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Intervention Effects of a School-Based Smoking Cessation Program on Nicotine Dependence and Mental Health Among Korean Adolescent Smokers: The Experience New Days (END) Program

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Abstract

Objectives: This study evaluated the effectiveness of Experience New Days (END), a school-based smoking cessation program, on smoking dependence and mental health among Korean adolescent smokers. Methods: A single-group pretest–posttest study was conducted from April to June 2024 with 40 adolescent smokers from three high schools. The program consisted of weekly 50 min sessions over an 8-week period. Smoking dependence was measured using FTND and CDS-12, while mental health was assessed through PHQ-9 and GAD-7. Urine cotinine test was used as a biomarker. Results: The results showed significant improvements with moderate to large effect sizes in nicotine dependence ($p = 0.033$, d = 0.25), cigarette dependence ($p = 0.034$, d = 0.31), depression ($p = 0.013$, d = 0.37), and anxiety ($p = 0.043$, d = 0.40). Daily cigarette consumption decreased by an average of 2.57 cigarettes per day ($p = 0.002$, d = 0.52), with 15% of participants achieving complete smoking cessation and 42.5% showing reduced smoking behaviors. Conclusions: The results suggest that the END program was associated with reduced dependence and improved mental health outcomes among adolescent smokers. The positive memory reinforcement had a beneficial effect on mental health.

Keywords: adolescent smoking; school-based intervention program; smoking cessation program; Experience New Days (END); nicotine dependence; mental health

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1. Introduction

Adolescent smoking has emerged as a serious public health issue worldwide. The World Health Organization (WHO) defines adolescent smoking as "having smoked cigarettes on one or more days in the past 30 days" [1], and approximately 38 million adolescents aged 13–15 years (13% males and 7% females) worldwide are identified as smokers [2]. The '2023 Youth Health Behavior Survey' (KDCA, 2023) [3] shows that the smoking rate among male high school students in Korea, at 9.0%, is higher than OECD countries such as Iceland (6.5%) and Canada (7%) (WHO, 2021) [2].

The most important predictors associated with increased youth smoking include negative moods (such as anxiety and depression) and mood variability [4]. Uncontrollable emotions contribute to adolescent instability, leading many adolescents to turn to tobacco use as a coping mechanism for stress [5]. Adolescent smoking leads to nicotine addiction, reduced lung function, and cardiovascular disease, while also increasing the risk of depression and anxiety [6]. In South Korea, the issue of adolescent smoking has been highlighted through numerous epidemiological surveys and studies due to its detrimental effects on both physical and mental health. According to the Korea Disease Control and Prevention Agency's Youth Risk Behavior Survey [3], the average age at which adolescents are first exposed to smoking is trending younger, and is currently at 13.5 years. Furthermore, the use of new tobacco products, such as liquid e-cigarettes and heated tobacco products (HTP), has also been rising rapidly. Meanwhile, the proportion of tobacco users who attempted to quit smoking in the past year decreased from 68.2% in 2019 to 60.3% in 2022.

Ok and Lim [7] reported that the use of multiple tobacco products among adolescents has negative effects on mental health. The more types of tobacco products a person uses, the significantly higher the risk of their developing anxiety, depression, and loneliness. Additionally, dual users who smoke both traditional cigarettes and one of two types of e-cigarettes (either liquid or heated) experience significantly higher levels of depression, anxiety, and loneliness compared to single users. This demonstrates that using more than one type of tobacco product is associated with a significantly greater risk of developing these psychological issues. These findings highlight the urgent need for integrated approaches to intervention that address both smoking and mental health issues among youth to improve the mental health of adolescents.

Smoking cessation intervention programs for adolescents require a different approach than those designed for adults. Adolescent smoking motivations and habits are influenced by several factors, including gender, age, stress levels, and the incidence of smoking among peers. Therefore, interventions for adolescent smoking must adopt a versatile approach that comprehensively addresses the psychological characteristics and mental health factors specific to young people [8,9].

Previous research has indicated that tailored smoking cessation programs, which consider personal and social influences on adolescents, are effective in reducing smoking prevalence [10]. Moreover, approaches that incorporate positive psychology have proven particularly effective in altering adolescent health behaviors, as reinforcing positive memories can help alleviate negative emotions [11–13].

Korean adolescents, in particular, face unique cultural and environmental factors such as excessive academic stress, troubled peer relationships, and social pressure [14]. Therefore, it is crucial to develop programs that reflect these specific characteristics.

Existing youth smoking cessation intervention programs have often taken a problem-based approach. The Not-On-Tobacco (N-O-T) program focused on the youth smoking problem itself (Dino G et al., 2008) [15], while the Q4L (Quest for Life) program focused on stress management in adolescents (Azagba & Asbridge, 2013) [16]. However, this problem-based approach has shown limitations, such as a lack of individualization, a lack of consideration of psychosocial factors, and difficulty in maintaining motivation to quit smoking (Onwuzo 2024; LI 2024) [17,18].

An approach integrating positive psychology and cognitive behavioral therapy (CBT) demonstrated the following advantages:

First, unlike existing smoking cessation programs that focus on behavioral correction, this approach promoted adolescents' holistic development by integrating psychological capital cultivation and the modification of maladaptive thought patterns (Sussman & Sun, 2009) [19].

Second, the integration of positive psychology mindset and CBT's cognitive restructuring enhanced cognitive flexibility, thereby strengthening stress-coping capabilities during the smoking cessation process (Garland et al., 2010) [20].

Third, reflecting the characteristics of adolescence, it promoted the multidimensional development of self-identity and psychological resilience (Peterson & Seligman, 2005; Kahler et al., 2015) [13,21].

The END program of this study integrates positive psychology and cognitive behavioral therapy to focus on improving psychological resilience in adolescents. In particular, the recall and acceptance of positive emotions were introduced as key elements, suggesting a comprehensive intervention that goes beyond simple behavior modification or coping with stress. It differentiated itself from existing programs by promoting inner transformation and the activation of positive resources through cognitive restructuring.

Korean adolescents prioritize group harmony over individual expression due to the influence of Confucian values and collectivist culture (Her & Oh, 2023) [22]. These cultural characteristics act as factors that hinder effective coping in peer pressure situations. Considering the unique circumstances of Korean adolescents who are exposed to excessive academic stress and peer pressure (Jihoon & Kim, 2024) [14], refusal skills training that aligns with the cultural context is required. Therefore, this program includes refusal skills training that enables effective self-assertion while maintaining interpersonal harmony. This aims to resolve negative perceptions of refusal and concerns about relationship disruption in collectivist cultures, while targeting the enhancement of balanced coping abilities that maintain respect for Korean adolescents' self-determination and peer relationships.

This study builds upon the research of Park et al. (2020) [23] and Kim & Lee (2021) [24] to evaluate the effectiveness of an 8-week school-based smoking cessation program for high school student smokers. The program's effectiveness is assessed through three indicators:

First, smoking dependence (nicotine and tobacco dependency).

Second, mental health status (depression and anxiety).

Third, biological markers (urinary cotinine levels).

Experience New Days (END) Program

The END program is a leading tobacco cessation support program tailored to the characteristics of Korean adolescents, reflecting the cultural context of South Korea. It shares some curriculum elements and concepts with international tobacco control programs for young people that incorporate various behavioral change theories. The END program utilizes a similar approach to internationally recognized smoking cessation programs, such as the U.S. Centers for Disease Control (CDC)'s Not On Tobacco (N-O-T) and Health Canada's Quit 4 Life (Q4L). Specifically, the END program is a school-based initiative that employs strategies proven effective in past international programs, such as encouraging voluntary participation and strengthening social support systems through peer support derived from shared experiences [19]. In addition, the END program comprehensively applies the Stages of Change Model, Social Influence Model, Social Cognitive Theory, Health Belief Model, and the Theory of Planned Behavior to smoking cessation practices. These practices include an evaluation of the anticipated and expected results of smoking and quitting, stress-management training, refusal training, assertiveness training, self-monitoring, and enhancing self-efficacy by improving behavioral [25].

The END program consists of eight sessions, each lasting 50 min, structured around eight stages: awareness, recognition, expression, discovery, awakening, confidence, management, and support. The program is also divided into motivation and action phases, depending on participants' willingness and readiness to quit smoking. Kim et al. [8]

suggested that this dual approach is a novel intervention method to promote voluntary participation among young people.

The first phase of the program is the motivation phase, which is designed for adolescents who are either unwilling to quit or uncertain about quitting smoking. This phase aims to increase self-awareness of smoking behaviors, explore the negative effects of smoking on health and everyday life, clarify values to strengthen motivation for change, and help participants learn about the benefits of successfully quitting smoking. Emphasis is placed on enhancing motivation rather than coercing individuals to quit smoking. Participants experience metacognitive awareness, which enables them to recognize that smoking limits positive memories, thus strengthening their motivation to make a change. The second phase is the action phase, which is designed for adolescents who are willing to quit smoking but face difficulties in doing so. This phase focuses on developing strategies for coping with withdrawal symptoms, training in refusal skills for situations where smoking is tempting, stress management, and establishing long-term plans to prevent relapse. The program's effectiveness can be enhanced by providing practical implementation strategies to young individuals already committed to quitting. For instance, an empirical intervention can apply positive memory recall techniques as an alternative coping strategy during stressful situations and moments of smoking cravings. A key aspect of this technique is its potential for participants to regulate such negative emotions as anxiety and depression through the process of recalling and sharing positive memories [20]. Such positive memories act as an emotional buffer, offsetting negative emotions and helping manage psychological distress [26]. Additionally, participants can maximize the therapeutic effects of group dynamics by sharing positive memories during the program [11], which aids in understanding and altering their emotions and behaviors. This approach is rooted in the positive psychological framework proposed by Seligman M.E et al. [13] and the therapeutic benefits of positive memory recall discussed by Young, K.D. et al. [27].

2. Method

2.1. Study Design

This study employed a single-group pretest–posttest design and implemented the Experience New Days (END) program developed by the Ministry of Health and Welfare of Korea. The program consisted of 50 min sessions held once a week for 8 weeks, as detailed in Table 1. The intervention program in this study was developed based on the core elements and basic structure of the END program. All sessions were conducted by smoking cessation specialists qualified in youth smoking cessation counseling, and to ensure intervention consistency, standardized implementation manuals, session-specific core element checklists, and session monitoring records were developed and applied. All three schools used identical worksheets and handouts, and session consistency was maintained through supervision by a psychiatrist. Under this standardized management system, no significant differences were observed in program implementation across schools.

In this study, we implemented two systematic control measures to minimize the influence of potential confounding variables.

First, in the pre-control phase, we established clear participant selection and exclusion criteria, secured sample representativeness through participant composition, considering demographic characteristics, and standardized the intervention environment.

Second, during the intervention process, we consistently maintained the time and location of all sessions, provided interventions according to standardized protocols, and continuously monitored participants' external activities and treatment participation.

Table 1. Highlights and therapeutic factors of the END program by session.

Session	Steps (Therapeutic Factor)	Topics	Program Highlights	Significance
1	Awareness (cognition)	Getting to know me	- Baseline Survey: Conduct a smoking-related survey and pretest. - Program Introduction: Explain the program's purpose and structure. - Build Rapport: Establish trust with participants.	- Develop a deeper awareness of smoking status. - Improve understanding of the program and motivate participation.
2	Recognition (understanding)		- Analyze Each Participant's Smoking Type: Understand smoking situations, reasons, and coping strategies by type (physical and psychological withdrawal symptoms, craving behaviors, and coping methods).	- Recognize smoking types and situations that trigger cravings. - Increase self-awareness of smoking behaviors.
3	Expression (coping strategy)	Sharing my emotions	- Making Emotion Cups: Recognize emotional expressions using various colors. - Emotion Word Cards: Share emotional states using words.	- Recognize and express inner feelings. - Understand the importance of expressing emotions. - Acknowledge the connection between emotions and smoking.
4	Discovery (coping strategy)	Happiness energy charging station	- Promote happiness through sharing happy and positive memories.	- Reinforce positive memories. - Strengthen peer group cohesion. - Discover ways to find happiness outside of smoking.
5	Awakening (motivation)	Smoking: True or false	- Smoking Quiz: Participants answer with "true" or "false" regarding smoking, with correct information provided. - Smoking Risk Awareness: Watch photos and videos of smoking-related diseases, discuss the benefits of quitting. - Promote happiness through sharing happy and positive memories.	- Explore the impact of smoking on health and everyday life. - Gain a better understanding of smoking and recognize its dangers. - Recognize the need to quit smoking. - Recognize the benefits of successfully quitting. - Clarify values to boost motivation to change.
6	Confidence (coping methods)	Practicing how to say no	- Refusal Practice: Smoking scenario role-plays, practicing assertive refusals. - Promote happiness through sharing happy and positive memories.	- Acquire skills to refuse temptations to smoke. - Learn how to maintain friendships after saying no to smoking.
7	Management (stress management)	Stress, go away!	- Understanding Stress: Learn how to manage stress. - Learn how to cope with withdrawal symptoms. - Promote happiness through sharing happy and positive memories.	- Learn stress-management techniques. - Habitualize positive replacement behaviors for withdrawal symptoms. - Develop long-term management plans to prevent relapse.
8	Support (Maintenance)	Let's GO together	- Follow-Up: Conduct a posttest. - Reflections on program activities, share experiences and learnings from the program.	- Evaluate program. - Share experiences and continue support for cessation.

2.2. Participants

Adolescents who had smoked at least one cigarette in the past 30 days were recruited from April to June 2024 from three high schools in an integrated urban–rural complex (population 200,000). Study participants were randomly selected from the current smoker lists of three high schools, which was intended to minimize selection bias and ensure research objectivity. Adolescents with severe mental illnesses, neurodevelopmental disorders, and physical illnesses—along with those participating in other smoking cessation programs—were excluded. Of the 61 initial applicants, 21 were excluded due to withdrawal and poor attendance, resulting in 40 final participants. Figure 1 illustrates the selection process.

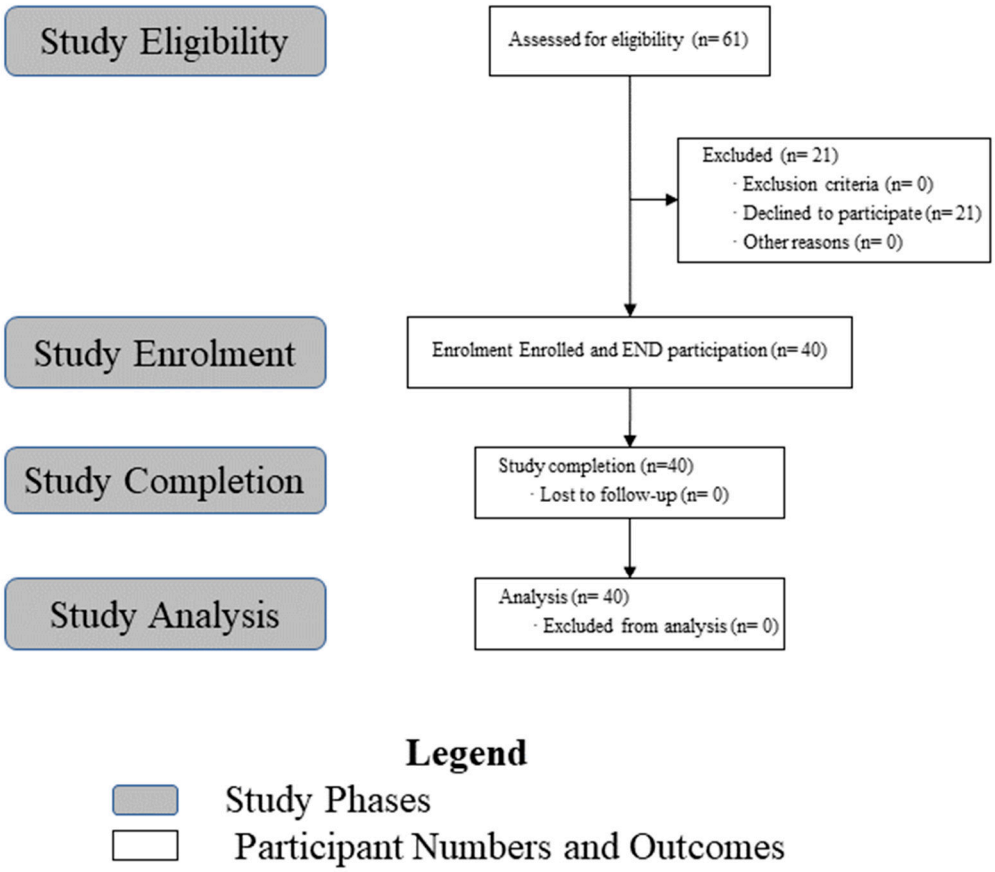


Figure 1. Participant selection process.

2.3. Intervention Program

Based on the END program, elements of sharing and reinforcing positive memory experiences were added to each session. Table 1 shows the highlights and significance of each session in the program.

2.4. Measures

The following instruments were used to measure nicotine dependence and cigarette dependence, which are risk factors for smoking, along with depression and anxiety, which are mental health factors.

2.4.1. Fagerström Test for Nicotine Dependence (FTND)

The Fagerström Test for Nicotine Dependence (FTND) is a shortened version of the FTQ developed by Fagerström [28] and modified by Fagerstrom et al. [29]. This research used the Korean version adapted by Ahn, H.K. et al. [30]. This instrument is primarily used

to measure physical dependence and tolerance to nicotine. The reliability was 0.61 at the time of development and 0.72 in this study.

2.4.2. Cigarette Dependence Scale-12 (CDS-12)

The Cigarette Dependence Scale-12 (CDS-12) is a 12-item scale developed by Etter [31] that reflects the DSM-IV and ICD-10 criteria for substance use disorders. Each item is rated on a five-point Likert scale. This scale is designed for adolescents and adults aged 12–74 years and is particularly effective in assessing physical and psychological nicotine dependence among teens. The reliability was 0.90 at the time of development and 0.96 in this study.

2.4.3. Patient Health Questionnaire-9 (PHQ-9)

The Patient Health Questionnaire-9 (PHQ-9) is a nine-item scale developed and validated by Spitzer et al. [32,33]. For this study, the Korean version adapted by Seung-Jin Park [34] was used. Each item is rated on a four-point Likert scale and measures depressive symptoms over the course of two weeks. The reliability was 0.89 at the time of development and 0.94 in this study.

2.4.4. Generalized Anxiety Disorder 7-Item Scale (GAD-7)

The Generalized Anxiety Disorder 7-item scale (GAD-7) is a seven-item scale developed by Spitzer et al. [35] for measuring anxiety symptoms experienced over the course of two weeks. Each item is rated on a four-point Likert scale. The reliability was 0.92 both at the time of development and in this study.

2.4.5. Urine Cotinine Test: Cotinine Qual, Cotinine Quant Mid

Tests on urine cotinine (a metabolite of nicotine) were conducted to objectively evaluate smoking status. In this study, qualitative and quantitative methods were combined, as follows:

- Qualitative Test (Cotinine Qual): Positive/negative (results are available within 30 s)
- Quantitative Test (Cotinine Quant Mid): Measures the amount of cotinine in the body to assess how much a person smokes (results are available within 4 min)

The accuracy of the test is 99% for positive results and 94% for negative results, and a minimum of one week of smoking cessation is required for a negative result. Participants were only considered successful if they tested negative on both tests.

2.5. Data Collection Procedure

All measurements were taken immediately before the program began (pretest) and after it ended (posttest). Cotinine tests were performed by trained professionals.

2.6. Ethical Considerations and Informed Consent

This study was conducted with the approval of the Institutional Review Board of Dankook University (DKU 2024-10-029-002). Voluntary consent was obtained from all participants and their guardians before the study was conducted, after explaining the purpose, procedures, potential risks, and benefits. Participants were also informed that they could withdraw from the study at any time without any penalty.

2.7. Statistical Analysis

Statistical analyses were performed using SPSS 29.0. The Shapiro–Wilk normality test on the difference in values pre- and post-intervention in a single group confirmed that the normality assumption was met, and accordingly, a paired sample t-test was conducted. The significance level for all statistical tests was set at $p < 0.05$.

3. Results

3.1. Participant Characteristics

Of 61 applicants, 21 were excluded due to withdrawal or frequent absences, and 40 ultimately completed the program without any dropouts during the study period.

3.2. Demographic Characteristics

The demographic characteristics of the participants are summarized in Table 2.

Table 2. Baseline characteristics of participants (N = 40).

Variables		Frequency (N)	Percentage (%)	M ± SD
Gender	Male	37	92.5	1.075 ± 0.27
	Female	3	7.5	
Age	17	18	45.0	17.725 ± 0.75
	18	15	37.5	
	19	7	17.5	
Family economic status	High	7	17.5	2.425 ± 0.81
	Middle	32	80.0	
	Low	1	2.5	
Cigarettes smoked per day	1–5	6	15.0	14.225 ± 7.73
	6–10	8	20.0	
	11–20	22	55	
	21 or more	4	10.0	
Drinking experience	Yes	31	77.5	1.23 ± 0.42
	No	9	22.5	

M = Mean; SD = Standard Deviation.

The results of the assessments measuring nicotine dependence, cigarette dependence, depression, and anxiety were analyzed to observe changes in participants' smoking behavior and mental health following their participation in the END program. Urine cotinine tests were conducted to determine whether participants smoked and, if so, how many cigarettes they consumed. These findings are presented in Table 3. After the intervention, there were significant reductions in the participants' nicotine dependence (FTND; $p = 0.033$), cigarette dependence (CDS-12; $p = 0.034$), depression (PHQ-9; $p = 0.013$), and anxiety (GAD-7; $p = 0.043$) levels. In addition, their average daily cigarette consumption decreased from 15.50 to 12.93 cigarettes per day ($p = 0.002$). Notably, 6 out of 40 participants (15.0%) successfully quit smoking, while 17 (42.5%) showed a significant reduction in smoking compared to baseline levels.

Table 3. Changes in main variables before and after program (N = 40).

Variable	N	Mean		Paired Sample *t*-Test		
		Pre	Post	*t*	*p*	*Cohen's d*
Nicotine dependence (FTND)	40	3.00	2.40	2.204	0.033 *	0.25
Cigarette dependence (CDS-12)	40	32.05	28.43	2.202	0.034 *	0.31
Depression (PHQ-9)	40	2.25	0.40	2.618	0.013 **	0.37
Anxiety (GAD-7)	40	2.13	0.83	2.092	0.043 *	0.40
Smoking status (Cotinine Qual)	40	1.00	0.85	2.623	0.012 *	0.42
Smoking quantity (Cotinine Quant MID)	40	15.50	12.93	3.318	0.002 **	0.52

Program Effectiveness * $p < 0.05$, ** $p < 0.01$; FTND: Fagerström Test for Nicotine Dependence, CDS-12: Cigarette Dependence Scale-12, PHQ-9: Patient Health Questionnaire-9, GAD-7: Generalized Anxiety Disorder 7-item scale, Cotinine Qual: qualitative test, Cotinine Quant Mid: quantitative test.

The effect size analysis showed that nicotine dependence (d = 0.25) and tobacco dependence (d = 0.31) demonstrated small effect sizes, while depression (d = 0.37), anxiety (d = 0.40), and smoking status (d = 0.42) showed small to medium effect sizes. The largest effect size was observed in smoking quantity (d = 0.52), showing a medium-level effect. This suggests that the program was effective in changing overall smoking behavior, particularly in reducing smoking quantity, and also led to significant improvements in emotional aspects.

While Park et al. (2020) [23] reported a 28% smoking cessation rate in the END program using a single cotinine test, this study showed a 15% cessation rate based on dual cotinine tests. These results were higher than both the 11.8% rate of the N-O-T program (Dino G et al., 2008) [15] and the 11.7% average cessation rate of school-based programs reported in Sussman et al.'s (2009) [19] meta-analysis.

Regarding changes in smoking behavior, this study showed a significant decrease in daily average cigarette consumption, from 15.50 to 12.93 cigarettes ($p = 0.002$), with 42.5% of all participants showing significant reduction in smoking behavior. These results were higher than both the 26% reduction rate of the N-O-T program (Dino G et al., 2008) [15] and the 26.4% average reduction rate reported in Sussman et al.'s (2009) [19] meta-analysis.

A limitation of this study is that due to the absence of long-term follow-up, a direct comparison with the 6-month sustained cessation rate of 7.2% reported in Sussman et al.'s (2009) [19] previous research was not possible.

4. Discussions and Conclusions

This study aimed to investigate the effects of the cognitive behavioral therapy-based smoking cessation program END (Experience New Days) on changes in smoking dependence (both nicotine dependence and cigarette dependence), mental health (depression and anxiety), and urine cotinine levels in Korean adolescent smokers. The main findings are as follows.

First, nicotine dependence and cigarette dependence significantly decreased after participants engaged in the END program. This research utilized a dual approach that considered both the demographic characteristics of the participants and the complexities of adolescent smoking behavior. First, based on the Stages of Change Theory [36], this study provided differentiated interventions, including a motivation-oriented and action-oriented approach, tailored to the participants' willingness and readiness to quit smoking. This step-by-step approach ensured program flexibility, allowing for content to be adjusted according to the individual needs of participants. The END program also incorporated an integrated approach that reflected unique aspects of Korean culture, drawing on suggestions from previous studies [8,10,22] that highlighted the importance of a customized approach based on participants' stages of change in smoking cessation interventions. As a result, this differentiated intervention was found to positively impact smoking dependence.

Second, depression ($p = 0.013$) and anxiety levels ($p = 0.043$) also decreased significantly after participants completed the END program. During the program, activities such as making emotion cups and using emotion word cards aimed to help participants identify and accurately recognize negative emotions. These exercises were based on the emotion regulation mechanisms of Compare et al. [37]. Furthermore, repeated activities (such as when participants were tasked with promoting happiness through sharing positive memories) were incorporated to reinforce positive emotional experiences. The results suggest that this strategy of positive memory reinforcement and recall-based intervention played a crucial role in improving participants' ability to cope with stress and regulate their emotions. These findings align with those of Askelund et al. [38], which demonstrated that the cortisol regulation of recalling specific positive memories can help mitigate depression

and anxiety. In terms of clinical effects, this paper's findings are also supported by Kassel et al. [39], who confirmed an intervention effect on the relationship between depression and smoking in adolescents, and Contractor et al. [40], who found that repetitive memory recall contributes to improved emotional and cognitive functioning. Notably, Gunter et al. [41] reported a unique cultural characteristic among Korean smokers, where they often express both positive and negative emotions simultaneously. This finding suggests that improving participants' abilities to recognize, express, and regulate their emotions is a key mechanism for changing smoking behavior, and the END program's culturally specific approach is an effective strategy for smoking cessation interventions in Korean adolescents. The main components of the END program were theoretically validated through many previous studies. Activities designed to enhance self-efficacy through positive memory reinforcement serve as a key mechanism for improving mental health [42]. Additionally, forming social support networks [43] and utilizing cognitive restructuring techniques [44] have been shown to promote psychological adaptation among participants. These results serve as evidence that acquiring adaptive coping strategies through the END program, as a stress-management mechanism, is essential for replacing smoking behavior.

Third, the urine cotinine tests showed that participants' average daily cigarette consumption decreased from 15.50 to 12.93 cigarettes (p = 0.002) after completing the END program. Furthermore, 15% of the participants successfully quit smoking, and 42.5% experienced a significant reduction in their smoking behavior. As noted by Park et al. [45], cotinine serves as a reliable biomarker for assessing nicotine exposure, and this was used to objectively validate the effectiveness of the END program. This paper adhered to the recommendations of Benowitz et al. [46] by performing additional quantitative tests to enhance the accuracy and reliability of the measurements. The results of this study align with previous research by Hendricks et al. [47], which indicates that interventions based on cognitive behavioral therapy have a significant impact on smoking cessation and reductions in cotinine levels. The results demonstrated that the END program reduced nicotine dependence. In particular, cotinine levels were measured to assess both the success of complete cessation and the gradual reduction in cigarette smoking throughout the cessation-attempt process, demonstrating the program's effectiveness in facilitating progress toward quitting. In addition, this paper verified the multifaceted effects of the END program by simultaneously evaluating the smoking cessation rates and the reduction in cigarette consumption, which aligns with the findings of Park et al. [23] and Kim and Lee [24], while also offering a different integrated evaluation intervention method.

The positive outcomes of this study corroborate findings from prior research that endorsed the effectiveness of emotion-management interventions in improving smoking cessation success rates [48].

The operating principles of this program can be explained through three core elements.

First, positive memory recall is used as an alternative coping strategy in situations of stress or smoking urges. Positive memories act as emotional buffers to offset negative emotions, and the therapeutic effect is enhanced through the group dynamics formed by participants sharing their experiences.

Second, cognitive–behavioral strategies improve awareness and coping skills during smoking trigger situations, increasing smoking cessation success rates and contributing to anxiety reductions through the modification of negative thought patterns.

Third, the group support system strengthens smoking cessation willpower and resistance to relapse through peer support.

The interaction of these three elements has the effect of promoting participants' self-understanding and behavioral change.

Stead et al. [43] reported that group counseling and social support significantly reduced depression and anxiety. Additionally, Kahler et al. [21] provided empirical evidence that positive emotion levels correlate positively with smoking cessation success rates, further justifying the emotion management approach adopted in the END program.

This study has the following limitations.

First, due to the pre–post design, without a control group, there are limitations in attributing the observed changes solely to the END intervention. In this study, since a covariate analysis was not performed of socioeconomic status, family, and peer factors known to influence smoking behavior, there are limitations in verifying the pure effects of the program.

Second, the small sample size (N = 40), obtained from three high schools in an urban–rural mixed area limits generalization to the national adolescent smoking population. Analysis of the 34% dropout rate showed no significant differences in baseline nicotine dependence and mental health scores between dropout and completion groups. Reasons for dropout were primarily external factors, such as long-distance commuting, conflicts with academic schedules, and after-school academy attendance.

Third, the 8-week follow-up period limits the verification of long-term program effectiveness.

To overcome these study limitations, future research should conduct studies with control groups and short-term studies, maintaining low dropout rates. Additionally, to enhance the effectiveness of smoking cessation intervention programs, the introduction of parent participation or digital intervention methods could be considered. Despite these limitations, this paper is significant for several reasons. First, it employs a multidimensional approach that integrates biomarkers and psychosocial factors as an effective intervention for tobacco use among adolescents, a pressing public health issue. Second, this research evaluates the effectiveness of a school-based smoking cessation program for Korean adolescent smokers using objective measures and confirms the efficacy of a school-based systematic approach to address smoking among teens. Third, in addition to behavior modification, it enhanced participants' emotional resilience through positive memory reinforcement. Notably, based on the principles of positive psychology proposed by Seligman and Csikszentmihalyi [49], this study empirically demonstrates that strengthening adolescents' positive self-image and intrinsic motivation constitutes an effective smoking cessation strategy.

In conclusion, the END program applied in this research demonstrated significant effects in reducing smoking dependence and improving mental health among adolescent smokers. This contribution holds academic significance, offering an effective method for interventions that promote smoking cessation among adolescents. Furthermore, the integrated approach provides a new perspective for both preventing smoking and promoting mental health among youth, with the potential to help establish policies and develop programs for promoting adolescent health in the future.

Author Contributions: Y.-S.Y. conceptualized the study, developed the data, and wrote the first draft of the manuscript; H.-S.K. validated and formally analyzed the data; E.B. participated in the methodology and formal analysis; Y.L., C.M.L. and S.H.S. participated in the validation and formal analysis; M.K. participated in validation and data curation; M.H.L. participated in the conceptualization, methodology, and writing of this manuscript. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the ethical review committee of Dankook University (code: No. DKU 2024-10-029-002; Approval Date 30 April 2024).

Informed Consent Statement: All participants were informed that participation was voluntary and provided written, informed consent. No competing interests.

Data Availability Statement: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request due to ethic ethical approval requirements.

Conflicts of Interest: The authors declare that they have no competing interests.

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