Journal of Medical Science and Sports Health

JoMaSSH, 1 (2), 2025, p. 87-97

available online at https://journal.uny.ac.id/publications/jomassh
doi: 10.21831/jomassh.v1i2.1162

Type of Paper: Original Research

The Development of Health Promotion Media for the Prevention of Adolescent Smoking Behavior through Anti-Smoking Animation Video

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Article history:
Received: April 15, 2025
Revised: May 20, 2025
Accepted: May 31, 2025

How to Cite: Fitriani, I.; Trisnowati, H.; Djannah, S.N. (2025). The Development of Health Promotion Media for the Prevention of Adolescent Smoking Behavior through Anti-Smoking Animation Video. JoMaSSH, 1(2), 87-97. doi: 10.21831/jomassh.v1i2.1162

E-ISSN 3109-5666

Abstrak

Pendahuluan: Perilaku merokok masih menjadi permasalahan utama remaja di Indonesia. Hal ini dipengaruhi oleh berbagai faktor, mulai dari teman sebaya, orang tua, alasan psikologis, dan iklan promosi rokok di media sosial. Penelitian ini bertujuan untuk mengembangkan media promosi kesehatan berupa video animasi anti rokok. **Metode:** Menggunakan metode penelitian dan Pengembangan (R&D) level 4 melalui enam tahap: analisis potensi dan masalah, perancangan desain, validasi ahli, revisi desain, pembuatan produk, dan uji coba terbatas. Sebanyak 12 siswa berusia 12-13 tahun dari SMPN 18 Purworejo menjadi peserta uji coba terbatas tersebut. Validasi ahli dilakukan oleh 2 ahli materi, 1 ahli media, dan 1 ahli bahasa. Penilaian kelayakan dianalisis menggunakan skala Likert dan diklasifikasikan berdasarkan kategori tidak layak-sangat layak. Tidak ada determinan perilaku yang diukur karena masih dalam tahap uji coba terbatas. **Hasil:** Hasil validasi ahli menunjukkan persentase kelayakan yang tinggi, yaitu 91,11% (ahli pengendalian tembakau), 86.67% (psikolog), 73.33% (ahli media), dan 91.11% (ahli bahasa). Persentase kelayakan media dari hasil uji coba terbatas sebesar 89.33%, yang berarti media tersebut sangat layak untuk digunakan. Respon remaja terhadap video yang dikembangkan cukup positif mulai dari visualisasi, durasi, dan audio. **Kesimpulan:** Hasil ini memungkinkan video animasi digunakan sebagai media promosi anti rokok di kalangan remaja awal. Pengembangan karakter tokoh kartun dan animasi pahlawan menjadi saran dari calon pengguna untuk penelitian di masa depan dengan uji coba skala besar. Hal ini dimaksudkan agar efektivitas media dapat terukur dalam mencapai perubahan perilaku individu di berbagai wilayah di Indonesia.

Kata kunci: Media promosi kesehatan; Remaja awal; Pencegahan merokok; Perkembangan; Video animasi

Abstract

Introduction: Smoking behavior is still a major problem for adolescents in Indonesia. This is influenced by various factors, ranging from peers, parents, psychological reasons, and cigarette promotional advertisements on social media. **Methods:** This study aims to develop health promotion media in the form of anti-smoking animation videos. Using level 4 research and development (R&D) method through six stages: potential and problem analysis, design drafting, expert validation, design revision, product manufacturing, and limited trial. A total of 12 students aged 12-13 years from SMPN 18 Purworejo participated in the limited trial. Expert validation was conducted by 2 material experts, 1 media expert, and 1 language expert. The feasibility assessment was analyzed using a Likert scale and classified based on the inappropriate-very feasible category. No behavioral determinants were measured because it was still in the limited trial stage. **Result:** The results of expert validation showed a high percentage of feasibility, namely 91.11% (tobacco control expert), 86.67% (psychologist), 73.33% (media expert), and 91.11% (linguist). The percentage of media feasibility from the limited trial results was 89.33%, which means that the media is very feasible to use. Teenagers' responses to the developed video were quite positive starting from visualization, duration, and audio. **Conclusion:** These results allow animated videos to be used as anti-smoking promotional media among early adolescents. The development of cartoon characters and hero animation is a suggestion from potential users for future research with large-scale trials. This is intended so that the effectiveness of the media can be measured in achieving changes in individual behavior in various regions in Indonesia.

Keywords: *Animated video; Development; Early adolescence; Health promotion media; Smoking prevention*

1. Introduction

Based on the results of the Indonesian Health Survey in 2023, Central Java Province was ranked fifth with the highest prevalence of smoking in the past month in the population aged 10-18 years, which amounted to 9.6% (1). The Central Java Health Profile 2023 notes that out of 35 cities and/or districts, Purworejo Regency is ranked 16th with the highest prevalence of smoking at the age of 5 years and above during the last 1 month, which is 23.53% (2). The results of the National Socio-Economic Survey (Susenas) also reported that cigarettes became the commodity group with the 5th highest percentage of per capita expenditure (5.75%) in a month in 2023 (3).

Basically, adolescents are a vulnerable group that is the target of cigarette industry marketing. This is because at that age a person will be more impressionable, happy to try new things, and is in search of identity (4)**.** In the book of adolescent psychology by Sarwono, adolescent development is divided into three stages, namely early adolescence (aged 10-13 years), middle adolescence (aged 14-17 years), and late adolescence (aged 18-21 years). In the early adolescent stage, individuals will tend to develop new thoughts, have a high ego, and want to do anything themselves without involving parents. In other words, individuals begin to understand privacy and can already make decisions for themselves (5) including smoking behavior. In fact, cigarettes can cause blockage of blood flow, heart disease, kidney failure, cancer, tuberculosis, and death (6). Nicotine in cigarettes can also reduce memory and brain function. As a result, the individual's ability to solve problems is reduced, resulting in a decrease in learning achievement (7).

The high rate of adolescent smoking is influenced by many factors, such as knowledge, attitudes, parental influence, peer influence, psychological reasons, and cigarette promotional advertisements in various media. Want to looking cool, being accepted by peers, and the claim that cigarettes can relieve stress are the most common psychological reasons that arise in adolescents. Imitating surrounding people such as parents and peers is the most dominant factor. In addition, weak supervision of cigarette promotional advertisements also participates in this case (8).

The 2019 *Global Youth Tobacco Survey of* the Indonesian Ministry of Health reported that at least 8 out of 10 students or around 78.9% knew anti-smoking messages in various media. However, of the 9,992 students in grades 7-12 who took part in the survey, only 39.4% thought not to smoke after seeing anti-smoking advertisements (9). This means that there are still 61.6% more students to reach. This is in line with the results of a preliminary study conducted in June 2024 where smoking was the highest problem at SMPN 18 Purworejo. Meanwhile, the most preferred media is animated video. Of the 33 students selected randomly, 24 students stated smoking as the main problem and 24 students chose animated videos as the preferred health promotion media because of the combination of moving images and sound so that it is not monotonous. In addition, the phenomenon of smoking at an early age at both junior high school and elementary school levels is considered normal, especially in rural communities, so it is often underestimated.

The different learning abilities of students make animated videos a practical choice because they are audiovisual, where sound elements and moving images can be displayed simultaneously. This media if technology-based will be a good alternative in optimizing the educational process because of several advantages including: easy to package, interesting, can be improved at any time, to the ability to combine two learning styles (audio/hearing and visual (seeing) (9)(10). The more senses involved, the better the absorption of information obtained. Thus, knowledge and behavioral intentions in individuals will increase (11).

Mc Guire's 1976 persuasive communication model states that there are six stages that individuals will go through to behave with an *input-output* framework. The delivery of messages using certain channels the *input* initiated in this study as it relates to health promotion media. Health messages contained in the media will be channeled to the audience for further attention, understanding, approval, and storage, and doing (behavior) (11). Although schools have been designated as smoke-free areas by the Indonesian government, the fact is that there are still very few of them that intensify education on the dangers of smoking specifically, including at SMPN 18 Purworejo. This has an impact on the lack of support in efforts to prevent smoking behavior in school residents,

especially students who are vulnerable groups. Therefore, this study aims to develop anti-smoking health promotion media in the form of animated videos as input in persuading early adolescents to be able to maintain their lifelong non-smoking behavior.

2. Materials and Methods

2.1 Study Design

This research uses Borg & Gall's (1989) level 4 Research & Development (R&D) method which includes the stages of potential and problem analysis, media design, expert validation, design revision, product manufacturing, and limited trials as in Figure 1. Okpatrioka (2023) (12)mentions that R&D products will go through a series of field trials and validation tests by experts. In addition, R&D is comprehensive and prioritizes continuous product innovation. In other words, the durability value of the product is good enough so that it is expected to always answer current needs.

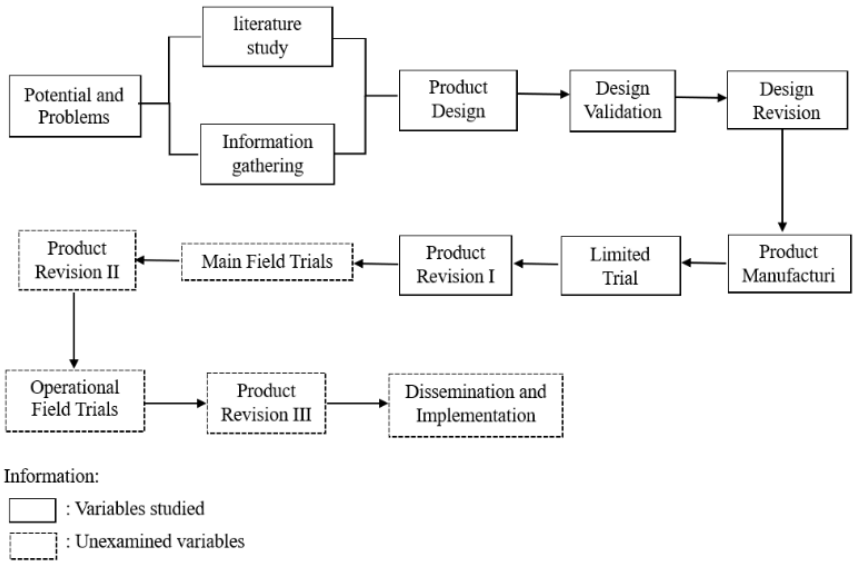

Figure 1. Research Scheme

The research subjects involved 12 adolescents at SMPN 18 Purworejo Jl. Raya Pituruh-Kemiri No.KM.1, Dukuh Lor, Kerep, Kec. Kemiri, Purworejo Regency, Central Java with criteria: 12-13 years old, have never smoked at all (especially in the last 1 month), willing to be an informant. The number of subjects was based on the principle of limited trials conducted in 1-3 schools with 6-12 subjects (13). The maximum number was chosen so that the data obtained varied because it was only done in one school. The research took place in December 2024 - February 2025.

2.2 Ethical Statement

This study received ethical approval from the Ahmad Dahlan University Research Ethics Committee, with Ethical Clearance Number: 012411347 on December 4, 2024. All participants have been explained the purpose of the study and given informed consent before participating.

2.3 Materials

The main materials in this study are: health promotion media in the form of animated videos, Guttman scale questionnaire (for potential and problem analysis), and Likert scale questionnaire (for expert validation and pilot test).

2.4 Procedures

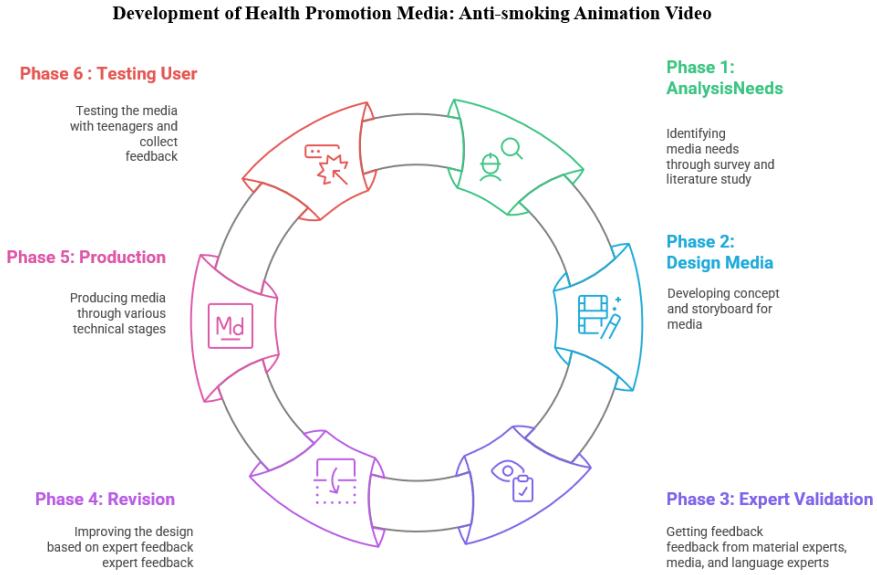

Figure 2. Research Procedure
Source: Researcher, 2024

2.4.1 Potential and Problem Analysis (Needs Identification)

Identification of the needs for health promotion materials and media began with the distribution of questionnaires through google form in June 2024. Literature studies on global adolescent smoking profiles (CDC), Indonesian adolescent profiles, SKI reports, Central Java Province BPS reports, and Purworejo District BPS reports were also conducted during June-September 2024. Results showed that smoking was the main problem with animated videos as the most preferred health promotion media by adolescents.

2.4.2 Media Design

At this stage, concept and storyboard development was carried out in October-November 2024. The material outline and complete storyboard were the output. After that, the design of the video elements including characters was made in November 2024.

2.4.3 Expert Validation

The expert validation stage was carried out by filling out a questionnaire during November-December 2024 which included assessments from material experts (psychologists & tobacco control activists), media experts (videography & animation lecturers), and linguists (junior high school Indonesian teachers).

2.4.4 Design Revision

The animated video design that has been validated is then improved according to the experts' suggestions until December 2024-January 2025.

2.4.5 Product Manufacturing

The animated video is revised and produced through the stages of animating, inking, coloring, composting, dubbing, and rendering. The final product that has been rendered becomes the output at this stage. Furthermore, a second expert validation test was conducted to get the categories of "feasible to use" and "very feasible to use."

2.4.6 Limited Trial

The limited trial was conducted on 12 teenagers at SMPN 18 Purworejo in February 2025. The feasibility assessment of the animated video media was carried out using a Likert scale and a brief description for criticism and improvement. The development of other characters in the anti-smoking video animation was a suggestion made by the research subject.

2.5 Statistical Analysis

The results of the expert validation and limited trial were analyzed using a five-point Likert scale and processed with Microsoft Excel. The percentage score was calculated using the following formula: Score = (Total score obtained / Maximum possible score) × 100%. The resulting percentages were then interpreted based on predefined media feasibility criteria. A score below 21 percent indicated that the media was very unfeasible, while scores between 21 and 40 percent were categorized as not feasible. Scores ranging from 41 to 60 percent were considered moderately feasible, and those between 61 and 80 percent were classified as feasible. Scores between 81 and 100 percent indicated that the media was highly feasible. These categories are presented in Table 1, which outlines the media feasibility classification system.

3. Results

3.1 Characteristics of Experts and Potential Users

The animated video media developed by researchers involved 2 material experts, 1 media expert, and 1 language expert. A total of 12 potential users (early adolescents) at SMPN 18 Purworejo became research subjects in a limited trial to assess the feasibility of the media quantitatively and provide criticism using narratives as qualitative data. The characteristics of experts and adolescents are presented in **Table 1** and **Table 1**.

Table 1. Expert Characteristic

Expert Characteristics		Frequency (n= 4)	Percentage (%)
Age	26-40 years	1	25
	41-60 years	3	75
Gender	Male	1	25
	Female	3	75
Education	S1	0	0
	S2	3	75
	S3	1	25
Jobs	Teacher	1	25
	Lecturer	3	75
Status	Material expert	2	50
	Media expert	1	25
	Language expert	1	25

Source: Primery Data, 2024

Based on **Table 1**, it can be seen that the experts in this study were dominated by 41-60 years old (75%), female (75%), master's degree (75%), and working as a lecturer (75%). Of the 4 experts, only the material expert had the highest number (50%) because the material in the animated video developed by the researcher was assessed in terms of tobacco control and adolescent psychology.

In **Table 2** shows, it can be seen that potential users (adolescents) are dominated by those aged 13 years, namely 9 people or 75%. Based on gender distribution, the number of adolescents is equal between females and males (no one is the most). Meanwhile, the status of smoking-related interventions had previously been received by 8 people (66.67%).

Table 2. Characteristics of Potential Users (Teenagers)

Expert		Characteristics	Frequency (n= 12)
Age	12 years	3	25
	13 years	9	75
Gender	Male	6	50
	Female	6	50
Previous Intervention Status	Not	4	33,33
	Yet	8	66,67

Source: Primery Data, 2024

3.2 Potential and Problem Analysis

The analysis of potential problems served as the foundation for developing the script and designing the animated video media. In this study, field data were obtained by distributing a needs assessment questionnaire via Google Forms, while additional insights were gathered through a review of relevant secondary literature sources. **Figure 3** indicate that, out of 30 students at SMPN 18 Purworejo, 24 identified smoking as the primary health issue and selected animated video as their preferred medium for education and anti-smoking health promotion.

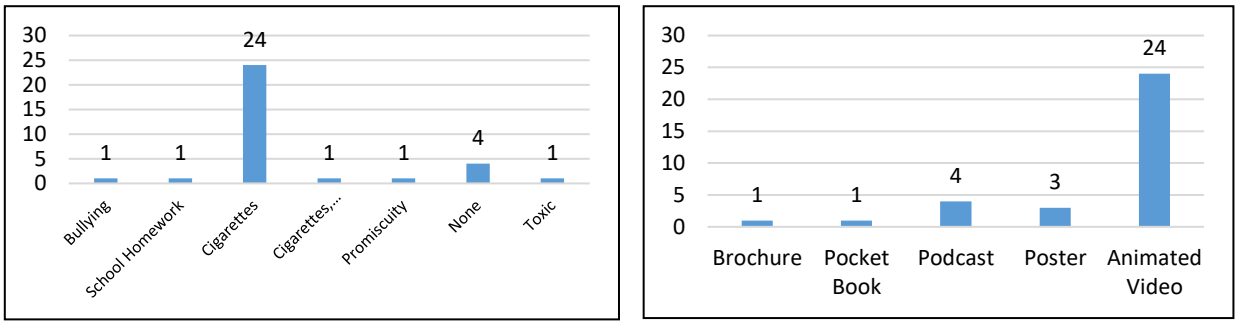

Figure 3. Material and Media Needs Analysis

3.3 Media Design

3.3.1 Script and Storyboard Creation

The first step in the media development process was creating a script that outlined the narrative structure of the animated video. The content was compiled based on seven thematic outlines sourced from WHO infographics, pocketbooks issued by the Indonesian Ministry of Health (Kemenkes RI), and relevant scientific literature. These themes included the types of cigarettes, factors influencing smoking behavior (behavioral determinants), the health risks of smoking for active smokers, the mechanisms of nicotine addiction, the dangers of passive smoking, the impact of smoking on academic performance, and strategies for smoking prevention. Following the script development, a storyboard was created to outline the estimated duration, visual scenes, audio components, applied effects, and scene groupings.

3.3.2 Character, Property, and Location

Character design was carried out using the Canva Pro application, resulting in four junior high school characters from grades VII and VIII: Luna (female), Rasya (male), Reza (male), and Rio (male). Luna is portrayed as Rasya's younger sister and a seventh-grade student, while the other three characters are friends in eighth grade. At this stage, various props such as books, lighters, bags, and vapes were also designed and assigned to specific scenes, along with the location settings for each character.

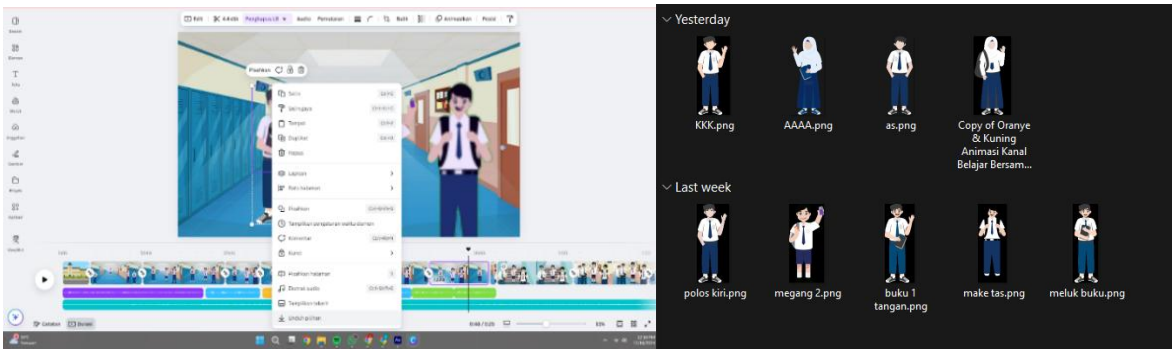

Figure 4. Illustrates The Media Design

3.3.3 Animation

Once the characters were finalized, they were enhanced with sound effects, background and foreground visuals, as well as key poses to define movement. Before introducing the interaction between characters, the animation opens with a depiction of the area in front of the school building, transitioning to an interior scene in the hallway near the library. The character animations were created using Adobe After Effects software.

3.4 Validations and Revisions

After the animated video design was finalized, expert validation was conducted involving specialists in tobacco control, psychology, media, and language. Each expert provided assessments both quantitatively through scoring and qualitatively through written feedback and suggestions. The psychologist conducted only one round of evaluation, as the initial assessment already met the "very feasible to use" category. The final feasibility percentages for the material, media, and language components were derived from the most recent evaluations, as illustrated in **Figure 5.**

Figure 5 presents the distribution of feasibility percentages from the expert validation tests. Both the tobacco control expert and the language expert rated the media at 91.11% feasibility. The psychologist provided a slightly lower rating of 86.67%, while the media expert assessed the media at 73.33%. Prior to the second round of expert validation, revisions were made based on the feedback provided in the initial assessments. In general, the modifications included removing speech balloons, adding content related to strategies for avoiding smoking, revising the material on the health impacts of smoking, incorporating additional animation elements, and including source references within the video.

Figure 5. Media Eligibility Percentage Distribution Graph

3.5 Product Manufacturing

3.5.1 Animating, Inking, and Coloring

Once the necessary revisions were completed, the product entered the development phase, which involved animating, inking, and coloring. Characters that had been previously designed using Canva Pro were digitally colored and enhanced with visual emphasis, including specific effects to strengthen character expression.

Following this, the characters were animated using Adobe After Effects to create movement, particularly in the head and hand regions as seen in Figure 6.

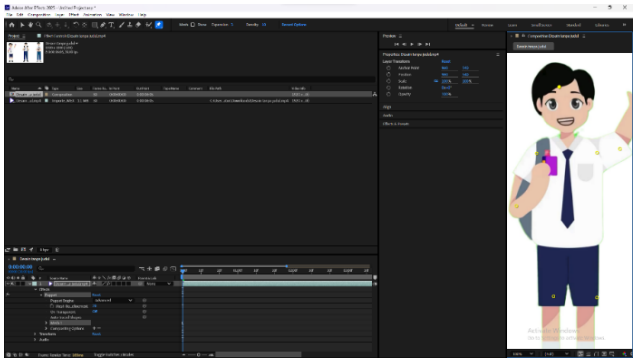

Figure 6. Product Development of Anti-smoking Animation Video

3.5.2 Compositing, Dubbing, and Rendering

After the animation, inking, and coloring phases were completed, the video proceeded to the compositing stage. Audio elements, including character voices and narration, were added using Kinemaster Diamond and Canva Pro software. To streamline the process, recorded audio clips were merged through the Kinemaster Diamond application before being integrated into the visual composition in Canva. This process was repeated as needed until the optimal composition was achieved. Once all visual and audio elements were finalized, the completed video was exported in MP4 format through the rendering process, marking the final stage of post-production.

3.6 Limited Trial

To assess media feasibility in a limited group, the researchers distributed 10 statement items evaluated using a Likert scale, with a maximum total score of 600. The informants' assessments resulted in a score of 536, corresponding to a feasibility percentage of 89.33%. This indicates that the animated video is considered highly feasible for use. In terms of duration, visual appeal, and audio quality, the video was deemed sufficient. However, a recommendation for future improvement emerged from this group—namely, the addition of more characters to enrich the video content. The feasibility percentage was calculated using the following formula: Media feasibility percentage = (536 / 600) × 100% = 89.33%

4. Discussion

The development of the anti-smoking animated video in this study was based on an analysis of content and media needs specific to early adolescents at SMPN 18 Purworejo. Although various anti-smoking media for adolescents already exist, the uniqueness of this study lies in its focus on early adolescents who have never smoked. The aim is to help these individuals maintain their non-smoking behavior and enhance their understanding of the dangers of smoking. In this context, the media serve as an essential tool to optimize the delivery of health messages and play a key role in the broader framework of health promotion.

In 2022, Imron emphasizes the importance of aligning media formats with the characteristics of the target audience to ensure effectiveness (14). Specific design elements, including color combinations, language use, clarity and depth of material, illustrations, and the choice of font type and size, must all be tailored to the needs of the intended viewers to successfully capture their attention and support message retention(15). Addressing the issue of smoking, the Chair of the Special Agency for Cigarette Control under IAKMI, reported a 240% increase over the past decade in first-time smokers among elementary and junior high school students. This alarming trend underscores the need for early prevention strategies targeting the younger generation (16). To support this effort, animated videos have been developed as health promotion tools aimed at raising awareness and reinforcing intentions not to smoke.

In health promotion, the media is inseparable from message delivery. Its role is not only to make messages more attractive and accessible but also to serve as a catalyst for behavioral change. Health messages in video format can take many forms, such as dramas, fictional narratives, or depictions of everyday situations, all of which are useful for influencing attitudes. The video developed in this study reflects current trends showing that video-based content generates higher engagement than static formats like text, links, or images (17).

Importantly, persuasive health communication must go beyond the mere transfer of information. It must aim to create lasting behavioral change. McGuire's communication model identifies attention as the first step in this process, followed by comprehension, trust, and behavioral intention (18). The animated video produced in this study functions as the input or channel designed to attract adolescents' attention and encourage them to avoid smoking, both within and beyond the school environment. Following the product design, the development phase included expert validation and limited trials. Expert validation plays a critical role in providing informed feedback and ensuring that the product is suitable before its application in the target population. This study involved both media and content experts. Their evaluations led to several revisions, culminating in a product deemed ready for use (19). Validation can be conducted through quantitative, qualitative, or mixed methods. In this context, experts with specialized knowledge contributed to the quality assurance of both the content and technical aspects of the media. Material validation focused on the accuracy and relevance of the content, while media expert evaluation examined production quality and technical integrity (20). These assessments were carried out using structured questionnaires (21) and analyzed using a Likert scale ranging from 1 to 5.

The results align with prior research by (22) who also developed animated health promotion videos on the benefits of vegetable consumption and reported feasibility scores above 70% for content, media, and language. Similarly, a study involving an animated solar system video achieved media feasibility of 82.40% and material feasibility of 79.16%. Based on these findings, the anti-smoking animated video developed in this study can be considered valid and appropriate for use among early adolescents in Purworejo Regency.

At the limited trial stage, the validated and revised product was tested on a group of 6 to 12 students in one to three schools as a preliminary step before broader implementation (23). Previous research tested the "Ungkapan Arina" animated video for Indonesian language learning and received over 80% approval from both teachers and students, confirming its practicality and feasibility (24). Similarly, learning animations addressing smoking-related content in previous studies showed excellent outcomes, echoing the successful trial results observed in the current study (25). The impact of three health message formats—visual, quiz, and text—on adolescents' perceptions of electronic cigarettes was studied in 2021 (26). The findings revealed a preference for visuals and quizzes over text-only formats. Moreover, messages focusing on chemical dangers and health consequences were more effective than those centered on nicotine alone. This supports the theory that persuasive communication, as outlined by McGuire, leads to cognitive, emotional, and behavioral change

This research frames health messaging through an individual and family-oriented lens using audiovisual media. It covers essential themes such as behavioral determinants, health risks, academic impacts, and social labeling. The animated video serves as a persuasive channel aimed at reinforcing adolescents' commitment to a smoke-free lifestyle. Understanding these behavioral determinants allows researchers to tailor content that effectively promotes cognitive engagement and assertive decision-making.

Schools as one of the smoke-free areas certainly have a strategic role in efforts to prevent smoking behavior from an early age. However, there are still many schools that have not massively provided specific anti-smoking health education. In this case, integrating tobacco control into the school curriculum is needed. This animated video can be the first step in initiating school-based smoking behavior prevention by playing it during counseling lessons. Various criticisms and suggestions in the development of design and materials resulted in a better product with complex information. In order to reach a wider and more inclusive target in the smallest areas, the animated video is saved in mp.4 format and can be distributed offline via flashdisks so that it can be watched together without internet access. Measurement of knowledge and attitude impact can

be done through interactive quizzes, while behavior change can be measured descriptively through logbooks collected at the end of each month.

5. Conclusions

This study developed a 6-minute and 12-second animated video as a health promotion medium, informed by a needs analysis and literature review. The content addresses evidence-based topics including cigarette types, behavioral determinants, health risks for active and passive smokers, addiction mechanisms, academic impact, and prevention strategies. Expert validation, conducted twice through qualitative and quantitative approaches, yielded feasibility scores of 91.11% for tobacco control material, 86.67% for psychological content, 73.33% for media design, and 91.11% for language. A limited trial produced an overall feasibility score of 89.33%, with suggestions to expand character diversity. These findings highlight the need for collaboration between educational institutions and government bodies to integrate tobacco control into junior high curricula, aiming to prevent early smoking behavior and reduce the burden of tobacco-related disease. Future research should involve professional animation teams to enhance development and support broader field testing.

Acknowledgments: Authors would like to thank the Faculty of Public Health of Ahmad Dahlan University and all the education staff of SMPN 18 Purworejo.

Author Contributions: The first author was involved in drafting the research proposal, collecting data in the field, processing and analyzing data, and writing the scientific article. The second and third authors provided scientific guidance and supervision during the research process, particularly in formulating the research questions, determining the methodology, validating the instruments, reviewing the analysis results, and writing the article.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Informed Consent Statement: Researchers gave informed consent to teenage subjects and school counselling guidance teachers. In a research permit along with Ethical Approval was also given to the Principal of SMPN 18 Purworejo.

List of Abbreviations

R&D : Research and Development
Susenas : Survei Sosial Ekonomi Nasional
SMPN : Sekolah Menengah Pertama Negeri
IAKMI : Ikatan Ahli Kesehatan Masyarakat Indonesia

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