



Adolescent Reproductive Health and Sexually Transmitted Infection Occurrence Based on Social Cognitive Theory in Pati Regency

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Abstract

Sexually transmitted infections (STIs) among adolescents remain a serious yet frequently undetected reproductive health threat, compounded by social stigma and limited knowledge; confirmed STI cases among adolescents aged 15-24 years in Pati Regency rose by 18.3% in 2024, with the true burden presumed far higher (iceberg phenomenon), while the pathway linking Social Cognitive Theory (SCT) constructs to preventive knowledge remains poorly understood. This study aimed to analyze the adolescent reproductive health profile and STI occurrence in Pati Regency using SCT as an analytical framework. An explanatory sequential mixed-methods design was conducted across three sub-districts of Pati Regency from January to March 2026, involving 150 adolescents aged 15-24 years selected through stratified random sampling. Data were collected using validated structured questionnaires and clinical/laboratory STI examinations, then analyzed using chi-square, correlation, logistic regression, and SEM-PLS. Results showed an STI prevalence of 24.7%, with chlamydia as the most common type (43.2%); SEM-PLS revealed that attention strongly influenced retention ($\beta=0.612$; $p<0.001$), and motivation significantly predicted preventive-knowledge improvement ($\beta=0.769$; $R^2=0.591$). Low STI knowledge (OR = 4.12; 95% CI: 2.18-7.79) and risky sexual behavior (OR = 4.89; 95% CI: 2.47-9.68) were significantly associated with STI occurrence ($p < 0.000$). These findings suggest that the sequential SCT constructs are associated with adolescents' STI preventive knowledge, consistent with the hypothesized SCT-based pathway, and point to the potential value of SCT-informed education in strengthening adolescent reproductive health practice and policy. Further research with longitudinal designs and larger, more diverse samples is needed to confirm and extend these findings.

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1. INTRODUCTION

Sexually transmitted infections (STIs) represent one of the most complex global reproductive health challenges, particularly among adolescents and young adults. The World Health Organization (WHO) estimates that more than 374 million new curable STI cases occur annually across four main types: chlamydia, gonorrhea, syphilis, and trichomoniasis (WHO, 2023) with adolescents and young adults consistently representing a disproportionate share of this global burden across diverse healthcare settings (Cannovo et al., 2024). In Indonesia, STIs among adolescents are a serious concern given the high rate of early marriage, low sexual health literacy, and limited access to adolescent-friendly reproductive health services (Ministry of Health of the Republic of Indonesia, 2023).

Adolescents aged 15-24 years are the group most vulnerable to STIs due to biological, psychosocial, and structural factors. Biologically, the cervix of adolescent girls has a wider transformation zone, increasing susceptibility to chlamydial and gonococcal infection. Psychosocially, peer pressure, limited sexual-negotiation skills, and inadequate STI knowledge contribute to risky sexual behavior (Agustini & Damayanti, 2023; Badan Pusat Statistik Indonesia, 2022). Even where general reproductive health knowledge exists, Indonesian adolescents' sexual well-being remains constrained by limited access to youth-friendly information and by conservative social norms surrounding sexuality (Kågesten et al., 2021). Data from the 2022 Indonesia Demographic and Health Survey show that 8.6% of adolescent girls and 34.7% of adolescent boys aged 15-24 years had engaged in premarital sexual intercourse, with condom use remaining very low, consistent with national evidence that condom use among Indonesian male adolescents is strongly determined by limited knowledge and restricted access to reproductive health services (Putra et al., 2021).

Pati Regency, Central Java, faces significant adolescent reproductive health challenges. Data from the Pati Regency Health Office recorded 342 confirmed STI cases among the 15-24 age group in 2024, an 18.3% increase from the previous year. This figure represents only the visible tip of an iceberg, as many STI cases remain asymptomatic or unreported due to strong social stigma. Pati Regency also has an early-marriage rate above the national average (14.2% versus 11.9% nationally); early marriage remains a persistent, multifactorial phenomenon across Indonesia driven by limited education, economic pressure, and local socio-cultural norms (Nur et al., 2024), and it indirectly increases adolescents' vulnerability to STIs by curtailing autonomy over reproductive health decisions and access to services (Badan Pusat Statistik Kabupaten Pati, 2023; Pati Regency Health Office, 2024; Wibowo et al., 2021).

Adequate reproductive health knowledge is a critical foundation for STI prevention. However, a preliminary survey conducted by the researchers in three sub-districts of Pati Regency found that 63.4% of adolescents had low STI knowledge, 57.2% did not correctly understand STI transmission routes, and 71.8% had never received STI information from a health worker. This knowledge gap creates high vulnerability to risky sexual behavior and delayed STI treatment-seeking (Agustini & Damayanti, 2023).

This study addresses this gap by applying Social Cognitive Theory (SCT) as an analytical framework, combined with a Structural Equation Modeling-Partial Least Squares (SEM-PLS) approach, to map the influence pathway of SCT constructs, namely attention, retention, behavioral reproduction, and motivation on STI preventive knowledge and behavior. SCT is among the most widely applied behavior-change theories in adolescent sexuality education and peer-led health interventions worldwide, alongside the theory of planned behavior (Torres-Cortés et al., 2023), and school- and community-based interventions grounded in such theories have shown evidence of improving adolescent

health knowledge, even though evidence for sustained behavior change remains more limited (Dodd et al., 2022). This approach is relevant given growing evidence that SCT-based educational interventions effectively improve knowledge and preventive behavior against infectious diseases among adolescents (Ariestiningsih et al., 2025; De La Fuente et al., 2023). Evidence from a comprehensive sexuality education trial in Jakarta further illustrates the difficulty of achieving measurable behavioral change through single-component interventions in the Indonesian context, underscoring the need for theory-driven, multi-construct approaches such as SCT (Todesco et al., 2023). The novelty of this study lies in its integration of an explanatory sequential mixed-methods design with SEM-PLS path analysis to simultaneously quantify the sequential influence of SCT constructs on adolescent STI preventive knowledge an approach not yet widely applied in adolescent reproductive health research in Indonesia.

It should be noted that these four constructs attention, retention, behavioral reproduction, and motivation originate from Bandura's observational learning sub-processes (De La Fuente et al., 2023), historically associated with Social Learning Theory, rather than the broader core constructs of Social Cognitive Theory (e.g., self-efficacy, outcome expectations, sociostructural factors, and self-regulation). This study adopts the observational learning framework as an operational pathway for examining how adolescents acquire and translate STI-related information into preventive knowledge and behavior. This operationalization was selected because it offers a parsimonious, empirically testable sequence suited to a cross-sectional survey design, while it is acknowledged that SCT more broadly emphasizes reciprocal determinism among personal, behavioral, and environmental factors rather than a strictly linear sequence. Future research employing longitudinal or experimental designs may more fully capture this reciprocal dynamic. This study aimed to analyze the adolescent reproductive health profile and STI occurrence in Pati Regency using SCT as an analytical framework.

2. METHODS

This study used a mixed-methods approach with an explanatory sequential design, in which the quantitative phase (analytical cross-sectional) was conducted first, followed by a qualitative phase (in-depth interviews) to deepen the interpretation of the quantitative findings (Toyon, 2021). The study was conducted in the sub-districts of Pati Kota, Tayu, and Juwana, Pati Regency, Central Java, from January to March 2026. The research framework integrated SCT constructs into a reproductive health education program, linking the stages of quantitative planning, evaluation, and interpretation of adolescent STI occurrence in Pati Regency.

The population comprised all adolescents aged 15-24 years attending health facilities in the three selected sub-districts. The quantitative sample ($n = 150$) was determined using the Lemeshow formula with stratified random sampling based on sub-district and sex (5% precision, 95% confidence level, plus a 15% contingency allowance). Inclusion criteria were: aged 15-24 years, currently or previously sexually active, willing to participate, and providing informed consent (with parental/guardian consent for participants under 18 years). Exclusion criteria were pregnancy, active STI treatment, or cognitive impairment.

Quantitative data were collected through six procedures: (1) clinical STI examinations conducted by trained physicians; (2) laboratory testing, including rapid syphilis testing, Gram staining for gonorrhea, and polymerase chain reaction (PCR) testing for chlamydia; (3) a structured 25-item STI knowledge questionnaire ($r = 0.831$; Cronbach's $\alpha = 0.891$) covering transmission routes, symptoms, prevention, and treatment; (4) a 15-item risky sexual behavior questionnaire ($r = 0.812$); (5) a 10-item

reproductive health service access questionnaire; and (6) a 20-item questionnaire assessing Social Cognitive Theory (SCT) constructs ($r = 0.856$), covering attention, retention, behavioral reproduction, and motivation related to STI prevention. Qualitative data were collected through in-depth interviews with 15 purposively selected key informants using a six-question interview guide based on SCT constructs. The qualitative data were analyzed using reflexive thematic analysis to identify recurring patterns and themes related to barriers to accessing reproductive health services (Braun & Clarke, 2019).

Quantitative data were analyzed using IBM SPSS Statistics version 25.0 for univariate and bivariate analyses, including the chi-square test and Pearson or Spearman correlation, and SmartPLS version 4.0 for partial least squares structural equation modeling (PLS-SEM). Logistic regression analysis was conducted in two stages: (1) simple logistic regression was performed for each independent variable separately to estimate the crude odds ratio (cOR); and (2) multiple logistic regression was performed by entering all candidate variables simultaneously, with variables showing $p < 0.25$ in the bivariate analysis included in the model, to estimate the adjusted odds ratio (aOR). Model fit was assessed using the Hosmer-Lemeshow test and Nagelkerke R^2 .

The PLS-SEM measurement model (outer model) was evaluated based on outer loadings (≥ 0.70), average variance extracted (AVE ≥ 0.50), Cronbach's alpha and composite reliability (≥ 0.70), and discriminant validity. Discriminant validity was assessed using the Fornell-Larcker criterion (Afthanorhan et al., 2021) and the heterotrait-monotrait ratio (HTMT < 0.90) (Dirgijatmo, 2023). The structural model (inner model) was evaluated using standardized path coefficients (β) and the coefficient of determination (R^2). The significance of the structural relationships was assessed using bootstrapping with 5,000 subsamples, employing bias-corrected and accelerated (BCa) confidence intervals with a two-tailed significance level of $\alpha = 0.05$ (Hair et al., 2019).

This study was approved by the Health Research Ethics Committee of STIKES Bakti Utama Pati (No. 05/KEP/STIKES-BU/II/2026). All respondents provided written informed consent prior to data collection, and respondent confidentiality was fully protected.

3. RESULTS AND DISCUSSION

All 150 respondents completed data collection. Table 1 presents the distribution of demographic characteristics and STI status.

Table 1. Demographic characteristics and STI status of respondents (n = 150).

Characteristic	n	%
Sex		
Male	68	45.3
Female	82	54.7
Age Group (years)		
15-17	38	25.3
18-20	67	44.7
21-24	45	30.0
Sub-district		
Pati Kota	50	33.3
Tayu	50	33.3
Juwana	50	33.3
Education Level		
Junior High School/equivalent	32	21.3

Senior High School/Equivalent	89	59.3
Higher Education	29	19.3
STI status (clinical/laboratory confirmation)		
STI positive	37	24.7
STI negative	113	75.3
Type of STI among positive cases (n = 37)		
Chlamydia	16	43.2
Gonorrhea	11	29.7
Syphilis	6	16.2
Mixed infection	4	10.8

The majority of respondents (44.7%) were aged 18-20 years, reflecting the transition from adolescence to young adulthood as the phase of highest STI vulnerability. The STI prevalence of 24.7% is considered high and indicates the urgency for immediate intervention. Chlamydia was the most common STI (43.2%), consistent with WHO (WHO, 2023) data identifying chlamydia as the most prevalent bacterial STI globally due to its frequently asymptomatic nature. This pattern of underdetection is further supported by Indonesian evidence showing that STI burden among vulnerable adolescent populations is frequently higher than routine surveillance suggests, largely due to limited screening access and low health-seeking behavior (Nilasari et al., 2024). The even distribution of respondents across the three sub-districts allows for more representative generalization across Pati Regency.

Table 2. Profile of STI knowledge and risky sexual behavior among respondents (n = 150).

Variable	n	%
STI knowledge level		
Low (score < 60%)	95	63.3
Moderate (score 60-79%)	38	25.3
High (score > 80%)	17	11.3
Mean SCT construct scores (1-5 scale)	Mean	SD
Attention	2.81	0.73
Retention	2.64	0.68
Behavioral Reproduction	2.49	0.71
Motivation	2.93	0.69
Risky sexual behavior	n	%
Multiple sexual partners	41	27.3
No condom use	118	78.7
First intercourse < 18 years	63	42.0
Access to reproductive health services	%	%
Difficult access	89	59.3
Easy access	61	40.7

Mean scores for all SCT constructs were below 3.0 (on a 1-5 scale), indicating low cognitive engagement and motivation among adolescents toward STI prevention. Descriptively, the highest mean scores were observed for motivation (2.93) and attention (2.81), while retention and behavioral reproduction showed comparatively lower scores, although these differences were not formally tested for statistical significance and should be interpreted with caution. The high proportion of adolescents not using condoms

(78.7%) and initiating sexual intercourse before age 18 (42.0%) reflects pervasive risky sexual behavior resulting from the gap between knowledge and actual practice.

The study's implementation framework integrated SCT into an STI reproductive health education program, linking the stages of quantitative planning, evaluation, and interpretation of adolescent reproductive health outcomes in Pati Regency. The SCT constructs (attention → retention → behavioral reproduction → motivation) functioned as moderators of knowledge improvement and behavioral change in STI prevention.

To evaluate the mechanism through which SCT constructs influence the improvement of STI preventive knowledge, SEM-PLS analysis was performed using SmartPLS 4.0, linking the latent variables of attention, retention, behavioral reproduction, motivation, and STI preventive knowledge, following Bandura's four-stage SCT model (De La Fuente et al., 2023).

Table 3. SEM-PLS path coefficients of SCT constructs on STI preventive knowledge (n = 150).

Path	β (O)	T-Statistik	p-value	95% CI
Attention → Retention	0.612	14.918	<0.001*	0.530–0.692
Attention → Behavioral Reproduction	0.298	11.427	<0.001*	0.247–0.349
Retention → Behavioral Reproduction	0.441	10.184	<0.001*	0.354–0.524
Behavioral Reproduction → Motivation	0.713	29.631	<0.001*	0.666–0.760
Motivation → STI Preventive Knowledge	0.769	22.817	<0.001*	0.702–0.833

R² of the STI preventive knowledge variable = 0.591 (strong predictive ability)

The path analysis (Table 3) showed a sequential pattern of significant relationships across the SCT constructs, with attention exerting the strongest direct influence on retention ($\beta=0.612$), followed by retention on behavioral reproduction ($\beta=0.441$), behavioral reproduction on motivation ($\beta=0.713$), and motivation on STI preventive knowledge ($\beta=0.769$), consistent with the SCT proposition that active cognitive engagement is an essential prerequisite for effective information processing (De La Fuente et al., 2023; Schunk & DiBenedetto, 2020). In the context of STI prevention, strong attention to material on transmission routes, clinical symptoms, and self-protection strategies represents a fundamental starting point for behavioral change.

The retention → behavioral reproduction pathway (beta = 0.441) demonstrates that memory consolidation supports the ability to replicate learned behaviour; for instance, adolescents who remember correct condom-use information are better able to practice it consistently. Behavioral reproduction had a very substantial effect on motivation (beta = 0.713), confirming that direct practice, such as condom-negotiation simulations and role-play in resisting peer pressure, effectively builds intrinsic motivation. Motivation subsequently emerged as the proximal determinant of improved STI preventive knowledge (beta = 0.769; $R^2 = 0.591$), reinforcing the relevance of SCT as a framework for community-based reproductive health education interventions.

The R^2 value of 0.591 indicates that the SCT model explains 59% of the variance in improved STI preventive knowledge, representing strong predictive ability in the context of community-based health research (Hair et al., 2019). The finding that attention is the most foundational construct strengthens the argument that STI education program design must first ensure active cognitive engagement through interactive visual media and peer discussion before behavioral change can be expected.

Table 4. Factors associated with STI occurrence: bivariate and multivariate logistic regression analysis (n = 150).

Variable	STI (+) n (%)	STI (-) n (%)	cOR (95% CI)	P	aOR (95% CI)	P
Low STI knowledge vs. moderate–high (ref)	27 (18.0%)	68 (45.3%)	4.12 (2.18–7.79)	<0.001*	3.74 (1.89–7.41)	<0.001*
Risky sexual behavior vs. not risky (ref)	29 (19.3%)	53 (35.3%)	4.89 (2.47–9.68)	<0.001*	4.21 (2.01–8.83)	<0.001*
Condom non-use vs. condom use (ref)	31 (20.7%)	87 (58.0%)	3.78 (1.94–7.37)	0.001*	3.12 (1.51–6.45)	0.002*
Difficult service access vs. easy access (ref)	25 (16.7%)	64 (42.7%)	2.63 (1.38–5.02)	0.004*	2.31 (1.15–4.64)	0.019*

*Significant p; cOR = crude odds ratio (simple logistic regression, one variable per model); aOR = adjusted odds ratio (multiple logistic regression, controlled for all other variables); ref = reference category; CI = confidence interval. Hosmer-Lemeshow test: $\chi^2=5.814$, $df=8$, $p=0.668$ (model fit adequate); Nagelkerke $R^2=0.392$.

Low STI knowledge was associated with 3.74 times higher odds of STI occurrence after adjusting for other variables (aOR=3.74; 95% CI: 1.89–7.41; $p<0.001$), confirming that a knowledge deficit is a central determinant of STI vulnerability. Risky sexual behavior showed the highest adjusted odds ratio (aOR=4.21; 95% CI: 2.01–8.83), consistent with global evidence that behavioral risk factors are leading predictors of STI transmission among adolescents (Statistics Indonesia, 2022; WHO, 2023).

Table 5. Correlations between SCT construct scores, knowledge, and STI preventive behavior (n = 150).

Variable	Correlation coefficient (r)	Test	p-value
Attention score ↔ STI knowledge score	0.487	Pearson	<0.001*
Motivation score ↔ STI preventive behaviour	0.524	Pearson	<0.001*
Knowledge score ↔ Preventive behavior	0.512	Pearson	<0.001*

* $p<0.001$; correlation test selected based on data distribution (Shapiro-Wilk).

The significant positive correlations between attention score and STI knowledge ($r=0.487$; $p<0.001$) and between motivation score and STI preventive behavior ($r=0.524$; $p<0.001$) provide convergent validation for the SEM-PLS model, indicating that the SCT constructs operate coherently within the context of adolescent STI prevention. The significant relationship between knowledge and preventive behavior ($r=0.512$; $p<0.001$) is consistent with the pathway hypothesized in the SCT model, in which good knowledge, increased motivation, and consolidated preventive behavior are interrelated, although the cross-sectional design does not permit causal inference. Limited access to reproductive health services was also associated with increased odds of STI occurrence (aOR=2.31;

95% CI: 1.15–4.64), underscoring the importance of structural interventions alongside educational interventions.

DISCUSSION

The STI prevalence of 24.7% among adolescents in Pati Regency is considered high. It should be noted that this figure cannot be directly compared to national prevalence, as laboratory-confirmed STI prevalence data for the general adolescent population aged 15–24 years are not yet available in Indonesia. Existing national data consist of case counts identified through health services (Ministry of Health of the Republic of Indonesia, 2025) and sexual behavior data from the 2022 Indonesia Demographic and Health Survey (Badan Pusat Statistik Indonesia, 2022). Furthermore, the study sample was recruited from sexually active adolescents visiting health facilities, which likely resulted in a higher prevalence estimate than would be found in the general adolescent population. These findings nonetheless indicate an iceberg phenomenon warranting immediate attention. This situation may be further compounded by limited STI screening capacity at the primary health center level and by stigma that discourages adolescents from seeking care, although screening capacity itself was not directly measured in this study, and this explanation should be regarded as a plausible contextual factor drawn from the broader literature rather than a direct finding of this research.

The application of PLS-SEM in this study represents a valuable methodological contribution to adolescent reproductive health research in Indonesia, as it enables simultaneous quantification of the influence pathway of SCT constructs on STI preventive knowledge, together with a rigorous assessment of the measurement model's validity and reliability (Appendix 1). The finding that motivation exerts the strongest direct influence on preventive knowledge, preceded by a substantial behavioral reproduction→motivation pathway, reinforces the argument that STI education programs should prioritize opportunities for direct practice and skill building not only passive information delivery if genuine improvements in preventive knowledge and behavior are to be expected.

The strong behavioral reproduction→motivation pathway ($\beta=0.713$) carries an important practical implication: effective STI education programs should provide opportunities to directly practice preventive skills rather than merely delivering information passively. A peer-educator model that engages adolescents as agents of change has been shown to be effective in building intrinsic motivation and shifting social norms around risky sexual behavior in prior interventions (Ariestiningsih et al., 2025; Vincent & Krishnakumar, 2022), although the broader evidence base on school-based peer education indicates that effectiveness for sex-related outcomes tends to be more consistent for knowledge and attitude change than for measurable behavioral change (Dodd et al., 2022).

The reproductive health service access barrier experienced by 59.3% of respondents reflects a significant structural gap. Qualitative findings revealed that adolescents reported feelings of embarrassment (83.3%), fear of being recognized (73.3%), and inconvenient service hours (60.0%) as the main reasons for not seeking STI services despite experiencing symptoms. Reform of STI service delivery models is needed to prioritize confidentiality, flexible service hours, and a non-judgmental approach consistent with WHO Youth-Friendly Health Services (YFHS) standards (World Health Organization & UNAIDS, 2025).

Several limitations should be acknowledged. First, the cross-sectional design limits causal inference, and sensitive sexual behavior data are susceptible to social desirability bias. Second, the sample was recruited from sexually active adolescents visiting health facilities rather than from the general adolescent population, so the STI prevalence

reported here may not be generalizable beyond this specific group. Third, with only 37 confirmed STI cases and four predictors included in the multivariable logistic regression model, the events-per-variable ratio (EPV=9.3) falls slightly below the recommended minimum of 10, which may affect the stability of the adjusted odds ratio estimates. Fourth, coverage of only three sub-districts limits generalizability across Pati Regency as a whole. Finally, the SEM-PLS model did not incorporate external moderating variables such as parental support, social media influence, and local cultural factors, including the persistence of early-marriage norms that continue to shape adolescent reproductive health trajectories in parts of Indonesia (Nur et al., 2024). Multi-sub-district longitudinal research with a randomized design is needed to evaluate the long-term impact of SCT-based interventions and to confirm the directionality of the pathways identified in this study.

4. CONCLUSION

This study demonstrates that the prevalence of STIs among adolescents in Pati Regency was 24.7%, with chlamydia as the most common type, strongly associated with low knowledge (OR=4.12) and risky sexual behavior (OR=4.89), although the cross-sectional design precludes causal interpretation. SEM-PLS analysis confirmed that the sequential SCT pathway (attention → retention → behavioral reproduction → motivation → preventive knowledge) significantly contributed to the improvement of STI preventive knowledge ($R^2 = 0.591$), with the motivation-to-knowledge path serving as the proximal determinant of the learning outcome ($\beta=0.769$) and the behavioral reproduction-to-motivation path representing the most substantial pathway ($\beta=0.713$).

An integrated intervention is recommended, combining SCT based STI reproductive health education with active peer educator components, preventive skills simulation, and interactive visual media in schools and communities; development of Youth Friendly Health Services across all primary health centers in Pati Regency; routine STI screening integrated into adolescent health programs; and strengthening of STI recording and reporting systems to reduce the iceberg phenomenon in Pati Regency. These recommendations are evidence informed, based on the association patterns identified in this study and supporting literature; intervention studies (e.g., experimental or quasi experimental designs) are needed to validate their effectiveness before broader implementation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Nur Cahyani Ari Lestari contributed to conceptualization, study design, supervision of data collection, and manuscript drafting. Luluk Yulianti contributed to study design and data analysis. Zuhijriani, Baharika Suci Dwi Aningsih, Nurul Fatimah, and Rizky Fitri contributed to data collection, laboratory coordination, and qualitative data analysis. All authors reviewed and revised the manuscript and approved the final version.

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DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors declare that a generative AI tool (Claude, Anthropic) was used solely to assist with translation and language editing of the manuscript into English, and with reference formatting. The authors reviewed and verified all content and take full responsibility for the accuracy, originality, and scientific integrity of the manuscript.

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