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Mobile Application for Drug Abuse Prevention among Teenagers: Effectiveness in Bandung City

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ABSTRACT

This study explores the effectiveness of a mobile application designed to prevent drug abuse among teenagers in Bandung City using a qualitative approach. The research involved five teenage informants aged 15–18 years who had used the application for at least one month. Data were collected through semi-structured interviews and analyzed using thematic analysis. The findings reveal that the application significantly increased awareness about the dangers of drug use, improved self-confidence in resisting peer pressure, and encouraged the sharing of knowledge within peer groups. Additionally, the app's interactive and gamified features contributed to a positive learning experience. However, suggestions for improvement included the need for real-time support and more localized content. Overall, the study highlights the potential of mobile technology as an innovative tool in youth-focused drug abuse prevention efforts, especially when designed with user engagement and cultural relevance in mind.

Keywords: *Drug Abuse Prevention, Mobile Application, Teenagers, Bandung City.*

1. INTRODUCTION

Drug abuse among teenagers remains a critical public health and social issue in Indonesia, particularly in urban areas such as Bandung City, where the transition from childhood to adolescence—marked by psychological, social, and emotional changes—makes teenagers more vulnerable to risky behaviors like substance abuse. According to the National Narcotics Agency (BNN), digital influences and peer pressure significantly shape teenage behavior, contributing to the rising trend of drug abuse. Over 2 million students in Indonesia have reportedly abused drugs, with onset often occurring during adolescence [1], and globally, drug use among individuals aged 18–25 increased by 22% between 2010 and 2019 [2]. Substance abuse leads to severe consequences, including health problems, legal issues, and social disintegration [1], [3]. Key risk factors include peer influence and smoking behavior, with male adolescent smokers being 23.82 times more likely to abuse drugs [2], as well as psychological vulnerabilities like impulsivity and conduct disorders [3], [4]. To address this issue, effective prevention strategies must involve collaboration among families, schools, and agencies such as BNN [5], with socialization programs proving successful in raising student awareness about the dangers of drug abuse [5].

In response to the growing problem of adolescent drug abuse, various preventive strategies—such as school-based education, family counseling, and community awareness campaigns—have been implemented; however, these traditional methods often struggle to effectively reach the digital-native generation. Adolescents today are deeply engaged with technology, spending significant time on smartphones and online platforms [6], and while many are technologically adept, variations in skills and access underscore the need for tailored digital solutions [6]. This behavioral shift presents an opportunity to explore digital interventions,

particularly mobile applications, as innovative tools for drug abuse prevention. Digital-based therapies have shown promising results in addressing substance use disorders, often surpassing traditional approaches in terms of engagement and accessibility [7]. A review identified 39 digital interventions targeting various substances, emphasizing early intervention and prevention and demonstrating the potential of mobile applications in this field [8]. Nevertheless, the implementation of digital interventions faces challenges, including issues related to funding, privacy, and the need for ongoing monitoring by professionals [7], with their effectiveness varying depending on individual characteristics and the specific substances being targeted—highlighting the necessity for continued research and refinement [8].

Mobile health (mHealth) applications have been increasingly recognized for their potential to deliver health education, provide real-time support, and encourage behavioral change, especially among youth, and hold significant promise for addressing drug abuse prevention among Indonesian adolescents by offering tailored and accessible content that aligns with their preferences and lifestyles. Research shows that many health apps incorporate behavior change techniques, such as goal setting and feedback, which are crucial for promoting positive health behaviors among youth [9], while the global rise in smartphone usage—with over 3.5 billion users—further enhances the accessibility and engagement potential of mHealth apps, particularly in areas like mental health and substance abuse prevention [10]. Effective mHealth applications should adopt user-centric designs that reflect the digital habits of teenagers, ensuring content is interactive and personalized [11]. Despite these advantages, the effectiveness of such applications in specifically addressing drug abuse prevention among Indonesian youth remains underexplored, and existing evaluation frameworks emphasize the need for rigorous clinical trials and assessments to determine their true impact on youth outcomes [10].

This study seeks to fill this gap by evaluating the effectiveness of a mobile application developed to prevent drug abuse among teenagers in Bandung City. Through a qualitative approach involving five teenage informants, this research aims to explore user perceptions, experiences, and the perceived impact of the application on their knowledge, attitudes, and behaviors related to drug use.

2. LITERATURE REVIEW

2.1 Drug Abuse

Addressing adolescent drug abuse in Indonesia, particularly in urban areas like Bandung, demands a comprehensive approach that considers individual, family, and community factors. Adolescents face heightened vulnerability due to peer pressure, emotional instability, and the desire for social acceptance. According to the National Narcotics Agency (BNN), drug use is prevalent among individuals aged 15–35, especially among high school and college students, highlighting the need for innovative, long-term prevention strategies. Family resilience is essential, with strong parental involvement offering protection, while poor supervision and substance use within the household increase risk [1], [12]. Community programs led by BNN in West Java, in collaboration with schools, have effectively raised awareness [5]. Additionally, school connectedness and extracurricular activities help deter substance abuse [12]. On a personal level, traits like impulsivity and emotional dysregulation raise the risk,

whereas optimism, mindfulness, and anti-drug beliefs offer protection; adolescents with psychiatric issues or past maltreatment need targeted mental health support [12].

2.2 Mobile Technology

The integration of smartphones into teenagers' daily lives presents a promising avenue for health promotion, particularly in drug abuse prevention, as over 90% of teenagers globally have access to smartphones, making them powerful tools for delivering educational content and behavior change interventions. Teenagers spend nearly three hours per day on smartphones, using various apps for communication, entertainment, and productivity [13], and this widespread usage supports the potential of mobile platforms for tailored health communication [14]. Mobile applications can effectively engage adolescents through interactive features such as games, quizzes, videos, and real-time support systems, which may be more impactful than traditional media in promoting healthy behaviors [15]. The interactive and mobile nature of smartphones makes them especially appealing to teens and suitable for health interventions [16]. However, challenges remain, including ensuring data privacy, addressing the digital divide, and keeping up with the rapid pace of technological change to ensure continued relevance and effectiveness [14], [15], [17]

2.3 Mobile Applications

The rapid expansion of mobile health (mHealth) applications has significantly impacted health promotion, particularly in drug abuse prevention, due to their cost-effectiveness, scalability, and accessibility, offering users the privacy and autonomy crucial for addressing sensitive issues. mHealth apps are generally more affordable than traditional interventions, making them accessible to wider audiences [18], and their ability to reach large populations quickly supports widespread health promotion efforts [19]. Users benefit from on-demand access to information, which is essential for timely support [18]. However, the effectiveness of these interventions depends heavily on user engagement, interface usability, and the quality and cultural relevance of the content. Maintaining user involvement remains a key challenge, as retention rates tend to be low [18], and interventions are most effective when they deliver age-appropriate, culturally sensitive content, especially for youth [10]. Additionally, usability plays a crucial role in sustaining app use [20], and despite their promise, more clinical trials are needed to evaluate the long-term impacts of mHealth applications on health outcomes [10].

2.4 Theoretical Framework

This study is guided by the Health Belief Model (HBM), which posits that individual health behavior is influenced by perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. In the context of this research, the mobile application serves as a medium to increase perceived threat of drug abuse and highlight the benefits of abstaining, while reducing perceived barriers through engaging content and support tools. The HBM is particularly relevant in shaping preventive behaviors among youth, as it integrates cognitive and motivational components of decision-making.

3. METHODS

3.1 Research Design and Location

This study employs a qualitative descriptive approach to explore the effectiveness of a mobile application aimed at preventing drug abuse among teenagers in Bandung City. The qualitative method was chosen to gain an in-depth understanding of teenagers' perceptions, experiences, and behavioral responses related to the use of the application. This approach enables the researcher to interpret meanings, opinions, and contextual influences that cannot be captured through quantitative analysis alone. The research was conducted in Bandung City, West Java, Indonesia, a region known for its dense urban population and active youth demographic. The study took place over a period of three months, from January to March 2025, allowing ample time for data collection, analysis, and validation.

3.2 Informants, Data Collection Techniques, and Data Analysis

A total of five teenage informants aged between 15 to 18 years were selected through purposive sampling based on the following criteria: residing in Bandung City, actively using the mobile application for a minimum of one month, willingness to participate in the study, and the ability to express thoughts and experiences clearly. The informants came from diverse school backgrounds (public and private high schools) to capture varied perspectives. Data were collected using semi-structured in-depth interviews guided by themes such as usability, content relevance, influence on drug-related attitudes and behavior, user engagement, and suggestions for improvement. Interviews were conducted either in person or via video call, lasting between 30 to 45 minutes and recorded with consent. Thematic analysis was employed to analyze the data, involving steps like familiarization, coding, theme development, and interpretation aligned with the Health Belief Model. NVivo software was used to facilitate data organization and management throughout the analysis process.

4. RESULTS AND DISCUSSION

4.1 Theme 1: Increased Awareness of Drug Dangers

All informants reported a noticeable increase in their knowledge about the dangers of drug abuse after using the application. The educational content—comprising interactive videos, real-life stories, and quizzes—was highlighted as especially effective in enhancing their awareness of various drug types, their harmful effects, and the legal consequences of drug use. This engagement with the material appeared to deepen their understanding and encourage more informed decision-making. One informant noted, *"I didn't know much about drugs before. But the app explains it in a simple way, so I understand better now... I was surprised to learn how dangerous even one-time use can be."* — Informant 3.

This finding aligns with the perceived severity and perceived susceptibility components of the Health Belief Model, suggesting that when adolescents understand the grave consequences of drug use and recognize their own risk, they are more motivated to steer clear of such behavior. The clarity and relatability of the app's content helped personalize the risks, prompting a stronger internalization of the dangers associated with drug abuse.

4.2 Theme 2: Accessibility and Ease of Use

Four out of five informants stated that the mobile application was user-friendly and easy to navigate. They appreciated features such as daily reminders, gamification elements like point systems and badges, as well as the use of short, manageable learning modules. These design choices contributed to sustained user engagement and made the learning experience feel less like a chore. One informant shared, *"I liked that it wasn't boring. The reminders helped me stay on track, and I enjoyed unlocking achievements. It felt like a game but with real info."* — Informant 1.

This feedback aligns with prior research emphasizing the importance of interactivity and engagement in digital tools aimed at adolescents (Hollis et al., 2017). By incorporating game-like elements and convenient access, the application effectively increased perceived benefits, making health education more enjoyable and accessible at any time. These design aspects contributed not only to continued use but also to the internalization of drug prevention messages.

4.3 Theme 3: Encouraging Positive Peer Influence

Three informants mentioned that they shared the app with friends or discussed its content within their social circles. This indicates that the mobile application functioned not only as a personal prevention tool but also as a medium for peer-to-peer education. The sharing of content and experiences helped to extend the app's impact beyond individual users. One informant remarked, *"I told my classmates about it. We sometimes do the quiz together during breaks."* — Informant 5.

This behavior illustrates how mobile-based interventions can influence social norms and encourage collective awareness, especially in peer-driven youth cultures. When adolescents engage with educational content together, it reinforces learning and creates a supportive environment that discourages drug use. Such peer engagement enhances the reach and effectiveness of health promotion strategies, making them more embedded in daily social interactions.

4.4 Theme 4: Motivation to Avoid Risky Behavior

The app's content—especially the testimonials from former drug users and vivid depictions of the consequences of drug use—served as a strong motivator for the informants to avoid engaging in risky behaviors. These real-life stories appeared to create an emotional impact and a sense of realism that resonated deeply with the teenagers. Several informants mentioned feeling more empowered and aware after engaging with the material. One noted, *"Before, I didn't think about it much. Now, I feel like I have stronger reasons to say no if someone ever offers me drugs."* — Informant 2.

This observation reflects the self-efficacy component of the Health Belief Model (HBM), which highlights the importance of an individual's belief in their ability to take action. As teenagers gain confidence in rejecting negative influences and making healthy choices, their likelihood of engaging in preventive behavior increases. Strengthening this internal sense of control is essential for fostering long-term resilience against peer pressure and drug experimentation.

4.5 Theme 5: Limitations and Suggestions for Improvement

Despite the positives, informants suggested several improvements to enhance the application's effectiveness. A common request was the inclusion of real-time interaction features, such as chat support or access to online counseling. These elements were seen as important for users who might have questions or need immediate guidance beyond the educational content. Additionally, some informants expressed a desire for more local content and relatable examples that reflect the specific context of Bandung. One user commented, *"It would be better if there were a way to chat with a counselor or ask questions live."* — Informant 4.

These suggestions align with challenges frequently noted in other mHealth studies [21], which emphasize the importance of continuous engagement and personalization to maintain user interest and program effectiveness. Without these interactive components, users may lose motivation over time, reducing the long-term impact of the intervention. Integrating locally relevant material and live support could significantly improve the app's relevance and usability for its target audience.

Discussion

The results of this study indicate that the mobile application serves as an effective supplementary tool in preventing drug abuse among teenagers in Bandung. Its user-friendly design, engaging content, and educational modules successfully increased awareness and influenced

behavioral intentions. The findings align with the Health Belief Model, particularly highlighting the relevance of perceived threat, perceived benefits, and self-efficacy in shaping how adolescents engage with digital health interventions. Additionally, peer influence and a youth-centered design were found to be critical components in maintaining user interest and fostering behavioral change.

However, the study also underscores the necessity of integrating interactive and personalized features, as well as culturally relevant content, to enhance the app's long-term impact. To ensure sustainability and continued engagement, mobile applications must evolve in response to user feedback and shifting behavioral patterns. These findings are consistent with previous research that emphasizes both the potential of mobile-based interventions for youth health promotion and the importance of participatory development processes that involve the target users directly.

CONCLUSION

This research concludes that mobile applications can be an effective medium for preventing drug abuse among teenagers, particularly when they are designed to be engaging, accessible, and educational. The findings from five youth informants in Bandung City demonstrate that the application not only increased awareness and understanding of drug-related risks but also fostered positive behavioral intentions and peer interaction. The application's gamified elements and user-friendly interface enhanced user engagement, while its educational content strengthened self-efficacy in avoiding drug use.

Nevertheless, the study also uncovered areas for development, including the integration of live counseling features and more locally relevant content to better reflect the cultural context of Bandung youth. As such, developers, educators, and policymakers are encouraged to collaborate in refining and promoting such digital tools as part of comprehensive public health strategies targeting adolescents. Future research with larger and more diverse samples is recommended to validate and expand upon these findings.

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