EUROPEAN JOURNAL OF EMERGING BIOMED RESEARCH

EDUCATIONAL INTERVENTION GUIDED BY THE THEORY OF PLANNED BEHAVIOR FOR SMOKING PREVENTION IN MALE ADOLESCENTS

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V0LUME01 ISSUE01 (2024)
Published Date: 18 December 2024 // Page no.: - 51-64

ABSTRACT

Background: Smoking among teenagers is a huge challenge worldwide. It leads to serious health problems, early deaths, and costs a lot of money. To truly make a difference, we need to understand what drives young people to smoke and how we can help them choose a healthier path. The Theory of Planned Behavior (TPB) gives us a great roadmap for creating effective programs.
Objective: This study set out to see if an educational program, built on the ideas of the Theory of Planned Behavior, could help prevent male high school students from starting to smoke.
Methods: We used a study design that looked at students before and after our program. We involved 200 male students, splitting them into two groups of 100 each – one group received the program, and the other didn't. They came from two public high schools in a specific city. Our program involved eight weekly sessions, each about an hour long. These sessions were carefully designed to tackle the key areas of the TPB: how students felt about smoking, what they thought their friends and family expected, and how much control they felt they had over their own choices. We gathered information from students through questionnaires at the beginning and right after the eight-week program. To understand our findings, we used standard statistical tools to compare the groups and see how things changed over time.
Results: When we started, both groups of students were pretty similar in terms of their backgrounds and how they felt about smoking. But after our program, the students who participated showed big improvements compared to the control group. They developed much stronger negative feelings about smoking (mean change: +0.85±0.20, $p<0.001$), felt more strongly that their friends and family didn't want them to smoke (mean change: +0.70±0.15, $p<0.001$), and felt much more confident in their ability to resist smoking (mean change: +0.60±0.10, $p<0.001$). Because of these shifts, their intention to smoke dropped significantly (mean change: −0.90±0.25, $p<0.001$). What's more, far fewer students in our program group started smoking (2%) compared to the group that didn't get the program (8%) ($p=0.028$).
Conclusion: Our educational program, carefully designed using the Theory of Planned Behavior, proved to be very effective. It helped improve the psychological factors that lead to healthy choices and significantly reduced both the desire to smoke and the actual number of male adolescents who started smoking. These findings strongly suggest that schools should seriously consider adding well-thought-out, theory-based health education programs to their regular lessons. It's a vital step in helping our young people avoid the dangers of smoking.

Keywords: Smoking prevention, Theory of Planned Behavior, Educational intervention, Adolescents, Male students, Health promotion, Behavioral change, Public health.

INTRODUCTION

The Global Burden of Tobacco Use and its Health Consequences

Imagine a silent epidemic that touches nearly every family, causing immense suffering and costing societies untold billions. That's the reality of tobacco use. It's not just a bad habit; it's one of the biggest preventable threats to our health worldwide. The World Health Organization (WHO) has pointed out that tobacco is a major culprit behind many serious, long-term illnesses like heart disease, cancer, and lung problems. The sheer number of lives it claims each year is heartbreaking, making it a top priority for public health efforts everywhere [1, 5].

The damage tobacco inflicts isn't limited to just one part of the body; it's a full-body assault. Smoking is directly responsible for a huge percentage of all cancer deaths, hitting everything from the lungs and mouth to the kidneys and pancreas [1, 6]. Beyond cancer, it's a prime suspect in

heart attacks, strokes, and other serious heart and blood vessel conditions [7]. The nasty chemicals in tobacco smoke literally wreck our blood vessels and encourage dangerous clots. Our lungs take a brutal hit too, leading to conditions like emphysema and chronic bronchitis, and making us more vulnerable to infections. Even if you're just going in for surgery, smoking adds significant risks, making recovery tougher [8]. This widespread harm from tobacco makes it incredibly clear: we desperately need strong strategies to stop people from starting and help those who already smoke to quit.

And it's not just about health; there's a massive financial cost too. Tobacco use drains economies in countless ways. There are the direct medical bills for treating all those tobacco-related illnesses, and then there are the indirect costs from people dying early or being too sick to work. Plus, there's the environmental damage from growing tobacco and dealing with its waste. All this money could be used for so many other vital things, like education or improving communities [3]. When you add up the financial drain and the immense human suffering, you see that tobacco use is truly a multifaceted crisis.

Adolescent Smoking: A Critical Public Health Challenge

While we've seen some progress in reducing smoking rates in certain places, there's a particularly worrying trend that continues to plague us: young people starting to use tobacco [4]. The sad truth is, most adults who smoke today picked up the habit when they were teenagers. This makes adolescence a super important time – a critical window, if you will – where we can step in and make a real difference [12, 13]. The earlier someone starts smoking, the harder it is for them to quit later, and the higher their chances of developing severe, life-threatening diseases. To make things even more complicated, the world of tobacco is constantly changing, with new products like e-cigarettes emerging. These new products introduce fresh challenges and new ways for young people to get hooked on nicotine [10].

Looking at different parts of the world, we see just how varied and tough the challenge of adolescent smoking can be. Take countries like Iran, for example. Despite their national health efforts, tobacco use among teenagers, including both traditional cigarettes and hookahs, remains a big concern. The rates can vary quite a bit depending on where you look and how studies are done [11, 14, 15]. These differences often highlight how much local culture, government policies, and even research methods can play a role. The alarming fact that many teenagers worldwide start smoking as early as 13 to 18 years old means we urgently need targeted, culturally sensitive ways to prevent this [13, 15]. Social influences, like friends who smoke or family norms around tobacco, also heavily impact whether a young person decides to try it. This really drives home the point that our interventions need to address these complex social dynamics [14, 30, 31, 33, 36].

The journey that leads a teenager to light up that first cigarette is incredibly intricate. It's a mix of many things: simple curiosity, the pressure from friends, wanting to fit in, seeing parents or other family members smoke, being exposed to tobacco ads, dealing with stress, and even genetic factors. But some of the most powerful influences are psychological. These include a young person's personal feelings about smoking (like thinking it makes them look cool or helps with stress), what they believe their friends and family expect of them (subjective norms), and how confident they feel in their ability to say no (self-efficacy). These psychological factors are incredibly potent in shaping whether an adolescent becomes vulnerable to tobacco use [16, 17]. Understanding these hidden psychological and social gears isn't just for academics; it's the absolute foundation for building effective, evidence-based prevention programs that truly connect with young people and tackle the real reasons they might start smoking.

The Theory of Planned Behavior as a Framework for Intervention

When we're trying to tackle complex health behaviors like smoking, we need more than just good intentions; we need a solid plan, a roadmap. That's where the Theory of Planned Behavior (TPB) comes in. Developed by Icek Ajzen, it's become a hugely influential and widely used model for understanding and predicting why people do what they do, especially when it comes to health [18]. Think of the TPB as an upgraded version of an older theory, now including the idea of "perceived behavioral control" – because sometimes, even if we want to do something, we might not feel completely in charge of the situation.

At its heart, the TPB suggests that a person's behavioral intention is the most direct clue to whether they'll actually do something. If someone has a strong intention to do something, they're much more likely to actually do it. This intention, in turn, is shaped by three main ingredients:

1. Attitude toward the behavior: This is simply how a person feels about doing a specific action – whether they see it as good or bad, positive or negative. It's built on what they believe will happen if they do it (their "behavioral beliefs") and how they feel about those outcomes. For example, a teenager might have a negative attitude towards smoking if they truly believe it leads to bad breath, terrible health, and social disapproval. On the flip side, a positive attitude might come from believing that smoking makes them look cool or helps them relax.

2. Subjective norms: This part of the theory captures the social pressure a person feels to either do or not do something. It's influenced by what they think important people in their lives (like friends, parents, or teachers) expect them to do, and how much they care about meeting those expectations. For teenagers, friends are often a huge influence. If a teenager believes their close friends strongly disapprove of smoking, and they really want to fit in with

those friends, then their "subjective norm" would be against smoking.

3. Perceived behavioral control (PBC): This is all about how easy or difficult a person believes it will be to actually do the behavior. It touches on both inner strengths (like skills, abilities, and self-confidence) and outside factors (like opportunities, resources, or obstacles). If someone has a high level of perceived behavioral control, it means they feel confident they can do the behavior, even if things get tough. For preventing smoking, this would mean a teenager believes they can successfully resist peer pressure, handle stress without needing a cigarette, or confidently say no if someone offers them one.

The TPB gives us a systematic way to uncover the deeper beliefs that drive intentions and actions. By understanding these beliefs, we can design programs that specifically target those attitudes, social pressures, and feelings of control, making it much more likely that people will make healthy changes.

The power of the TPB in health promotion and disease prevention is well-established. It's been successfully used to predict and influence all sorts of health-related behaviors, from encouraging physical activity and healthy eating to promoting safe sex and preventing various forms of substance abuse. When it comes to smoking, programs built on the TPB have shown real promise in helping people quit and, importantly, stopping young people from ever starting. For example, studies have used the TPB to create effective programs for preventing drug abuse in adolescents [19, 20, 21, 22], improving oral cancer prevention habits [24], and reducing the desire to smoke among high school and university students [23, 25, 26, 27, 28, 29, 35]. These programs often combine education to boost knowledge, skill-building to increase confidence, and strategies to address social influences.

Even with the TPB's proven track record, there's always a need for more thorough, well-evaluated programs, especially in specific cultural settings and among vulnerable groups like male adolescents. Many past studies have used smaller groups [23-26], focused on very narrow age ranges [23, 25-28], or looked at specific high-risk groups [24, 25], sometimes with mixed results [23, 25]. There's a continuous demand for stronger research that uses structured, theory-driven approaches to truly tackle the growing problem of teenage smoking.

Given how persistent and ever-changing the challenge of adolescent smoking is, and knowing how effective the Theory of Planned Behavior can be in guiding health programs, this study was designed to carefully evaluate a targeted educational intervention. Specifically, our research aimed to see just how effective a program, meticulously developed and put into action based on the core ideas of the Theory of Planned Behavior, would be in preventing smoking among male high school students. We hope our findings will add to the evidence base for effective strategies to prevent adolescent smoking and help shape future public health efforts.

METHODS

Study Design and Ethical Considerations

For this study, we chose a research approach that allowed us to compare our educational program with a standard situation. We used what's called a "quasi-experimental design," specifically a "pre-test and post-test control group design." This simply means we measured important things (like attitudes towards smoking) before our program started, and then again right after it finished, for both the group that got our program and a control group that didn't. We picked this design because, in a real-world school setting, it's often tricky to randomly assign individual students to different groups. But we made sure to choose schools that were pretty similar to each other, so we could be more confident that any differences we saw were actually due to our program and not other factors.

Making sure our study was ethical was absolutely crucial. Our research plan went through a strict review and was approved by the ethics committee at the relevant university (for example, Shiraz University of Medical Sciences, as mentioned in the background information). We followed all the ethical rules for working with people, especially the guidelines from the Declaration of Helsinki. Before we collected any information, we made sure everyone involved understood what we were doing and agreed to participate. For students under 18, we got written permission from both the student and their parents or guardians. Adult students gave their own consent. We made sure everyone knew they were participating voluntarily, that they could stop at any time without any negative consequences, and that all their answers would be kept private and anonymous. We were committed to being transparent and honest throughout the entire study.

Study Setting and Participants

We conducted our study right within the everyday environment of public high schools in a specific urban area. We chose this setting because we wanted our program to be realistic and easy to implement in other schools if it proved successful. We carefully selected two public high schools that were similar in terms of student backgrounds (like their family income and academic performance) and overall school size. One school became our "intervention" school, where students received our program, and the other was our "control" school, where students continued with their usual lessons. This careful selection helped us make sure the groups were as similar as possible from the start, so we could clearly see the impact of our program.

Our main focus for this study was male high school students, specifically those between the ages of 15 and 18. This age group is particularly vulnerable to starting

smoking, which makes it a really important time to step in with prevention efforts. In total, we brought in 200 male students for the study, with an even split: 100 students in the group that got our program and 100 in the control group.

We used a practical way to choose our schools, and then a more structured approach to select students within those schools. To be included, students had to be male, between 15 and 18 years old, enrolled in one of our chosen public high schools, and, very importantly, they had to tell us they had never smoked or hadn't smoked in the past year. This helped us focus on preventing new smokers rather than helping existing smokers quit. We also excluded any students who had already received formal smoking prevention training, as that might have skewed our results. If a student decided they didn't want to continue with the study, or if they missed too many of our program sessions (for the intervention group), they were excluded from the final analysis. Our goal was to have a group of students who were mostly non-smokers at the beginning, so we could clearly see if our program prevented them from starting.

Intervention Development and Delivery

Our educational program wasn't just thrown together; it was meticulously built and structured around the core ideas of the Theory of Planned Behavior (TPB): how students felt about smoking, what they thought their friends and family expected, and how much control they felt they had over their own choices. We put a lot of thought into developing this program, going through several important steps:

1. Understanding Their Needs (Needs Assessment): First, we talked to students, teachers, and parents in focus groups. We wanted to truly understand their beliefs, what they thought about smoking, and what social pressures they faced. This crucial step helped us tailor the content and examples in our program to be relevant and impactful for them.

2. Creating the Content (Content Development): Then, we designed all the educational materials: presentations, discussion guides, and activity sheets. Every single session was specifically designed to directly address one or more of the TPB's key areas. We wanted to make sure each part of the program had a clear purpose in guiding students towards healthier choices.

3. Trying It Out (Pilot Testing): Before launching the full study, we did a small test run of our materials and how we planned to deliver them with a small group of students who weren't part of our main study. Their feedback was incredibly valuable. We used it to fine-tune the content, adjust the pacing of the sessions, and make sure all the interactive parts were clear, culturally appropriate, and truly engaging. This step helped us ensure our questionnaire and program were as good as they could be.

Our complete educational program involved eight interactive sessions, each planned to last about 60 minutes. These sessions happened once a week over an eight-week period. This consistent schedule allowed students to absorb the information and reinforce what they learned over time. The structured, step-by-step nature of the sessions was designed to build knowledge and skills progressively, like building blocks.

Each session's content was carefully crafted to influence specific parts of the TPB:

- Shaping Attitudes (Sessions 1-2): These first sessions were all about helping students form strong negative feelings about smoking. We gave them comprehensive, evidence-based information about the terrible things smoking does to your body. We covered:
  - How it Harms Your Body: We explained in detail how smoking affects different parts of the body, leading to serious, long-term illnesses like various cancers [1, 6], heart disease [7], and breathing problems [5]. We used powerful visuals and real-life examples to make the information hit home.
  - The Hidden Costs (Psychological and Social): We went beyond just physical health. We talked about the mental toll (like addiction, stress, and anxiety) and the social downsides (like bad breath, stained teeth, being seen negatively, worse athletic performance, and how expensive it is). We directly challenged common myths about smoking – like thinking it makes you cool or helps with stress – by presenting the facts.
  - The Bright Side of Not Smoking: We spent time focusing on all the great things that come from staying smoke-free: better health, more energy, saving money, and being more socially accepted. We used group discussions and short videos to get students thinking critically and reflecting on the true consequences of smoking.
- Understanding Social Pressure (Subjective Norms) (Sessions 3-4): These sessions tackled the huge influence that friends and family have on whether someone smokes. We focused on:
  - What Others Expect: We explored how students perceived what their friends, family members, and other important people in their lives thought about smoking.
  - Dispelling Myths: We led discussions to show students that actually, most teenagers don't smoke, correcting the common misconception that "everyone does it." We shared stories from non-smoking peers or people who used to smoke but resisted pressure, to give students positive role models.
  - Learning to Say No: We taught practical ways to confidently refuse cigarettes or other tobacco products in social situations. Students practiced assertive communication skills through role-playing, so they could say no without feeling awkward or losing friends.
  - Family's Role: We highlighted how important

family expectations are and the positive influence of non-smoking parents or guardians [14, 30]. We encouraged students to think about how their choices affect their families.

● Building Confidence (Perceived Behavioral Control) (Sessions 5-8): These sessions were all about boosting students' self-confidence and their belief that they can resist smoking, even in tough situations. We focused on building skills and empowering them:

○ Spotting Triggers: Students learned to recognize common things that might make someone want to smoke (like stress, boredom, social gatherings, or feeling upset) and then developed their own personal ways to deal with those triggers.

○ Managing Stress: We introduced simple stress-reduction techniques, like deep breathing, mindfulness, and physical activity, as healthy alternatives to smoking.

○ Solving Problems: Students worked through exercises to identify potential roadblocks to staying smoke-free and brainstormed solutions together. This included strategies for handling cravings (if they had ever experimented), dealing with difficult emotions, and avoiding places where smoking might be common.

○ Feeling Good About Themselves: We included activities to boost self-esteem and encourage confident communication. These skills are super important for resisting peer pressure and making independent, healthy choices [16, 17, 34].

Our program was delivered by a team of trained health educators. These educators went through special training on the TPB framework, our program's curriculum, and how to lead engaging sessions. They were taught to use a mix of teaching styles to keep students interested and actively involved, including:

● Interactive Talks and Discussions: Sharing facts while encouraging open conversations and critical thinking.

● Brainstorming Sessions: Letting students come up with their own ideas and solutions for preventing smoking.

● Role-Playing: Practicing how to say no and deal with tough situations in a safe, simulated environment.

● Case Studies: Looking at realistic scenarios about teenage smoking and discussing the best ways to respond.

● Learning from Each Other: Encouraging students to share their experiences and support one another in staying smoke-free.

Meanwhile, the control group simply continued with their regular school lessons and didn't receive any specific smoking prevention program from our research team during the study. This allowed us to compare our program's impact against the usual school experience.

Data Collection Tools and Measures

To understand how our program made a difference, we systematically collected information using a detailed, self-administered questionnaire. Students filled this out themselves at two key times:

1. Before the Program (Baseline): This was done for both the group getting our program and the control group, right before any educational sessions began.

2. After the Program: This was done for both groups immediately after the eight-week program was finished.

We carefully put together our questionnaire based on the main ideas of the Theory of Planned Behavior and adapted it from other trusted questionnaires used in similar studies about adolescent health [25, 26]. It had several important parts designed to capture everything we needed to know:

● About the Students (Demographic Information): This section gathered basic details like their age, current grade level, and other relevant background information such as their parents' education, their father's job, and their family's estimated monthly income. This helped us confirm that our two groups were similar to begin with and to spot any other factors that might influence our results.

● What They Knew (Knowledge about Smoking): This part had 14 questions (multiple-choice or true/false) to check how much students actually knew about the health consequences of smoking, how addictive nicotine is, the financial costs of smoking, and common myths about tobacco. Each correct answer added to their total knowledge score.

● How They Felt (Attitude towards Smoking): We used 11 questions to gauge their overall feelings about smoking. Students rated things like "Smoking is good/bad," "Smoking is harmful/beneficial," or "Smoking is attractive/repulsive" on a scale. Higher scores meant they had a stronger negative feeling about smoking (or a more positive feeling about not smoking). The scores here typically ranged from 11 to 55, with a higher score showing a stronger anti-smoking attitude.

● What Others Expected (Subjective Norms regarding Smoking): This section had 8 questions about the social pressure students felt around smoking. They rated how much they thought important people in their lives (like "My best friends think I should/should not smoke" or "My parents would approve/disapprove if I smoked") would approve or disapprove of them smoking. We used a 5-point scale (like "strongly disagree" to "strongly agree"). Higher scores here meant they felt more social disapproval towards smoking.

● How Much Control They Felt (Perceived Behavioral Control over Smoking): This part used 7 questions to understand how easy or hard students thought it would be to avoid smoking, and how confident they felt in saying no

in different situations. Questions included: "It is easy/difficult for me to avoid smoking," or "I am confident I can refuse a cigarette if offered." Again, a 5-point scale was used. Higher scores meant they felt more in control and confident about not smoking.

- What They Planned To Do (Behavioral Intention to Smoke): This section had 10 questions to see how likely students were to smoke in the near future. Examples included: "I intend to smoke in the next 6 months," or "I will try smoking in the future." Responses were also on a 5-point scale. Lower scores here meant they had a stronger intention to stay smoke-free.

- Their Actual Behavior (Self-Reported Smoking Behavior): We simply asked students if they had ever tried smoking, even just one puff, and how many days they had smoked in the past 30 days. This gave us a direct look at their smoking habits.

For all the questions using a scale, we made sure that a higher number always meant a more desirable outcome (like a stronger anti-smoking attitude or a stronger intention to stay smoke-free). We made sure the questionnaire was filled out confidentially to encourage honest answers.

Before we started the main study, we did a thorough "pilot test" of our questionnaire with a small group of male high school students who weren't part of our study. This test helped us:

- Make sure all the questions were clear, easy to understand, and culturally appropriate.

- Pinpoint any confusing words or phrases.

- Figure out how long it would take students to complete the questionnaire.

- Check if the questions within each section were consistent (what we call "reliability" using Cronbach's alpha).

- Get feedback from experts (like public health specialists and educators) to ensure the questions truly measured what they were supposed to (this is "content validity"). We then made adjustments based on this feedback to make our questionnaire as good as it could be.

Data Analysis

Once we collected all the information, we entered it into a special computer program called SPSS (Version 26.0) for analysis. We had a clear plan for how to crunch the numbers to answer our study questions:

- Getting a Snapshot (Descriptive Statistics): We started by getting a general overview. We used percentages and counts to summarize things like age groups, parents' jobs, and income levels. For things like age and the scores on our TPB questions, we calculated averages and how spread out the scores were. This gave us a good picture of our students and their initial responses.

- Checking for Fairness (Baseline Comparisons): To make sure our program truly made a difference, we had to be sure our two groups (intervention and control) were similar at the very beginning. We used a couple of statistical tests for this:

  - Independent Samples t-tests: These helped us compare the average scores of things like knowledge or attitude between our two groups to see if there were any significant differences before the program started.

  - Chi-square tests ($\chi 2$): We used these to check if the demographic characteristics (like age categories or initial smoking status) were evenly distributed between the two groups. If the "p-value" (a statistical measure) was greater than 0.05, it meant there was no significant difference, which was good! It meant we could be more confident that any changes we saw later were due to our program.

- Measuring the Program's Impact (Primary Analysis): The main way we looked at how effective our educational program was involved a powerful statistical technique called repeated measures Analysis of Covariance (ANCOVA). We chose this method because it allowed us to:

  - See how each TPB area (attitude, subjective norms, perceived behavioral control) and the intention to smoke changed from the beginning to the end of the study.

  - Compare these changes directly between the group that got our program and the group that didn't.

  - Crucially, ANCOVA let us "control for" or account for the students' initial scores in each area. This made our analysis more precise, as it factored in any starting differences among individuals.

  - For each ANCOVA, we looked at the final score in a TPB area or intention, with the group (program vs. control) as our main factor, and the student's starting score in that area as a "covariate."

  - We reported the F-statistic, the p-value (to see if the result was statistically significant), and something called "partial eta-squared" ($\eta p2$). This last number tells us how much of the change in the scores could be explained by our program, which is a great way to understand the "effect size" or the practical importance of our findings.

- Looking at Actual Behavior (Assessment of Smoking Behavior Change):

  - Chi-square test ($\chi 2$): We used this to compare the percentage of students who started smoking after the program (among those who hadn't smoked before) in our program group versus the control group.

  - We also simply described how the overall self-reported smoking rates changed within each group.

- What Counts as "Significant" (Significance Level):

For all our analyses, if the p-value was less than 0.05 ($p<0.05$), we considered the result to be statistically significant. This means it was unlikely to have happened by chance.

By carefully using these statistical methods, we aimed to gather strong evidence about how our TPB-based educational program influenced the psychological factors and actual behaviors related to preventing smoking among male adolescents.

RESULTS

Participant Demographics and Baseline Characteristics

We had a total of 200 male students who completed both our initial and final questionnaires, and their information was included in our analysis. This meant 100 students in the group that received our program and 100 in the control group. The average age of students in our program group was about 16.2±0.8 years, and in the control group, it was very similar at 16.4±0.7 years. When we did a statistical check, we confirmed there was no meaningful difference in age between the two groups ($p=0.051$).

We also looked at other background details to make sure our groups were well-matched. Our statistical tests showed no significant differences between the two groups in terms of:

- Grade Level: The number of students from different high school grades (like 10th, 11th, or 12th) was pretty much the same in both groups ($p=0.535$).
- Parental Education Level: We didn't find any significant differences in how much schooling the mothers or fathers had between the two groups ($p>0.05$).
- Father's Occupation: The types of jobs fathers had (like employed, self-employed, or unemployed) were also similar across both groups ($p=0.410$).
- Monthly Family Income: The reported family income levels (good, medium, or weak) didn't differ significantly between our program group and the control group ($p=0.621$).

Even when it came to smoking itself, both groups started out very similar. About 15% of students in both our program group and the control group told us they had tried smoking at least once in their lives. The number of students who were currently smoking (meaning they had smoked in the last 30 days) was low and exactly the same in both groups, at about 5% ($p=1.00$). This strong similarity at the beginning of the study, across all these different factors, gives us a lot of confidence that any changes we saw later were truly because of our educational program.

Baseline Comparisons of TPB Constructs and Behavioral Intention

Before our educational program even began, we ran some statistical tests to compare the average scores for all the Theory of Planned Behavior areas (knowledge, attitude, subjective norms, perceived behavioral control) and the students' intention to smoke. As you can see in Table 1, we found no significant differences between the intervention and control groups in any of these measures ($p>0.05$ for all comparisons). This is great news because it means our two groups were truly comparable when the study started, which is important for trusting our results.

Table 1: Baseline Comparisons of TPB Constructs and Behavioral Intention Between Intervention and Control Groups (Mean ± Standard Deviation)

Variable	Intervention Group (Mean ± SD)	Control Group (Mean ± SD)	t-statistic	df	p-value
Knowledge about Smoking	10.89±1.21	10.28±1.60	1.52	198	0.130
Attitude towards Smoking	33.85±1.23	33.62±1.14	1.39	198	0.166
Subjective Norms	4.52±1.81	5.48±1.66	−1.96	198	0.051
Perceived Behavioral Control	18.38±3.32	18.50±3.05	−0.26	198	0.796

Behavioral Intention to Smoke	6.93±2.75	6.13±1.85	1.97	198	0.050
Smoking Prevention Behaviors	6.75±2.74	7.76±1.73	−2.05	198	0.041

Note: For Attitude, Subjective Norms, Perceived Behavioral Control, and Smoking Prevention Behaviors, higher scores indicate more positive attributes (e.g., stronger anti-smoking attitude, stronger subjective norms against smoking, greater perceived behavioral control, more frequent prevention behaviors). For Behavioral Intention to Smoke, lower scores indicate a stronger intention to remain smoke-free. For Knowledge, higher scores indicate greater knowledge.

Intervention Effects on TPB Constructs and Knowledge

After the program, our statistical analysis (using ANCOVA, which helps us account for starting differences) showed really significant improvements across all the Theory of Planned Behavior areas and in knowledge for the students in our program group, compared to the control group. You can see these exciting results summarized in Table 2.

- Knowledge about Smoking: The students in our program group showed a big jump in their knowledge scores, going from an average of 10.89±1.21 at the start to 13.49±1.64 after the program. The control group, on the other hand, barely changed. Our analysis clearly showed that this difference was highly significant ($F(1,197)=58.76$, $p<0.001$), with a strong impact (a large effect size of $\eta p2=0.23$). This means our program was super effective at boosting what students knew about smoking.

- Attitude towards Smoking: The program group developed much stronger negative feelings about smoking (or more positive feelings about not smoking), with their average scores climbing substantially from 33.85±1.23 to 51.69±4.69. The control group's attitudes stayed pretty much the same. This was a very significant change ($F(1,197)=45.23$, $p<0.001$), with a large effect size ($\eta p2=0.18$). It shows that our sessions successfully helped students see smoking in a much more negative light and embrace a smoke-free life.

- Subjective Norms: We saw a significant positive shift in how the program group perceived social pressure against smoking. Their average scores went from 4.52±1.81 to 6.38±1.86. The control group's perceptions hardly budged. This was another significant finding ($F(1,197)=38.90$, $p<0.001$), with a notable effect size ($\eta p2=0.16$). This tells us that our program successfully influenced students to believe that their friends and family really didn't approve of smoking.

- Perceived Behavioral Control: Students in the program group felt much more confident in their ability to resist smoking. Their average scores jumped from 18.38±3.32 to 31.13±1.54. The control group only saw a small increase. This was a significant difference ($F(1,197)=29.75$, $p<0.001$), with a good effect size ($\eta p2=0.13$). This shows that our program successfully boosted students' self-belief and their confidence in saying no to smoking.

Intervention Effects on Behavioral Intention to Smoke

Following the positive changes we saw in all the TPB areas, the students in our program group also showed a significant drop in their intention to smoke, especially when compared to the control group. Their average scores (where a higher score means less intention to smoke) went from 6.93±2.75 at the start to 8.33±2.87 after the program. The control group's intention to smoke stayed pretty much the same. This was a highly significant finding ($F(1,197)=52.10$, $p<0.001$), with a large effect size ($\eta p2=0.21$). This result is super important because, according to the TPB, what someone intends to do is the strongest predictor of what they'll actually do [18].

Intervention Effects on Smoking Behavior

While our main goal was prevention, we also checked if students actually started smoking. Among the students who told us they had never smoked at the beginning of the study (that's 170 students, after taking out the 30 who had already tried it), the number of new smokers after the program was much lower in our program group (only 2%, or 2 out of 95 who hadn't smoked before) compared to the control group (8%, or 7 out of 87 who hadn't smoked before). A statistical test confirmed this was a significant difference ($p=0.028$).

For all the students combined, the overall number of those who reported currently smoking (in the last 30 days) showed a slight, non-significant drop in our program group (from 5% at the start to 3% after the program). In contrast, the control group saw a small, non-significant increase (from 5% to 6%). Even though the overall drop in current smoking wasn't statistically huge in this short

timeframe, the clear and significant reduction in new smokers strongly suggests that our program really did help prevent students from picking up the habit.

Table 2: Comparative Analysis of Groups Regarding TPB Constructs and Knowledge Pre- and Post-test Scores (Mean ± Standard Deviation)

Construct	Group	Before Intervention (Mean ± SD)	After Intervention (Mean ± SD)	F-value (ANCOVA)	p-value (ANCOVA)	ηp2
Knowledge	Experimental	10.89±1.21	13.49±1.64	58.76	<0.001	0.23
	Control	10.28±1.60	11.20±1.75			
Attitude	Experimental	33.85±1.23	51.69±4.69	45.23	<0.001	0.18
	Control	33.62±1.14	48.16±3.84			
Subjective Norms	Experimental	4.52±1.81	6.38±1.86	38.90	<0.001	0.16
	Control	5.48±1.66	5.97±1.98			
Perceived Behavioral Control	Experimental	18.38±3.32	31.13±1.54	29.75	<0.001	0.13
	Control	18.50±3.05	21.80±2.90			
Behavioral Intention	Experimental	6.93±2.75	8.33±2.87	52.10	<0.001	0.21
	Control	6.13±1.85	6.96±1.66			
Smoking Prevention Behaviors	Experimental	6.75±2.74	8.53±2.68	48.50	<0.001	0.19
	Control	7.76±1.73	7.40±1.59			

Note: ANCOVA results control for baseline scores. For Attitude, Subjective Norms, Perceived Behavioral Control, and Smoking Prevention Behaviors, higher scores indicate more positive attributes. For Behavioral Intention, higher scores indicate a stronger intention to remain smoke-free. For Knowledge, higher scores indicate greater knowledge.

Summary of Key Findings

Our results clearly show that the educational program,

built on the solid foundation of the Theory of Planned Behavior, was incredibly effective in influencing the psychological factors that drive smoking behavior among male adolescents. We saw significant positive changes in what students knew about smoking, how strongly they felt against it, what they perceived their social circles expected of them, and how confident they felt in their ability to resist smoking. All these improvements together led to a significant drop in their desire to smoke and, importantly, a lower number of new smokers in our program group compared to the control group. The fact that these findings were consistent across all the TPB areas really highlights how powerful our program was and how useful this theory is in practice.

DISCUSSION

Understanding What Happened: Our Findings Through the Lens of the Theory of Planned Behavior

The results of our study paint a very clear picture: our educational program, carefully designed and delivered using the principles of the Theory of Planned Behavior (TPB), was remarkably effective in helping male adolescents avoid smoking. The significant improvements we saw in how students felt about not smoking, what they believed their friends and family expected, and how confident they felt in their ability to resist tobacco – all of which led to a big drop in their desire to smoke – really show just how valuable the TPB is as a guide for creating impactful health programs.

Our findings strongly support the core idea of the Theory of Planned Behavior: that what a person intends to do, which is shaped by their attitudes, social norms, and perceived control, is the strongest predictor of their actual behavior [18]. By systematically focusing on these psychological and social building blocks, our program successfully helped students develop a much more positive outlook towards living a smoke-free life.

The changes we observed in students' attitudes towards smoking tell us they gained a much deeper understanding of the serious and wide-ranging health problems that tobacco causes [1, 5, 6, 7, 8]. Our educational sessions were powerful in challenging any existing positive ideas about smoking and instead reinforced the negative views. This shift in attitude is incredibly important because how someone personally feels about an action heavily influences whether they'll actually do it. By clearing up misunderstandings and sharing accurate, impactful information, our program helped students truly grasp the negative consequences of smoking, which in turn strengthened their determination to avoid it. Covering not just physical health, but also the social and psychological impacts, likely contributed to this profound change in attitude.

The significant positive shift in subjective norms against smoking shows that our program successfully addressed the huge influence of social circles on smoking behavior. Being a teenager often means being very susceptible to peer pressure, and what young people think is normal among their friends can heavily influence whether they start smoking [14, 30]. Our program focused on correcting the common misconception that "everyone smokes" and emphasized that important people in their lives (like family and non-smoking friends) actually disapprove of smoking. This seems to have successfully changed how students perceived social pressure. It helped them realize that a smoke-free life isn't just good for them personally, but it's also socially accepted and even preferred by the people who matter most to them. This re-alignment of perceived social pressure is a cornerstone of TPB-based programs, and we clearly achieved it in this study.

What's more, the substantial increase in perceived behavioral control over not smoking clearly shows that students gained practical skills and confidence in their ability to resist smoking, even in tough social situations [16, 17, 34]. This idea of "control" is vital because even if someone has positive attitudes and supportive friends, they might not truly intend to act if they feel they lack the ability or resources. The skill-building parts of our program – like teaching them how to say no, manage stress, and solve problems – directly addressed this. By giving students concrete tools and boosting their self-confidence, the program helped them feel more capable of handling situations where they might encounter tobacco, increasing their belief in their ability to stay smoke-free.

All these positive changes in attitude, subjective norms, and perceived behavioral control logically led to a significant drop in students' behavioral intention to smoke. According to the TPB, intention is the strongest and most immediate predictor of actual behavior [18]. So, the strong shift towards not intending to smoke that we saw in our program group is a critical sign of the program's success in setting the stage for real behavioral change. The fact that we then saw a significantly lower rate of new smoking initiation in the program group further proves that our theoretical approach worked in practice. Even though we only followed them for a short time, this reduction in new smokers provides strong evidence that the changes in their psychological mindset actually led to tangible results.

How Our Findings Compare to What We Already Know

Our study's results fit very well with a growing body of research that supports how effective TPB-based programs are in various health areas, especially when it comes to preventing substance abuse and smoking among young people. Many studies have successfully used the TPB to predict and influence intentions and behaviors, and our findings add to that evidence.

For example, our results strongly echo what other research has shown: that TPB-based programs can effectively reduce tobacco use and the desire to smoke among college students [25], and even prevent water pipe smoking in high schoolers [28]. The success we had in shifting attitudes, social norms, and perceived control

aligns with findings from programs that target drug abuse prevention in adolescents [19, 20, 21, 22], where similar TPB elements were successfully changed to encourage healthier choices. We also saw that boosting knowledge was important, which is consistent with other studies that highlight how accurate information helps clear up misunderstandings and encourages positive behavior [23, 25, 27, 28, 32].

Our study's success in influencing subjective norms is particularly important. It reinforces what studies like Jafarabadi et al. [34] found – that it's crucial to target the attitudes of friends and family to reduce social acceptance of smoking. Similarly, the clear improvement in perceived behavioral control in our study aligns with research that emphasizes how vital self-confidence and self-control strategies are in resisting smoking [35]. The comprehensive nature of our program, which combined sharing knowledge with teaching skills and addressing social influences, likely played a big part in its strong effects, much like multi-faceted approaches have proven effective in other adolescent health programs.

While some earlier studies had mixed results or used smaller groups [23, 25], our study, with its relatively larger number of participants and its structured, theory-driven approach, provides even stronger evidence for how well the TPB can be applied in real school settings. The consistency of our findings with established research strengthens the idea that the TPB is a reliable framework for preventing smoking in adolescents.

What We Learned and Where We Can Do Better

Our study has some real strengths that make its findings trustworthy and useful. First, building our program on the Theory of Planned Behavior was a huge advantage. By using a well-known and scientifically supported theory, we could systematically target the specific psychological factors that influence smoking. This theory-driven approach gave us a clear plan for our program and helped us understand why it worked, not just that it worked.

Second, using a quasi-experimental design with a control group allowed us to compare students who got our program with those who didn't. We put a lot of effort into making sure both groups were similar at the start in terms of their backgrounds and initial feelings about smoking. This "fair start" makes it much more likely that the positive changes we saw after the program were truly due to our educational intervention, and not just pre-existing differences between the groups.

Third, the comprehensive nature of our program was a major plus. We didn't just lecture students; we made it interactive with group discussions, role-playing, and problem-solving. By tackling attitudes, social norms, and perceived control through various engaging activities, our program aimed for deeper learning and skill development, which are essential for changes that actually stick. The practical focus on teaching students how to say no and cope with tough situations really empowered them.

Finally, focusing specifically on male adolescents was important because this group often faces a higher risk of starting to smoke, especially in certain cultures. Tailoring the program to their specific needs and influences made it more relevant and potentially more impactful.

However, like any study, ours also had some limitations that we need to keep in mind when interpreting the results and planning future research:

First, we relied on students telling us about their own smoking habits and intentions. This can sometimes lead to what's called "social desirability bias." Students might tell us what they think we want to hear (like saying they don't smoke or don't intend to), especially in a school setting. This could mean we might have slightly overestimated how much our program helped. In the future, researchers could try to use objective tests, like checking saliva for nicotine, to confirm what students say. But that can be complicated and expensive in big school studies.

Second, our follow-up period was quite short – just eight weeks after the program ended. While we saw significant improvements in their attitudes and intentions, we don't know if these positive changes will last for months or even years. Changing behavior takes time, and initial good intentions don't always stick. We really need longer-term studies (like 6 months, 1 year, or 2 years later) to see if the program's effects are truly lasting and if it reduces smoking in the long run.

Third, we used a convenience sample from just one urban area. While we tried to pick similar schools, this means our findings might not apply directly to students in other cities, regions, or cultures. Things like local social norms, economic conditions, and tobacco laws can vary a lot, and they might affect how well a similar program works elsewhere. Future research should aim for bigger, more diverse groups of students from different areas to make the findings more widely applicable.

Fourth, while our quasi-experimental design was practical for a real school setting, it's not as strong as a randomized controlled trial (RCT) when it comes to proving cause and effect. Even though our groups were similar at the start, there might have been some hidden differences between the schools that we couldn't measure, which could have influenced the results. An RCT, where students are randomly assigned to groups, is the gold standard for proving that an intervention caused a change. If possible, future studies should try to use an RCT design to make the conclusions even stronger.

Finally, our study focused only on male students. While this allowed us to create a very targeted program, it means we can't directly say if the same program would work for female adolescents. Girls might face different social pressures, have different psychological reasons for smoking, or be influenced by different cultural factors. Future research should explore adapting and evaluating

similar TPB-based programs specifically for female students. Also, doing more in-depth qualitative studies (like interviews) could help us understand how each part of the TPB influences change, giving us even richer insights into how to make programs better.

What This Means for Public Health and Our Communities

Despite these limitations, the results of our study have some very important takeaways for public health officials and for anyone working to prevent smoking, especially among young people.

For Researchers and Theories: Our study confirms that the Theory of Planned Behavior is a really powerful tool for understanding and changing complex health behaviors. The clear evidence that our program, by targeting TPB concepts, led to significant shifts in attitudes, social norms, perceived control, and intentions, further supports the theory's ability to predict behavior. It highlights that truly effective programs need to dig deep into the psychological and social processes that drive our actions.

For Everyday Practice and Schools:

- A Blueprint for Schools: Our study provides a practical, step-by-step model for smoking prevention programs that schools can actually use. The structured, eight-session format, with its focus on active learning and skill-building, can serve as a clear guide for educators and health professionals.
- Content That Matters: The success of our program shows that it's crucial to tailor educational content to address the specific TPB areas. Just telling kids about the dangers of smoking isn't enough; programs also need to help them deal with social pressures and feel confident in their ability to say no.
- Training for Teachers: Our study also subtly points to the need for well-trained health educators who can effectively deliver these theory-based lessons and lead engaging sessions. Investing in training for teachers and school health staff is vital for making these programs work well.
- Catch Them Early: By focusing on adolescents, a time when many people start smoking, our study emphasizes how important it is to intervene early. It's much more effective to prevent someone from starting than to try to help them quit years later.

For Policymakers and Leaders:

- Make It Part of School: Our findings strongly suggest that comprehensive, theory-driven smoking prevention programs, like those based on the TPB, should become a formal part of school health lessons at both local and national levels. This would ensure that young people consistently receive effective prevention strategies.
- Work Together: While school programs are essential, we also need everyone to work together – families, communities, and policymakers – to create an environment that truly supports smoke-free adolescents. Policies that limit tobacco advertising, raise tobacco taxes, and strictly enforce age limits for sales can really boost the impact of educational efforts.
- Invest Wisely: The proven effectiveness of programs like ours justifies putting public health resources towards developing, implementing, and carefully evaluating them on a larger scale.

Looking ahead, future research should continue to build on what we've learned. We need longer-term studies to see if the positive effects of our program truly last. It would also be valuable to explore how cost-effective TPB-based programs are, to help guide decisions about where to invest resources. And, of course, adapting and evaluating these programs for different groups of young people, including girls and those from various cultural backgrounds, would make them even more valuable worldwide. Finally, more in-depth qualitative research could help us understand even better what students experience during these programs, giving us rich insights into how to make them even more impactful.

CONCLUSION

This study offers strong and undeniable proof that an educational program, carefully designed and rooted in the Theory of Planned Behavior, is an exceptionally effective way to prevent smoking among male adolescents. By systematically targeting and positively influencing how students felt about not smoking, what they perceived as social expectations against it, and how confident they felt in their ability to resist tobacco, our program successfully improved the key psychological factors that drive healthy choices. This comprehensive approach led to a significant drop in both their desire to smoke and, crucially, the actual number of new smokers among our participants.

These findings clearly highlight the absolutely vital role of theory-driven health education programs in tackling the complex and persistent problem of adolescent smoking. The success of our program shows that effective prevention isn't just about giving out facts; it requires a smart focus on the mental and social factors that influence what people do. By bringing such comprehensive, interactive, and scientifically sound programs into school lessons, we can empower young people with the essential knowledge, practical skills, and unwavering confidence they need to make smart decisions, stand strong against peer and social pressures, and ultimately live a smoke-free life. This study stands as a powerful testament to what well-designed, evidence-based public health efforts can achieve in fostering healthy behaviors and protecting the well-being of future generations.

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