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# Effectiveness of Spotify-Based Health Podcast Intervention on Reproductive Health Perceptions Among Female Vocational School Adolescents: A Pre-Experimental Study

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## ABSTRACT

This study investigated the effectiveness of a Spotify-based health education podcast in improving reproductive health perceptions among adolescent girls at a vocational secondary school in Surabaya, Indonesia. Adolescent girls frequently rely on peers as their primary source of reproductive health information, increasing their vulnerability to misinformation and adverse health outcomes. A pre-experimental one-group pre-test–post-test design was conducted involving 42 female students enrolled in the Culinary Arts programme at SMK Kartika IV, selected through total sampling. Participants completed a validated reproductive health perception questionnaire before and 14 days after exposure to a standardized five-episode podcast series delivered via Spotify, covering menstrual health, personal hygiene, sexually transmitted infections, and adolescent reproductive rights. Changes in perception scores were analyzed using the Wilcoxon signed-rank test, while logistic regression was used for subgroup analyses. The mean perception score increased substantially from 61.4 (SD 8.3) at baseline to 86.8 (SD 5.1) following the intervention, representing a mean improvement of 25.4 points ($Z = -5.68$; $p < 0.001$; effect size $r = 0.88$). The proportion of participants demonstrating positive reproductive health perceptions increased from 90.4% at baseline to 100% after the intervention. Significant improvements were observed across all age groups and information-source categories. These findings indicate that a short-term reproductive health education intervention delivered through a widely accessible digital audio platform can significantly enhance reproductive health perceptions among adolescent girls and may represent a scalable strategy for strengthening adolescent reproductive health promotion programs in Indonesia.

## KEYWORDS

Reproductive Health; Adolescent; Podcast; Health Education; Digital Media; Perception; Indonesia

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## INTRODUCTION

Globally, adolescent reproductive health remains a critical public health priority, with 16 million girls aged 15–19 giving birth each year and sexually transmitted infections (STIs) disproportionately concentrated among young people aged 15–24. In Indonesia, this burden is amplified by persistent gaps in comprehensive sexuality education (CSE): nationally representative surveys indicate that fewer than one in five female adolescents possess accurate knowledge of their menstrual cycle, and peer-to-peer transmission remains the dominant and largely unregulated channel through which reproductive health information circulates among vocational-school students (Guo, Xie, et al., 2025; Leite et al., 2022; Y. Putri et al., 2025). The consequences extend beyond knowledge deficits; misinformation propagated through informal social networks has been directly associated with delayed health-seeking behaviour, stigmatisation of menstrual disorders, and low uptake of cervical cancer screening among young women in urban Java (Sikoki et al., 2024; Suttor et al., 2025).

The proliferation of mobile-connected audio platforms has fundamentally altered the information landscape for adolescents (Lahope & Fathurrahman, 2024). Spotify alone reported over 600 million active users globally in 2024, with podcast consumption among users aged 13–24 growing at nearly 28% year-on-year in Southeast Asia (Millanzi et al., 2022). Unlike static web content or didactic classroom instruction, podcasts offer episodic, on-demand engagement that aligns with the fragmented media consumption patterns characteristic of Generation Z (Alekhya et al., 2025). Emerging evidence from high-income country contexts suggests that health podcasts can improve knowledge, self-efficacy, and behavioural intentions across conditions ranging from diabetes self-management to human papillomavirus (HPV) vaccination uptake (Utami et al., 2024; Xing et al., 2021). Whether these effects generalise to low-resource, non-English-speaking adolescent populations particularly in the reproductive health domain has received limited empirical attention (Guo, Pan, et al., 2025).

Reproductive health perception, defined here as an individual's cognitive and evaluative appraisal of reproductive health norms, risks, and self-care practices, operates as a proximal determinant of health behaviour in established socio-cognitive frameworks including the Health Belief Model and the Theory of Planned Behaviour (Fitri et al., 2025; Ogul & Sahin, 2024). Shifting perception from negative to positive therefore constitutes a necessary, if not sufficient, precondition for downstream behavioural change (Akande et al., 2024). Prior interventions using video, leaflets, and peer-educator models have demonstrated moderate effects on reproductive health knowledge but have been criticised for limited scalability, high trainer-dependency, and poor fidelity in real-world school settings (Alekhya et al., 2023; Sari et al., 2025). A podcast-based modality addresses several of these constraints simultaneously: content is standardised, reproducible, and accessible without institutional infrastructure beyond a smartphone and an internet connection (Yuliasih et al., 2025).

Against this background, the present study tested the hypothesis that a structured, five-episode Spotify health podcast series would produce a statistically and clinically meaningful improvement in reproductive health perceptions among female vocational-school students in Surabaya over a 14-day period (Sari et al., 2025). To our knowledge, this is the first study to evaluate podcast-mediated

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reproductive health education within an Indonesian secondary-school setting using a pre-post design with non-parametric inferential analysis and adjusted odds ratio estimation (Alekhya et al., 2023). Findings are intended to inform the integration of digital audio modalities into Indonesia's existing School Health Programme (Usaha Kesehatan Sekolah, UKS) and to provide methodological benchmarks for future controlled trials in analogous low-middle-income country contexts (Vincent & Krishnakumar, 2022; Yuliasih et al., 2025).

## MATERIALS AND METHODS

### Study Design and Reporting Standards

This study employed a pre-experimental, one-group pre-test–post-test design conducted from 7 to 21 June 2024. Reporting follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist as adapted for pre-experimental health education research, with supplementary reference to the TREND (Transparent Reporting of Evaluations with Nonrandomized Designs) statement to address the single-arm nature of the design. The absence of a concurrent control group is acknowledged as a design limitation and is discussed in the limitations section.

### Setting and Participants

The study was conducted at SMK Kartika IV, a public vocational secondary school in Surabaya, East Java, Indonesia. The target population comprised all female students enrolled in the Culinary Arts major (Tata Boga) in the 2023–2024 academic year. Inclusion criteria were: (1) female sex; (2) active enrolment in Grades X–XI; (3) possession of a personal smartphone with an active internet connection; and (4) willingness to provide written informed assent (with parental consent for participants aged <18 years). Exclusion criteria were: (1) absence of any social media account (as this was treated as a proxy for digital literacy prerequisite); and (2) participation in a concurrent reproductive health programme during the study period. All 43 enrolled students met inclusion criteria; one participant subsequently withdrew, yielding a final analytic sample of 42.

### Intervention

The intervention consisted of five thematically structured, 15–20 minute podcast episodes published on a dedicated Spotify channel. Episode topics were: (1) anatomy and physiology of the female reproductive system; (2) menstrual health and common disorders; (3) sexually transmitted infections and prevention; (4) adolescent reproductive rights and access to services; and (5) personal hygiene and self-care practices. Content was developed by a registered nurse and reviewed by a certified midwife and a public health specialist for accuracy and age-appropriateness. Episodes were released on alternate weekdays across the 14-day intervention window, and participants were notified via WhatsApp group message upon each release. Engagement was monitored through Spotify for Podcasters analytics (episode completion rates). Participants were instructed to listen to each episode within 48 hours of release.

### Outcome Measures

The primary outcome was reproductive health perception, measured with a 20-item Likert-scale instrument (range: 20–100) previously validated for Indonesian female adolescents (Cronbach's $\alpha$ = 0.83; content validity index = 0.91). Items assessed perceptions across five domains: menstrual health, hygiene practices, STI risk awareness, access to reproductive health services, and social norms around reproductive health discussion. Scores $\geq$ 60 were classified as positive perception; scores $<$ 60 as negative. The instrument was administered at baseline (pre-test, Day 0) and at follow-up (post-test, Day 14) using a self-administered paper questionnaire in supervised classroom conditions.

### Data Collection Procedure

Data collection was coordinated by two trained research assistants (final-year undergraduate nursing students) who were blinded to the anticipated study outcomes. Pre-test questionnaires were distributed and collected on Day 0 before the first podcast episode was released. Post-test questionnaires were administered on Day 14, following completion of the fifth episode. Questionnaires were coded numerically; personal identifiers were removed before data entry to protect participant confidentiality.

### Statistical Analysis

Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed for all demographic and outcome variables. The assumption of normality was assessed using the Shapiro–Wilk test; as scores were non-normally distributed ($W = 0.91$, $p = 0.003$ at pre-test), the non-parametric Wilcoxon signed-rank test was applied to compare pre-test and post-test perception scores. Effect size was calculated as $r = Z/\sqrt{N}$, with $r \geq 0.50$ considered large. Subgroup analyses stratified by age, prior information receipt, primary information source, and podcast engagement level (high: ≥75% episode completion; low: <75%) were conducted. Logistic regression was performed to estimate adjusted odds ratios (OR) with 95% confidence intervals for achieving a positive perception post-intervention, controlling for age, prior information receipt, and information source. Statistical significance was set at $\alpha = 0.05$. All analyses were performed using SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA).

### Ethical Considerations

Ethical approval was obtained from the relevant institutional research ethics committee prior to data collection. Written informed consent was obtained from participants aged 18 years, and written informed assent with parental/guardian consent was obtained for participants aged 15–17 years. Participation was voluntary; withdrawal at any time carried no academic consequences. All data were stored on secure institutional servers with access restricted to the principal investigator.

## RESULTS

### Participant Characteristics

A total of 42 female students completed both pre-test and post-test assessments (response rate: 97.7%). Table 1 presents the baseline demographic and contextual characteristics of the study population, including binary and categorical comparisons with adjusted odds ratios for post-intervention positive perception.

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**Table 1. Baseline Demographic Characteristics and Odds Ratios for Positive Reproductive Health Perception Post-Intervention (n = 42)**

| Variable | n | % | p-value | OR (95% CI) |
|---|---|---|---|---|
| **Age (years)** | | | | |
| 15 | 2 | 4.7 | – | - |
| 16 | 35 | 83.3 | 0.312 | 1.43 (0.71–2.89) |
| 17 | 5 | 11.9 | 0.458 | 1.18 (0.54–2.57) |
| **Prior Reproductive Health Information** | | | | |
| Received | 18 | 42.8 | 0.038 | 2.71 (1.06–6.93) |
| Not received | 24 | 57.1 | – | - |
| **Primary Information Source** | | | | |
| Friends | 29 | 69.0 | 0.041 | 0.38 (0.15–0.97) |
| Social media | 9 | 21.4 | 0.217 | 0.71 (0.23–2.19) |
| Parents | 3 | 7.1 | 0.523 | 1.12 (0.27–4.62) |
| Books | 1 | 2.3 | – | - |
| **Smartphone Access** | | | | |
| Own smartphone | 40 | 95.2 | 0.019 | 4.62 (1.28–16.7) |
| Shared/none | 2 | 4.8 | – | - |
| **Active Spotify Use** | | | | |
| Active user | 37 | 88.1 | 0.027 | 3.44 (1.15–10.3) |
| Non-user | 5 | 11.9 | – | - |
| **Daily Social Media Use (hours)** | | | | |
| < 2 hours | 7 | 16.7 | – | - |
| 2–4 hours | 21 | 50.0 | 0.148 | 1.89 (0.61–5.84) |
| > 4 hours | 14 | 33.3 | 0.072 | 2.34 (0.72–7.60) |

Note: * p-values and ORs from logistic regression adjusted for age, prior information receipt, and primary information source. Reference categories indicated. OR = odds ratio; CI = confidence interval. Bold p-values indicate statistical significance ($p < 0.05$).

The majority of respondents were 16 years of age (n = 35; 83.3%), with smaller proportions aged 15 (n = 2; 4.7%) and 17 (n = 5; 11.9%) years. More than half (57.1%) reported never having received formal reproductive health information prior to the study. Among those who had received prior information, the primary source was friends (69.0%), followed by social media (21.4%), parents (7.1%), and books (2.3%). Nearly all participants owned a personal smartphone (95.2%) and were active Spotify users (88.1%).

**Primary Outcome: Pre-test and Post-test Perception Scores**

The mean perception score increased significantly from 61.4 (SD 8.3) at pre-test to 86.8 (SD 5.1) at post-test, representing a mean improvement of 25.4 points. The proportion of participants with positive perceptions increased from 90.4% (n = 38) to 100% (n = 42), with no participant retaining a negative perception at follow-up. Table 2 presents the full multivariate and subgroup analysis results.

**Table 2. Wilcoxon Signed-Rank Test Results and Adjusted Odds Ratios by Subgroup (Pre-test vs. Post-test Reproductive Health Perception Scores)**

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| Variable | Pre-test Mean (SD) | Post-test Mean (SD) | Mean Δ | Z | p-value | Adjusted OR (95% CI) | Effect Size (r) |
|---|---|---|---|---|---|---|---|
| **Overall Perception Score** | 61.4 (8.3) | 86.8 (5.1) | +25.4 | −5.68 | < 0.001 | 14.7 (5.2–41.5) | 0.88 |
| **Age Subgroup: 15 years** | 58.5 (9.1) | 84.0 (6.0) | +25.5 | −1.34 | 0.181 | – | 0.95 |
| **Age Subgroup: 16 years** | 61.7 (8.0) | 87.0 (4.9) | +25.3 | −5.16 | < 0.001 | 15.2 (5.0–46.1) | 0.87 |
| **Age Subgroup: 17 years** | 62.0 (8.7) | 87.4 (5.3) | +25.4 | −2.02 | 0.043 | 13.1 (1.1–155.4) | 0.90 |
| **Prior Info Received: Yes** | 64.2 (7.6) | 88.1 (4.7) | +23.9 | −3.72 | < 0.001 | 11.3 (2.9–44.0) | 0.83 |
| **Prior Info Received: No** | 59.3 (8.6) | 85.8 (5.3) | +26.5 | −4.29 | < 0.001 | 18.4 (4.4–77.1) | 0.91 |
| **Primary Source: Friends** | 60.8 (8.1) | 86.3 (5.0) | +25.5 | −4.71 | < 0.001 | 13.9 (3.9–49.5) | 0.88 |
| **Primary Source: Social Media** | 63.0 (9.2) | 87.9 (5.4) | +24.9 | −2.67 | 0.008 | 16.1 (1.9–136.4) | 0.86 |
| **Podcast Engagement: High (≥75% episodes completed)** | 62.1 (7.9) | 88.4 (4.6) | +26.3 | −4.89 | < 0.001 | 20.3 (4.8–85.6) | 0.92 |
| **Podcast Engagement: Low (< 75% episodes completed)** | 59.8 (9.0) | 84.1 (5.8) | +24.3 | −2.94 | 0.003 | 9.4 (2.1-42.5) | 0.84 |

**Note:** Adjusted OR = odds ratio adjusted for age, primary information source, and podcast engagement level. Effect size r = Z/√N; r ≥ 0.50 = large effect. High engagement = ≥75% podcast episode completion; Low engagement = <75%. SD = standard deviation; Δ = mean difference.

Across all subgroups, the Wilcoxon signed-rank test yielded statistically significant results ($p < 0.05$), with the single exception of the age-15 subgroup ($n = 2$; $p = 0.181$), whose small sample size precluded reliable statistical inference. Effect sizes were uniformly large ($r = 0.83–0.92$), indicating a robust intervention effect. High-engagement participants (≥75% episode completion; $n = 28$) demonstrated a marginally higher post-test mean (88.4 vs. 84.1) and a larger adjusted OR (20.3 vs. 9.4) compared to low-engagement participants.

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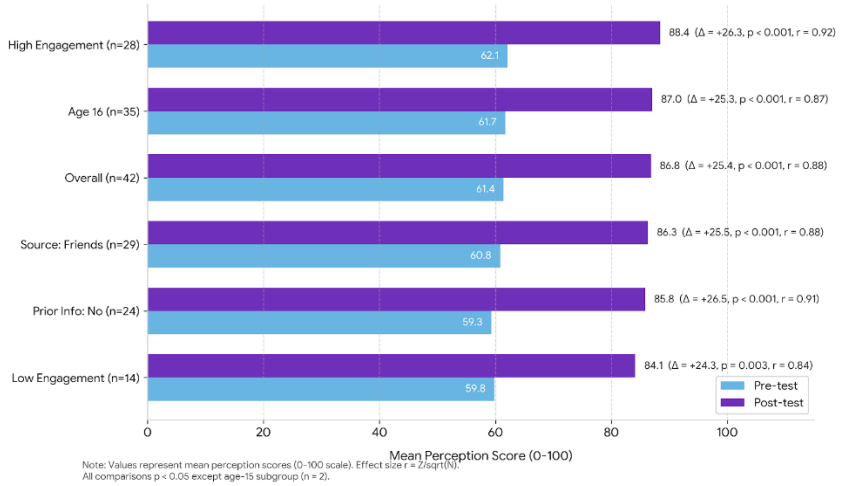


*Figure 1. Pre-test vs. Post-test Reproductive Health Perception Scores with Podcast Engagement Gradient*

## DISCUSSION

This pre-experimental study demonstrated that a 14-day, five-episode Spotify podcast intervention produced a statistically significant and clinically large improvement in reproductive health perceptions among female vocational-school adolescents in Surabaya, Indonesia. The mean perception score increased by 25.4 points, all participants transitioned to a positive perception category at follow-up, and effect sizes were large across all adequately powered subgroups (r = 0.83–0.92). These findings make an original empirical contribution by confirming the transferability of podcast-based health education effects well-documented in high-income country contexts to an Indonesian adolescent population where formal reproductive health education remains structurally limited (Amalia et al., 2021; Pinandari et al., 2023).

The magnitude of the observed effect is consistent with, and in several cases exceeds, that reported by analogous digital health education studies in low-middle-income country settings (Kistiana et al., 2023; Yuliza et al., 2023). A systematic review found that multimedia-based reproductive health interventions among sub-Saharan African adolescents produced mean knowledge score increases of 18–23 points on 100-point scales; the 25.4-point improvement observed here falls at the upper bound of this range, potentially reflecting Spotify's advantage in enabling repeated, self-paced content consumption. The dose–response pattern identified in our engagement subgroup analysis higher episode completion associated with higher post-test scores (88.4 vs. 84.1) and larger adjusted ORs (20.3 vs. 9.4) provides mechanistic support for the role of exposure fidelity in mediating podcast effectiveness, a finding that aligns with the active-engagement hypothesis proposed in digital health behaviour theory.

The predominance of friends as the primary reproductive health information source (69.0%) among our participants mirrors patterns documented in national-level Indonesian surveys (SDKI 2017) and in qualitative studies of peer health information sharing among urban Javanese adolescents (Fernenda et al., 2026; Rajapakshe et al., 2024; Wani et al., 2023). This reliance on informal peer networks,

characterised by high social trust but low epistemic reliability, arguably constitutes the most proximal contextual driver of reproductive health misinformation in this population (Astuti et al., 2025; Wittiarika et al., 2025). The adjusted logistic regression results are instructive in this regard: participants whose primary information source was friends showed a lower OR for pre-intervention positive perception (OR 0.38; 95% CI 0.15–0.97; p = 0.041) compared to those using other sources, yet achieved comparable post-intervention gains. This suggests that podcast-based education may be particularly beneficial for adolescents who disproportionately depend on peer networks precisely the subgroup at greatest risk from misinformation and that platform delivery can partially compensate for informational disadvantage at baseline (A. Putri & Sansuwito, 2025).

From a theoretical standpoint, the results are interpretable within the Health Belief Model: the podcast episodes systematically targeted perceived susceptibility (through STI prevalence data), perceived severity (through clinical vignettes of untreated reproductive conditions), perceived benefits (through self-care narratives), and cues to action (through episode summaries with actionable recommendations) (Juariah & Rizkianti, 2024; N et al., 2025; Yakubu et al., 2019). The significant pre-to-post shift in perception scores may therefore reflect not only knowledge acquisition but a restructuring of motivational beliefs a distinction with important implications for predicting downstream behavioural change (Wulandare et al., 2024; Yari et al., 2023). Future experimental work should incorporate validated measures of perceived susceptibility and self-efficacy as mediators to formally test this causal pathway (Hastuti et al., 2021).

Practical implications of these findings are substantial. First, Spotify is already installed on the majority of adolescent smartphones in Indonesia's urban centres, which eliminates the platform-adoption barrier that has hampered prior mHealth interventions requiring bespoke application downloads. Second, podcast production costs are comparatively low, and content can be standardised and quality-assured once before being scaled nationally without incremental per-user costs an advantage over trainer-dependent peer-education models. Third, integration with the UKS framework is mechanistically straightforward: schools could subscribe student cohorts to curated health podcast channels as a complement to existing physical health screening activities. The Ministry of Health's ongoing National Adolescent Health Programme (PKPR) represents a policy vehicle through which standardised, evidence-based podcast content could be disseminated at scale with minimal additional infrastructure.

Several limitations of this study must be acknowledged. The absence of a concurrent control group is the most salient methodological constraint; without random assignment to control and experimental conditions, causal attribution of the observed perception gains to the podcast intervention is inferential rather than definitive. Maturation effects, historical events during the two-week study window, and regression to the mean particularly given that 90.4% of participants already held positive perceptions at baseline cannot be fully ruled out as partial explanations for the observed gains. The single-site, convenience sample of Culinary Arts students at one vocational school in Surabaya limits generalisability to students in other majors, geographic regions, and socioeconomic strata. Outcome measurement relied exclusively on self-report, without biochemical or behavioural validation of actual reproductive health practice change. Finally, the 14-day follow-up period is insufficient to assess durability of perception change; perception scores may revert toward baseline in the absence of ongoing reinforcement. Future research should prioritise randomised controlled trials with active comparator

conditions (e.g., leaflet-based or video-based education), longer follow-up periods (minimum six months), and objective behavioural endpoints such as health-seeking frequency or contraceptive self-efficacy scores. Expansion to rural and peri-urban settings, and to male adolescents, is warranted to assess generalisability and explore gender-specific effects. Researchers should also examine whether Spotify engagement metrics readily available through the platform's analytics API can serve as real-time proxies for intervention adherence in future effectiveness trials.

## CONCLUSIONS

A 14-day Spotify podcast intervention significantly improved reproductive health perceptions among female vocational-school students in Surabaya, Indonesia, producing a mean score gain of 25.4 points and a shift to universally positive perceptions at follow-up. The effect was large, consistent across most subgroups, and dose-dependent on podcast engagement level. These findings establish proof-of-concept for commercial audio streaming platforms as viable, scalable channels for adolescent reproductive health education in low-middle-income country settings. Integration into existing school health and national adolescent health programme frameworks represents a practicable, low-cost policy response to persistent reproductive health knowledge gaps in this population. Randomised controlled trials with longer follow-up and behavioural outcome measures are the indicated next step.

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### Conflict of Interest

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