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Effectiveness and Participant Characteristics of a Guided Computer-based Cognitive Behavioral Therapy for Depressed Adolescents

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Abstract

Effectiveness and Participant Characteristics of a Guided Computer-based Cognitive Behavioral Therapy for Depressed Adolescents

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Background: Depression in adolescence is common, and has negative effects on adolescent's lives over time. However, many depressed adolescents do not receive any treatments despite there being evidence-based treatments for depression, such as computer-based cognitive behavioral therapy (CCBT). Many CCBT programs were developed in Western societies as a promising solution for untreated depression. The effectiveness study on the Korean version of CCBT is necessary. Moreover, few studies examined the factors influencing treatment outcomes and CCBT dissemination.

The aim of this study was to investigate the effectiveness and identify the characteristics of depressed adolescents that participated in the CCBT program. It was hypothesized that

adolescents with high homework compliance would experience a decrease in depression compared to those with low homework compliance.

Methods: A total of 376 students (mean age 15.71 years, 53.7% female) in South Korea completed screening tests for depression, help-seeking attitudes, and intentions. Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9) and Center for Epidemiological Studies Depression Scale (CES-D). Help-seeking attitudes were measured using the Attitudes Toward Seeking Professional Psychological Help Scale (ATSPPH). Professional help-seeking intentions were translated and culturally attuned based on the Intentions to Seek Counseling Inventory (ISCI). The number of adolescents that scored above mild depression (PHQ-9, CES-D) was 139. Each adolescent was contacted by their mobile phone to investigate their participation in the CCBT program. Of those, 82 adolescents disagreed to participate in the CCBT program. Fifty adolescents participated in the CCBT program with pre- and post-tests, as treatment (n=25) and waitlist control group (n=25). Two groups were randomly divided. Both groups of adolescents were individually assessed for depression, quality of life, self-esteem, attention, and memory at 5-week intervals.

The treatment group received 10 sessions of the guided CCBT, which included therapist support. Adolescents in the treatment group participated in the Haengbok-Nuri program, a CCBT program twice a week for 5 weeks, for about 30 minutes per session. Therapist support was provided to help them participate in the program for about 10 minutes each session and to promote the performance of the homework. To identify the variables that

affected treatment outcomes, their homework compliance was assessed according to the quality of homework performance in each session.

Results: Adolescents (n=50) who agreed to participate in the CCBT program exhibited different help-seeking attitudes – greater recognition of the need for help and lower interpersonal openness – compared with those (n=87) who disagreed to participate (t = −2.93, p < .01; t = 3.50, p < .001). Adolescents who agreed to participate in the CCBT program showed higher help-seeking intentions than those who disagreed to participate (t = −2.27, p < .05).

The treatment group demonstrated significant improvements in depression, self-esteem, attention, and quality of life after treatment compared to the waitlist group. However, the CCBT group mainly comprised of adolescents with mild depression, and the waiting group comprised of those with moderate depression. Adolescents with high homework compliance demonstrated a significant decrease in depression compared to those with low homework compliance at the post period.

Conclusion: CCBT could be an effective, alternative treatment option for adolescents with depression, especially those tending to have low interpersonal openness. Because the CCBT group consisted mostly of adolescents with mild depression, the effect of CCBT was verified mainly in mild depression. In future studies with larger samples, it is necessary to generate randomized allocation sequencing considering the level of depression. To improve the effects of CCBT, therapeutic support needs to be provided to

increase participant engagement, including completing sessions and homework compliance.

For resolving untreated depression in adolescents, universal interventions improving recognition of the need of help are needed. Moreover, direct and continuous efforts to find and ask participation to depressed adolescents, including screening process are important. Finally, continuous efforts are needed to improve and spread the CCBT program to depressed adolescents, especially male adolescents, who tend to be alienated from treatment due to their low interpersonal openness.

Keyword: Computer-assisted therapy, Depression, Adolescent, Help-seeking behavior, Cognitive behavioral therapy, Randomized controlled trial

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Table of Contents

Chapter 1. Introduction

1.1. Study background

Depression in adolescence is common, and negatively impacts adolescent's lives, including peer and family relationships, and academic performance over time (Jaycox et al., 2009). Even sub-threshold depression can increase the burden of disease and suicide risk (Balazs et al., 2013). Early identification and intervention is crucial. However, many adolescents who experience depression do not receive any therapy (Lu, 2019). One study found that only one in four depressed adolescents sought professional help (Essau, 2005). Adolescents attempt to solve their difficulties by themselves rather than seek professional help (Sylwestrzak et al., 2015). In particular, males are reluctant to seek help such as psychotherapy (Jorm et al., 2006). Although adolescents can have the intention to get therapy, consistent treatment is difficult due to the lack of accessibility and time, and/or high costs.

Computer-based cognitive behavioral therapy (CCBT) is considered to be a promising solution for untreated depression due to its availability, anonymity, and accessibility. CCBT programs have been developed and proven to be effective in the treatment of depressed adolescents (Johnston et al., 2014; Merry et al., 2012; Smith et al., 2015; Stallard et al., 2011). However, most randomized controlled trials on computer-based therapy have been performed in Western countries. Related studies based on more diverse cultural backgrounds are, therefore, needed (Bernal et al., 2009). In Eastern countries, CCBT programs have begun to be developed

based on Western developed internet interventions such as CATCH-IT (Ip et al., 2016; Sobowale et al., 2013). Nevertheless, an originally developed CCBT – not simply a translated one – that takes cultural characteristics into account needs to be developed and validated.

In South Korea, the mental health of teenagers is a serious problem, and suicide is the leading cause of death from the teenage years to the thirties (MOHW, 2016). Therefore, it is necessary to develop a CCBT that reflects the cultural specificity of South Korea. Furthermore, the quality of life was ranked the lowest among Organization for Economic Co-operation and Development (OECD) countries, although Korean children and adolescents had the highest academic performance (Statistics Korea, 2019). The point prevalence of depressive disorder is approximately 3% in both South Korea (Kim et al., 2009) and US (Lewinsohn et al., 1998). However, the proportion of adolescents with more than mild depression is higher in Korea than in other countries: 65.3% in Korea (Jang, 2014), 57% in Hong Kong (Chi et al., 2020), 39% in India (Hanspal et al., 2019), and 23.2 % (males) & 26.9% (females) in Germany (Sauer et al., 2014). A high proportion (33.8%) of adolescents in South Korea reported that they occasionally had suicidal thoughts (Statistics Korea, 2019). Academic problems accounted for the largest proportion among causes of suicidal thoughts. Despite severe psychological stress, it is difficult for adolescents to get treatment consistently due to long study hours and participation in learning-related activities after school. As such, CCBT is promising, especially for Korean adolescents. South Korea is the highest-ranked country in terms of internet connection speed in the world (Akamai, 2017). Korean teenagers are accustomed to

the Internet and use computer-related programs in their free time (Statistics Korea, 2018). Considering the cultural characteristics, a CCBT for Korean adolescents with depression was developed in South Korea (Shin et al., 2018). The program contains three modules including cognitive behavioral therapy for depression, interpersonal skills, and learning ability training (more details in Table 2). Unlike other CCBT programs, however, it is characterized by learning ability training. The module was included because academic stress is considered to be an important factor contributing to depression among Korean youth (Yoo, 2010). Attention and memory decline with the severity of depression; therefore, memory and attention training were also included. A preliminary effectiveness study of the currently developed CCBT was conducted (Shin et al., 2018). Although the treatment group demonstrated improvement in memory and attention, there was no significant difference in depression scores between the treatment and waitlist groups. Moreover, the study design had some limitations, including the absence of randomization. The study was conducted without excluding other interventions. During the study period, approximately one-half of the participants were taking medication and/or undergoing counseling. Therefore, an effectiveness study of a CCBT that compensates for the limitations of the preliminary study is needed.

Contrary to the expectation that most CCBT programs will be effective, many studies have reported that some are less effective and have high rates of attrition (Christensen et al., 2009; Simco et al., 2014). High dropout-attrition rates are generally common in unguided self-administered CCBTs that do not include therapeutic support. Most participants completed only one or two sessions of

unguided CCBT (Bobier et al., 2013). Unguided CCBTs yielded lower effect sizes than guided CCBTs that included therapeutic support (Grist et al., 2019). Recent research results suggest that CCBT should be designed with therapeutic support to increase participant adherence (Topooco et al., 2019). It is important to complete the session itself in cognitive behavioral therapy (CBT). However, it is also important to complete the program outside the session. In other words, it is important to complete one's homework outside the session. Homework compliance has a pivotal role in facilitating the generalization of adaptive CBT skills. Many studies on CBT programs have confirmed the relationship between homework compliance and CBT outcomes (Kazantzis et al., 2017; Kazantzis et al., 2016). Therefore, for participant engagement in CCBT, adherence was also defined as either session completion or homework compliance (Alfonsson et al., 2016). Nevertheless, little research investigating homework compliance in CCBT has been conducted (Fleming et al., 2020).

Compared with many studies on the effects of CCBT, very little is known about CCBT dissemination. The advent of CCBTs emerged with the expectation that they would overcome the barriers to seeking professional help by saving time and money, and enhancing accessibility of the intervention. Although the effectiveness of many CCBT programs have been reported (Garrido et al., 2019; Grist et al., 2019), few studies have examined whether CCBT is perceived to be accessible. In addition, considering that CBT did not spread to actual routine clinical care despite its effectiveness (Shafran et al., 2009), it is necessary to study the dissemination of CCBT programs, particularly to adolescents. Little is known about the attitudes of depressed adolescents enrolled in

CCBT programs. Previous studies suggest that people prefer face-to-face therapy over internet-based intervention (Apolinário-Hagen et al., 2018). Although clinicians and parents demonstrated positive attitudes toward computerized therapy, young people have been skeptical (Stallard et al., 2010; Vigerland et al., 2014). It was necessary to investigate specific help-seeking attitudes toward computerized therapy. One study investigated help-seeking attitudes related to the perceptions of computerized therapy (Do et al., 2019). Male adolescents and lower interpersonal openness were related to positive perceptions of computerized therapy. Lower interpersonal openness has been shown to be one of several predictors related to lower frequencies of help-seeking behavior (Cankaya & Duman, 2010). As a barrier to seeking professional counseling services, both children and adolescents reported difficulties with interpersonal openness. Furthermore, the barrier was augmented by the point that counselors and/or psychiatrists are, in large part, strangers (Del Mauro & Jackson Williams, 2013). Interestingly, however, it was suggested that in computerized therapies the characteristic of lower interpersonal openness could encourage participation in the therapy (Do et al., 2019). Therefore, research is needed to identify the characteristics of adolescents who actually participate in computer-based therapies. More specifically, it is necessary to investigate whether adolescents with low interpersonal openness are actually more likely to participate in computer-based psychotherapy. By identifying the characteristics of adolescents who actually participate in CCBT, strategies regarding how to disseminate CCBT in the communities could be developed.

1.2. Purpose of research

The aims of this study were to investigate the effectiveness of CCBT and to create a dissemination plan of the program for depressed adolescents. After the screening tests, help-seeking related variables that affected participation in the CCBT program among depressed adolescents were examined. Treatment outcomes in the CCBT group were compared with those of the waitlist control group. It was hypothesized that adolescents with high homework compliance would experience a decrease in depression compared to those with low homework compliance. This study was designed to identify the characteristics of adolescents who participated in CCBT, and who gained the most benefits from the program.

Chapter 2. Methods

2.1. Study design and participants

Adolescents aged 12 to 17 participated. Adolescents were recruited from two high schools, two private academies, and one adolescent center from the communities of Seoul, South Korea (Table 1).

This study was conducted after permission was obtained from the Institutional Review Board of Seoul National University Hospital (IRB No.1904-136-1030).

Table 1. Descriptive characteristics of the participants (N=376)

Variables		M	*(SD)*
Gender (N)	Male/Female	174/202	
School (N)	Middle/High school	14/362	
Age (years)		15.71	*(0.65)*
Depression	PHQ-9	6.77	*(5.11)*
	CES-D	15.21	*(10.70)*
ATSPPH	Total	77.87	*(11.02)*
	Recognition of the need for help	20.10	*(3.90)*
	Stigma tolerance	15.09	*(3.18)*
	Confidence in therapists	23.51	*(4.76)*
	Interpersonal openness	19.17	*(3.87)*
ISCI	Total	40.95	*(11.73)*

PHQ-9: Patient Health Questionnaire-9, CES-D: Center for Epidemiological Studies Depression Scale, ATSPPH: Attitudes Toward Seeking Professional Psychological Help, ISCI: Intentions to Seek Counseling Inventory.

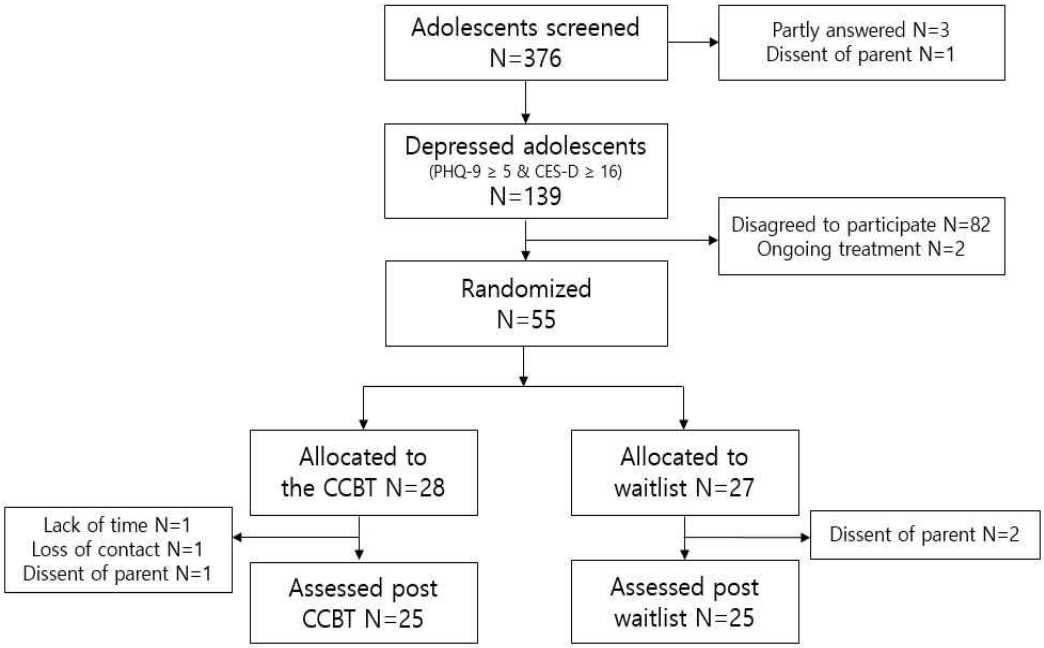

Fig.1. Participant flow

This study was conducted in two stages (Fig.1). In the first stage, between June 25, 2019 and February 7, 2020, a screening survey was administered to 376 adolescents (174 male, 202 female) in a classroom setting, who voluntarily completed it after informed consent was received from their parents. Participants were offered gift cards worth 3,000 won ($2.4) as reimbursement.

The screening questionnaires included depression-related measures for screening, and help-seeking related measures to identify help-seeking attitudes and intentions that affect participation in CCBTs. Depressed adolescents who scored above mild depression based on the Patient Health Questionnaire-9 (PHQ-9) and Center for Epidemiological Studies Depression Scale (CES-D) were contacted directly via cellular phone. Through phone, what they can learn and the benefits of participation (30,000

won [$24] as reimbursement) were explained. They were also informed that they could start immediately after the assessment or five weeks after the assessment through randomization. Their depression scores were made available upon inquiry.

In the second stage, after explaining the CCBT program and receiving informed consent from parents and adolescents, 57 adolescents agreed to participate in the program. Two subjects who initially agreed to participate, however, were not included because they were taking medications or undergoing counseling. The CCBT group consisted of 28 adolescents, and 27 adolescents were allocated in the waitlist control group, following randomization. An independent researcher, who was not involved in this study, generated the randomized treatment allocation sequence using an Excel program with block sizes of 2 or 4, at a 1:1 ratio of the treatment and control groups. Pre- and post-assessments were conducted within a five-week interval in both the treatment and waitlist groups.

Pre- and post-assessments and administration of the program were conducted between July 25, 2019, and February 10, 2020 at the schools or centers the participants belonged to. The assessments and the program were performed individually by a researcher with a single adolescent in a quiet room. The waitlist group participated in the pre- and post-tests without any other treatment over a five-week period, and participated in the program, if desired, after the post-tests. All participants in both groups were given gift cards worth 30,000 won as reimbursement.

2.2. Treatment conditions

Regarding treatment conditions, CCBT program for depressed Korean adolescents, so called "Haengbok-Nuri program" was used (Shin et al., 2018). "Haengbok" means happiness and "Nuri" means world in Korean. In this program, adolescents learn and practice content through animation and game-like activities (Fig. 4, 5).

Fig.2. Main screen before starting program


Fig.3. Happy Master

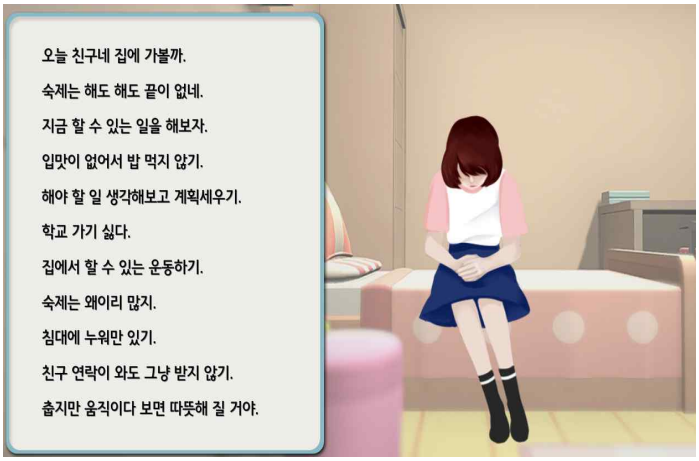

Fig.4. Example of game scene

Fig.5. Example of choosing emotions and its degree

It consisted of ten 30-minute sessions, twice per week, for five weeks. Each session had simple homework, shown in Table 2. The program contains three modules: depression cognitive behavioral therapy, interpersonal skills, and learning ability training.

Unlike other CCBT programs, it is characterized by learning ability training after considering the cultural characteristics of Korean adolescents. Learning ability training was included in the CCBT because poor academic achievement is a factor influencing depression among Korean youth (Yoo, 2010). Learning ability training consisted of attention and memory training because both are important cognitive abilities that contribute to academic achievement.

The program on depression and interpersonal skill was inspired by several programs, such as CBT for depressed adolescents (Coping with Depression Course, CWD-A: Cuijpers et al., 2009), and computer-based CBT (SPARX, Merry et al., 2012; MoodGYM, Calear et al., 2013). Learning ability training was developed based on computer-based memory or attention programs (Shin et al., 2016; Oh et al., 2018).

Table 2. Outline of the CCBT for Korean adolescents

Session	Module 1 Overcoming depression	Module 2 Interpersonal skills	Module 3 Learning ability training	Homework
1	Psycho-education on feeling		Time management and planning	Feeling & its degree in each situation
2	Exercising relaxation training		Visual attention training	Relaxation training
3	Identifying automatic thoughts		Auditory attention training	Relaxation training & automatic thoughts
4	Changing Cognitive distortions		Attentional shifting training	Relaxation training & automatic thoughts
5	Thinking differently		Response inhibition training	Automatic thoughts, thinking differently
6		Practicing active listening	Auditory memory training 1	Active listening
7		Understanding reactions	Auditory memory training 2	Understanding reactions
8		Assertiveness training	Spatial memory training	Assertiveness training
9		Anger control	Auditory working memory training	Anger control with relaxation training
10		Act differently	Spatial working memory training	

After developing the program, a pilot study was conducted with the adolescents, which led to necessary modifications and, finally, culminated in the development of a completed version.

This program was originally developed as a self-administered CCBT for depressed adolescents. However, considering the results of previous researches on the program effects and therapeutic support (Grist et al., 2019), the program was supplemented with therapeutic support by researchers who had Master's degrees in clinical psychology, and had completed at least one year of clinical practice. Each adolescent in the treatment group received 10 minutes of therapeutic support each session, for a total of 100

minutes. Active therapist support above 90 minutes was defined as minimal contact therapy (Newman et al., 2011). Therapeutic support for 10 minutes was provided before or after the CCBT program. Adolescents participated in the CCBT program next to a researcher through a researcher's laptop computer in a school or a center. Adolescents were treated with youth-friendly attitudes to build rapport. Researchers checked whether adolescents completed the homework, encouraged them to perform it, and answered questions about the contents of the program. Therapist support was intended to be standardized according to the treatment manual, consistent workshop training, and supervision from a principal investigator.

2.3. Measures

Measures for screening

Patient Health Questionnaire-9 (PHQ-9): The PHQ-9 modified for use with adolescents was recommended by American Psychiatric Association (2016) for research and clinical evaluation. The PHQ-9 translated in Korean includes nine questions on a 4-point Likert scale. Total scores between 5 and 9 indicated mild depression, while scores from 10 to 14 indicated moderate depression. The overall Cronbach's alpha in this study was 0.859.

Center for Epidemiological Studies Depression Scale (CES-D): The original scale, developed by the National Institute of Mental Health

(NIMH), was validated for Korean adolescents (Heo et al., 2018). It consists of 20 items rated on a scale from 0 to 3. Total scores between 16 and 23 signify mild depression, while scores from above 24 indicate above moderate depression. The Cronbach's alpha was 0.927.

Attitudes Toward Seeking Professional Psychological Help (ATSPPH): Help-seeking attitudes were measured using the Korean version of the Attitudes Toward Seeking Professional Psychological Help Scale (Yoo, 2005). Since it is for college students, some of the expressions have been modified to help adolescents understand the content of the scale, based on the opinions of adolescents and related experts. The scale consists of 29 items using a 4-point Likert-scale. The scale contains four sub-factors, including Recognition of the Need for Help, Stigma Tolerance, Interpersonal Openness, and Confidence in Therapists. Higher scores represent more positive attitudes toward professional help-seeking. Cronbach's alpha for the total scale was 0.825 and that for the sub-factors ranged from 0.626 to 0.781.

Intentions to Seek Counseling Inventory (ISCI): Professional help-seeking intentions were developed based on the Intentions to Seek Counseling Inventory (ISCI) (Cepeda-Benito and Short, 1998). Intentions to seek counseling services were measured when adolescents have specific problems such as depression, weight control, and interpersonal problems. Considering the characteristics of Korean adolescents in statistical data provided by the Korea Youth Counseling and Welfare Institute (KYCI, 2019), some items from the ISCI were modified. The item regarding difficulties with

dating was excluded. Additionally, two items regarding relationship difficulties and difficulties with friends were merged into one item. Two items regarding self-understanding and loneliness were merged into one item to represent personality problems. Items for anger control problem and juvenile delinquency were added. The revised version contained 18 items using a 4-point Likert scale, while the original ISCI contained 17 items using a 6-point Likert scale. Cronbach's alpha for this modified version of the ISCI was 0.911.

Measures for the effectiveness: Primary outcome variables

Patient Health Questionnaire-9 (PHQ-9), Center for Epidemiological Studies Depression Scale (CES-D).

Measures for the effectiveness: Secondary outcome variables

Conners-Wells Adolescent Self Report Scale (CASS): This self-report scale on adolescents' attentional problems contains 27 items on a 4-point Likert-type form (Conners and Wells, 1985). The Korean version of CASS was used (Bahn et al., 2001).

Rosenberg Self-esteem Scale: The scale includes items measuring self-concept and self-esteem (Rosenberg, 1986). The Korean version of 10 items was used (Kim, 2011).

Pediatric Quality of Life Inventory: The inventory measures the quality of an adolescent's life in physical, emotional, social, and school functioning (Varni et al., 2001). A validation study has been conducted for the Korean version (Choi, 2005). In this study, three sub-scales including quality of life in emotional, social, school

functioning were used, excluding physical functioning.

Wechsler Intelligence Scale: The Korean Wechsler Intelligence Scale for Children-IV is for 6-16 year-olds (Gwak et al., 2011). The Korean Wechsler Intelligence Scale-IV is for 16-60-year-olds (Hwang et al., 2012). In this study, memory and attention function were assessed through two subtests, that is, Digit Span and Letter-Number Sequencing of WISC-IV. Digit Span and Letter-Number Sequencing from the children's version for the 13-15 year-olds, and from the adult version for the 16-17 year-olds

Measures for the effectiveness: Moderating variables

Homework Compliance: Homework compliance assesses the quality of task performances. For assessing the quality of task performances, the homework compliance was scored in each session according to the degree of homework performance from 1 to 6 (Primakoff et al., 1986). For example, one point was given when a participant did not perform the homework, two points given when one attempted to do the homework, but it fails to complete due to lack of ability or situational circumstances, three points given when one did related homework but different from what was given, four points given when one did only part of homework, five points were given when one completed the assigned homework, and six points were given when one performed more than the assigned homework. The scores for each session were totaled to obtain a total score for each adolescent.

Measures for Participation Motivation: The participation motivation was surveyed with pre-tests. It is difficult to investigate the

reasons to why adolescents disagreed to participate as they declined to explain about that. Therefore, it was decided to investigate participation motivation by targeting only participants. The survey included two questions. The first question was to choose the top 3 reasons for their participation among 9 given reasons: program content (learning depression relief & stress management), program content (learning how to get along with friends), program content (attention, memory training, learning ability training), proximity, cost, time limit, and a reliable institution. The second question asked whether their participation was decided by themselves or by a parent.

2.4. Statistical analyses

SPSS 23.0 (IBM Corp., Armonk, NY, USA) was used for analysis. First, to investigate help-seeking related variables affecting the participation in the CCBT among the depressed subjects, t-tests and x^2 tests were conducted. These tests were done in order to verify whether there were significant differences in depression scales, help-seeking attitudes, help-seeking intentions, and gender between participants who received CCBT and depressed adolescents who disagreed to participate.

For the effectiveness study, self-reported questionnaires and subtests scores measuring attention and working memory were analyzed between the CCBT treatment group and waitlist group. Independent t-tests and x^2 tests were conducted to verify

difference between two groups in pre-tests. A two-way mixed design ANOVA was carried out for the independent variables before and after 5 weeks for the treatment and waitlist groups. Cohen's *d* between effect sizes were calculated from pooled SD values. Between-group effect sizes were assessed according to Cohen's d criteria, with Cohen's *d* values around $d = 0.20$ considered small, d = 0.50 considered medium, and $d = 0.80$ considered large.

For the relation between change scores in depression and those in memory or attention, it was checked whether pre-post change scores in depression were related to pre-post change scores in Digit span and Letter-number sequencing. The total scores of PHQ-9 and CES-D were converted into T score (10±3 as mean±1SD), similar to Digit span and Letter-number sequence, which are T scores. The simple linear regression were performed to examine the relation between the pre-post change scores of PHQ-9 and those of Letter-number sequence.

According to depression level, pre-post change patterns in depression of the CCBT group and the waitlist group were calculated. The numbers of participants deteriorating (i.e., symptom deterioration ≥ 30%), not improving (i.e., symptom deterioration ≤ 29% and symptom improvement ≤ 29%), making minor improvements (i.e., symptom improvement ≥ 30%) and making major improvements (i.e., symptom improvement ≥ 50%) were calculated. This method was used based on findings of recent methodological study suggesting proportional change may be an optimal method for evaluating symptom changes. The symptom changes ≥ 30% are difficult to find in the absence of treatment and can be considered evidence of a minor treatment effect (Hiller et al., 2012; Karin et al., 2018). The standard of changes ≥ 50% can be

defined as major clinical improvement in symptoms of depression (Cuijpers et al., 2014; Hiller et al., 2012).

For the effect of homework compliance, the difference in depression scores between the high and low task compliance groups was analyzed by independent t-tests.

Chapter 3. Results

3.1. Help-seeking related variables affecting the participation of the CCBT

In this study, among the 376 adolescents who completed the screening test, 139 adolescents were identified as having above mild depression. A total of 50 adolescents participated in and completed the CCBT program (PC group), while 87 depressed adolescents disagreed to participate in the program (DC group). Five adolescents who dropped out of the program were counted in the DC group as they disagreed to participate in the beginning. Two participants agreed to the CCBT program but were not included because they were already receiving medication or counselling.

Independent t-tests and x^2 tests were performed to explore the differences between the PC group and DC group, with the results shown in Table 3. As a result, there was a significant difference between the PC group and DC group on the recognition of the need for help and interpersonal openness, which are the sub-factors of attitudes toward seeking professional psychological help.

The program participant group had significantly higher awareness of necessity than the DC group, and the interpersonal openness was significantly lower in the participants group (t = −2.925, p < .01; t = 3.50, p < .001). The participant group also had significantly higher help-seeking intentions than the DC group (t = −2.266, p < .05).

Table 3. Help-seeking variables between depressed adolescents who participated in the CCBT (PC group) and those who disagreed to participate (DC group) (N=137)

	PC group(n=50) M *(SD)*	DC group(n=87) M *(SD)*	*t*
Gender(male/female) (N)	24/26	56/31	3.501a
Depression			
PHQ-9	11.96 *(5.32)*	10.92 *(4.12)*	-1.276
CES-D	27.46 *(10.27)*	25.32 *(8.10)*	-1.348
ATSPPH total scores	73.88 *(11.72)*	73.87 *(11.29)*	-0.005
Recognition of need for help	21.34 *(4.32)*	19.29 *(3.71)*	-2.925**
Stigma tolerance	13.66 *(3.79)*	14.29 *(3.26)*	1.025
Confidence in therapists	23.00 *(4.80)*	22.18 *(4.97)*	-0.937
Interpersonal openness	15.88 *(3.57)*	18.10 *(3.51)*	3.50 ***
ISCI	44.22 *(8.73)*	40.60 *(9.41)*	-2.266 *

* $p < .05$, ** $p < .01$, *** $p < .001$. a: $\chi 2$ test. PHQ-9: Patient Health Questionnaire-9, CES-D: Center for Epidemiological Studies Depression Scale, ATSPPH: Attitudes Toward Seeking Professional Psychological Help, ISCI: Intentions to Seek Counseling Inventory.

3.2. Participation motivation

In the first question on participation motivation, the reason chosen by 52 participants, was as follows: 20 participants (38.5%) chose program content (learning depression relief & stress management), 13 participants (26.9%) chose program content (attention, memory training, learning ability training), and 9 participants (17.3%) chose low cost. As for their second and third reasons, the answers were similar to the first reason, with the exception that proximity was chosen by 6 participants (11.5%). The second question was whether their participation was decided by themselves or by a parent. Most of the participants (50 adolescents, 96.2%) answered that their participation was decided by themselves.

3.3. The effectiveness of the CCBT

The analysis was performed on the 50 subjects who completed the pre- and post-tests. First, an independent t-test and x^2 test were performed on the pre- test results from the treatment group and the waitlist group. There were no statistically significant differences in the pre-test results between the treatment group and waitlist group in all variables, shown in Table 4.

Second, among the treatment group, 25 out of 28 participated in the post-test. Three dropouts withdrew or lost contact. Attribution (dropout) rate was only 10%. The remaining 90% of participants completed all 10 sessions.

Table 4. Baseline characteristics of the participants (N=50)

Characteristics		CCBT group (n=25)	Waitlist group (n=25)	*t*
		M *(SD)*	M *(SD)*	
Gender (N)	male/female	11/14	13/12	0.571a
Age	Years	15.64 *(0.64)*	15.64 *(0.76)*	0.000
Depression	PHQ-9	9.24 *(4.62)*	11.92 *(6.87)*	-1.618
	CES-D	23.12 *(9.36)*	25.36 *(15.40)*	-0.622
Attention	CASS	19.88 *(7.96)*	23.64 *(12.02)*	-1.304
Self-esteem	Rosenberg self-esteem	29.88 *(4.13)*	30.92 *(6.14)*	-0.703
Quality of life	Emotional	56.60 *(17.54)*	51.80 *(26.84)*	0.748
	Social	68.20 *(23.04)*	73.00 *(23.72)*	-0.726
	School	69.00 *(18.43)*	66.40 *(19.01)*	0.491
Wechsler Intelligence Scale	Digit span(forward)	13.00 *(1.96)*	12.32 *(2.41)*	1.095
	Digit span(backward)	9.20 *(2.63)*	9.28 *(2.78)*	-0.105
	Letter-Number Sequencing	20.16 *(3.02)*	19.04 *(3.16)*	1.281

a: χ^2 test. PHQ-9: Patient Health Questionnaire-9, CES-D: Center for Epidemiological Studies Depression Scale, CASS: Conners-Wells Adolescent Self Report Scale.

Third, a mixed design variance analysis was conducted to test difference between the pre- and post-tests between the treatment group and waitlist group in Table 5. The treatment group showed significant improvements in depression, self-esteem, and quality of life after treatment compared to the waitlist group. The interaction effects on depression (CES-D), self-esteem, and quality of life (emotional and social functioning) were significant (F = 8.321, p < .01; F = 15.173, p < .001; F = 8.442, p < .01; F = 5.935, p < .05), shown in Fig. 6, 7. CCBT treatment produced large effect-size reductions for all primary outcome measures (Cohen's d = 0.80, 95% CI 0.22-1.37 for PHQ-9; d = 1.09, 95% CI 0.48-1.67 for CES-D). In addition, the between-group effect sizes of the CCBT group were large for self-esteem and quality of life (emotion) among the secondary outcome variables (Cohen's d = 1.00, 95% CI 0.40-1.57 for self-esteem; d = 0.81, 95% CI 0.22-1.37 for quality of life, emotional).

Table 5. Effect of the CCBT between the CCBT group (N=25) and the waitlist group (N=25)

Measure	Mean *(SD)*		Group × Time	Effect size, Cohen's d (95%Cl)
	Pre-treatment	Post-treatment		Within-group, pre to post
PHQ-9				
CCBT	9.24 *(4.62)*	5.84 *(3.74)*	F = 3.991,	0.80 (0.22 - 1.37)
Waitlist	11.92 *(6.87)*	10.44 *(6.28)*	p =.051	0.22 (−0.33 - 0.78)
CES-D				
CCBT	23.12 *(9.36)*	13.40 *(8.43)*	F = 8.321,	1.09 (0.48 - 1.67)
Waitlist	25.36 *(15.40)*	22.48 *(14.21)*	p < .01	0.19 (−0.36 - 0.75)

CASS				
CCBT	19.88 *(7.96)*	16.00 *(8.53)*	F = 3.988,	0.47 (−0.10 – 1.02)
Waitlist	23.64 *(12.02)*	23.40 *(13.66)*	p = .051	0.02 (−0.54 – 0.57)
Self−esteem				
CCBT	29.88(4.13)	34.20 *(4.50)*	F = 15.173,	1.00 (0.40 – 1.57)
Waitlist	30.92(6.14)	30.96 *(5.53)*	p < .001	0.01 (−0.55 – 0.56)
Quality of life (emotional)				
CCBT	56.60 *(17.54)*	71.80 *(19.94)*	F = 8.442,	0.81 (0.22 – 1.37)
Waitlist	51.80 *(26.84)*	54.60 *(26.96)*	p < .01	0.15 (−0.41 – 0.70)
Quality of life (social)				
CCBT	68.20 *(23.04)*	83.80 *(15.56)*	F = 5.935,	0.79 (0.21 – 1.36)
Waitlist	73.00 *(23.72)*	77.40 *(22.69)*	p < .05	0.19 (−0.37 – 0.74)
Quality of life (school)				
CCBT	69.00 *(18.43)*	78.60 *(17.65)*	F = 1.096,	0.52 (0.04 – 1.09)
Waitlist	66.40 *(19.01)*	72.40 *(19.26)*	p = .300	0.31 (−0.25 – 0.87)
Digit span(forward)				
CCBT	13.00 *(1.96)*	13.52 *(2.00)*	F = 0.654,	0.26 (−0.30 – 0.82)
Waitlist	12.32 *(2.41)*	13.20 *(2.31)*	p = .423	0.37 (−0.19 – 0.93)
Digit span(backward)				
CCBT	9.20 *(2.63)*	10.76 *(2.63)*	F = 0.391,	0.59 (0.02 – 1.15)
Waitlist	9.28 *(2.78)*	10.44 *(2.83)*	p = .535	0.41 (−0.15 – 0.97)
Letter−number sequencing				
CCBT	20.16 *(3.02)*	21.52 *(3.19)*	F = 0.068,	0.44 (−0.13 – 0.99)
Waitlist	19.04 *(3.16)*	20.20 *(3.96)*	p = .795	0.32 (−0.24 – 0.88)

PHQ−9: Patient Health Questionnaire−9, CES−D: Center for Epidemiological Studies Depression Scale, CASS: Conners−Wells Adolescent Self Report Scale.

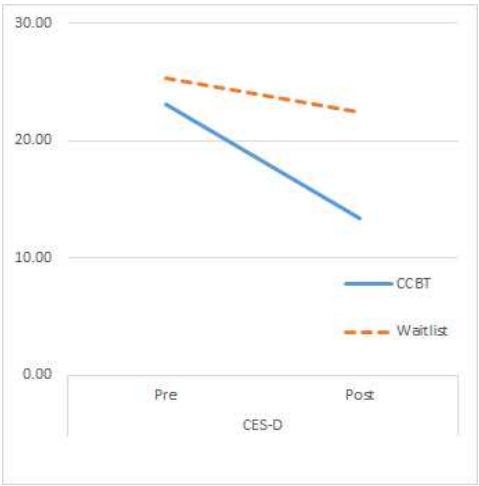

Fig.6. Interaction of group×time on CES-D

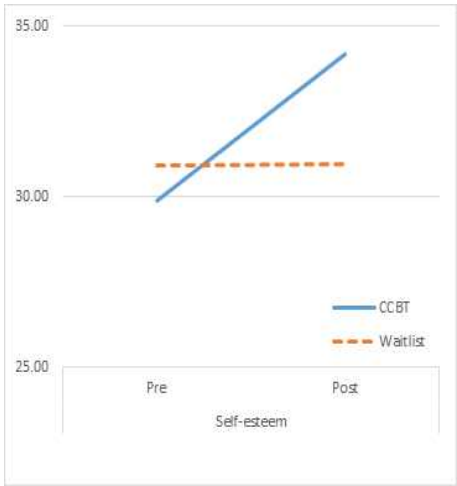

Fig.7.Interaction of group×time on Self-esteem

3.3.1. The relation between change scores in depression and those in Letter-number sequence subtest

As the results of the effectiveness of the CCBT, the interaction effect was significant in self-reported scales such as depression, self-esteem, and quality of life. However, the interaction effect was not significant in the performance-based subtests of Wechsler Intelligence Scale (WISC-IV), such as Digit span and Letter-number sequencing, which assess memory and attention function. Therefore, it was checked whether changes in depression were related to changes in attention and memory performance. As the results of simple linear regression among CCBT group, the main effect of the pre-post change scores of PHQ-9 on those of Letter-number sequence was significant (F = 4.907, p < .05, R^2 = .176). The pre-post change scores of PHQ-9 were significantly related to those of Letter-number sequencing.

3.3.2. Pre-post change according to depression level

According to depression level, pre-post change patterns in depression of the CCBT group and the waitlist group were identified. Despite randomization controlled trial (RCT), at pre-test period the CCBT group had a lot of mild or moderate levels of depression, and the waiting group had more moderate or severe depression. Pre-post changes of CCBT and waitlist groups according to depression level by PHQ-9 and CES-D were shown in Table 6, 7. The ratio of the number showing minor or major improvement is higher in the CCBT group than in the waitlist group.

Table 6. Pre-post change of CCBT and waitlist group according to depression level (PHQ-9)

Depression (PHQ)	Group	N	Pre-post change			
			Deterioration	No response	minor improvement	major improvement
Overall	CCBT	25	1	9	7	8
	Waitlist	25	3	14	7	1
Normal (0 to 4)	CCBT	1			1	
	Waitlist	3	1	1	1	
Mild (5 to 9)	CCBT	15	1	5	2	7
	Waitlist	8	1	3	4	
Moderate (10 to 14)	CCBT	8		4	3	1
	Waitlist	4	1	3		
Moderate to severe (15 to 19)	CCBT					
	Waitlist	4		3		1
Severe (20 to 27)	CCBT	1			1	
	Waitlist	6		4	2	

PHQ-9: Patient Health Questionnaire-9.

Table 7. Pre-post change of CCBT and waitlist group according to depression level (CES-D)

Depression (CES-D)	Group	N	Pre-post change			
			Deterioration	No response	minor improvement	major improvement
Overall	CCBT	25	1	6	5	13
	Waitlist	25	5	14	3	3
Normal (0 to 15)	CCBT	4	1	2		1
	Waitlist	9	4	3	1	1
Mild (16 to 23)	CCBT	10		2	1	7
	Waitlist	4		2	2	
Above moderate (23 to 60)	CCBT	11		2	4	5
	Waitlist	12	1	9		2

CES-D: Center for Epidemiological Studies Depression Scale.

3.4. Effect of homework compliance

In order to analyze the effect of the homework compliance on treatment outcomes among the treatment group, based on researchers' experience that adolescents with high homework compliance improved in post-test, two groups were divided and analyzed. Adolescents who scored higher than the mean of the homework compliance were classified into the high homework compliance group, and those who scored lower than the average were classified into the low homework compliance group.

Independent t-tests were performed for depression between the homework compliance groups for the pre- and post-periods, shown in Table 8.

Table 8. Change in depression level depending on homework compliance among CCBT group (N=25)

		High compliance group (n=15)		Low compliance group (n=10)		t
Measure	Time	M	*(SD)*	M	*(SD)*	
PHQ-9	Pre	8.20	*(3.12)*	10.80	*(6.11)*	1.406
	Post	4.27	*(2.55)*	8.20	*(4.10)*	2.967 **
CES-D	Pre	21.73	*(6.49)*	25.20	*(12.65)*	0.904
	Post	11.40	*(5.73)*	16.40	*(11.03)*	1.49

*p < .05, **p < .01, ***p < .001. PHQ-9: Patient Health Questionnaire-9, CES-D: Center for Epidemiological Studies Depression Scale.

Depression levels of the high compliance group were significantly lower than depression levels of the low compliance group at the post period (t = 2.967, p < .01 in PHQ-9).

Chapter 4. Discussion

The aim of the present study was to investigate the effectiveness of a CCBT program for depressed adolescents and to identify the characteristics of those who participated in CCBT program. The effectiveness of the CCBT and the effects of homework compliance on treatment outcomes were investigated. The characteristics of depressed adolescents who participated in the CCBT program were identified and compared with those who disagreed to participate, which enabled us to devise a more effective strategy for disseminating CCBT in communities.

Among depressed adolescents, characteristics of those who participated in and completed the CCBT were different from those who disagreed to participate, particularly with regard to help-seeking attitudes and intentions, rather than depression levels. This is consistent with previous research findings that help-seeking attitudes are more important in help-seeking intentions than depression levels (Do et al., 2019). Participants reported significantly higher help-seeking intentions than those who disagreed to participate ($t = -2.266$, $p < .05$). These results are consistent with previous studies based on the planned behavior theory in which help-seeking intentions are the most essential predictors of actual help-seeking behavior (Fishbein and Ajzen, 1975), and in which help-seeking attitudes play an important role in actual help-seeking behavior as well as help-seeking intentions (Carlton and Deane, 2000; Seyfi et al., 2013). These results go a step further and specifically identify what help-seeking attitudes could influence actual help-seeking behavior. The participants

exhibited higher recognition of the need for help and lower interpersonal openness than depressed adolescents who disagreed to participate (t = −2.776, p < .01; t = 3.520, p < .01). It is highly probable that participants in the CCBT program felt a strong need for therapeutic assistance. However, it was surprising to find that the participants had low interpersonal openness. Interpersonal openness is considered to be a key factor in seeking professional help in mental health problems. High interpersonal openness predicted high intentions to seek psychological help for distress (Thomas et al., 2014). A previous study suggested that low interpersonal openness contributed to men's underutilization of mental health services (Mackenzie et al., 2006). However, in this study, among depressed adolescents, those with low interpersonal openness tended to participate in and complete the CCBT program. This results suggested that because the program is a computer-based therapy, adolescents with low interpersonal openness may choose to participate. This result is accordance with a previous survey study in which attitudes toward computer-based therapy were positive in adolescents with low interpersonal openness (Do et al., 2019). This study is the first to suggest that adolescents with low interpersonal openness have a tendency to actually participate in CCBT.

The study confirmed that the treatment group experienced a significant decrease in depression (PHQ-9, d = 0.80; CES-D, d = 1.09) and a significant increase in self-esteem (d = 1.00), quality of life (emotion, d = 0.81) compared to the waitlist group (PHQ-9: d = 0.22, CES-D: d = 0.19, self-esteem: d = 0.01, quality of life, emotion: d = 0.01). In addition, the ratio of the number

demonstrating minor or major improvement was higher in the CCBT group than in the waitlist group. However, because adolescents with mild depression were mainly assigned to the CCBT group, and those with moderate depression to the waitlist group, the results of this study, in large part, are applicable only to the effect of CCBT in those with mild depression.

Among adolescents in the treatment group, those with high task compliance demonstrated a greater decrease in depressive symptoms after treatment compared to those with low task compliance (t = 2.967, p < .01). To our knowledge, this is the first CCBT study to identify the effect of homework compliance on treatment outcome. In this study, the attrition rate was low because the guided CCBT was performed in a place adolescents could access easily, such as schools. This result demonstrated the significance of human interaction even in CCBT (Garrido et al., 2019). Moreover, it is in accordance with a previous study in which a school-based setting contributed to greater adherence (Neil et al., 2009).

To improve the effects of CCBT, therapeutic support is an important factor in enhancing participant engagement, especially among adolescents. However, when guided CCBT programs incorporate in-person support, it could raise concerns about increasing costs and undermining anonymity. Treatment costs can be reduced through therapeutic support from less trained therapists. The results of a systematic review also suggested that the influence of professional qualifications in therapeutic support of CCBT was minor (Baumeister et al., 2014). In situations in which less trained therapists have to manage clinical groups such as those

with depression or anxiety, providing treatment manuals along with the CCBT program would be useful. In previous studies, even when therapeutic support was provided over the telephone, the treatment effect of guided CCBT was better than that of unguided CCBT (Baumeister et al., 2014). However, further research is needed to investigate which communication mode of therapeutic support is more effective among adolescents (i.e., face-to-face communication and versus others [telephone or online]). Moreover, considering cost, it is necessary to develop a CCBT without in-person guidance, which would be exclusively online CCBT and assisted by a virtual therapist who can encourage participant engagement. In the case of anonymity, it has been questioned whether guided CCBT can undermine the advantages of anonymity. In the present study and the previous study (Do et al., 2019), people with low interpersonal openness exhibited a tendency to prefer and choose the CCBT program. The content of a CCBT program also consists of repetitive exercises of CBT skills in a given situation rather than talking about one's own experiences. Therefore, in the current study, anonymity was not a major problem in the research process; nevertheless, further research is needed.

Considering the cultural characteristics of Korea, CCBT for Korean adolescents includes learning ability training, which is different from other CCBT programs. It was hypothesized that attention and memory may improve after practicing learning ability training in the CCBT program. However, the effect of CCBT in improving attention and memory was not supported although the relationship between change in depression and those in attention and memory was significant. It can be estimated that the attention

and memory training effects were not sufficient due to limited time. The effect of attention and memory training needs to be investigated in larger samples in future studies. Nevertheless, it is suggested that the addition of learning ability training incentivized the youth to participate, considering the results of the participation motivation survey. Due to the cultural characteristics of Korea, which value academic performance, many students participated in the program to receive learning ability training. A CCBT study conducted in Hong Kong (Sobowale et al., 2013) also suggested that academic expectations acted as a motivating factor for participation in the program.

As solutions for untreated depression in youth, three therapeutic suggestions could be proposed. First, as a preventive measure for general adolescents, efforts are needed to improve stress management skills and change their perceptions of treatment. A computer-based stress management program for general adolescent groups will be helpful in preventing the risk for mental disorders such as depression or anxiety (George et al., 2013; Saleh et al., 2018; Zetterqvist et al., 2003). The results of the screening test in our study revealed that 37% of the general adolescents had significant depression. Therefore, it is necessary to develop a computer-based stress management program for Korean adolescents. In depression awareness programs and social campaigns for general adolescents, the focus should be on improving recognition of the need for help. In the CCBT program participation motivation survey, the youths' opinions were more decisive than those of the parents. Therefore, education or campaigns directly targeting youth will be essential. It is important

to inform normal adolescents that psychological distress, such as depression, can be easily overcome with professional help, before symptoms worsen and academic achievement decreases. A social campaign with the following message should be provided to adolescents: It is better to go to a professional than to solve mental problems alone or wait for the problem to work itself out on its own.

Second, mental health practitioners need to devote active and continuous effort to identifying depressed adolescents and requesting their participation in treatments. Adolescents do not seek and decide to find help by themselves. It is not enough to merely inform them of the existence of mental health services. Considering the recruitment experience in the current and preliminary study, it was important that the process of asking adolescents individually and directly about their intentions to participate in the program was conducted in a youth-friendly manner. In this study, the researchers asked for their intention to participate via the youth's personal mobile phone with a warm and bright voice, and their schedule was considered as much as possible when making phone calls or program appointments. In a preliminary study with depressed adolescents (Shin et al., 2018), not a single contact came through posters that were posted at the school, nor be recruitment via the Internet. Furthermore, very few depressed adolescents were referred by professionals and, in many cases, the problem was already very serious. Therefore, in this study the screening process toward normal adolescents was conducted. Thorough screening tests, adolescents with above moderate levels of depression have been identified. However, they had not received any intervention, despite the presence of public counseling centers

in their schools and communities. Direct and continuous effort to find and ask participation to depressed adolescents, including screening process is important.

Third, continuous efforts to improve and spread CCBT are required. Based on participant feedbacks, improvement of CCBT programs is needed according to participants' feedback to increase the participation of youth, which is consistent with the findings from a previous study (Saleh et al., 2018). CCBT could be an effective alternative for untreated depression in adolescents. A higher level of depression was associated with a lower level of interpersonal openness (Do et al., 2019). In particularly, male adolescents are often reluctant to receive psychological therapy and express their feelings (Do et al., 2019; Masuda et al., 2005). However, depressed adolescents who are reluctant to talk about their problems tend to actually participate in CCBT. As a solution for untreated depression in adolescents, especially for male adolescents with depression, there is a need for continuous research and dissemination of CCBT in communities.

The generalizability of this results has limitations in subjects and study design. The region of subjects was restricted to Seoul, the capital of South Korea, although the recruitment process was conducted from various institutions and schools. Furthermore, there were several additional limitations in verifying the program's effectiveness. First, the study had a small sample size, such that the study is pilot in essence. Despite randomization controlled trial (RCT), at pre-test period the CCBT group had a high rate of mild depression, while the waiting group had a high rate of moderate depression. In future studies with larger samples, it will be

necessary to generate randomized allocation sequencing considering the level of depression. In addition, the analysis of homework compliance was conducted with only 25 subjects, and a significant difference was found in only one of the two measures of depression. The effect of homework compliance was not significant in CES-D. Therefore, further study is required to investigate whether this is a limitation of the scale or rather, a limitation of the self-reported scale. A study with a greater number of subjects will be needed to examine moderating factors such as homework compliance. Rather than dividing participants based on mean scores of homework compliance, it may be necessary to examine the effect through regression analysis. The study design included only pre- and post-assessments, without follow-up assessments. Practicing effects may also affect memory and attention tests because the pre-test and post-test are only five weeks apart. Statistical analyses in the present study included only those who completed the program because there was no follow-up measure allowing multiple inputs for dropout subjects. To inspect long-term treatment effects, a follow-up assessment should be included in a future study. In addition, the assessments, administered by researchers, were not blinded, as such, may have influenced the results. In future studies, it is necessary to add an attention control group (Popp and Schneider, 2015), which is provided online psychological education on depression, as well as a waitlist control group.

Chapter 5. Conclusions

The present study suggests that CCBT can be effective and an even more accessible treatment alternative for depressed adolescents, who commonly have low interpersonal openness. Although this study provides preliminary evidence indicating therapist influence on participant engagement, this finding needs to be further tested with a greater number of subjects in the future. Overall, the study highlights the value of CCBT as an effective alternative treatment option for untreated depression in youth.

References

Akamai, 2017. Akamai's state of the Internet: Q1 2017 report. Cambridge, MT: Akamai.www.akamai.com/us/en/multimedia/documents/state- of- the- internet/q1- 2017- state- of- the- internet - connectivity- report.pdf

Alfonsson, S., Olsson, E., Linderman, S., Winnerhed, S., Hursti, T., 2016. Is online treatment adherence affected by presentation and therapist support? A randomized controlled trial. Computers in Human Behavior 60, 550–558.

American Psychiatric Association 2016. DSM V Severity measure for Depression, Child Age 11 to 17 (PHQ–9 Modified for Adolescents (PHQ–A), Adapted). Available online at: https://www.psychiatry.org/File%20Library/ Psychiatrists/ Practice /DSM/APA_DSM5_Severity–Measure–For–Depression–Child–Age–11–to–17.pdf

Apolinário–Hagen, J., Harrer, M., Kählke, F., Fritsche, L., Salewski, C., Ebert, D.D., 2018. Public attitudes toward guided internet–based therapies: Web–based survey study. Journal of Medical Internet Research 20.

Bahn, G.H., Shin, M.S., Cho, S.C., Hong, K.E., 2001. A Preliminary study for the development of the assessment scale for ADHD in adolescents: Reliability and validity for CASS(S). Journal of the Korean Academy of Child and Adolescent Psychiatry 12, 7.

Balazs, J., Miklosi, M., Kereszteny, A., Hoven, C.W., Carli, V., Wasserman, C., Apter, A., Bobes, J., Brunner, R., Cosman, D., Cotter, P., Haring, C., Iosue, M., Kaess, M., Kahn, J.P., Keeley, H., Marusic, D., Postuvan, V., Resch, F., Saiz, P.A., Sisask, M., Snir, A., Tubiana, A., Varnik, A., Sarchiapone, M., Wasserman, D., 2013. Adolescent subthreshold–depression and anxiety: psychopathology, functional

impairment and increased suicide risk. Journal of child psychology and psychiatry 54, 670-677.

Baumeister, H., Reichler, L., Munzinger, M., Lin, J., 2014. The impact of guidance on Internet-based mental health interventions — A systematic review. Internet Interventions 1, 205-215.

Bernal, G., Jiménez-Chafey, M.I., Domenech Rodríguez, M.M., 2009. Cultural Adaptation of Treatments: A Resource for Considering Culture in Evidence-Based Practice. Professional Psychology: Research and Practice 40, 361-368.

Bobier, C., Stasiak, K., Mountford, H., Merry, S., Moor, S., 2013. When 'e' therapy enters the hospital: Examination of the feasibility and acceptability of SPARX (a cCBT programme) in an adolescent inpatient unit. Advances in Mental Health 11, 286-292.

Calear, A.L., Christensen, H., Mackinnon, A., Griffiths, K.M., 2013. Adherence to the MoodGYM program: Outcomes and predictors for an adolescent school-based population. Journal of Affective Disorders 147, 338-344.

Cankaya, P., Duman, Z.C., 2010. Evaluation of nursing students' attitudes towards seeking psychological help and factors affecting their attitudes. Nurse Education Today 30, 784-788.

Carlton, P.A., Deane, F.P., 2000. Impact of attitudes and suicidal ideation on adolescents' intentions to seek professional psychological help. Journal of adolescence 23, 35-45.

Cepeda-Benito, A., Short, P., 1998. Self-concealment, avoidance of psychological services, and perceived likelihood of seeking professional help. Journal of Counseling Psychology 45, 58-64.

Chi, X., Liu, X., Huang, Q., Huang, L., Zhang, P., Chen, X., 2020. Depressive Symptoms among Junior High School Students in Southern China: Prevalence, Changes, and Psychosocial Correlates.

Journal of Affective Disorders 274, 1191-1200.

Choi, E.S., 2005. Psychometric test of the PedsQLTM 4.0 generic core scale in Korean adolescents. Journal of nursing query 14, 17.

Christensen, H., Griffiths, K.M., Farrer, L., 2009. Adherence in internet interventions for anxiety and depression. Journal of Medical Internet Research 11, e13.

Conners, C.K., Wells, K.C., 1985. ADD-H adolescent self-report scale. 21, 2.

Cuijpers, P., Karyotaki, E., Weitz, E., Andersson, G., Dolllon, S.D., van Straten, A., 2014. The effects of psychotherapies for major depression in adults on remission, recovery and improvement: a meta-analysis. Journal of Affective Disorders 159, 118-126.

Cuijpers, P., Muñoz, R.F., Clarke, G.N., Lewinsohn, P.M., 2009. Psychoeducational treatment and prevention of depression: The "coping with depression" course thirty years later. Clinical Psychology Review 29, 449-458.

Del Mauro, J.M., Jackson Williams, D., 2013. Children and Adolescents' Attitudes Toward Seeking Help From Professional Mental Health Providers. International Journal for the Advancement of Counselling 35, 120-138.

Do, R., Park, J.R., Lee, S.Y., Cho, M.J., Kim, J.S., Shin, M.S., 2019. Adolescents' Attitudes and Intentions toward Help-Seeking and Computer-Based Treatment for Depression. Psychiatry Investigation 16, 728-736.

Essau, C.A., 2005. Frequency and patterns of mental health services utilization among adolescents with anxiety and depressive disorders. Depression and anxiety 22, 130-137.

Fleming, G.E., Kohlhoff, J., Morgan, S., Turnell, A., Maiuolo, M., Kimonis, E.R. 2021. An Effectiveness Open Trial of Internet-

Delivered Parent Training for Young Children With Conduct Problems Living in Regional and Rural Australia. Behavior therapy 52(1), 110-123.

Fishbein, M., Ajzen, I., 1975. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Addison-Wesley Publishing Company, MA.

Garrido, S., Millington, C., Cheers, D., Boydell, K., Schubert, E., Meade, T., Nguyen, Q.V., 2019. What Works and What Doesn't Work? A Systematic Review of Digital Mental Health Interventions for Depression and Anxiety in Young People. Frontiers in Psychiatry 10.

George, D.R., Dellasega, C., Whitehead, M.M., Bordon, A., 2013. Facebook-based stress management resources for first-year medical students: A multi-method evaluation. Computers in Human Behavior 29, 559-562.

Grist, R., Croker, A., Denne, M., Stallard, P., 2019. Technology Delivered Interventions for Depression and Anxiety in Children and Adolescents: A Systematic Review and Meta-analysis. Clinical Child and Family Psychology Review 22, 147-171.

Gwak, G.J., Oh, S.O., Kim, C.T., 2011. K-WISC-IV Korean Wechsler Intelligence Scale for Children Manual for Experts. Inpsyt, Seoul

Hanspal, I., Krishnaswamy, P., Rose, M., Mary, T., Antony, J., Johnson, A.R., 2019. How prevalent is depression among rural school-going adolescents: A cross-sectional study in south karnataka. Journal of Indian Association for Child and Adolescent Mental Health 15, 124-139.

Heo, E.H., Choi, K.S., Yu, J.C., Nam, J.A., 2018. Validation of the Center for Epidemiological Studies Depression Scale among Korean Adolescents. Psychiatry Investigation 15, 124-132.

Hiller, W., Schindler, A.C., Lambert, M.J., 2012. Defining response and remission in psychotherapy research: a comparison of the RCI and the method of percent improvement. Psychotherapy research 22, 1-11.

Hwang, S.T., Kim, J.H., Park, K.B., Chey, J.Y., Hong, S.H., 2012. Korean Wechsler adult intelligence scale-IV manual Korea Psychology, Daegu.

Ip, P., Chim, D., Chan, K.L., Li, T.M., Ho, F.K., Van Voorhees, B.W., Tiwari, A., Tsang, A., Chan, C.W., Ho, M., Tso, W., Wong, W.H., 2016. Effectiveness of a culturally attuned Internet-based depression prevention program for Chinese adolescents: A randomized controlled trial. Depression and anxiety 33, 1123-1131.

Jang, S.H., 2014. An Analysis on Mental Health Conditions (Suicide, Depression, Stress) of Children and Adolescents and a Study on Improvement Plans. Journal of Child Education 23, 95-110.

Jaycox, L.H., Stein, B.D., Paddock, S., Miles, J.N.V., Chandra, A., Meredith, L.S., Tanielian, T., Hickey, S., Burnam, M.A., 2009. Impact of teen depression on academic, social, and physical functioning. Pediatrics 124, e596-e605.

Johnston, L., Dear, B.F., Gandy, M., Fogliati, V.J., Kayrouz, R., Sheehan, J., Rapee, R.M., Titov, N., 2014. Exploring the efficacy and acceptability of Internet-delivered cognitive behavioural therapy for young adults with anxiety and depression: an open trial. The Australian and New Zealand journal of psychiatry 48, 819-827.

Jorm, A.F., Kelly, C.M., Wright, A., Parslow, R.A., Harris, M.G., McGorry, P.D., 2006. Belief in dealing with depression alone: results from community surveys of adolescents and adults. Journal of Affective Disorders 96, 59-65.

Karin, E., Dear, B.F., Heller, G., Gandy, M., Titov, N., 2018.

Measurement of symptom change following web-based psychotherapy - statistical characteristics and analytical methods for measuring and interpreting change. JMIR mental health 5, e10200.

Kazantzis, N., Brownfield, N.R., Mosely, L., Usatoff, A.S., Flighty, A.J., 2017. Homework in Cognitive Behavioral Therapy: A Systematic Review of Adherence Assessment in Anxiety and Depression (2011-2016). Psychiatric Clinics of North America 40, 625-639.

Kazantzis, N., Whittington, C., Zelencich, L., Kyrios, M., Norton, P.J., Hofmann, S.G., 2016. Quantity and Quality of Homework Compliance: A Meta-Analysis of Relations with Outcome in Cognitive Behavior Therapy. Behavior Therapy 47, 755-772.

Kim, H.S., 2011. Effects of parental empathy on the adolescent's empathy, self-esteem, parent-child relationship. Sookmyung Women's University, Seoul.

Kim, H.J., Cho, S.C., Kim, J.W., Kang, J.W., Shin, M.S., Kim, H.W., Yun, M.J., Lee, K.Y., Kang, Y.J., Kim, B.N., 2009. The Effectiveness of Mental Health Problems Screening and Treatment Linkage in Children & Adolescents: Community Based Study Focused on ADHD and Depression. Journal of the Korean Academy of Child and Adolescent Psychiatry 20, 129-139.

KYCI, 2019. Annual statistics of Korean adolescents' use of Korea Youth Counseling and Welfare Institute and centers Korea Youth Counseling and Welfare Institute. Busan.

Lewinsohn, P.M., Rohde, P., Seeley, J.R., 1998. Major depressive disorder in older adolescents: Prevalence, risk factors, and clinical implications. Clinical Psychology Review 18, 765-794.

Lu, W., 2019. Adolescent depression: National trends, risk factors,

and healthcare disparities. American Journal of Health Behavior 43, 181–194.

Mackenzie, C.S., Gekoski, W.L., Knox, V.J., 2006. Age, gender, and the underutilization of mental health services: the influence of help-seeking attitudes. Aging & mental health 10, 574–582.

Masuda, A., Suzumura, K., Beauchamp, K.L., Howells, G.N., Clay, C., 2005. United States and Japanese college students' attitudes toward seeking professional psychological help. International Journal of Psychology 40, 303–313.

Merry, S.N., Stasiak, K., Shepherd, M., Frampton, C., Fleming, T., Lucassen, M.F.G., 2012. The effectiveness of SPARX, a computerised self help intervention for adolescents seeking help for depression: Randomised controlled non-inferiority trial. BMJ (Online) 344.

MOHW, 2016. The Survey of Mental Disorders in Korea. The Ministry of Health and Welfare(MOHW), Seoul.

Neil, A.L., Batterham, P., Christensen, H., Bennett, K., Griffiths, K.M., 2009. Predictors of adherence by adolescents to a cognitive behavior therapy website in school and community-based settings. Journal of Medical Internet Research 11, e6.

Newman, M.G., Szkodny, L.E., Llera, S.J., Przeworski, A., 2011. A review of technology-assisted self-help and minimal contact therapies for anxiety and depression: is human contact necessary for therapeutic efficacy? Clinical psychology review 31, 89–103.

Oh, S.J., Seo, S., Lee, J.H., Song, M.J., Shin, M.S., 2018. Effects of smartphone-based memory training for older adults with subjective memory complaints: a randomized controlled trial. Aging & mental health 22, 526–534.

Primakoff, L., Epstein, N., Covi, L., 1986. Homework compliance: An

uncontrolled variable in cognitive therapy outcome research. Behavior Therapy 17, 433-446.

Rosenberg, M., 1986. Conceiving the self. R.E. Krieger.

Saleh, D., Camart, N., Sbeira, F., Romo, L., 2018. Can we learn to manage stress? A randomized controlled trial carried out on university students. PLoS One 13.

Sauer, K., Barkmann, C., Klasen, F., Bullinger, M., Glaeske, G., Ravens-Sieberer, U., 2014. How often do German children and adolescents show signs of common mental health problems? Results from different methodological approaches-a cross-sectional study. BMC Public Health 14, 229.

Seyfi, F., Poudel, K.C., Yasuoka, J., Otsuka, K., Jimba, M., 2013. Intention to seek professional psychological help among college students in Turkey: influence of help-seeking attitudes. BMC research notes 6, 519.

Shafran, R., Clark, D.M., Fairburn, C.G., Arntz, A., Barlow, D.H., Ehlers, A., Freeston, M., Garety, P.A., Hollon, S.D., Ost, L.G., Salkovskis, P.M., Williams, J.M.G., Wilson, G.T., 2009. Mind the gap: Improving the dissemination of CBT. Behaviour Research and Therapy 47, 902-909.

Shin, M.S., Lee, M., Do, R., Lee, J.E., Cho, M.J., Ok, J., Yoo, H.J., Kim, J.W., Kim, B.N., 2018. Development of a 3D-Game-based Cognitive Behavioral Therapy Program for Depressed Adolescents. Cognitive Behavior Therapy in Korea 18, 355-375.

Shin, M.S., Lee, J., Lee, J., Lee, I., Kwon, E., Jeon, H., Lee, S., 2016. The Effect of a Computerized Attention Training Task Using Smart Toy for Preschool Children: A Preliminary Study. Journal of the Korean Association of Psychotherapy 8, 1-36.

Simco, R., McCusker, J., Sewitch, M., 2014. Adherence to self-care

interventions for depression or anxiety: A systematic review. Health Education Journal 73, 714-730.

Smith, P., Scott, R., Eshkevari, E., Jatta, F., Leigh, E., Harris, V., Robinson, A., Abeles, P., Proudfoot, J., Verduyn, C., Yule, W., 2015. Computerised CBT for depressed adolescents: Randomised controlled trial. Behaviour research and therapy 73, 104-110.

Sobowale, K., Zhou, A.N., Van Voorhees, B.W., Stewart, S., Tsang, A., Ip, P., Fabrizio, C., Wong, K.L., Chim, D., 2013. Adaptation of an internet-based depression prevention intervention for Chinese adolescents: From "CATCH-IT" to "Grasp the opportunity". International Journal of Adolescent Medicine and Health 25, 127-137.

Stallard, P., Richardson, T., Velleman, S., Attwood, M., 2011. Computerized CBT (Think, Feel, Do) for depression and anxiety in children and adolescents: outcomes and feedback from a pilot randomized controlled trial. Behavioural and cognitive psychotherapy 39, 273-284.

Statistics Korea, 2018. 2018 Youth statistics. Ministry of Gender Equality and Family of South Korea, Seoul.

Statistics Korea, 2019. KOSTAT Statistics Plus, winter in 2019. Statistics Korea (KOSTAT), Seoul.

Sylwestrzak, A., Overholt, C.E., Ristau, K.I., Coker, K.L., 2015. Self-reported Barriers to Treatment Engagement: Adolescent Perspectives from the National Comorbidity Survey-Adolescent Supplement (NCS-A). Community mental health journal 51, 775-781.

Thomas, S.J., Caputi, P., Wilson, C.J., 2014. Specific attitudes which predict psychology students' intentions to seek help for psychological distress. Journal of clinical psychology 70, 273-282.

Topooco, N., Byléhn, S., Nysäter, E.D., Holmlund, J., Lindegaard, J., Johansson, S., Åberg, L., Nordgren, L.B., Zetterqvist, M., Andersson, G., 2019. Evaluating the efficacy of internet-delivered cognitive behavioral therapy blended with synchronous chat sessions to treat adolescent depression: Randomized controlled trial. Journal of Medical Internet Research 21.

Varni, J.W., Seid, M., Kurtin, P.S., 2001. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. Medical care 39, 800-812..

Wilson, C.J., Deane, F.P., Ciarrochi, J.V., Rickwood, D., 2005. Measuring help seeking intentions: properties of the general help seeking questionnaire. Canadian Journal of Counselling 39, 15.

Yoo, J., 2010. A Study of Psychological Variables based on Academic Achievement Levels - Middle School Students' Cases. Youth Facility & Environment 8, 35-42.

Yoo, S.K., 2005. Korean College Students Attitudes Toward Counseling, Psychotherapy, and Psychiatric Help. Korean Journal of Counseling and Psychotherapy 17, 617-632.

Zetterqvist, K., Maanmies, J., Ström, L., Andersson, G., 2003. Randomized controlled trial of internet-based stress management. Cognitive Behaviour Therapy 32, 151-160.

국문초록

배경 및 목적

청소년기에 우울은 매우 흔하며 청소년의 삶에 오랫동안 여러 가지 부정적인 영향을 미친다. 그러나 컴퓨터 기반 인지행동치료(Computer-based Cognitive Behavioral Therapy, 이하 CCBT)와 같은 근거기반 치료가 있음에도 우울한 많은 청소년들은 심리치료를 받지 못하고 있다. 많은 CCBT 프로그램이 치료되지 못한 우울증 문제에 대한 해결책으로 서구사회에서 개발되었다. 우리나라 청소년에게 적합한 청소년용 CCBT 프로그램에 대한 효과성 연구가 필요하다. 그리고 CCBT의 치료 성과에 영향을 미치는 요인이나 CCBT 보급에 대한 연구는 아직 미흡한 편이다.

본 연구의 목적은 우울한 청소년들을 위한 CCBT 효과성을 검증하고 CCBT 프로그램에 참여하는 청소년의 특성을 밝히고자 하는 것이다. 또한 치료집단 내에서 치료 전후로 과제 순응도가 높은 청소년이 과제순응도가 낮은 청소년에 비해 우울감이 더욱 저하될 것이라는 가설을 검증하고자 하였다.

연구방법

서울 시내에서 총 376명의 일반 청소년(평균연령 15.71세, 53.7% 여자청소년)이 우울, 도움추구 태도 및 의도로 이루어진 선별검사에 참여하였다. 우울 수준은 우울증 평가도구(Patient Health Questionnaire-9, PHQ-9)와 역학연구센터 우울척도(Center for Epidemiological Studies Depression Scale, CES-D)로 평가하였다. 도움추구태도는 전문적 도움추구 태도 척도(Attitudes Toward Seeking Professional Psychological Help Scale, ATSPPH)로 측정하였고, 전문적 도움추구 의도는 상담추구 의도 척도 (Intentions to Seek Counseling Inventory, ISCI)를 번역하고 한국 청소년 상황에 맞게

수정 보완하였다. PHQ-9와 CES-D, 두 척도 모두에서 경도 이상 수준의 우울 증상을 보고한 청소년은 139명이었다. 대상자들에게 청소년 개인 핸드폰으로 개별적으로 연락을 취하여 CCBT 프로그램 연구 참여자를 모집하였다. 경도이상 우울 증상을 보고한 139명 청소년 중에서 87명이 프로그램 참여 동의하지 않고 참여하지 않았다. 50명은 프로그램에 참여동의하고 프로그램 완수하였고 25명은 치료집단에, 25명은 무처치 대기통제집단에 무선 배정되었다. 두 집단 모두 5주 간격으로 사전, 사후로 우울, 삶의 질, 자존감, 주의력, 기억력을 일대일로 평가하였다. 치료집단은 치료자 지원이 수반된 CCBT에 10회기 참여하였다. 치료집단은 5주간 주2회씩, 한번에 30분 내외로 행복누리 프로그램에 참여하였다. 치료자 지원은 한 회기 당 10분 내외로 청소년들 프로그램 참여를 돕고 과제수행을 촉진하기 위해 제공되었다. 치료결과에 영향을 미치는 요인을 확인하기 위하여 치료집단을 대상으로 매 회기 과제 수행의 질에 따라서 과제 순응도를 측정하였다.

연구결과

우울한 청소년 중에서 프로그램 참여 동의 집단(n=50)은 참여 비동의 집단(n=87)에 비해 전문적 도움추구태도 중에서 필요성 인식은 유의미하게 더욱 높았으며, 관계개방성은 낮았다(t = −2.93, p < .01; t = 3.50, p < .001). 또한 참여 동의집단은 참여 비동의집단에 비해 도움추구의도가 유의미하게 더욱 높았다(t = −2.27, p < .05).

사전, 사후 검사 결과를 비교해봤을 때 치료집단은 대기집단에 비해서 우울감, 자존감, 주의력, 삶의 질에서 유의미한 향상을 보였다. 다만 치료집단에 경도이상 우울이 배정되었고 대기집단에 중등도 이상 우울이 편중되게 배정된 면이 있었다. 치료집단 내에서는 과제순응도가 높은 집단이 낮은 집단에 비해서 사후검사에서 우울감이 유의미하게 낮았다.

결론

본 연구결과에 의하면, 우울한 청소년, 특히 대인관계 개방성이 낮은 우울한 청소년에게 CCBT가 효과적인 대안이 될 수 있다는 점이 시사되었다. 치료집단에 경도 우울이 편중되게 배정된 점으로 인해 본 연구결과에서는 경도 수준 우울 집단에 CCBT 효과가 있었다고 볼 수 있다. 추후 연구에서는 좀더 많은 참여자들을 대상으로 우울 수준을 고려하여 무선 할당할 필요성이 시사되었다.

CCBT의 효과를 높이기 위해서는 참여자의 참여를 높이는 것이 중요하며, 참여를 높이기 위해서는 청소년들의 경우에는 치료자 지원이 함께 제공될 필요가 있겠다. 세션 완수나 과제순응도를 높이는 방향으로 CCBT 프로그램에서 치료자 지원이 수반되어야 하겠다.

또한 우울한 청소년들이 치료를 받지 않는 문제점을 해결하기 위해서는 일반 청소년을 대상으로 치료에 대한 필요성 인식을 높여야 하겠다. 그리고 청소년의 치료 참여를 유도하기 위해서는 선별검사를 활용하여 우울한 청소년들을 찾아내고 치료 프로그램 참여를 개별적으로 권유하는 과정이 이루어져야 하겠다. 특히 대인관계 개방성이 낮아서 치료에서 소외되기 쉬운 우울한 남자 청소년들을 대상으로 CCBT 프로그램을 보급하는 지속적인 노력이 필요하겠다.

주요어: 컴퓨터 기반 치료, 우울, 청소년, 도움추구행동, 인지행동치료, 무선할당

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