| Research Article / Araştırma Makalesi|

# The Impact of Web-Based Educational Software on Smoking Addiction: A Study on High School Students' Knowledge and Emotional Development

## Web Tabanlı Eğitim Yazılımının Sigara Bağımlılığı Üzerindeki Etkisi: Lise Öğrencilerinin Bilgi ve Duygusal Gelişimleri Üzerine Bir Çalışma[1]

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**Abstract**

*Purpose:* The objective of this study is to investigate the impact of educational software designed to combat smoking addiction on the knowledge levels and positive emotional development of high school students.

*Design/Methodology/Approach:* The study employed an experimental research model conducted in two 10th-grade classes. Prior to the intervention, a pre-test using the 'For a Smoke-Free Life' scale was administered to each class. The web-based educational software, 'Connect to Life, Not Cigarettes' (CLNC), was presented to the students during two course hours. A post-test was conducted after the presentation using the same scale as the pre-test. The data collected from both tests were analyzed using the SPSS statistical program.

*Findings:* As a result of this research, it was concluded that CLNC had a positive effect (z = -4.042, p < .05, r = - 0.52) on the knowledge level, but had no effect (z = -1,595, p > .05, r= - 0.20) on the mood levels of high school students. However, in the case of gender, while it had a positive effect on both the mood (z = -2.08, p < .05, r = -0.35) and knowledge levels (z =-3.59, p < .05, r = 0.61) of female students, it did not have any effect (z = -0.70, p > .05, r = 0.14) on the mood levels of male students.

*Highlights:* The findings of the study provided evidence that web-based educational software was partially effective in increasing students' knowledge and mood levels in quitting smoking. Concentrating research on this issue may contribute to the improvement of current understanding.

**Öz**

*Çalışmanın amacı:* Bu çalışmanın amacı, sigara bağımlılığıyla mücadele için tasarlanan eğitim yazılımlarının lise öğrencilerinin bilgi düzeylerine ve olumlu duygusal gelişimlerine etkisini araştırmaktır.

*Materyal ve Yöntem:* Araştırma deneysel araştırma modeli kullanılarak 10. sınıftaki iki sınıfta yürütülmüştür. Deney öncesinde her sınıfa 'Dumansız Bir Yaşam İçin' ölçeği kullanılarak ön test uygulandı. Web tabanlı eğitim yazılımı 'Sigaraya Değil Hayata Bağlan' (SDHB) iki ders saati boyunca öğrencilere sunuldu. Sunumun ardından ön testle aynı ölçek kullanılarak son test uygulandı. Her iki testten elde edilen veriler SPSS istatistik programı kullanılarak analiz edildi.

*Bulgular:* Bu araştırma sonucunda SDHB'nin lise öğrencilerinin bilgi düzeyine olumlu etki yaptığı (z = -4.042, p < .05, r = - 0.52) ancak duygudurum düzeylerine etkisinin olmadığı (z = -1,595, p > .05, r= - 0.20) sonucuna varılmıştır. Ancak cinsiyet durumunda kız öğrencilerin hem duygudurum (z = -2.08, p < .05, r = -0.35) hem de bilgi düzeylerine (z =-3.59, p < .05, r = 0.61) olumlu etki yaparken, erkek öğrencilerin duygudurum (z = -0.70, p > .05, r = 0.14) düzeylerine herhangi bir etkisi olmamıştır.

*Önemli Vurgular:* Araştırmanın bulguları, web tabanlı eğitim yazılımlarının öğrencilerin sigarayı bırakma konusunda bilgi ve duygudurum düzeylerini artırmada kısmen etkili olduğuna dair kanıt sağladı. Araştırmaların bu konu üzerine yoğunlaştırılması mevcut anlayışın geliştirilmesine katkı sağlayabilir.

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## INTRODUCTION

Cigarettes are the most commonly used addictive substance worldwide, including in Turkey (Selim & Sülükçüler, 2023). Cigarette addiction affects a significant portion of society, particularly young people (Ertaş et al., 2023). Cigarettes contain over 4,000 harmful chemicals. Cigarette smoke includes harmful chemicals such as nicotine, used in pesticide production; cadmium, used in mobile phone battery charging; methane gas, found in swamps; and ammonia, used in liquid fertilizer production (Korkut & Sevinç, 2021). According to the 2021 Organization for Economic Co-operation and Development (OECD) report, which covered 34 member countries, Turkey has the highest cigarette consumption rate at 28%. In OECD countries, 16.5% of individuals aged 15 and above report smoking daily (*Health Risks - Daily Smokers - OECD Data*, 2021). Data from the Turkish Statistical Institute indicate that the smoking rate among adults over age 15 in Turkey was 26.5% in 2016 and increased to 28% in 2019. Of smokers, 41.3% are male and 14.9% are female (TÜİK, 2020).

In Turkey, stringent tobacco control policies have been implemented to decrease smoking prevalence and protect public health. Since the 2008 indoor smoking ban, measures such as restrictions on tobacco advertising and promotion, increased tax rates, and mandatory graphic health warnings on cigarette packaging have significantly contributed to reducing tobacco consumption (Bilir, 2017). However, smoking remains a significant public health challenge, especially among youth, where usage rates continue to be concerning. Addiction education has gained prominence, with organizations like Yeşilay leading initiatives to raise awareness through school programs and public campaigns. These efforts aim to educate individuals about the health risks of smoking, counteract the tobacco industry's marketing strategies, and support cessation efforts. Nevertheless, the reach and effectiveness of these educational programs, particularly in rural areas, require further enhancement to achieve a comprehensive impact.

Young people may initiate smoking out of curiosity, peer or familial influence, or exposure to social media (Akkuş, 2017). Typically, smoking initiation occurs during high school, with some individuals starting even earlier (Ayten & Güven, 2023). Those who become addicted to cigarettes during their youth often continue smoking into adulthood, thereby increasing their risk of developing smoking-related illnesses later in life (Perinçek & Yağcı, 2022). Therefore, anti-smoking studies are necessary to protect young people from the harms of smoking.

In recent years, the widespread availability of Internet access has made web-based smoking cessation methods increasingly advantageous. Early studies explored diverse approaches to treatment delivery and user behavior. However, these studies often found that websites failed to fully incorporate recommended behavioral treatment elements for smoking cessation. For example, Bock et al. (2008) argued that websites offering direct treatment frequently do not fully implement treatment guidelines and neglect to leverage the interactive and personalized capabilities of the Internet. Consequently, they emphasized the need for further research to understand how to maximize the Internet's interactive potential to achieve and sustain population-based health behavior change.

In later years, a study on web-based tobacco cessation interventions by Taylor et al. (2017) concluded that some Internet-based interventions, especially interactive and tailored interventions, can help achieve smoking cessation in the longer term. Furthermore, as Web-based interventions have become more sophisticated, including better website design and improved functionality, the effectiveness of such interventions on smoking cessation has increased significantly (Graham et al. 2016). On the other hand, a comparison of Web-based cessation interventions with face-to-face counseling and quitline counseling suggests that these different methods have the potential to produce similar cessation outcomes (McCrabb et al. 2019).

Several studies suggest that educational software can positively influence adolescents' attitudes toward smoking and reduce their intentions to smoke. For instance, the Stanford Tobacco Prevention Toolkit study found that exposure to an educational session was associated with reduced intentions to try e-cigarettes among participants (Gaiha et al., 2021). De Graaf et al. (2016) compared the effectiveness of print versus audiovisual smoking education materials for low-educated adolescents in the Netherlands. While both modalities improved negative beliefs about smoking, video-based software led to a more negative attitude toward smoking at follow-up, suggesting that dynamic, audiovisual content may be particularly effective for attitude change. However, Park et al. (2017) noted that although participatory digital media production (e.g., creating anti-smoking videos) decreased intentions to smoke, the effect size was modest, indicating that engagement level may influence outcomes. In contrast, research by Cremers et al. (2015) indicated that web-based, computer-tailored feedback was not effective in altering Dutch adolescents' smoking intentions or behavior compared to providing no information.

Mixed evidence exists regarding the impact of educational software on actual smoking behavior. A meta-analysis by Song and Park (2021) examined the effectiveness of smoking prevention programs for young adolescents, which included web-based interventions. They found that school-based, high-intensity programs were more effective than standalone web-based programs in reducing smoking initiation, suggesting that digital tools may need to be integrated with in-person support for optimal behavioral impact. Similarly, Bashirian et al.'s (2021) study investigated the impact of web-based education on preventing hookah smoking in girls and revealed a potential for reducing smoking rates. Their results highlight the significant role of social influences, such as peer and family norms, in this behavior. However, their intervention did not significantly alter perceived behavioral control, indicating that other factors may also affect hookah smoking.

The effectiveness of educational software is influenced by several mediating factors, including program design, user engagement, and social context. Programs that incorporate theory-based approaches, such as the Theory of Planned Behavior (TPB) or Social Learning Theory, tend to yield stronger outcomes. For example, Lareyre et al. (2020), using TPB constructs, significantly impacted adolescents' attitudes and perceived behavioral control over smoking. Social influences, such as peer and family smoking behaviors, also play a critical role. Sajjadi et al. (2018) found that the quality of a boy's social network influences how family smoking impacts their potential for addiction in Iran. Educational programs tailored to local customs and cultural norms are recommended to address tobacco smoking within families. Furthermore, increased efforts to enhance adolescent mental health are necessary to prevent future substance use.

Based on the reviewed studies, ongoing advances in web technologies and web-based smoking cessation interventions, along with the broad reach and customizability of such technologies, indicate potential for future interventions to significantly improve current outcomes. Within this context, web technology advancements can enhance user experience, streamline content management, better integrate interactive elements, and incorporate diverse media types, such as videos and audio. Furthermore, the increasing prevalence of smartphones facilitates web access anytime and anywhere. Consequently, many websites now employ adaptive design optimized for mobile devices, enabling widespread engagement with target audiences. Overall, evidence suggests that websites incorporating interactive components can effectively support smoking cessation. Therefore, further research is necessary to optimize the effectiveness of web-based smoking cessation interventions using the latest technologies.

Researchers have conducted comparative studies on the effectiveness of web-based software. For instance, Severson et al. (2008) found in a randomized trial of 2,523 adults that participants in an interactive, adapted web-based intervention (Enhanced) had significantly higher smoking cessation rates compared to those in a more linear, text-based website (Basic). Similarly, Danaher et al. (2013) compared the effectiveness of two web-based programs for young people aged 14-25 seeking to quit smoking. While the interactive program showed significantly greater engagement, there was no significant difference in smoking cessation rates between the interactive and text-based programs. Another comparative study by An et al. (2010) examined the effectiveness of four tobacco treatment programs: clinic, work-site, phone, and web-based. However, Hutton et al. (2011) concluded that there is currently insufficient evidence to support the use of web-based interventions for smoking cessation in adults, and the evidence remains inconclusive for college students and adolescents.

Existing web-based smoking cessation studies are outdated and fail to fully utilize new web technologies. The effectiveness of these interventions yields mixed results. Comparative studies suggest that interactive environments in web-based smoking cessation software are effective. Testing the impact of an interactive, effective web-based application utilizing new web technologies will address this gap and contribute to the field. This study investigates the impact of web-based educational software developed to combat smoking addiction on the knowledge and positive emotional development of high school students.

## METHOD/MATERIALS

### Research Model

An experimental research model with a pretest/posttest single group design was employed to determine the effectiveness of an intervention using a systematic method under specified conditions (Tekin, 2000). This design tested the impact of educational software developed to combat smoking addiction on high school students' knowledge levels and positive emotional development. A measurement tool titled "For a Smoke-Free Life" was used to assess students' knowledge and emotional states regarding cigarette addiction. This scale was administered to all participants in the study group as a pre-test before the intervention and as a post-test after the intervention. The dependent variables were knowledge and mood, while the independent variable was the software.

### Working Group and Sample

The study group for this research comprised 10th-grade students attending high schools in Hatay/Turkey. The research sample consisted of 10th-grade students from Abdullah Sayek Anatolian High School, selected from high schools in the Iskenderun district of Hatay province. The study was conducted with two randomly selected 10th-grade classes from this school during the 2021-2022 academic year, totaling 61 participating students. Of these 61 students, 35 were female and 26 were male. Before the study, students were surveyed regarding their smoking history. The data is presented in Table 1. Fifty-one students reported never having smoked, five reported having smoked but quit, four reported smoking without regret, and one reported smoking but wanting to quit. Based on these findings, the majority of students in the study group had never smoked.

The sample size was calculated based on a power analysis using G*Power software, targeting a medium effect size (Cohen's d = 0.5, r= 0.3), a significance level of $\alpha = 0.05$, and a power of 0.80. This yielded a minimum required sample size of 47 participants. To account for potential attrition, we aimed to recruit a slightly larger sample (Durlak, 2009; Kang, 2021; Verma & Verma, 2020; G*Power, 2024).

Table 1: *Distribution of High School Students Participating in the Study by Smoking Status*

| Smoking Status | Girl | Male | Total |
|---|---|---|---|
| I've never smoked before. | 29 | 22 | 51 |
| I've smoked before. But then I quit. | 2 | 3 | 5 |
| I do not smoke. I don't regret it. | 3 | 1 | 4 |
| I do not smoke. But I want to leave. | 1 | 0 | 1 |
| **Total** | 35 | 26 | 61 |

## Data Collection Tool

The study used the "For a Smoke-Free Life" measurement tool to assess high school students' knowledge and emotional states regarding cigarette addiction. Developed by Büyüköztürk et al. (2019), the tool comprises 17 items and has a validated reliability coefficient of 0.84 using Cronbach's alpha. Of the 17 items, the first 12 measure knowledge, and the remaining 5 measure mood. The knowledge section, consisting of the first 12 items, offers three response options: true, false, and "No idea." Participants select "true" if they believe the statement is correct, "false" if they believe it is incorrect, and "No idea" if they lack the necessary information. Before analysis, correct answers to the 12 knowledge items were coded as 1, while incorrect answers and "No idea" responses were coded as 0. The last five items, which measure emotions, are structured using a five-point Likert scale. Adjective pairs are used to express emotions, and participants indicate their emotions by marking the adjective pair that best describes them. Sample items include: "Cigarettes are the most widely used addictive substance in the world" and "One of the immediate effects of smoking is the slowing of blood flow to the brain."

## Procedure

The experimental phase of the research was conducted in two 10th-grade classes. Initially, for each class, the "For a Smoke-Free Life" scale was administered as a pre-test. Subsequently, the CLNC software was presented to the students over two course hours. Following the presentation, the same scale was administered as a post-test. Finally, the data collected from the pre-test and post-test results were analyzed using the SPSS statistical program.

## CLNC Software

The CLNC educational software was meticulously developed by the researchers to serve as an engaging and informative tool for high school students regarding the perils of smoking. Recognizing the need for interactive and accessible health education resources, the researchers chose the Xerte platform, as the foundational technology for developing the CLNC. The Xerte's capabilities allowed for the creation of dynamic and user-friendly modules, ensuring that the educational content would capture and maintain the attention of its target audience.

The Xerte offers significant pedagogic advantages by enabling educators to create interactive, accessible, and engaging e-learning materials that promote active learning through diverse templates like quizzes and multimedia activities, catering to various learning styles and fostering deeper understanding. Its HTML5-compliant, accessible design ensures inclusivity for all learners, including those with disabilities, while supporting personalized learning through customizable content and adaptive assessments. Features like immediate feedback, collaborative authoring, and cross-platform compatibility (including offline and LMS integration) enhance formative assessment, learner autonomy, and collaborative learning, aligning with modern educational theories. Additionally, Xerte's open-source nature and reusable learning objects support scalable, sustainable curriculum design, making it a versatile tool for blended and remote education environments (Xerte, 2023).

The purpose of the CLNC software is to inform high school students about the harms of smoking, with the aim of preventing non-smokers from starting and supporting smokers to quit. The software employs methods to aid in smoking cessation. The software contains information on the addictive nature of smoking, harmful chemicals in cigarettes, the negative impact of smoking on human health, passive smoking, changes in the human body after quitting smoking, and methods to quit smoking. The content

is both informative and interactive, allowing users to test their knowledge. The educational software, CLNC, enhances the permanence and interest of the information that students learn.

The primary objective of the CLNC software is twofold: to proactively prevent non-smoking high school students from initiating cigarette use and to provide crucial support and information to students who are already smokers, encouraging them to embark on the journey of quitting. To achieve these goals, the software incorporates various evidence-based methods aimed at facilitating smoking cessation and fostering a comprehensive understanding of the risks associated with tobacco consumption.

The content within the CLNC is structured to deliver a broad spectrum of information related to smoking and its consequences. Key topics addressed include a detailed explanation of the addictive properties inherent in nicotine and cigarette smoking, a comprehensive overview of the numerous harmful chemicals present in cigarettes and their detrimental effects on the human body, an in-depth exploration of the wide-ranging negative impacts of smoking on overall human health, and a clear exposition of the dangers associated with passive smoking, highlighting its risks to non-smokers exposed to secondhand smoke. Furthermore, the software provides encouraging information regarding the positive physiological changes that occur in the human body after an individual quits smoking, underscoring the tangible benefits of cessation. Finally, CLNC offers practical guidance and outlines various methods and resources available to assist smokers in successfully quitting.

The pedagogical approach adopted in the development of CLNC emphasizes a balance between informative content delivery and interactive engagement. The software incorporates features that allow users to actively participate in the learning process, including opportunities to test their comprehension through quizzes and interactive exercises. This interactive element is strategically designed to enhance the permanence of the information acquired by the students and to foster a greater level of interest in the subject matter. By providing a dynamic and engaging learning experience, the CLNC educational software aims to maximize knowledge retention and encourage positive behavioral changes among high school students regarding smoking. Representative examples of the software's interactive pages are available for review, offering insight into its user interface and content presentation. Figures 1 through 4 provide sample screenshots of the software.
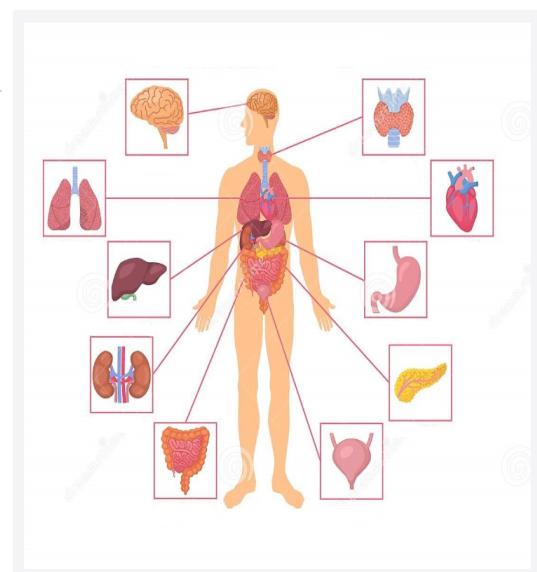


**Figure 1: The exercise of matching organs to diseases caused by smoking in CLNC courseware**

**Figure 2: Visual describing the difficulties experienced in quitting smoking in the CLNC curriculum**



**Figure 3: The exercise of matching the changes that will occur in our body when we quit smoking in the CLNC educational software to the time intervals**
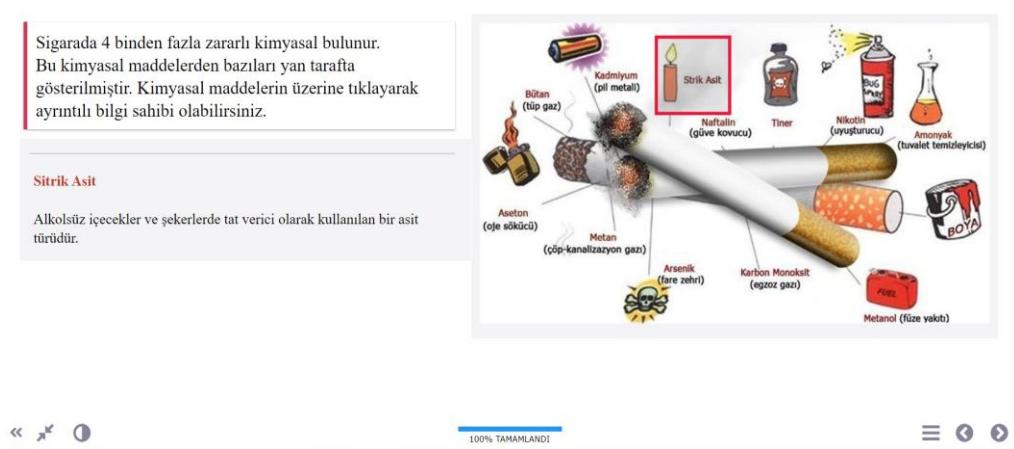
**Figure 4 : The visual that gives information about the chemical substances in cigarettes in the CLNC educational software**

## Analysis of Data

The data collected from the research was analyzed using the SPSS program. The information gathered from the measurement tool, which was used to assess the knowledge and emotional states of high school students regarding cigarette addiction, was entered into the SPSS program and analyzed accordingly. Initially, the Kolmogorov-Smirnov test was conducted to determine whether the data exhibited a normal distribution. The data were found to be non-normally distributed as a result of the test, so non-parametric tests were used. The Wilcoxon Signed Rank Test was used to determine if there was a significant difference between the pre-test and post-test results. Additionally, the r effect size value was used to measure the magnitude of the differences between the pre-test and post-test scores. This value supports the p-value and is interpreted as having a small effect if $r = 0.20$, medium if $r = 0.30$, and large if $r = 0.50$. The effect size r is calculated by dividing the Z statistic by the square root of the sample size (N) ($r = Z/\sqrt{N}$) (Fritz, Morris, & Richler, 2012; Field, 2005).

Effect size is used alongside the p-value because while the p-value indicates whether an observed effect is statistically significant (i.e., unlikely to have occurred by chance), it does not convey the magnitude or practical importance of that effect. Effect size quantifies how large or meaningful the effect is, helping researchers assess its real-world relevance. A statistically significant result can have a very small effect size, especially in large samples, and may not be practically meaningful. Therefore, reporting both p-values and effect sizes provides a more comprehensive understanding of research findings and is recommended by major reporting guidelines (Sullivan & Feinn, 2012).

## RESULTS

### Normality Test

The t-test, a parametric test, is employed to compare mean scores in related measurements. It assumes that the data follow a normal distribution (Field, 2005; Büyüköztürk, 2002). To verify this assumption for the study data, the Kolmogorov-Smirnov test was applied to the pretest-posttest difference scores, and a normality analysis was conducted. The results are presented in Table 2.

**Table 2:** *Kolmogorov-Smirnov and Shapiro-Wilk Test Results of Mood and Knowledge Scores*

|  | Kolmogorov-Smirnov | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
|  | statistic | df | Shallow. | statistic | df | Shallow. |
| **Mood Test** | 0.31 | 61 | 0.00 | 0.72 | 61 | 0.00 |
| **Knowledge Level Test** | 0.15 | 61 | 0.01 | 0.96 | 61 | 0.00 |

Upon examination of the results, it was found that the difference score between the emotion pretest posttest and knowledge pretest posttest scores had a significant p-value (p<.05), indicating that both distributions were non-normal. Therefore, the non-parametric Wilcoxon Signed Rank Test was used for the analysis instead of the paired groups t-test.

**Is there a significant difference between Knowledge and Emotion pre-test and post-test scores?**

A Wilcoxon Signed Rank Test analysis was conducted to determine whether there was a significant difference in students' knowledge and mood scores before and after the experiment. The results are presented in Table 3 and Table 4. The analysis indicates that there was no significant difference between the scores of the students who participated in the study on the emotion test before and after the experiment (z = -1.595, p > .05, r = - 0.20). However, a significant difference was found between the students' knowledge test scores before and after the experiment (z = -4.042, p < 0.05, r = - 0.52).

**Table 3:** *Wilcoxon Signed Rank Test Results of Knowledge Scores of High School Students Participating in the Research*

| Knowledge Test Pre-Test-Post-Test | N | Rank Average | Rank Sum | Z | P |
|---|---|---|---|---|---|
| Negative Rank | 8 | 22.94 | 183.50 | -4.04 | 0.00 |
| Positive Sequence | 39 | 24.22 | 944.50 | | |
| Equal | 14 | | | | |

**Table 4:** *Wilcoxon Signed Rank Test Results of Mood Scores of High School Students Participating in the Study*

| Mood Test Pre-Test-Post-Test | N | Rank Average | Rank Sum | Z | P |
|---|---|---|---|---|---|
| Negative Rank | 8 | 11.81 | 94.50 | -1.59 | 0.11 |
| Positive Sequence | 16 | 12.84 | 205.50 | | |
| Equal | 37 | | | | |

Considering the rank sums of emotion and knowledge difference scores, it is seen that this difference is in favor of positive ranks, in other words, posttest scores. As a result, it was shown that the program applied to quit smoking had a significant effect on increasing the knowledge level of students on this subject (r = 0.52), while it had a lesser effect on their emotions (r = 0.20).

**Do the mood and knowledge test results of the high school students participating in the research differ according to their gender?**

A Wilcoxon Signed Rank Test analysis was conducted to determine whether there was a significant difference between the pre- and post-mood and knowledge test scores of the students who participated in the study, based on their gender. The results are presented in Tables 5, 6, 7, and 8.

**Table 5:** *Wilcoxon Signed Rank Test Results of Mood Scores of Female Students*

| Mood Test Pre-Test-Post-Test | N | Rank Average | Rank Sum | Z | P |
|---|---|---|---|---|---|
| Negative Rank | 4 | 7.00 | 28.00 | -2.08 | 0.03 |
| Positive Sequence | 12 | 9.00 | 108.00 | | |
| Equal | 19 | | | | |

Upon examining Table 5, a significant difference is observed between the mood scores of female students before and after the experiment (z = -2.08, p < .05, r = -0.35). The rank sums of the pretest and posttest scores indicate that this difference is in favor of positive ranks, i.e., the posttest score. Based on the results, it can be concluded that the smoking cessation program has a significant impact on the emotions of female students, with an effect size above the medium level (r = 0.35).

**Table 6: *Wilcoxon Signed Rank Test Results of Female Students' Knowledge Scores***

| Knowledge Test Pre-Test-Post-Test | | Rank Average | Rank Sum | Z | P |
|---|---|---|---|---|---|
| Negative Rank | 3 | 13.33 | 40 | -3.59 | 0.00 |
| Positive Sequence | 24 | 14.08 | 338 | | |
| Equal | 8 | | | | |

Table 6 shows that there is a significant difference between the knowledge scores of female students before and after the experiment (z =-3.59, p <.05, r = 0.61). Considering the rank sums of the difference scores, it is seen that this difference is in favor of the positive ranks, that is, the posttest score. According to this result, it can be said that the smoking cessation program has a significant effect on increasing the knowledge scores of female students, and this effect is quite large (r = 0 .61).

**Table 7: *Wilcoxon Signed Rank Test Results of Male Students' Mood Scores***

| Mood Test Pre-Test-Post-Test | N | Rank Average | Rank Sum | Z | P |
|---|---|---|---|---|---|
| Negative Rank | 4 | 4.63 | 18.50 | -0.70 | 0.94 |
| Positive Sequence | 4 | 4.38 | 17.50 | | |
| Equal | 18 | | | | |

Table 7 shows that there is no significant difference between the mood scores of male students before and after the experiment (z =-0.70, p > .05, r = 0.14). Based on the rank totals of the mood pretest and posttest scores, it is evident that the difference favours the negative ranks, i.e., the pretest score. Therefore, it can be concluded that the smoking cessation program had an insignificant effect on the emotions of male students, with a very low effect size (r = 0.14).

**Table 8: *Wilcoxon Signed Rank Test Results of Male Students' Knowledge Scores***

| Knowledge Test Pre-Test-Post-Test | N | Rank Average | Rank Sum | Z | P |
|---|---|---|---|---|---|
| Negative Rank | 5 | 10.40 | 52 | -1.98 | 0.47 |
| Positive Sequence | 15 | 10.53 | 158 | | |
| Equal | 6 | | | | |

Table 8 shows that there is no significant difference between male students' knowledge scores before and after the experiment ($z = -1.99$, $p > .05$, $r = 0.39$). Based on the rank sums of the difference scores, it is evident that the positive ranks, i.e., the posttest scores, are higher. This result suggests that the smoking cessation program has a positive effect on increasing the knowledge scores of male students. However, this effect is not statistically significant.

## DISCUSSION

This study evaluated the effects of the web-based educational software CLNC on 10th-grade students' knowledge and mood levels related to cigarette addiction, as measured by the 'For a Smoke-Free Life' tool. This section compares and evaluates the data obtained from the research with similar studies in the literature. The research concluded that the educational software named CLNC had a positive effect on the knowledge level of high school students. The findings indicate that a brief, two-hour intervention significantly improved knowledge about smoking risks across all 61 participants, aligning with prior research on technology-based anti-smoking interventions for adolescents (Bashirian et al., 2021; Gaiha et al., 2021). The effectiveness of CLNC in enhancing knowledge supports the use of web-based platforms for delivering concise, scalable tobacco prevention education, particularly for 10th graders, a critical age group for preventing smoking initiation (Song & Park, 2021). The brevity and accessibility of CLNC make it a practical tool for integration into high school health curricula, especially in resource-limited settings where time-efficient interventions are essential.

Several other studies have also found results consistent with this study. For example, Doğan and Ulukol (2010) conducted a study on the effect of an anti-smoking education model on the smoking status and knowledge level of high school students, and reached a similar conclusion. They reveal that the implementation of an anti-smoking education program in schools would impact the smoking status and knowledge level of adolescents. Graham et al., in 2016, examined the effectiveness of web-based smoking cessation interventions in their research, which included randomized trials published from January 1990 to April 2015. They found that web-based applications that include smoking cessation exercises, self-assessment, games and online social interaction are effective in helping people quit smoking. In addition, based on meta-analysis by McCrabb et al. (2019) they argues that internet-based programs increased smoking cessation by an average of 29% in the short term (less than 6 months) and by an average of 19% in the long term (6 months or more). When web-based studies in the literature on cigarette addiction are examined, it is seen that many studies target adults who are addicted to cigarettes or that anti-smoking interventions for adolescents and children provide information about the harms of smoking. In this research, a comprehensive study was conducted for high school students by providing information about both the harms of smoking and techniques to help quit smoking with educational software, and smoking addiction was examined in a different dimension than other studies in the literature.

Surprisingly, as a result of the research, the educational software named CLNC had a positive effect on the mood levels of high school female students. However, it did not have any effect on the mood levels of male students. Considering the entire study group, it was concluded that the educational software named CLNC had no effect on the mood levels of high school students. Öztürk et al. reached a similar conclusion in a study they conducted in 2020. The effects of the Turkey's Addiction Struggle Program implemented by the Counselors in schools on the students' knowledge and emotional states of alcohol, tobacco, substance and technology addiction were examined. As a result of the research, it was determined that the Turkish Addiction Prevention Program showed positive progress in the knowledge and emotional states of the primary school students, but the students at the secondary and high school level showed a positive progress only in the knowledge dimension. Bektaş and Öztürk reached a similar conclusion in a study they conducted with primary school students in 2012. They developed a smoking prevention program for primary school students and evaluated the effectiveness of this program. As a result of the research, it was determined that the students had more information about the harms of smoking, but the rate of trying to smoke did not change.

This key finding on the gender-specific effect on mood also aligns with studies suggesting that female adolescents may respond more positively to emotionally engaging or narrative-driven health interventions (De Graaf et al., 2016). The mood enhancement in female students could be linked to CLNC's web-based format, which may incorporate interactive or relatable content that resonates more with female participants, potentially due to gendered differences in emotional processing or engagement with health messages (Park et al., 2017). Conversely, the lack of mood improvement in male students suggests that gender moderates the emotional impact of CLNC, consistent with research highlighting differential responses to health interventions based on gender-specific socialization or emotional expression norms (Sajjadi et al., 2018). This discrepancy underscores the need to explore how intervention design influences emotional outcomes across genders.

Gender roles may be the reason why this study had a positive effect on both the knowledge and mood levels of female students, while it was not effective on either the knowledge level or the mood level of male students. According to their gender roles, girls are raised to obey the rules and show their feelings, while boys are raised to be independent, strong and not show their feelings (Saygan & Uludağlı, 2021). According to social norms; Men are asked to answer each question correctly and make wise decisions. This norm causes men to not readily accept what they do not know. Also, men are not allowed to live and express their feelings much by society. When they express their feelings, they worry that they will be perceived as weak and they will not be respected (Demirel, 2016). In this study conducted in accordance with these social norms, male students, ignoring the information explained during the research process, assuming their answers to the pre-test are correct, and marking them again while answering the post-test, they may have hidden their true feelings or expressed them differently. In order for this study to be

effective on male students, it is necessary to change the perception of gender. It is imperative for men to recognize that the articulation of their emotions does not denote vulnerability and to acknowledge areas of limited knowledge.

Theoretically, these findings contribute to the Theory of Planned Behavior (TPB), which posits that knowledge and attitudes shape health-related intentions and behaviors (Lareyre et al., 2020). The significant increase in knowledge scores suggests that CLNC effectively enhances students' perceived risks of smoking, a key TPB construct, potentially influencing their intentions to avoid tobacco use. The gender-specific mood effect adds to the literature on tailored interventions, indicating that emotional outcomes may depend on alignment with adolescents' gender-specific needs or preferences (Bashirian et al., 2021). Practically, the results support the adoption of CLNC in 10th-grade health education programs to improve knowledge about cigarette addiction, with particular benefits for female students who experience both cognitive and emotional gains. For male students, schools may need to combine CLNC with supplementary strategies, such as participatory video production or peer-led discussions, to address emotional well-being alongside knowledge acquisition (Park et al., 2017).

## CONCLUSION LIMITATIONS AND RECOMMENDATIONS

In conclusion, the CLNC web-based intervention is an effective tool for improving 10th-grade students' knowledge about cigarette addiction, with additional mood benefits for female students. These findings highlight the potential of brief, technology-based interventions in adolescent tobacco prevention while emphasizing the need for gender-sensitive approaches to maximize emotional outcomes. Schools and public health practitioners should consider integrating CLNC into health education programs, while policymakers could leverage its scalability to support national anti-smoking initiatives. Future research should refine CLNC's design and application to ensure equitable benefits for all students, contributing to comprehensive tobacco prevention strategies.

In this study, a single-group pretest/posttest experimental research design was used. The most important threat in this design is the long time between the pretest and the posttest and the use of a less reliable measurement tool (McMillan & Schumacher, 1997). In this context, the time between the pretest and the posttest was kept short and a reliable measurement tool was used. However, this can be seen as two limitations of the study.

One of these limitations is that only because one group intervention method was tested on the knowledge levels and positive emotion development of high school students, other factors that possibly contributed to the decrease of smoking addiction still remain a possibility. To strengthen the evidence base for effective interventions, future research should incorporate control groups that do not receive the tested intervention. This would allow researchers to isolate the specific impact of the intervention by comparing outcomes between the intervention group and the control group, thereby accounting for the influence of extraneous variables. Furthermore, future studies could explore and compare the effectiveness of multiple intervention methods simultaneously, providing a more comprehensive understanding of the most impactful approaches to combating smoking addiction among adolescents.

Another limitation of this study is the short duration of the intervention. In this context, future studies include longitudinal follow-up (e.g., 1-month and 3-month post-intervention assessments) to better assess the long-term impact of the intervention. Investigating the long-term effects of such interventions and exploring the mediating factors that contribute to their success would also be valuable for developing sustainable and evidence-based prevention strategies.

Based on the findings of this study, the following suggestions are recommended for future studies: (1) In a study conducted by Emekdar et al. in 2017, it was determined that while the smoking rate of secondary school students was 17.3% in boys and 4% in girls, a total of 10.3%, this rate increased to 22% in total, 29.9% in boys and 7.1% in girls. In order to make more effective studies on smoking addiction and to prevent young people from starting smoking, studies on smoking addiction should be conducted not only for high school students but also for secondary school students, and these studies should be repeated from time to time., (2) When investigating the effectiveness of studies against smoking addiction, students from all high school types and all grade levels should be included in the study group. As a result of a study conducted by Kurtuluş et al. in 2016, it was stated that smoking habits of adolescents vary according to high school type, age and class level., (3) In order for the studies to be carried out against smoking addiction to be effective on male students as well, gender perceptions such as the fact that men's expressing their feelings are a sign of weakness and that they cannot easily accept what they do not know should be changed. To change gender perceptions schools can implement practices that promote emotional literacy, challenge stereotypes, and provide positive male role models. This includes integrating emotional education into the curriculum, offering peer support groups, using media and open discussions to question traditional masculinity norms, and training teachers and parents to reinforce healthy behaviors., (4) In order to protect students against smoking addiction, support from their families should be sought. The families of the students can be included in the study group of the research to be conducted. Particularly, the support of families should be sought in studies to be carried out on cigarette addicted students. In the development of emotion regulation skills of adolescents; The safe environment provided by families and their positive approach to their children's emotions have a significant impact (Atalar & Atalay, 2018)., and (5) A safe environment should be created so that students can answer the questions in the questionnaire correctly. Especially, smoking students can hide their smoking because they doubt the confidentiality of their answers.

## IMPLICATIONS

The findings indicate that the web-based CLNC software, delivered in just two course hours, significantly enhances 10th-grade students' knowledge about smoking risks, making it a practical and scalable tool for high school health education. For female students (n=35), CLNC also improves mood, suggesting its potential as a dual-purpose intervention to support both academic and emotional outcomes in this group. However, the lack of mood improvement among male students (n=26) underscores the need for gender-sensitive approaches in health education. These results contribute to health behavior theories by demonstrating the efficacy of brief, web-based interventions for knowledge acquisition and highlight gender differences in emotional responses to such programs. Schools should integrate CLNC into 10th-grade curricula to bolster anti-smoking education, particularly for female students, while exploring supplementary interventions for male students' emotional well-being. Future research should investigate the mechanisms behind CLNC's gender-specific mood effects and assess its long-term impact on smoking behaviors. Policymakers could leverage these findings to promote CLNC in national tobacco prevention strategies, ensuring equitable health education for all adolescents.

### Declaration of Conflicting Interests

The authors declare that there is no conflict of interest with any institution or person within the scope of the study.

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### Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

### Researchers' contribution rate

The authors contributed equally to all processes of the article. The authors have read and approved the final version of the article.

### Ethics Committee Approval Information

The authors declare that the work is written with due consideration of ethical standards. The study was conducted in accordance with the ethical principles approved by the Ethics Committee of Çukurova University Social Science Institution (Protocol No. 15 of 22.11.2021-E.246410).

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