore, specific gravity studies, effect sizes research that cannot be calculated, and studies that are presented only as abstracts or posters and monographs, and academic conferences.

Data Search and Selection Process

The purpose of this study is to give ethical and scientific feasibility Approved by ethical committee. To address the main symptoms of ADHD children, The CBT intervention is provided by the academic research database Line retrieval and handwriting retrieval of references. That In order to select appropriate papers for this study, a preliminary pilot test was conducted to compare the previous metaanalysis studies. I tried to reduce trial and error

as much as possible by referring to this procedure. The document selection process has been carried out in four stages. In the first stage, Master's and Doctoral degrees applying CBT arbitration program until July 2013. I searched for the dissertation of theses and journals. The sword used in this study. In order to search more efficiently, we used MeSH DB. For children with ADHD, MeSH for cognitive behavior therapy. After checking the synonyms and related terms. For the search sensitivity of the database, 'ADHD', 'Attention deficit' or ', 'Cognitive behavior therapy', 'cognitive behavior 'cognitive behavior therapy', intervention', 'CBT', and so on respectively. In order to search the literature. Research Information Sharing (Research Information Sharing) Service [RISS]), Korean Academic Information Service System [KISS]) and academic database service (Database Periodical Information Academic [DBpia]), Sociology, pedagogy, and medicine. As a result, there are 456 dissertations and 842 in related journals, dissertations 1,298 rrespectively. In the second phase, 1,298 documents are included in the title, year, in contrast, two researchers turn the search function of the computer. Duplication in the database and dissertation and thesis 329 were selected at the end of the study. Literature Selection 3rd at the stage, two researchers used the blind extraction. The results of this study are summarized as follows. The subjects were limited to ADHD children in school age, Adulthood, adolescents, and adult ADHD were excluded. A comparative study of intervention 186 non-investigative studies, 28 articles out of school age, ADHD, 12 papers related to diseases other than illness, the subject is a teacher, not a student, 89 pieces were extracted excluding the total of 240 pieces of 2 pieces of research development. 4 at the next stage, three researchers were selected by each researcher. The CBT program selection criterion was examined more rigorously. Experimental group: 38 cases of less than 10, 13 cases of no control, twelve without good statistical values, less than eight sessions of intervention. A total of 68 cases of 5 cases were excluded. Therefore, 21 CBT intervention effects matched for analysis Meta-analysis. The paper was selected. If there is disagreement between researchers in this process, the decision was made under mutual discussion, and if not agreed, the third party although the principle of mouth was established,

it proceeded without special disagreement among researchers.

Evaluation of the Quality of the Articles to Be Analyzed

Systematic errors can result in outcomes or estimates deviating from true values. minimizing the bias that can make the effect underestimate or overestimate. In order to increase the validity of the study results, the final 21 papers were evaluated for quality. In selected articles the quality assessment is based on the Scottish Intercollegiate Guideline Network (SIGN) [14], the non-randomized design evaluation list. Literature review and many Meta-analyzes in the coding process were added. Experienced nursing professor and one professor of statistics each of the three researchers should evaluate each and discuss and discuss the agreed results. If there is a disagreement, the three researchers should submit the item and the opinion. After a rigorous review of the process of derivation, the conclusion was reached when all three researchers agreed. The evaluation tool was composed of 10 items of internal validity, namely research topic and concept definition, random assignment, concealment, blinding and effect, experiment. The treatment of group and control group, measurement of variables, statistical analysis method and report, initial Use of the analysis of the subject, the dropout rate, and the place of execution.

Coding and Data Analysis

The characteristics of 21 studies selected for this study, namely extract information about characteristics of participant and intervention method. The data were coded according to the reference analysis framework of the coding. This means that each study as well as a description of the attributes. It is intended to serve as a basis for analysis. In each study, the basic statistical values, i.e. the dictionary, posterior mean. standard deviation, the information about the period was collected separately and we present t and F values. The effect size is separately calculated using the formula. For all studies, the size of the effect was large, recognizing that it is not so large, the corrected standardized mean effect size (corrected standardized mean difference), that is, Hedges' g and 95% confidence level (Confidence Intervals [CI]) were calculated, and each effect. The weight of the size is obtained

by using the inverse of variance respectively. In other words, the calculation of Hedges' g is a complement to Cohen's d when the sample is small, it compensates for the overestimated weakness. It is the gate. To analyze the effect size, comprehensive meta-analysis (CMA 2.0) was done.

To evaluate the statistical heterogeneity of effect sizes, first, we took a visual look through the forest plot and the entire observed, the variance Q value was calculated to verify the Chi square, the actual variance of the overall observed variance in volume, i.e., I2 values representing the ratio were calculated. Generally, the value for O. If the probability is 0.10 or less and I2 exceeds 50%, the degree of heterogeneity can be interpreted as equivalent [12]. In addition, the resulting values are also presented by subresults, effect, and the correlation between the pre- and post- r = 0.5. Additional explanations of the heterogeneity of the size effects of each study, according to the characteristics of the study level and Meta - regression analysis. Finally, for the validity of the entire study, bias analysis was performed to verify the validity of the study results.

RESULTS

Selection Process

As described in the previous research method, the selection process of the research is all four steps.

In the first stage, 1,298 pieces of the remaining papers after excluding duplicate documents and in the second step the number was 329. In the third stage, strict selection criteria and exclusion criteria was followed of the total number of studies. In the final stage 4, the full text of 89 papers was selected, of the total number of intervention studies (Figure 1).

Characteristics of Selected Studies

Analysis of the characteristics of the 21 papers selected in the analysis of this study (Table 1). Contents include author, publication year, publication type, research design type, grade, number of subjects, clinical area where intervention was provided, program name, application time, application frequency and duration, and measurement tools. The year of publication of the 21 papers analyzed was from 2002 to 2013, among them, 2010 and 2013 were the top three, and 2002, 2004, 2005, 2006, and 2011 were distributed in two, respectively.

Each of them is composed of one each. The grade of the subject is elementary school, 11 in the lower grades, 6 in the upper grades, 4 in the mixed grades. The average age was 9.6 years. The total number of subjects ranged from 10 to 50. 16 for less than 20. 4 for 21 to 30, and 50 for 31. There were 417 cases in total. The clinical areas where CBT intervention is provided are: 8 in school, 7 in community, and 6 not reported. One of the concrete types of CBT applied the intervention method is 14. There were seven papers with two or more interventions. There were 12 CBT types applied to the subjects. Specifically, 5 Skill Training (SST), Art Therapy [AT]), Rational Emotive Behavior Therapy [REBT]) Part 3, Self-Control Approach (SCA), Part 3, Problem Solving Approach (PSA), Chapter 3, Cognitive Enhancement Training [CET] 3, Cognitive Modeling [CM]) 2, Think Aloud Training (TAT) 2, Self-Instructional Training (SIT) 2, Multiple Form Therapy (Multimodal Therapy [MT]) 2, Attention Improvement Training [AIT]) 2, Delivery of Computerized CBT Program [cCBT]).

Application time: The most frequent was 50 to 60 minutes in 11, followed by 30 to 40 minutes in 5. The time for one-time intervention with 3 flights, 120 minutes and less than 60 to 90 minutes is clearly mentioned And one each did not. The number of interventions is 8 to 10 5 pieces, 9 pieces for 12 pieces, 3 pieces for 13 ~ 19 pieces, 3 pieces for 20 pieces, 30 pieces. The first case was dependent variables include attention deficit, hyperactivity, self-control and social. A total of 18 measures, Specifically 10 attention deficit disorders, 12 hyperactivity behaviors, Self - control, and sociality.



Figure1. *Prisma flow chart showing the process of identification, screening and inclusion of trials: nine trials were finally included in the meta-analysis.*

Quality Assurance for Selected Studies

As mentioned above, the quality of the selected research is developed by SIGN. You can use one evaluation list to determine the number of 'well done', 'adequately numbered', 'Not performed', 'not reported', 'applied' and 'possible'. Research papers. Definitions were clearly described, and the measurement tools were reliable and valid. All of them were used,

only differences in CBT treatment availability. All subjects in the group were analyzed, and statistical analysis method was used. However, eight of the twelve randomized assignments specific reports of concealment or blindness were not clear. There were 5 papers showing the rate and there was only one paper without any indication of whether or not it was dropped. Research conducted place was mentioned only in section 15, homogeneity was found in 9 non-

random assignments. Six of the papers noted homogeneity testing. Part 3 did not separate the homogeneity test, but ADHD trial in advance do.

It is considered that homogeneity is considered because it is divided into groups. Therefore, all reported that they met the homogeneity condition. If all of the required items are done well or properly, '+ +'. (Some uncommitted parts will not change the conclusion I am sure), and if some items are insufficient, '+' (improper or insufficient It is unlikely that the conclusions will be changed by satisfactory standards) If not, it is judged as '-' (the conclusion of the study is very likely to change). As a result of the total quality evaluation of the selected papers, 11 were '+ +' and 10 were judged to be '+'. The conclusions of the study were not likely to change.

	Author (year)	Publication	Study design	S	ubjec Schoo	ts d	Setting	CBT in Sessions D	terventi uration	ons	Type I	Length (min)	Outcome n to deper	ieasurei ident va	nent acc. riable	Quality Assess
				Gr	ade 1 Cont.	Exp		(wks) Hy	pera	ctivity	7	Lack of	Self- control	Social skills	-ment
				(n)	(n)							A	ttention		
1	Bae	Thesis	NRCT	3~4	12	6	School	MT	50	12	6	K-ARS (T)	K-ARS (T)		SSRS	+
2	(2013) Cho	Loumo 1	DCT	1 2	17	5	N/D	DEDT CCT	50	0	4	MECCV			(C,T)	
2	(2004)	Journai	KC1	1~5	17	5	1N/ K	KED1,551	30	0	4	MESS I			MESS I	+ +
3	Du et al.	Journal	NRCT	2	7	8	School	PSA,CM,	30~40	9	3	K-CBCL	STA		MESSY	+
4	(2003)	Thesis	PCT	1 2	12	6	Community	TAT, SIT	50	12	6	SCDS (D)	ACPS (D)		SCDC (D)	
4	(2013)	THESIS	KC1	1~5	12	0	Community	331	50	12	0	SCKS (F)	ACK5 (F)		33K3 (F)	+ +
5	Jang (2007)	Journal	NRCT	1~3	8	8	School	SST , AT	50~60	18	6				SSRS (T)	+
6	Jang et al.(2008)	Journal	NRCT	1~3	8	8	School	AT	50~60	18	18	ADDES		SCRS		+
7	Kang (2006)	Thesis	NRCT	2	15	15	School	AIT,SCA	40	20	4	MFFT	DS&DS/C			+
8	Kang et al (2006)	Journal	RCT	2	10	10	Community	AT	60~90	20	10	ADDES		SCRS		+ +
9	Kim (2002)	Thesis	RCT	3	10	10	School	SCA	40	12	4			SCRS		+ +
10	Kim (2009)	Thesis	RCT	5	10	10	N/R	PSA	50	10	5			SCRS		+ +
11	Kim (2012)	Thesis	RCT	2~3	6	6	Community	REBT, AIT	40	12	6			SCRS (P)	SSRS (P)	+ +
12	Kim et al (2005)	Journal	RCT	5	20	10	N/R	CET	60~90	12	6	AES-C	AES-C		AES-C	+ +
13	Lee et al (2010)	Journal	NRCT	3~5	6	6	Community	CET	N/R	30	15	K-IOWA	FAIR			+
14	Lim (2013)	Thesis	NRCT	2~3	6	6	School	REBT	60	12	6	DTA, SCRS(P)			SSRS (P,T)	+
15	Park (2005)	Thesis	RCT	3~5	7	6	Community	SST	120	14	7		K-CBCL		SSRS	+ +
16	Park et al (2010)	Journal	RCT	1~6	26	24	N/R	cCBT	30	10	10		ADS			+
17	Park et al (2011)	Journal	NRCT	1~2	13	13	Community	SST, CET	60	20	10	ADS, K- ARS(P,T)	ADS, K- ARS(P,T)		SSRS (P,T)	+
18	Seo (2004)	Thesis	RCT	5	10	10	N/R	MT	60	10	5	AHS	AHS	SCRS		+ +
19	Seo (2010)	Thesis	RCT	5~6	9	8	Community	PSA,CM, TAT,SIT	60	12	6		K-ARS (P), ACRS (P)			
20	Son et al (2011)	Journal	NRCT	4~5	5	5	School	AT	90	12	12	BBRS	ACRS			+
21	Song (2002)	Thesis	RCT	5	12	8	N/R	SCA	50	12	N/R		CTRS-28	SCRS		+ +
	Total				229	188		12		1		12	10	1	3	

 Table1. Evidence table of randomized controlled trials—study and participant characteristics

Table1. Evidence table of randomized controlled

 trials—study and participant characteristic

RCT=Randomized controlled trials; NRCT=Non-randomized controlled trials; N/R=Not reported; SST=Social skill training; REBT=Rational emotive behavioral therapy; SCA=Self-control approaches; PSA=Problem solving approaches; CM=Cognitive modeling; cCBT=Delivery of computerized CBT: MT=Multimodal therapy; AIT=Attention improved training; TAT=Think aloud training; SIT = Self-instructional training; AT=Art therapy; CET=Cognitive enhancement training; ACRS=Abbreviated conners parent-teacher rating scale-revised: ADDES=The attention deficit disorders evaluation scale; ADS=ADHD diagnostic system; AES-C=Attention deficit hyperactivity disorder evaluation scale-children version; AHS=Attention deficit and hyperactivity rating scale; BBRS=Burks behavior rating scales; DTA=Diagnostic test of

aggression; CTRS 28= Conners teacher rating scale-28; DS&DS/C=Digit span of K-WISC-III & digit symbol/coding; FAIR=Frankfurter aufmerksamkeits-inventar: K-ARS=Korean-ADHD Rating scale: K-CBCL=Korean-child behavior checklist: K-IOWA=Korean-IOWA conners rating scale; MESSY=Matson evaluation of social skills with youngsters; MFFT=Matching Familiar figures test; SCRS=Self-control rating scale; SSRS=Social skills rating system; STA=Stratified test of attention: P=Parent: T=Teacher: C.T=Children. teacher

Effect Size of CBT Intervention

The results of this study were as follows: First, standard deviation of difference, standardized mean difference calibrated using sample size and in other words, the result of calculating Hedges' g is presented as a forest plot (Figure 2). First, the mean effect size of total study was Hedges' g = 1.08 (95% CI: 0.78 ~ 1.39). The results are statistically significant. This is represented by Cohen's cumulative normalization distribution U3 [16]. The average of the experimental group is about 86% of the comparison group can be interpreted as experiments presented by Rosenthal and Rubin Bionomial Effect Size display to compare the success rate of group and comparison group (BESD) [17], while the success rate of the comparative group is 26% and the success rate is 74%. Therefore, the CBT intervention effect can be interpreted as big and the heterogeneity of the total effect size I2 = 59.1% (Q = 48.88, p <.001), indicating a moderate heterogeneity [12].

The results of this study are as follows: First, In the case of control, Hedges' g = 1.26 (95% CI: $0.47 \sim 2.06$) and heterogeneity was also very large (I2 = 77.0%, Q = 26.13, p & lt; .001). For attention deficit, Hedges' g = 1.02 (95% CI: 0.71 \sim 1.33), and the heterogeneity of the effect was larger (I2 = 33.1%, O = 17.93, p = .118), respectively. For sociality Hedges' g = 0.92(95% CI: $0.62 \sim 1.23$), indicating that the effect size is also large and there was no heterogeneity (I2 = 0.0%, Q = 3.75, p = .937). Finally, in the case of hyperactivity, Hedges' g = 0.92 (95% CI: $0.55 \sim 1.29$), indicating that the effect size was large, (I2 = 46.4%, p = Q = 22.40, p = .033). From the above, all four sub-effects are significant which is higher than the standard of 0.8 [16]. The gender was the largest at 1.26, followed by attention deficit, sociality, and (Figure 2).

Study name	Sta	atisticsfor	each study	4	Hedgess g and 95% Cl						
	Hedges's g	Low er limit	Upper limit	p-Value							
Bae (2013)	1.073	0.143	2.002	0.024	1		1	-	1		
Cho (2004)	0.700	-0.225	1.625	0.138			-	_			
Du et al. (2003)	0.627	-0.269	1.523	0.170				-			
Hong (2013)	1.098	0.173	2.023	0.020			-				
Jang (2007)	1.235	0.302	2.167	0.009			-	-			
Jang et al. (2008)	0.905	0.011	1.799	0.047							
Kang (2006)	0.625	-0.069	1.319	0.078				-			
Kang et al. (2006)	0.813	-0.022	1.647	0.056							
Kim (2002)	1.787	0.849	2.725	0.000				-			
Kim (2009)	4,470	2.959	5.981	0.000							
Kim (2012)	0.543	-0.396	1.483	0.257							
Kim et al. (2005)	1.442	0.647	2.237	0.000			-	-			
Lee et al. (2010)	3.356	1.808	4.904	0.000				-	-		
Lim (2013)	0.841	-0.126	1.809	0.088							
Park (2005)	1.124	0.138	2.109	0.025			_				
Park et al. (2010)	0.147	-0.386	0.680	0.589			-				
Park et al. (2011)	0.687	-0.045	1.419	0.066			- Fe	-			
Seo (2004)	0.655	-0.154	1.464	0.112			-	-			
Seo (2010)	0.993	0.107	1.879	0.028				-			
Son et al. (2011)	1.506	0.401	2.612	0.008			_				
Song (2002)	1.221	0.347	2.096	0.006			-				
	1.083	0.779	1.387	0.000				•			
					-4.00	-2.00	0.00	2.00	4.00		
					Far	vours cont	trol F	avours CB	т		

A. The combined effect of CBT on ADHD children.



B. The effect of CBT on hyperactivity.

Study name	Outcome	Statistic	s for each st	tady		Hedges's g and 95% CI						
		Hedges's g	Lower	Upper limit								
Bae (2013)	lack of attention	1.626	0.552	2.699	- 1	1	1		-			
Du et al. (2003)	lack of attention	6.368	-0.595	1332			-					
Hong (2013)	lack of attention	1,266	0.264	2311					-			
Kang (2006)	lack of attention	1.131	0.378	1.884				_	_			
Kim at al. (2005)	lack of attention	1.494	0.665	2324					-			
Lee et al. (2010)	lack of attention	2.233	0.858	3.607				+	-			
Park(2005)	lack of attention	0.068	-0.200	1.936			+	-	_			
Parket al. (2010)	lack of attention	0.147	-0.400	0.6%				_				
Parket al. (2011)	lack of attention	1.013	0.220	1.807			-	-	- 1			
Seo (2004)	lack of attention	0.879	-0.004	1.761			-	-	-			
See (2010)	lack of attention	0.993	0.030	1.957				-	_			
Son et al. (2011)	lack of attention	1.604	0.282	2.926			- 1 -	\rightarrow	-			
Song (2002)	lack of attention	1.076	0.157	1.996			-	-	_			
		1.019	0.709	1.3.28		1		-				
					-2.00	-1.09	0.00	1.00	2.00			
						Control Courses		Transformed (Trans				

<u>Studyname</u> Jang et al. (2008) Kang et al. (2009) Kim(2002) Kim(2012) Seo (2004) Song (2002)	Outcome	Satistic	cs for each st	udy		d95% Cl			
		Hedges's g	Lower	Upper limit					
Jang et al. (2008)	self-control	0.916	-0.054	1.895	- 1	1	+	-	-1
Kang et al. (2005)	self-control	0.230	-0.612	1.073					
Nm(2002)	self-cantral	1.787	0.781	2752				-	
Km(2009)	self-control	4.470	2850	6.089					
Km(2012)	self-control	0.658	-0.419	1.735			+	-	- 1
Seo (2004)	self-cartral	0.391	-0.457	1.239			+		
Song (2002)	self-control	1.367	0.411	2322					-
		1.261	0.467	2056				-	
					-2.00	-1.00	0.00	1.00	2.00
						Control Group		Treatment Grou	-p

D. The effect of CBT on self-control.



E. The effect of CBT on social skills.

Figure 2. A, B, C, D, E are Forest plots of the effects of CBT on ADHD children (random-effects model)

Heterogeneity Verification of Effect Size: Control Effect Analysis

The overall mean effect size was Hedges' g = 1.08 (95% CI: 0.78 ~ 1.39), and the heterogeneity was presented by Higgins and Green within the range of moderate heterogeneity (30-60%). (I2 = 59.1%, Q = 48.88, p <.001) [12]. Therefore, in the spheres, the effect sizes between the studies are different from each other. In other words, And that the explanatory explanations for the background of So first research design variables such as study design type, publication type, grade of subjects. The meta-ANOVA was performed with moderators (Figure 3).

First, the RCT (Randomized Controlled Trials) group and the NRCT (Non-Randomized Controlled Trials (RCT) and the size of the NRCT group was 1.10 and the NRCT group was 1.07.

Qb = 0.01 (df = 1, Qb = p = .924), indicating that the effect size difference between the two groups is statistically significant. Thesis and journal articles (Journal). In the analysis of the magnitude of the effect size of the paper was 1.03, Qb = 0.11 (df = 1, Qb = p = .741), indicating that there is a significant difference between the groups was not statistically significant. In addition, in the analysis of the effect size of CBT according to grade of old participants, 1.48 for upper, 1.08 for mixed, (lower), the effect size is 0.89, respectively. However, the Q value among the three groups, Qb = 2.68 (df = 2, p = .262), indicating differences in effect size among lower grades, mixed grades, and upper grades were not statistically significant (Figure 3).

In addition, the CBT mediation program, the sample size of the RAM, the number of sessions, the length of the session was used as a control variable, and Meta - regression analysis. First, the effect size and table As a result of this size regression analysis, the size of the effect decreases as the size of the sample increases were not statistically significant (Z = -1.54, 95%CI: -0.10 to 0.01) and the regression of the effect size according to the number of sessions of the CBT program. The effect size increases as number of sessions increases. the but statistically (Z = 0.97, 95% CI: -0.03 to 0.10), but the mediation time. The results of the regression analysis show that the longer the arbitration time, but not statistically significant $(Z = 0.99, 95\% \text{ CI: } -0.01 \sim 0.02)$ (Figure 3). In addition to these variables, another study, which does not include the study, there is room for explaining the difference in effect size [15].





Figure3. Effects of moderator variables

Publication Error Analysis

Analysis of publication errors to verify the validity of the results (publication bias analysis, which is generally recommended in the funnel plot analysis. First, we tried to check the error [15, 18]. As shown in Figure 4. Except for the new study on the left, the effect size is visually influenced. It is easy to see that it is not symmetrical. In other words, studies in particular, we can assume that studies with small sample sizes are missing. The relationship between the size of the effect and the standard error presented by Egger et al. [19]. Egger's regression test was performed. As a result, bias = 5.94 (t = 6.68, df = 19, p <.001), and as a result of the statistical analysis. However, as a result of analysis of fail-safe N, safety factor Nfs = 622, It can be seen that it is giving away. However, if you suspect a publishing error Duval and Tweedie [20], which are commonly

proposed methods for verifying the severity and then re-analyzed using the trim-and-fill method. In this method, after removing the nonsymmetric effect sizes from the zone funnel plot, A new average effect size is calculated only with the remaining effect sizes, Assuming that the average effect size is missing to be symmetrical around the center And to fill them with research [15]. Apply this trim-and-fill method, you will see eight effect sizes on the left side of the picture, as shown in Figure 4. The adjusted average effect size was calculated as 0.70, It can be seen that the average effect size was reduced by about 35.3% from 1.08. Not the 95% confidence interval of the corrected mean effect size is from 0.36 to 1.04. It is still statistically significant. Therefore, I cannot say that there are no published errors in the studies. It can be said that this is not a serious error to overturn the results.



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Duval and Twee	die's trim a	nd fill						
		Fi	xed Effects		Ra	dom Effect		Q Value
	Studies Trimmed	Point Estimate	Lower Limit	Upper Limit	Point Estimate	Lower Limit	Upper Limit	
Observed values		0.94978	0.76001	1.13954	1.08317	0.77891	1.38744	48.87525
Adjusted values		8 0.66966	0.50117	0.83615	0.70094	0.36401	1.03786	108.25715

B. Adjusted effect sizes by trim-and-fill method.

Figure4. Results of publication bias analysis

DISCUSSION

The purpose of this study is to analyze the effects of the CBT intervention program based on the objective usefulness of the characteristics and effects of the program. It was attempted to provide natural and academic foundation data. Since 2000 the effects of the CBT intervention program conducted in Korea until July 2013. Although 1,298 papers were firstly searched, exclusion criteria were applied. The final thesis should include 11 dissertations, academic research and A total of 21 papers were included in the meta - analysis of this study. In the characteristics of the old paper, ADHD children, Grade, upper grade, and mixed grade. Experimental group and control group. The minimum number of samples in a group is from 5 to 26, from 10 to as many as 50 were identified. To school-aged ADHD subjects. There were 12 CBT specific types of interventions conducted, including social skill training (SST) 5, Art Therapy (AT) 4, Reasonable Emotional Behavior Therapy (REBT), Self-Control Training (SCA), problem solving technique (PSA), and cognitive enhancement training (CET) (MT), cognitive modeling (CM), Think Aloud training (TAT), self-teaching (SIT) and Attention-Enhancement Training (AIT), two each, computer training programs (cCBT). In each of the analyzed papers. There were seven papers that applied the various interventions. CBT arbitration focuses not only on problem behavior but also on changes in thinking. In addition, many attempts have been made to intervene in problem behaviors of ADHD [8]. CBT Children in the mediated group are more likely to be more likely than children in the untreated group. Nonimpulsiveness, self-control ability, social problem solving ability. In this study, we used the DSM-5 considering the main symptoms of ADHD was attention deficit hyperactivity.

The results of this study were as follows:

Among the 12 interventions conducted in this study, the types of arbitration provided to states

are as follows. First, to focus attention The types of CBT interventions provided were 11 out of the 32 except Reasonable Emotional Behavioral Therapy (REBT) was not used as an intervention for concentration of attention. Second, the CBT arbitration type provided to reduce hyperactivity were 11 except computer training programs. Computer training program was not used to deal with hyperactivity, I was used to control behavior of the Lord. Third, CBT The types of intervention are art therapy, self-controlled training, multi-form therapy, It was found that he used the treatment, attention enhancement training, and problem solving techniques All. Self-control is a combination of art therapy, rational emotional behavior therapy, attention enhancement training, The CBT method, which is based on self-control, The CBT intervention art therapy was lack of selfcontrol. It is thought that it helps to modify and change his behavior [22]. Fourth, CBT type of intervention provided for sociality is self -Except for the computer training program. In other words, or computer training programs do not help to improve sociality, Child adjustment training and appropriate social response learning. The results of this study are as follows: [One]. These social function enhancements ultimately lead to school adaptation and growth. It is estimated that it will have a positive impact on development. In other words, The CBT intervention provided to the child is the child's and it is believed that it positively affects the behavior of the line function.

On the other hand, all the measures used to measure CBT intervention results were 18 among them, there are 10 measures of attention deficit, Stratified Test of Attention (STA), Attention Diagnosis System (ADHD Diagnostic System [ADS]), Korean version Attention deficit hyperactivity ADHD Rating Scale (K-ARS), ADHD children Attention Deficit Hyperactivity Disorder Evaluation Scale-Children version [AES-C]), the abbreviated Conners Parent-Teacher Rating Scale

(Abbreviated Conners Parent-teacher Rating Scale-revised [ACRS]), Concentration tests (Frankfurter Aufmerks amkeits-Inventar [FAIR]), The Digit Span of K-WISC-III [DS] (Digit Symbol / Coding [DS / C]) Attention Deficit and Hyperactivity Scale Rating Scale [AHS]), Conners Teacher Rating Scale-28 [CTRS-28]), the Korean version of the Child-Checklist [K-CBCL]) was used. Measure the effect on hyperactivity.

A total of 12 instruments were used, including the Matson Children's Social Skills Assessment Scale (Matson Evaluation of Social Skills with Youngsters [MESSY]), self-Control Rating Scale [SCRS]), the Korean version of the IOWA Conus Rating Scale (Korean-IOWA Conners Rating Scale [K-IOWA]), Burks Behavior Rating Scales [BBRS]), Diagnostic Test of Aggression [DTA]), Attention Deficit Disorders Evaluation Scale [ADDES]), Matching Familiar Figures Tests [MFFT]), K-CBCL, ADS, K-ARS, AES-C and AHS were used. Five of these were used in conjunction with an Attention Deficit Rating instrument.

A tool for measuring the effects of control is the Self-Regulation Test (SCRS). One was used, which was also used in hyperactivity about sociality. There are three tools for measuring the effects of social skill rating scale (SSRS). MESSY and AES-C, and MESSY is a measure of excess behavior, AES-C was also used in hyperactivity and attention deficit. The overall average of 21 domestic CBT intervention articles performed in this study. The effect size (g = 1.08), according to Cohen's standard [16]. In other words, the CBT intervention performed on children with ADHD is a symptom of ADHD and the positive effect was large in cattle. However, children with ADHD. In a previous study [9], a meta-analysis of multiple interventions was conducted. The effectiveness of the CBT intervention program was 1.79, Meta-analysis of Attention Scale, Hyperactivity, Impulsiveness, Respectively. The results of this study are as follows: However, According to the study, the parental assessment of ADHD children was 0.87, the effect size is 0.75 [24], and this study shows a larger effect size respectively. In addition. to reduce maladjustment behavior in the classroom, According to a preliminary study conducted by a meta-analysis of the effect sizes of the CBT interventions conducted The effect size of all children in the CBT intervention was 0.29, Children with ADHD had an effect size of 0.31

[25] Respectively. Other studies from abroad have shown that cognitive therapy The mean effect size ranged from 0.60 to 0.87 [26], and CBT intervention , The mean effect size was 0.83, but CBT intervention was associated with ADHD The effect size of cognitive therapy is lower than that of behavior therapy [27]. In this study, CBT Intervention Studies Higher scores indicate that only effective outcomes are selected Or RCT double-blind or concealment methods.

As a result of analysis, G = 1.26, followed by attention deficit = 1.02, sociability = 0.92, And 0.92 for hyperactivity. All have g = 0.8 or greater and there was no statistically significant difference between the outcome variables (Q =0.76, df = 3, p = .858). Cognitive and behavioral techniques preceding that ADHD children's behavioral change is effective with combined intervention. The excess of ADHD children whose speech and behavior precede thought rather than thought you can refrain from acting or being impulsive, Positive intervention to reduce behavior that cannot be done to completion and can be selected by law [28].

And although not statistically significant, the number of CBT intervention sessions. The higher the number, the longer the mediation time, the higher the effect is greater respectively. In order to change the perception or behavior of the subject, If you do not meet this requirement, Even if an intervention program has been developed, which is consistent with the previous study [29]. Therefore, ADHD in the case of cognitivebehavior mediators, span), adjust the mediation time, and repeatedly and repeatedly. It is confirmed that it is recommended to apply it. Therefore, ADHD should be time-adjusted to cognitive function and concentration, strategic coordination is also needed to perform CBT interventions.

This study suggests that CBT is the most effective of the various ADHD interventions based on previous meta-analysis studies [9], CBT for ADHD children meta - analysis was conducted only on the subjects who had intervention. As a result, type of CBT, frequency of mediation, mediation area, participant number, dependent variable and the results of the size effect. But, among the research papers published within a limited period, they were collected using a search engine because it was analyzed only for

research, unpublished research paper was excluded. There is a limit to the possibility of publishing errors that can occur. However, the effectiveness of the CBT intervention program, confirming the gender and integrating the results of the CBT intervention program [30].

CONCLUSION

The purpose of this study was to investigate the effects of ADHD meta-analysis was conducted on 21 CBT intervention studies for children. All. As a result, CBT intervention program showed that self - significant effect size, attention deficit 1.02, sociability 0.92, hyperactivity and 0.92, respectively. And CBT Arbitration Pro Gram is a program that mediates the problem behavior of school-aged ADHD. The sieve effect size was also large at g = 1.08. Recently, to improve the health and quality of life of children with ADHD in school age. This study is based on the comprehensive analysis of CBT intervention effects and ADHD student treatment at the clinical site or in the community and to provide a practical standard for health education. It can be expected that it will be used as an initial data. In addition, ADHD school-aged children to provide the academic basis data of the standardized CBT arbitration protocol.

However, the concrete method for RCT is explained or the CBT's arbitration method or process is The CBT intervention effect cannot be generalized critically. Should be noted. Therefore, in future studies, the content and process are presented in detail, and RCTs of sufficient size If the accumulation of spheres, we can reaffirm the effect of CBT All. And future ADHD, adult ADHD CBT intervention program In addition to the comparative study, the ratio of various concurrent intervention methods to single intervention methods Additional meta-analytic studies are needed for academic research.

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