Original Paper

# Usability and Perceived Acceptability of the "MedSMARxT: *Adventures in PharmaCity*" Opioid Safety Serious Game Among County-Based Extension Agents in Kentucky: Single-Group Pretest-Posttest Formative Stakeholder Evaluation

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## Abstract

**Background:** Prescription opioids are a major pathway to opioid initiation and misuse among adolescents. Access to leftover medications and limited awareness of safe storage and disposal increase this risk. Adolescents often prefer game-based and digital opioid education. MedSMARxT Families combines the serious game *Adventures in PharmaCity* with a personalized Family Medication Safety Plan to promote medication safety and opioid risk awareness. Delivering it across home, school, and community settings may broaden reach and reinforce learning. Family and Consumer Sciences (FCS) Extension professionals can assess the game's suitability for community-based medication safety education.

**Objective:** This study aimed to examine Kentucky FCS Extension agents' perceptions of the usability, acceptability, age appropriateness, and educational value of MedSMARxT: *Adventures in PharmaCity* and to assess gameplay engagement.

**Methods:** In this single-group, pretest-posttest formative stakeholder evaluation, agents were recruited by convenience sampling during 3 mandatory in-person trainings. Participants completed a presurvey, played for approximately 30 minutes, and completed a postsurvey. The presurvey assessed participant characteristics, populations served, and perceived opioid severity. The postsurvey included nine 5-point Likert items assessing usability, engagement, age appropriateness, perceived educational value, and intended future use, a 0 to 10 recommendation item, and open-ended feedback. Telemetry captured playtime, chapter progression, and completion. Results were summarized descriptively, with 95% CIs. Regional and responder-nonresponder differences were assessed using chi-square or Fisher exact tests (2-sided $\alpha$=.05). Analyses were conducted in R (version 4.5.1).

**Results:** A total of 96 FCS Extension agents participated. Among 92 with regional data, 85 (92.4%) had ≥2 years of Extension experience, and 87 (94.6%) served adults or caregivers. The mean playtime was 25.6 (SD 8.1; 95% CI 24.0-27.3) minutes, with a mean of 3.8 (SD 1.6; 95% CI 3.5-4.1) chapters played and 3.3 (SD 2.0; 95% CI 2.9-3.7) completed; 51 agents (53.1%; 95% CI 43.2%-62.8%) completed all 5 chapters. Fifty-five (57%) participants completed all 9 postsurvey Likert items. Most (43/55, 78.2%; 95% CI 65.6%-87.1%) rated the design as appealing and professional, while 30 (54.5%; 95% CI 41.5%-67.0%)

of 55 found the interactive elements engaging. Fewer rated the game as easy to navigate (22/55, 40.0%; 95% CI 28.1%-53.2%) or appropriate for adolescents aged 12 to 18 years (24/55, 43.6%; 95% CI 31.4%-56.7%). Approximately half (29/55, 52.7%; 95% CI 39.8%-65.3%) planned to recommend the game. Open-ended feedback reflected perceived educational value but identified concerns about navigation, pacing, guidance, and suitability for older adolescents. Overall, 56 (58.3%; 95% CI 48.3%-67.7%) of 96 encountered naloxone content through the epilog or conditional chapter 4 pathway. Postsurvey response differed by region ($P$<.001).

**Conclusions:** Unlike prior MedSMART evaluations, this study paired Extension agents' perspectives with in-game telemetry. Agents valued the game's design but identified usability, age appropriateness, and guidance gaps. These findings set refinement priorities and support pairing the game with structured instruction before evaluation with adolescents and families.

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**Keywords:** serious game; Extension agent; MedSMART; adolescents; prescription opioid; community

## Introduction

As the opioid epidemic in the United States remains one of the deadliest drug crises in modern history [1], prescription opioids have become a common entry point to opioid misuse and are associated with broader risk behaviors and substance co-use [2,3]. Opioid misuse among adolescents is particularly concerning, as approximately 14% of high school seniors report lifetime prescription opioid misuse [4]. Early exposure to opioids, including prescribed medical use, increases the risk of later misuse and opioid use disorder [5-8]. Increases in opioid prescribing have also been associated with rising rates of pediatric opioid misuse, opioid-related mortality, and health care use [9-11]. Notably, overdose death rates among US adolescents nearly doubled between 2019 and 2020, driven largely by illicitly manufactured fentanyl, including counterfeit pills made to resemble prescription medications [12,13], while prescription opioid–involved death rates across all ages rose by 17% over the same period [14].

Adolescents often access opioids from leftover prescriptions in the home [15], a risk driven by limited parental supervision, poor communication about medication safety, and improper storage or disposal [16,17]. Beyond the household, broader community and social environments such as schools, neighborhoods, and peer networks play an important role in shaping opioid-related behaviors [18-21]. Peer influence and permissive social norms can increase exposure to and acceptance of prescription drug misuse, thereby elevating risk. In contrast, strong social support, positive peer relationships, and cohesive community structures can reinforce protective behaviors, promote healthy decision-making, and reduce the likelihood of opioid misuse among adolescents [18-21]. Community- and systems-level strategies represent important components of broader opioid prevention efforts [22]. Extending adolescent-focused medication safety education into community settings may provide additional opportunities to support prevention across adolescents' social environments.

Video gaming is deeply integrated into adolescent life in the United States, with 85% of teens playing video games and approximately 4 in 10 playing daily [23]. Adolescents show a strong preference for digital formats, especially videos, websites, and serious games (SGs) for learning about opioids [24]. SGs offer an interactive approach to opioid safety education [24,25]. In a prior nationally representative study of 592 US adolescents, nearly 80% reported willingness to engage with an educational game focused on opioid safety [24]. However, few interventions integrate adolescent-focused digital tools with parent-targeted components to support family communication around medication safety [26-28].

MedSMART Families is a dual-component digital intervention that addresses this gap by combining *Adventures in PharmaCity*, an evidence-based SG for adolescents, with the Family Medication Safety Plan (FMSP), a personalized tool for parents to support communication and safe medication practices [29,30]. Prior research has described the game as engaging and realistic for adolescents across diverse educational settings, including middle schools, high schools, and colleges [29,31]. Evaluations have also reported improvements in opioid safety knowledge and related behavioral intentions, alongside favorable perceptions of the game among adolescents and other stakeholders [24,30-35]. Nonetheless, the value of such interventions may depend on how well they fit the needs of their intended users. Adaptable psychoeducational mobile health systems can tailor content, pacing, and guidance to users' characteristics, needs, and delivery contexts [36,37]. MedSMART: *Adventures in PharmaCity* currently supports English and Spanish and incorporates branching gameplay, but its pacing, instructional guidance, and presentation do not adapt to age, gaming experience, or individual user needs. The fit of MedSMART: *Adventures in PharmaCity* for different audiences, including community educators who may deliver the game, has not been examined.

MedSMART Families has also been evaluated in pediatric emergency department (ED) settings, where adolescents and parents reported favorable perceptions of its educational value while identifying areas for refinement [38]. Clinical encounters provide opportunities for opioid safety education [39-41], but adolescents also encounter medication-related influences across home, school, and community environments [42,43]. Extending digital medication safety resources into these settings may provide additional opportunities to reinforce opioid safety education. Nevertheless, their suitability for community-based educational programming requires input from professionals who routinely work with youth and families.

Cooperative Extension provides an established infrastructure for delivering research-informed health education through locally embedded community networks [44-48]. County-based Extension professionals work directly with communities and adapt educational programming to local needs and priorities [44-48]. This infrastructure provides a relevant setting for examining the perceived suitability of digital medication safety resources for community education. This perspective is salient in Kentucky, where rurality, health care access, socioeconomic conditions, and geographic variation contribute to the broader context of opioid-related harms [49-53].

Within the University of Kentucky Cooperative Extension Service, county-based Extension agents deliver programming across 4-H Youth Development, Agriculture and Natural Resources, Family and Consumer Sciences (FCS), and Community and Economic Development. FCS Extension agents have a substantial role in health- and family-focused programming [44-48], making their perspective relevant to the assessment of digital medication safety resources for youth and families. The objectives of this formative stakeholder evaluation were (1) to examine FCS Extension agents' perceptions of the usability, acceptability, age appropriateness, and perceived educational value of the MedSMART: *Adventures in PharmaCity* SG and (2) to assess patterns of gameplay engagement using in-game telemetry.

# Methods

## Research Design Overview

This single-group, pretest-posttest formative stakeholder evaluation assessed the acceptability, perceived usability, age appropriateness, and educational value of the MedSMART: *Adventures in PharmaCity* SG among FCS Extension agents in Kentucky. The evaluation combined preparticipation and postparticipation surveys, in-game telemetry, and descriptive open-ended feedback to characterize agents' perceptions and gameplay engagement. Participants completed the preparticipation survey (pretest) before gameplay and the postparticipation survey (posttest) immediately after gameplay. The pretest collected participant characteristics and baseline perceptions, and perceptions of the game were assessed only at posttest; therefore, no pretest-posttest change in outcomes was estimated. Only the game component was evaluated; the FMSP was not examined in this study and is assessed separately.

## Inclusion and Exclusion Criteria

Eligible participants were aged ≥18 years, currently employed as a University of Kentucky FCS Extension agent in any Kentucky county office, in possession of a smartphone, and able to download and install mobile apps. Agents who did not meet all criteria were excluded, and no additional exclusion criteria were applied.

## Participant Characteristics

Participants were county-based FCS Extension agents from all 3 University of Kentucky Cooperative Extension regions (Central, Eastern, and Western Kentucky). Participants reported their county of employment, years of experience, and the age groups they most frequently served. Region of employment was derived from the reported county and classified as Central, Eastern, or Western using the University of Kentucky Cooperative Extension Service regional classification [54].

## Sampling Procedures

A convenience sampling approach was used. Recruitment occurred during 3 mandatory in-person FCS Extension agent training sessions held at Kentucky Extension offices in the Western (February 17, 2026), Central (February 18, 2026), and Eastern (February 19, 2026) regions. All FCS Extension agents present at these sessions were invited to participate, and no recruitment occurred outside the sessions. Participation was voluntary and independent of training attendance.

## Sample Size, Power, and Precision

An a priori power analysis was not performed. The sample comprised all eligible agents present at the mandatory training sessions during the study window. Thus, the achieved sample size was determined by attendance. Precision of the estimated proportions and means was characterized using 95% CIs.

## Intervention

The MedSMART Families intervention has been described previously [30]. Briefly, it is a digital health program that combines the MedSMART: *Adventures in PharmaCity* SG with a personalized FMSP. For this study, only the *Adventures in PharmaCity* game was evaluated; the FMSP is assessed in a separate study.

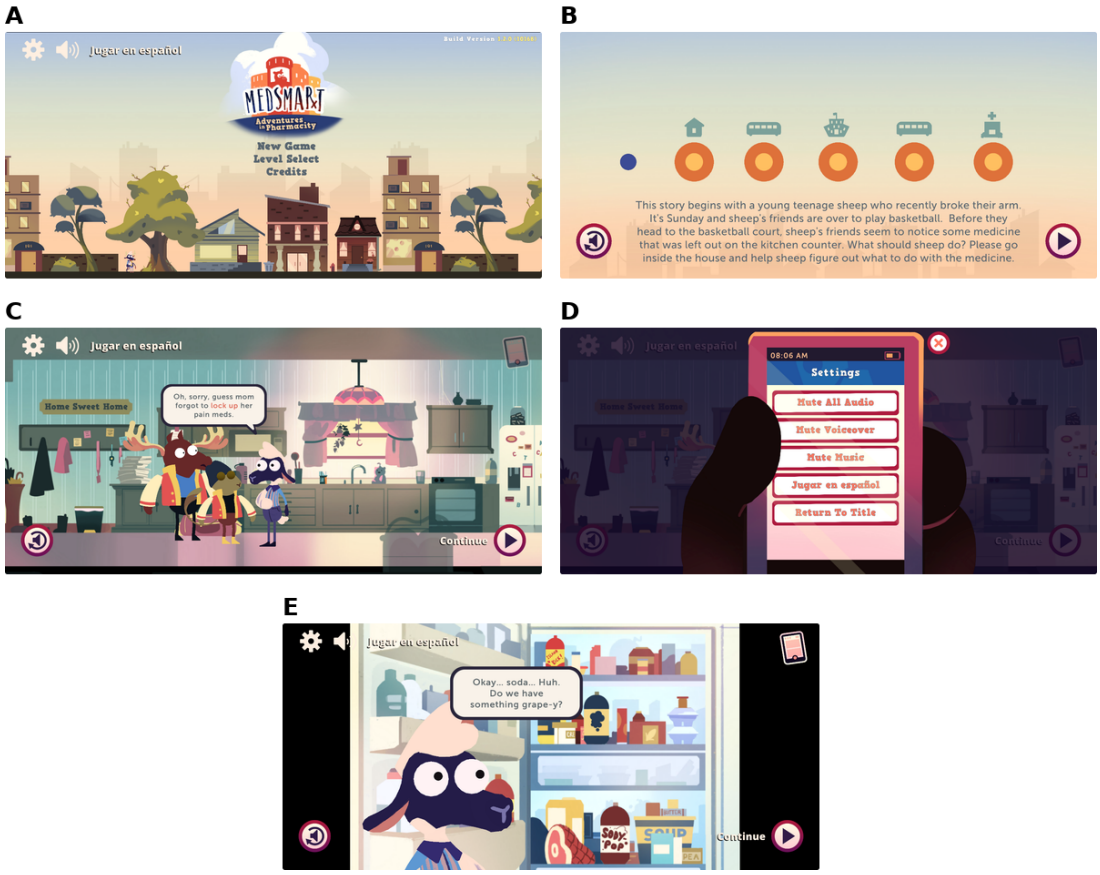
The version evaluated in this study was a new native mobile build, distinct from the prototype described in earlier reports [29]. The app was rebuilt for iOS and Android using Unity 6 (version 6000.0.60f1). In-game analytics were transmitted through an analytics layer to Firebase Analytics (GA4 [Google Analytics 4]; Google LLC). Development began in March 2025, and the main build occurred between April and June 2025. The app was first released publicly on July 10, 2025. Participants played version 1.2.0, released on December 2, 2025. No updates were released before the February 2026 study sessions. The development team comprised members of the research team and a professional educational game development team, with expertise spanning pharmaceutical sciences, behavioral research, computational methods, production, software engineering, user experience design, and quality assurance. The full development team roster and credited roles are provided in Multimedia Appendix 1. The original prototype incorporated end user input during earlier development work [29]. The app supports English and Spanish. However, telemetry did not record the language used by individual participants.

The game consists of 5 sequential chapters followed by an epilog: chapter 1 (storage), chapter 2 (bus), chapter 3 (overdose), chapter 4 (sharing), and chapter 5 (disposal). Chapter 1 covers safe prescription medication storage. Chapter 2 is a transitional narrative scene without player

decisions. Chapter 3 highlights the risks of using nonprescribed opioids. Chapter 4 presents decisions about sharing one's prescription medication with another person in pain. Choosing to share medication leads to an overdose recognition and naloxone response sequence. Chapter 5 addresses safe medication disposal. The epilog provides naloxone education, including its role in reversing opioid overdose, how it is administered, the need to contact emergency services, and its availability without a prescription. According to the development team, the game is designed to be completed in a single session of approximately 25 to 30 minutes.

Representative gameplay screens are shown in Figure 1, and the 5-chapter structure and decision pathways are detailed in Multimedia Appendix 2. The app's distribution platforms, store URLs, and geographic availability are described in the Data Availability section.

**Figure 1.** Representative gameplay screens from MedSMART: *Adventures in PharmaCity*. (A) Game title screen showing version 1.2.0, chapter selection, and Spanish-language option; (B) game introduction showing narrative context and chapter progression; (C) chapter 1 gameplay showing medication storage education and character dialogue; (D) in-game settings showing audio controls and Spanish-language option; and (E) interactive gameplay showing character dialogue and player decision-making.




## Measures and Covariates

The preparticipation survey collected participants' county of employment, region, years of experience, and age groups most frequently served. Participants also rated the significance of opioid or prescription drug misuse among youth and families in their service county. Eligibility was confirmed with 3 screening items: age ≥18 years, smartphone ownership, and ability to download and install apps from the Apple App Store or Google Play Store.

The postparticipation survey was developed specifically for this study; no previously validated instrument was adapted. It comprised 9 statements rated on a 5-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5), 1 likelihood-to-recommend item rated on a 0 to 10 scale (0=not at all likely, 10=completely likely), and 1 open-ended feedback item. The Likert statements assessed usability and engagement (ease of navigation and use, professional and appealing design, and engagement with interactive elements), age appropriateness (appropriateness for adolescents aged 12-18 y), implementer confidence and perceived educational value (confidence in delivering safe storage and disposal programming, confidence in initiating prevention conversations, and perceived knowledge of opioid misuse risks and terminology), and adoption intention (plans to recommend the game in the community and use its content and resources in existing Extension programs). The 0 to 10 item asked participants how likely they were to recommend the MedSMART app to a fellow Extension agent. The open-ended item invited additional feedback about the game. Both surveys, including their item wording, are provided in Multimedia Appendix 3.

In-game telemetry captured gameplay activity and engagement through a back-end system that recorded timestamped events linked to unique participant identifiers (player IDs). Each event was characterized by chapter, event code, and outcome. Key progression events included ChapterStart, generated when a participant entered a chapter, and ChapterComplete, generated when a participant completed a chapter. Outcome values represented unfavorable (0), favorable (1), or neutral (2) game events; value 3 represented system telemetry and was excluded from decision metrics. Engine-generated progression markers, including ChapterStart and ChapterComplete, were excluded from decision counts. Derived measures included chapters played and completed, chapter-specific time, total playtime, number of sessions, overall game completion, and opioid-related decisions or actions associated with game progression. Detailed telemetry event definitions, metric derivation procedures, denominator handling, and data cleaning rules are provided in Multimedia Appendix 4. The telemetry event dictionary is provided in Multimedia Appendix 5.

## Data Collection

Data were collected from February 17 to 19, 2026, at 3 Kentucky Extension offices representing the Central, Eastern, and Western regions. Data collection occurred during mandatory in-person training sessions for FCS Extension agents. All agents attending the sessions were invited to participate in the study. Participants completed the study activities in large meeting rooms using their own mobile devices and the venue's Wi-Fi or their cellular data. Pre- and post-participation surveys were administered through Qualtrics (Qualtrics, LLC) [55]. In-game telemetry was captured automatically through Firebase Analytics and stored in Google BigQuery.

Participants first completed the preparticipation survey, which collected demographic information and baseline perceptions. They then played MedSMART: *Adventures in PharmaCity* for approximately 30 minutes. During gameplay, the telemetry system automatically recorded timestamped in-game events linked to individual player IDs. Participants were encouraged to explore the game fully and to deliberately make incorrect choices to observe the resulting teaching content and outcomes.

Following gameplay, participants completed the postparticipation survey. The survey assessed their perceptions of the game and its potential use in community programming. An optional open-ended item invited participants to provide additional feedback about the game.

## Quality of Measurements

Survey and telemetry data were collected electronically, minimizing transcription and data entry error. Telemetry was recorded automatically, independent of participant self-report. Each perception outcome was assessed once, immediately after gameplay.

## Instrumentation

The postparticipation survey was an ad hoc instrument developed specifically for this study. No previously validated instrument was adapted, and its psychometric properties have not been established.

## Masking

Not applicable. All participants received the same gameplay exposure, with no condition assignment. Participants were aware of the study purpose, and members of the research team who developed the game conducted the evaluation.

## Psychometrics

Survey items were analyzed individually rather than as composite scales; therefore, internal consistency coefficients were not calculated. Open-ended responses were categorized by 2 reviewers (RO and YS), with discrepancies resolved through consensus. Interrater agreement statistics were not calculated.

## Conditions and Design

No conditions were manipulated. This was a nonexperimental, single-group, pretest-posttest formative stakeholder evaluation in which all participants played the same version of the game under the same conditions.

## Data Diagnostics

For participants with more than 1 postsurvey submission, the first complete submission was retained. Completed postsurvey records that could not be linked to the presurvey were retained in the primary postsurvey descriptive analysis. One postsurvey response was begun during the February 19 session but not submitted (67% progress). Qualtrics, however, automatically recorded it 7 days later. As it included responses to all 9 Likert items, it was retained. A sensitivity analysis excluding it changed item-level agreement by no more than 1.4 percentage points.

Telemetry data were restricted to the 96 study participants and the supervised study period. Time stamps were converted from Coordinated Universal Time to Eastern Time before applying study session boundaries. Events occurring after the supervised sessions were excluded, including a later full-game replay, app removal events, and app launches without gameplay. This removed 60 (1.1%) of 5630 events, leaving 5570 events for analysis. No duplicate events were identified, and no telemetry values were imputed.

Missing data were not imputed. Item-specific denominators were reported. An assessment of the missing completely at random assumption was not performed as missingness primarily reflected unit nonresponse to the postsurvey. Postsurvey response proportions differed significantly by region ($P<.001$). The postsurvey data therefore cannot be assumed to be missing completely at random.

### Statistical Analysis

Descriptive analyses summarized participant characteristics by region, survey responses, and in-game metrics. Categorical variables were reported as frequencies and percentages with 95% CIs, and means were reported with 95% CIs. Regional differences were assessed using Pearson chi-square or Fisher exact tests, as appropriate. All regional comparisons were exploratory, and no adjustment was made for multiple comparisons.

Postsurvey items were analyzed individually. Likert items were summarized using means, SDs, response distributions, and the proportion agreeing or strongly agreeing (ratings of 4 or 5), with 95% CIs. The 0 to 10 recommendation item was summarized using the mean, SD, and 95% CI.

As a sensitivity analysis, baseline characteristics were compared between participants with and without a linked postsurvey response using Fisher exact tests to assess potential nonresponse bias. A postsurvey response was considered linked when it could be matched to a presurvey record through verified participant identifiers. Participants without a linked postsurvey response (n=42) comprised the 41 participants who did not complete the postsurvey and 1 participant whose completed postsurvey could not be matched to a presurvey record. Characteristics included region, years of experience, populations served, and perceived opioid severity. Analyses were exploratory, and no adjustment was made for multiple comparisons.

In-game metrics were derived from the 5570 time stamped telemetry events retained after data cleaning (see "Data Diagnostics" section), linked by player ID. A session was defined by a unique combination of player ID and Firebase session identifier. A chapter was considered played when at least one ChapterStart event was recorded and completed when at least one ChapterComplete event was recorded for chapters 1-5. The epilog was analyzed separately and was not counted as a sixth chapter. Overall game completion was defined as completion of all 5 chapters. Total playtime was calculated from participant-level engagement time events. Chapter-specific time was calculated from the first ChapterStart to the last ChapterComplete within a single session and included repeated attempts. When a chapter was completed in more than 1 session, the most recent completion within the study window was used. Participants without both events within the same session were excluded from the corresponding chapter-specific time estimate but retained in the overall analysis. Analyses were performed in R version 4.5.1 (R Foundation for Statistical Computing) [56]. Statistical significance was set at a 2-sided $P<.05$.

Opioid-related decision events were identified using a predefined list of opioid safety choices. System telemetry events and engine-generated progression markers were excluded from decision counts. In-game metrics were summarized using means, SDs, and 95% CIs, with measure-specific denominators reported.

Open-ended responses were independently reviewed by 2 authors (RO and YS) and grouped into 4 descriptive categories: user experience, age appropriateness, perceived value, and suggestions for improvement. Responses could be assigned to more than 1 category, and nonsubstantive responses (eg, "No") were excluded from category counts. Discrepancies were resolved through discussion. No thematic analysis was conducted.

### Ethical Considerations

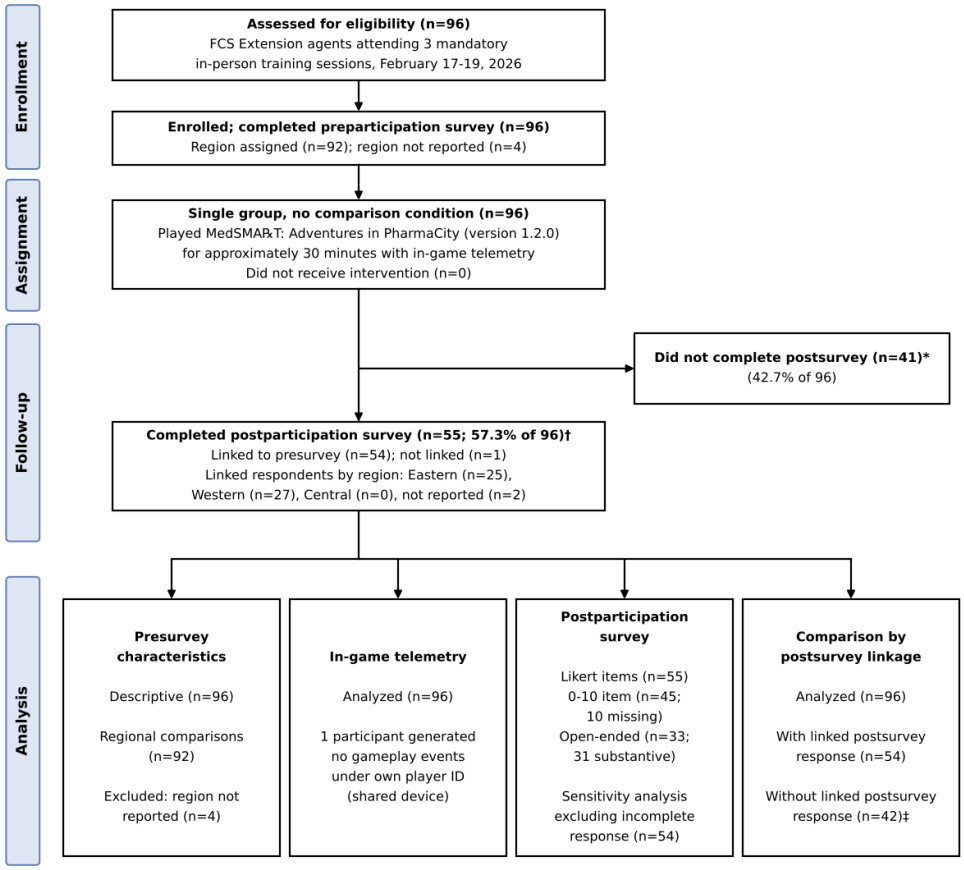
This study was reviewed and approved by the University of Kentucky Institutional Review Board (IRB 109171), and written informed consent was obtained from all participants. Although attendance at the training sessions was mandatory, research participation was voluntary and independent of training attendance. Agents could decline participation without consequences to their employment or professional standing. Study data were deidentified to protect participant privacy and confidentiality, and no identifiable information was retained. Data were collected using Qualtrics, a Health Insurance Portability and Accountability Act (HIPAA)–compliant survey platform [55]. Participants were not eligible for monetary compensation because they were employees of the University of Kentucky. No participants are identifiable in the figures or multimedia appendices.

## Results

### Overview

All 96 agents assessed for eligibility met the inclusion criteria and completed the preparticipation survey (Figure 2). Of these, 55 (57.3%; 95% CI 47.3%-66.7%) completed the postparticipation survey and 41 (42.7%; 95% CI 33.3%-52.7%) did not. No postparticipation surveys were submitted during the Central region session (February 18, 2026). No procedural or technical problems were noted, and the reason could not be determined. Consequently, no Central region participants had a linked postsurvey response. All 55 respondents completed the 9 Likert items, 45 (81.8%; 95% CI 69.7%-89.8%) completed the 0 to 10 recommendation item, and 33 (60.0%; 95% CI 46.8%-71.9%) provided open-ended feedback (Figure 2).

**Figure 2.** Participant flow of county-based Family and Consumer Sciences (FCS) Extension agents through a single-group formative stakeholder evaluation of MedSMART: *Adventures in PharmaCity*, conducted during 3 mandatory in-person training sessions in Central, Eastern, and Western Kentucky, February 17-19, 2026. †Fifty-six postsurvey records were received from 55 participants; 1 duplicate submission from the same participant was excluded, and the first complete submission was retained. Participants with a linked postsurvey response were those whose postsurvey was matched to a presurvey record through verified participant identifiers (n=54). *Of the 96 enrolled participants, 41 did not complete the postsurvey. ‡Participants without a linked postsurvey response (n=42) comprise these 41 participants and 1 participant who completed the postsurvey but whose response could not be matched to a presurvey record. One postsurvey response was begun during the February 19 session but not submitted (67% progress) and was automatically recorded by the survey platform 7 days later. As it included all 9 Likert items, it was retained, and a sensitivity analysis excluding it is reported.




Baseline characteristics of the 96 participants are presented in Multimedia Appendix 6. Exploratory analyses by region included 92 participants with reported counties of assignment (Table 1). No statistically significant regional differences were observed in years of experience or populations served (all $P>.05$). Perceived opioid severity differed by region ($P=.045$), with a higher proportion of participants in the Eastern region rating opioid misuse as a very serious problem than in the Central and Western regions.

**Table 1.** Characteristics of Kentucky Extension agents by region.

| Characteristic | Extension region | | | | |
|---|---|---|---|---|---|
| | Overall (N=92), n (%) | Central (n=26, 28.2%) | Eastern (n=30, 32.6%) | Western (n=36, 39.1%) | *P* value |
| Years of experience | | | | | .50[a] |
| <2 | 7 (7.6) | 1 (3.8) | 3 (10) | 3 (8.3) | |
| 2-5 | 39 (42) | 10 (38) | 15 (50) | 14 (39) | |
| 6-10 | 16 (17) | 7 (27) | 5 (17) | 4 (11) | |
| ≥11 | 30 (33) | 8 (31) | 7 (23) | 15 (42) | |
| Target population served[b] | | | | | |
| Elementary (K-5) | 44 (48) | 12 (46) | 11 (37) | 21 (58) | .20[c] |
| Middle school (6-8) | 23 (25) | 9 (35) | 5 (17) | 9 (25) | .30[c] |
| High school (9-12) | 14 (15) | 5 (19) | 3 (10) | 6 (17) | .60[a] |
| Adults/caregivers | 87 (95) | 23 (88) | 29 (97) | 35 (97) | .40[a] |

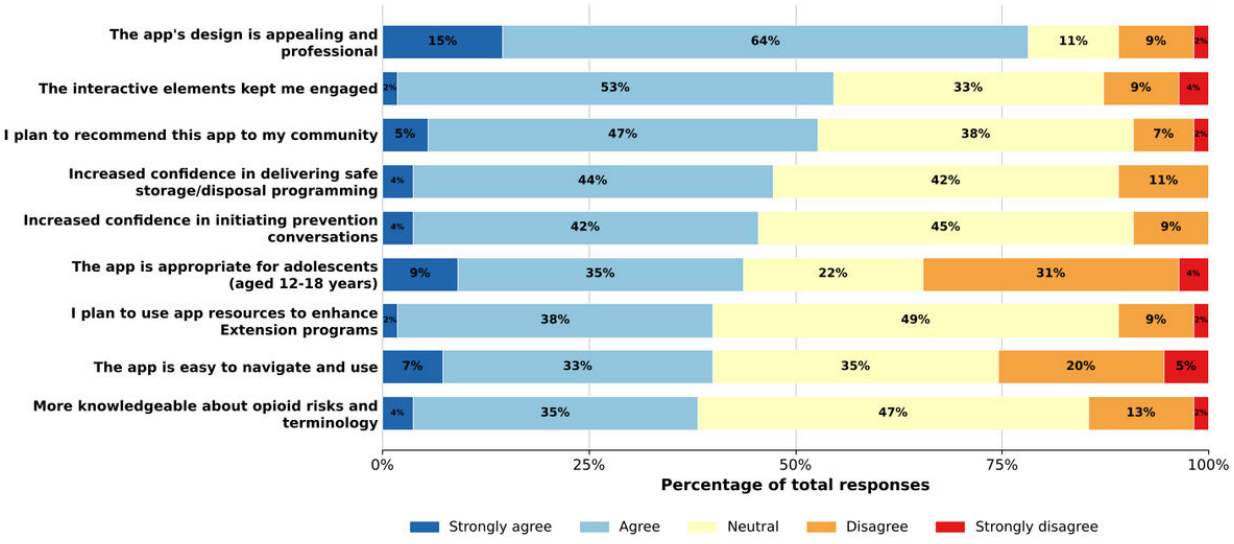
| Characteristic | Extension region | | | | |
|---|---|---|---|---|---|
| | Overall (N=92), n (%) | Central (n=26, 28.2%) | Eastern (n=30, 32.6%) | Western (n=36, 39.1%) | *P* value |
| Others | 11 (12) | 4 (15) | 3 (10) | 4 (11) | .80[a] |
| Perceived opioid severity in the region[d] | | | | | .045[a] |
| Minor problem | 6 (6.5) | 1 (3.8) | 1 (3.3) | 4 (11) | |
| Moderate problem | 30 (32.6) | 12 (46) | 6 (20) | 12 (33) | |
| Significant problem | 37 (40.2) | 8 (31) | 12 (40) | 17 (47) | |
| Very serious problem | 18 (19.6) | 4 (15) | 11 (36.7) | 3 (8.3) | |

[a]Fisher exact test.
[b]Categories are not mutually exclusive; percentages represent the proportion of participants (N=92) who identified each group as a target audience. "Adults/caregivers" combines participants who selected "parents/caregivers" or "general adults."
[c]Pearson chi-square test.
[d]One participant from the Central region did not report perceived opioid severity and was categorized as "unknown." This category is not displayed; therefore, percentages may not total 100% because of rounding.

In the sensitivity analysis, 54 participants had a linked postsurvey response and 42 did not. Linkage status differed by region ($P$<.001), with no linked postsurvey responses from the Central region (Multimedia Appendix 7). No statistically significant differences were observed by years of experience, populations served, or perceived opioid severity (all $P$≥.20).

Postsurvey perceptions of the MedSMART: *Adventures in PharmaCity* game are presented in Figure 3 and Multimedia Appendix 8. Among the 55 respondents, 43 (78.2%; 95% CI 65.6%-87.1%) agreed or strongly agreed that the app's design was appealing and professional, and 30 (54.5%; 95% CI 41.5%-67%) agreed or strongly agreed that the interactive elements kept them engaged. Twenty-nine (52.7%; 95% CI 39.8%-65.3%) participants reported that they would recommend the app to their community, while 22 (40%; 95% CI 28.1%-53.2%) intended to use its content and resources to enhance existing Extension programs.

**Figure 3.** Family and Consumer Sciences Extension agents' perspectives on MedSMART: *Adventures in PharmaCity* (N=55).




A total of 26 (47.3%; 95% CI 34.7%-60.2%) participants agreed or strongly agreed that the app increased their confidence in delivering safe storage and disposal programming, while 25 (45.5%; 95% CI 33%-58.5%) reported increased confidence in initiating prevention conversations (Multimedia Appendix 8). Similarly, 21 (38.2%; 95% CI 26.5%-51.4%) reported feeling more knowledgeable about opioid misuse risks and terminology. Regarding usability and age appropriateness, 22 (40%; 95% CI 28.1%-53.2%) agreed or strongly agreed that the app was easy to navigate and use, while 24 (43.6%; 95% CI 31.4%-56.7%) considered it appropriate for adolescents aged 12 to 18 years.

Among the 45 respondents who completed the recommendation item, the mean likelihood of recommending the game to another Extension agent was 5.64 (SD 2.05; 95% CI 5.03-6.26) on a 0 to 10 scale (median 6, IQR 5-7; range 1-10).

In-game telemetry included 5570 events across 96 participants, comprising 5162 gameplay events, 393 user engagement events, and 15 other Firebase system events (Table 2). Overall, 51 (53.1%) participants completed all 5 chapters.

**Table 2.** In-game telemetry summary for Kentucky Family and Consumer Sciences Extension agents who played the MedSMART: *Adventures in PharmaCity* serious game (February 2026).

| Characteristic | Value |
|---|---|
| Total participants (users), n | 96 |
| iOS users, n (%; 95% CI) | 83 (86.5; 78.2-91.9) |
| Android users, n (%; 95% CI) | 13 (13.5; 8.1-21.8) |
| Total sessions, n | 101 |
| Sessions per participant, mean (SD) | 1.05 (0.22) |
| Total telemetry events, n[a] | 5570 |
| Gameplay events, n (%) | 5162 (92.7) |
| User engagement events, n (%) | 393 (7.1) |
| Other Firebase system events[b], n (%) | 15 (0.3) |
| Completed all 5 chapters, n (%; 95% CI) | 51 (53.1; 43.2-62.8) |

[a]Percentages for gameplay, user engagement, and other Firebase system events are calculated out of the 5570 total telemetry events and may not total 100 because of rounding.
[b]Included 8 screen-view events, 5 session-start events, and 2 operating system update events.

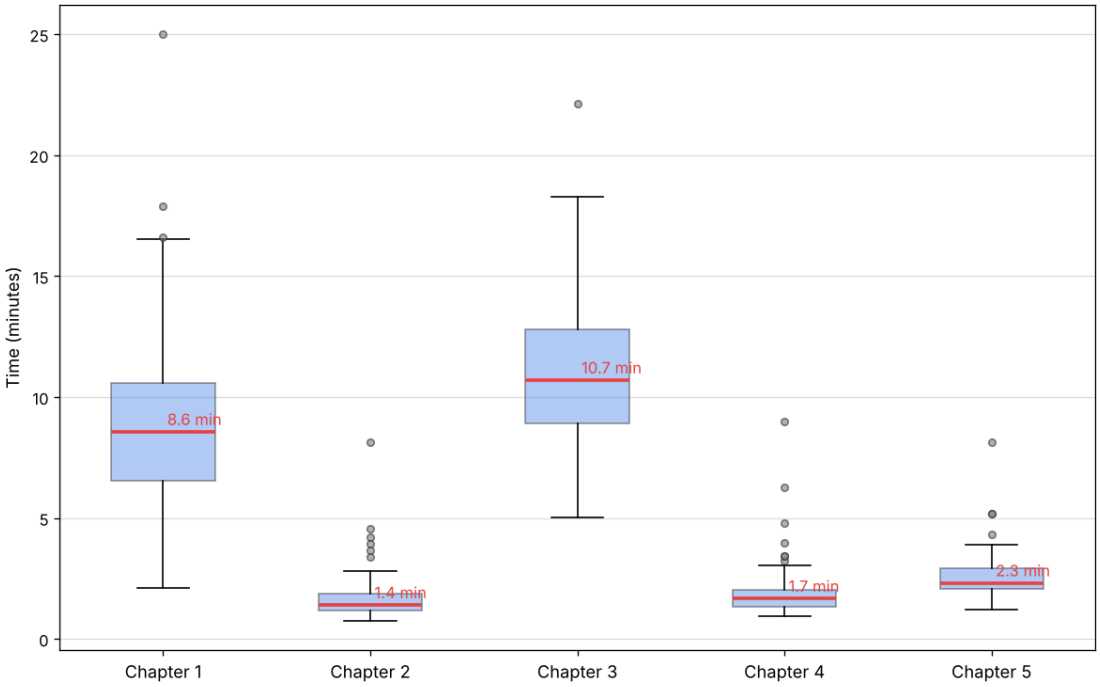
Participants spent an average of 25.6 (SD 8.1; 95% CI 24.0-27.3) minutes playing the game, engaged with a mean of 3.8 (SD 1.6; 95% CI 3.5-4.1) chapters, and completed an average of 3.3 (SD 2.0; 95% CI 2.9-3.7) chapters (Table 3). Chapter-specific engagement time was longest for chapter 3 (overdose; mean 11.1, SD 3.3; 95% CI 10.2-11.9 minutes; n=61) and chapter 1 (storage; mean 8.9, SD 3.8; 95% CI 8.0-9.7 minutes; n=77). Mean engagement times for chapters 2, 4, and 5 ranged from 1.7 to 2.7 minutes. The distributions of chapter-specific engagement times, including medians and variability, are shown in Figure 4. Participants recorded a mean of 3.8 (SD 2.3; 95% CI 3.3-4.3) opioid-related decisions or actions associated with game progression (Table 3). Among the 51 participants who completed all 5 chapters, the mean time across the 5 chapters and the epilog was 25.1 (SD 4.6; 95% CI 23.8-26.4) minutes, including restarts after unfavorable choices. Their total engagement time, which also included time in menus and between chapters, averaged 28.1 (SD 5.3; 95% CI 26.6-29.6) minutes.

**Table 3.** Gameplay engagement metrics for Kentucky Family and Consumer Sciences Extension agents who played the MedSMART: *Adventures in PharmaCity* serious game (February 2026; N=96)

| Measure | Participants, n | Mean (SD) | 95% CI |
|---|---|---|---|
| Total playtime (min) | 96 | 25.6 (8.1) | 24.0-27.3 |
| Chapters played (of 5) | 96 | 3.8 (1.6) | 3.5-4.1 |
| Chapters completed (of 5) | 96 | 3.3 (2.0) | 2.9-3.7 |
| Opioid-related decisions/actions associated with game progression | 96 | 3.8 (2.3) | 3.3-4.3 |
| Chapter 1 time[a] (min) | 77 | 8.9 (3.8) | 8.0-9.7 |
| Chapter 2 time (min) | 77 | 1.7 (1.1) | 1.5-1.9 |
| Chapter 3 time (min) | 61 | 11.1 (3.3) | 10.2-11.9 |
| Chapter 4 time (min) | 54 | 2.0 (1.4) | 1.7-2.4 |
| Chapter 5 time (min) | 51 | 2.7 (1.2) | 2.3-3.0 |

[a]Chapter-specific time was calculated among participants who completed the respective chapter within a session and includes repeated attempts within the session. The epilog was analyzed separately and was not counted as a sixth chapter.

**Figure 4.** Median engagement time across the 5 chapters. Time spent in each chapter (minutes) among participants who completed that chapter (chapter 1, n=77; chapter 2, n=77; chapter 3, n=61; chapter 4, n=54; and chapter 5, n=51). Red lines represent the medians, boxes show the IQRs, whiskers extend across the nonoutlier range, and gray points represent outliers. Engagement time includes repeated attempts within the session.




Of the 96 participants, 51 (53.1%; 95% CI 43.2%-62.8%) reached the epilog containing explicit naloxone education and spent a median of 28 (IQR 21-49) seconds in it. Ten (10.4%; 95% CI 5.8%-18.1%) participants also encountered the overdose recognition and naloxone response sequence after choosing to share medication in chapter 4. Five of these participants also reached the epilog. Overall, 56 (58.3%; 95% CI 48.3%-67.7%) participants encountered naloxone content through at least one pathway, while 40 (41.7%; 95% CI 32.3%-51.7%) encountered none.

Gameplay progression across the 3 study days is shown in Figures 5-7 (n=38, 27, and 30, respectively). On all 3 days, unfavorable-choice events were concentrated in chapter 1 (storage). Participants who progressed beyond chapter 1 generally continued to later chapters, including chapters 3 (overdose) and 5 (disposal), whereas some participants on days 2 and 3 did not progress beyond chapter 1. Among participants who reached chapter 5, most reached the completion milestone. On days 1 and 3, chapter 3 was characterized by longer engagement times than the other later chapters.

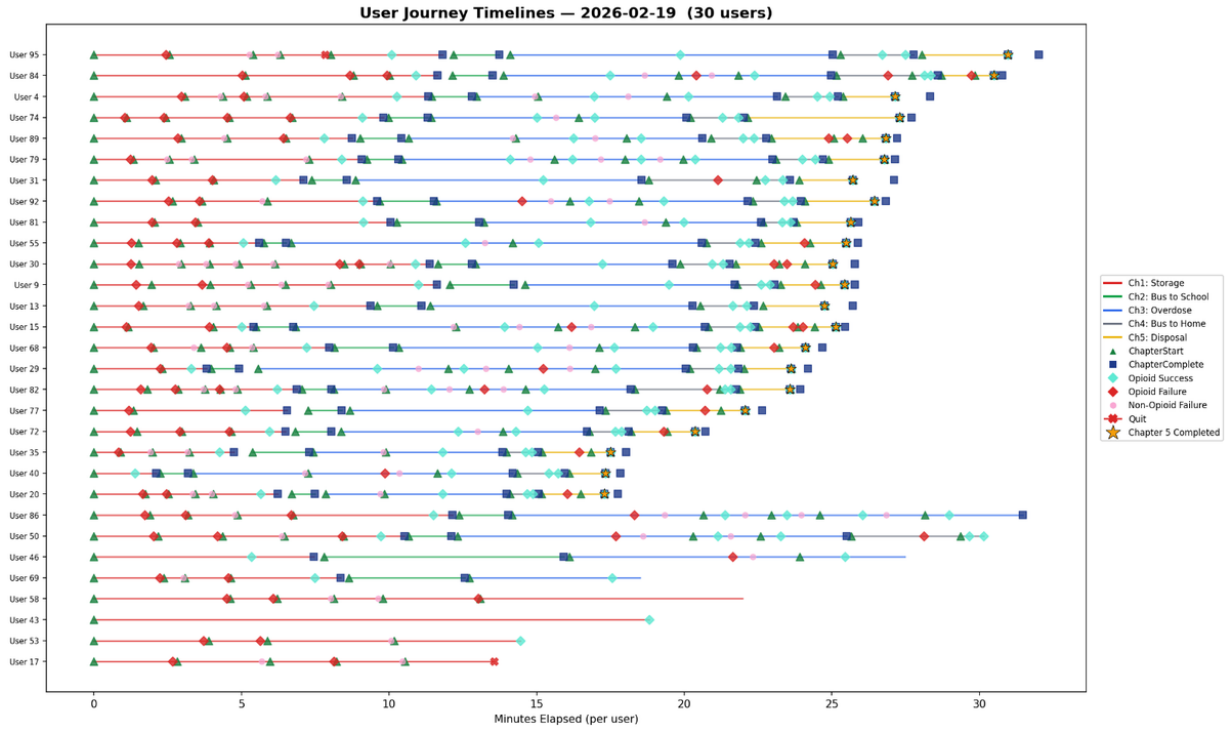
**Figure 5.** User journey timelines, day 1 (February 17, 2026; n=38). Each horizontal line represents 1 participant's gameplay over elapsed time (minutes). Line colors indicate chapters, and markers indicate chapter starts and completions, favorable and unfavorable choices, quitting, and completion of chapter 5.




**Figure 6.** User journey timelines, day 2 (February 18, 2026; n=27). Each horizontal line represents 1 participant's gameplay over elapsed time (minutes). Line colors indicate chapters, and markers indicate chapter starts and completions, favorable and unfavorable choices, quitting, and completion of chapter 5.



**Figure 7.** User journey timelines, day 3 (February 19, 2026; n=30). Each horizontal line represents 1 participant's gameplay over elapsed time (minutes). Line colors indicate chapters, and markers indicate chapter starts and completions, favorable and unfavorable choices, quitting, and completion of chapter 5.




## Participants' Feedback

Of the 55 postsurvey respondents, 33 (60.0%; 95% CI 46.8%-71.9%) provided open-ended feedback, of whom 31 provided substantive comments (Multimedia Appendix 9). Two participants responded "No." A descriptive review of the 31 substantive responses identified recurring feedback related to user experience (n=18), age appropriateness (n=18), perceived value (n=5), and suggestions for improvement (n=15). Responses could address more than 1 category.

### User Experience

Feedback on user experience primarily concerned navigation and pacing. Some participants described difficulty navigating the game and determining the actions required to progress, particularly those who described themselves as nongamers. One participant commented:

> *Found difficult to use it. Not intuitive. But I am old. Info was good I just struggled with the controls.* [P52, Eastern region]

Participants also commented on slow pacing, repetitive sequences, and the number of clicks required to advance dialogue:

> *You had to click through the same scenario too many times.* [P17, Western region]

> *The amount of clicks on "continue" is excessive.* [P49, Eastern region]

### Age Appropriateness

Several participants questioned whether the game's design was appropriate for adolescents aged 12 to 18 years. Comments suggested that the animation style and tone may be more suitable for younger audiences:

> *I think ideal age is 4-6th grade, I think much older than that and the kids think it's trivial.* [P47, Eastern region]

> *If you want it to be for high school it needs to be much faster and more engaging. I really like the idea, it just needs fine tuning.* [P17, Western region]

> *I fear once you reach ages 15-16, this game will feel juvenile for participants.* [P49, Eastern region]

Participants also noted a practical tension between the game's apparent audience and its delivery format:

> *Interestingly, I am not sure how many 4-6th grader will have a mobile device to play it on. Is this web browser friendly for Chrome Books?* [P47, Eastern region]

### Perceived Value

Some participants commented positively on the game's educational purpose and potential to increase awareness:

> *Great program and generates awareness*. [P53, Eastern region]

> *I like that the game meets the audience where they are in regards to learning styles*. [P49, Eastern region]

### Suggestions for Improvement

Suggestions included clearer instructions, additional visual or auditory cues, shorter dialogue transitions, and more guidance during gameplay:

> *Needs more information on steps that you need to take on game. More of a guide like look for a key etc*. [P15, Western region]

Another participant suggested providing prompts after repeated unsuccessful attempts:

> *After failing a few times maybe receiving a prompt ... to make the game more enjoyable*. [P18, Western region]

Some participants also suggested using the game alongside structured instruction or facilitated discussion rather than as a standalone resource:

> *If this app was provided in addition to a lesson/curriculum, I would feel more comfortable recommending it to another agent and/or using it for programming in my county*. [P49, Eastern region]

## Discussion

### Principal Findings

This formative stakeholder evaluation examined Kentucky FCS Extension agents' perceptions of the MedSMART: *Adventures in PharmaCity* SG and their gameplay engagement. Usability emerged as the primary concern. Fewer than half of agents found the game easy to navigate, and their comments pointed to unclear progression cues, slow pacing, and limited guidance. Perceptions of age appropriateness and intended future use were also mixed. Agents nonetheless viewed the game's design as professional, and some reported greater confidence in delivering medication safety education and initiating prevention conversations. Gameplay data showed that exposure to naloxone education depended on progression through the game, which was constrained mainly by the time available within the session, and on the decision pathways encountered.

The findings also offer insight into the game's potential role as an educational resource from an implementer perspective. Participants suggested that it could complement medication safety education and support prevention conversations with youth and families. Some considered the game more useful when paired with structured instruction or facilitated discussion rather than used as a standalone resource. This feedback points to potential integration within existing community education. However, the results should not be interpreted as evidence of improved knowledge, implementation feasibility, or preventive effectiveness because these outcomes were not directly evaluated.

Usability emerged as a key concern. Agents described difficulty identifying the actions required to progress, especially among those unfamiliar with gaming. They recommended clearer instructions, prompts, and more intuitive navigation. Slow pacing, repetitive dialogue, and limited guidance were also identified as barriers to engagement. These concerns suggest that visual appeal did not necessarily translate into ease of use and identify specific targets for future game refinement.

Age appropriateness also warrants attention. Participants raised concerns about the suitability of the game's animation style, pacing, and tone for adolescents aged 12 to 18 years. Some considered the game more appropriate for upper elementary or early middle school students. As Extension agents routinely deliver educational programming to youth and families [44-48], their feedback offers a distinct implementer perspective on audience fit. This perspective is relevant because the study assessed potential implementers rather than adolescents directly using the current version of the game.

Gameplay data further clarified access to naloxone education. Explicit naloxone instruction was delivered in the epilog, which required completion of all 5 chapters. Additional overdose recognition and naloxone response content was accessible through a conditional medication sharing pathway in chapter 4, encountered by 10.4% of participants. Access to this pathway was determined by the game's branching structure, independent of overall game completion. In contrast, reaching the epilog required completing all 5 chapters, and progression may have been constrained by the time-limited session and encouragement to make incorrect choices. Consequently, the proportion of participants who encountered no naloxone content may reflect the study conditions rather than the game's design alone (see Limitations section). These results reinforce the need to improve the accessibility of naloxone education across gameplay pathways in future revisions.

### Comparison With Prior Work

Findings from this study align with and extend earlier evaluations of MedSMART Families among adolescents, parents, pharmacists, and health care staff [31,33-35]. Previous studies reported favorable perceptions of the game's interactive format, graphics, characters, and realistic medication safety scenarios [31,35-38]. Extension agents identified similar strengths, including the professional design

and potential value of the game as a medication safety educational resource. However, the current results also reinforce previously reported concerns about navigation and pacing [31,33,38].

These recurring usability concerns are notable as this study evaluated a new native mobile build rather than the prototype described in earlier reports [29]. Despite substantial technical redevelopment, challenges with navigation, pacing, and instructional guidance persisted. Technical redevelopment alone did not resolve the previously identified interaction design challenges. Future revisions may therefore require targeted changes to navigation cues, onboarding, pacing, and instructional support.

Naloxone education also remains an area for refinement. Participants in the earlier ED-based study requested greater naloxone coverage and clearer guidance on opioid-related emergencies [38]. In this study, explicit naloxone instruction was delivered only in the epilog, making exposure dependent on completing all 5 chapters. However, the 30-minute supervised session and encouragement to make incorrect choices may have limited progression to this content. Thus, limited naloxone exposure may reflect the study conditions rather than the game's design alone. Future revisions could increase the prominence and accessibility of naloxone education across gameplay pathways.

Perceptions of age appropriateness varied across prior evaluations [31,34,38]. Adolescents generally viewed the game favorably and described its scenarios as realistic and relatable to teens [31], while pharmacists considered its language, characters, and scenarios appropriate for adolescents [34]. In contrast, parents in a more recent ED-based study questioned the game's fit for adolescents and considered some design features more suitable for younger children [38]. Extension agents raised similar concerns in this study regarding animation style, pacing, and tone. This consistency across parents and Extension agents strengthens the concern that the game's current design may not fully align with its intended adolescent audience. Extension agents add a distinct perspective as community educators who routinely select and adapt educational materials for youth and families [44,46]. Their feedback reinforces the need to better align the game's design with its intended adolescent audience. The current distribution conditions present a related concern: at the time of revision, the US App Store listed the game as 18+ and categorized it as medical, despite an intended audience of adolescents aged 12 to 18 years. Revising the store listing to reflect the intended age range is an important consideration before evaluation with adolescents.

Previous MedSMART Families studies have largely examined the experiences of adolescents, parents, pharmacists, and other stakeholders in educational or clinical contexts [31,33-35,38]. In contrast, Extension agents considered the game within the context of community education and existing Extension programming. Their preference for pairing the game with structured instruction or facilitated discussion suggests that perceived value may depend partly on the educational context in which the game is used. Agents also raised implementation-specific delivery considerations, including access to mobile devices among the intended audience and compatibility with school-issued Chromebooks. Although this study did not evaluate implementation feasibility, these perspectives identify practical considerations for incorporating the game into community-based education.

The study's findings are also relevant to broader research on adaptable psychoeducational mobile health interventions. Prior work emphasizes tailoring digital interventions to users' characteristics, educational needs, and delivery contexts [36,37]. MedSMART*: Adventures in PharmaCity* currently supports English and Spanish and incorporates branching gameplay. Nonetheless, its pacing, instructional guidance, and presentation do not adapt to age, gaming experience, or individual user needs. Extension agents' feedback suggests that greater adaptability in these areas could improve usability and alignment with the intended audience across educational settings.

## Limitations

This study has several limitations. First, participants were county-based FCS Extension agents from a single state Cooperative Extension system, which may limit generalizability to Extension programs with different organizational structures, resources, or populations. The study also focused on FCS agents and may not reflect the perspectives of professionals in other Extension program areas, including 4-H Youth Development, Agriculture and Natural Resources, and Community and Economic Development.

Second, the structured gameplay conditions may have influenced participant engagement and completion. Although research participation was voluntary, participants were recruited during mandatory professional training and given approximately 30 minutes of supervised gameplay. The game requires 25 to 30 minutes to complete, and completers averaged 25.1 minutes, leaving little time for delays. This time constraint likely contributed to incomplete gameplay and limited exposure to naloxone education. Participants were also encouraged to make incorrect choices, which sometimes required restarting chapters and further delayed progression. These factors may have influenced completion rates, naloxone exposure, and perceptions of pacing, rather than these findings reflecting the game's design alone. Engagement during a single supervised session also does not establish sustained use or adoption in community settings. Future evaluations should allow self-paced gameplay or multiple sessions to assess engagement under less restrictive conditions.

Third, the primary survey outcomes reflected participants' self-reported perceptions immediately after gameplay. These measures captured initial perceptions of usability, acceptability, age appropriateness, and educational value but did not establish changes in knowledge, behavior, or preventive outcomes. In addition, the postsurvey was developed for this study and has not been psychometrically validated, so individual items may not precisely measure the intended constructs. Members of the research team were also

involved in developing the game, which may have introduced expectancy or social desirability bias in participants' responses [57,58].

Fourth, postsurvey nonresponse may have introduced selection bias. No postparticipation surveys were submitted during the Central region session; no procedural or technical problems were noted, and the reason could not be determined. Postsurvey findings therefore reflect Eastern and Western region agents only and may not represent the perspectives of Central region agents. While other measured baseline characteristics did not differ significantly between participants with and without a linked postsurvey response, this regional imbalance may limit the representativeness of the postsurvey findings. The modest postsurvey sample resulted in wide 95% CIs around the agreement estimates, with interval widths of approximately 25 percentage points, indicating limited precision. These estimates should therefore be interpreted cautiously.

Furthermore, this was a descriptive formative evaluation; no a priori hypotheses were tested. Regional comparisons and comparisons by postsurvey linkage status were exploratory and not adjusted for multiple comparisons, so statistically significant results, such as the regional difference in perceived opioid severity, may reflect chance and should not be interpreted as confirmatory.

Interpretation of the telemetry data also requires caution. Participants were encouraged to explore the game by selecting both safe and unsafe choices. Events representing unsafe choices therefore cannot be interpreted as errors, poor performance, or lack of knowledge. Telemetry captured gameplay activity and progression but could not fully characterize participants' motivation, frustration, understanding, or reasons for discontinuing gameplay. In addition, 1 participant generated minimal engagement and no gameplay events under their assigned player ID because gameplay appeared to continue on a shared device under another participant's identifier. This may have resulted in limited misclassification of participant-level gameplay activity.

Finally, the open-ended responses provided descriptive feedback rather than data from a qualitative study. The comments offer useful context for the survey findings but do not provide the depth achievable through interviews or focus groups. Future research should include prospective qualitative inquiry and evaluate the game with other Extension professionals, adolescents, and families in community settings.

## Conclusions

This formative stakeholder evaluation provides the perspective of community-based Extension professionals on the usability and perceived acceptability of the MedSMART: *Adventures in PharmaCity* SG. Agents recognized strengths in the game's professional design and perceived educational value but also identified clear concerns about navigation, pacing, instructional guidance, and age appropriateness. Gameplay data further showed that within a time-limited session, participants who did not complete all 5 chapters did not reach the epilog's naloxone education. These results identify specific priorities for refining the game before broader evaluation in community settings.

Unlike prior MedSMART Families evaluations, which examined adolescents, parents, pharmacists, and ED staff in educational or clinical contexts [31,33-35,38], this formative stakeholder evaluation examined the perspectives of Cooperative Extension agents who routinely deliver education to youth and families [44-48]. The study is also innovative in pairing implementer-reported perceptions with objective in-game telemetry, which showed that access to naloxone education depended on reaching the epilog, a structural feature that matters most when playtime is limited. This study contributes an implementer perspective to research on SGs for medication safety. Its feedback emphasizes the importance of audience fit, usability, content accessibility, and integration with existing educational programming when considering SGs for community-based medication safety education.

In practice, these results support that developers should prioritize clearer onboarding and navigation, age-appropriate presentation, and consistent access to naloxone education across gameplay pathways. Community educators considering the game may find it most useful alongside structured instruction or facilitated discussion rather than as a standalone resource. Future research should address these design priorities and evaluate the refined game with adolescents and families in community settings before examining implementation and longer-term educational or behavioral outcomes.

### Acknowledgments

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### Generative AI Use

The authors declare the use of generative AI solely to assist with prioritizing reviewer and editor comments during manuscript revision. According to the GAIDeT taxonomy (2026) [59], the following task was delegated to a generative AI tool under full human supervision: recommendations. The generative AI tool used was Microsoft Copilot. Responsibility for the final manuscript lies entirely with the authors. Generative AI tools are not listed as authors and do not bear responsibility for the final outcomes.

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## Data Availability

All data generated or analyzed in this study are included in this article and Multimedia Appendices 1-10. At the time of data collection in February 2026, the MedSMART: *Adventures in PharmaCity* app was available for iOS and Android devices. At the time of manuscript revision, the iOS version was available only in the United States through the Apple App Store [60]. The previous Google Play listing was removed in May 2026 during Google Play's enforcement action on a vulnerability in the Unity runtime. A rebuilt version using the patched runtime has been prepared, and restoration of the listing is under way. A browser-based version that runs on any platform without installation is available [61] and will be used for future community evaluations. The game can also be provided on request. The analysis code used to derive the telemetry measures is provided in Multimedia Appendix 10.

## Authors' Contributions

Conceptualization: RO, O Abraham
Data curation: RO, YS
Formal analysis: RO
Investigation: RO, JS
Methodology: RO, O Abraham, YS, AE, RG, O Adedokun
Supervision: O Abraham
Writing – original draft: RO
Writing – review & editing: RO, JS, O Abraham, YS, AE, RG, O Adedokun
All authors read and approved the final manuscript.

## Conflicts of Interest

O Abraham led the development of the MedSMART: *Adventures in PharmaCity* intervention evaluated in this study. The other authors declare no conflicts of interest.

## Multimedia Appendix 1

Development team roster and credited roles for MedSMART: *Adventures in PharmaCity*.
[DOCX File (Microsoft Word File), 15 KB-Multimedia Appendix 1]

## Multimedia Appendix 2

Game-flow schematic showing the 5 chapters, epilog, scripted events, player decisions, decision pathways, and corresponding telemetry events.
[PDF File (Adobe File), 871 KB-Multimedia Appendix 2]

## Multimedia Appendix 3

Preparticipation (eligibility and baseline) and postparticipation surveys administered to Kentucky FCS Extension agents.
[DOCX File (Microsoft Word File), 34 KB-Multimedia Appendix 3]

## Multimedia Appendix 4

Telemetry event definitions, metric derivation, denominator handling, and data-cleaning procedures.
[DOCX File (Microsoft Word File), 19 KB-Multimedia Appendix 4]

## Multimedia Appendix 5

Telemetry event dictionary documenting gameplay events, outcome coding, event frequencies, and participant counts.
[DOCX File (Microsoft Word File), 39 KB-Multimedia Appendix 5]

### Multimedia Appendix 6

Baseline characteristics of Kentucky FCS Extension agents (N=96), including region, years of experience, populations served, and perceived opioid severity.
[DOCX File (Microsoft Word File), 16 KB-Multimedia Appendix 6]

### Multimedia Appendix 7

Comparison of baseline characteristics among Kentucky Family and Consumer Sciences Extension agents with and without a linked post-survey response. Of the 96 study participants, 54 had linked pre- and post-survey records and 42 had no linked postsurvey response (41 who did not complete the postsurvey and 1 whose completed postsurvey could not be matched to a presurvey record). Differences were assessed using Fisher exact tests.
[DOCX File (Microsoft Word File), 18 KB-Multimedia Appendix 7]

### Multimedia Appendix 8

Item-level postsurvey responses (n=55), with response distributions, means, SDs, and agreement proportions with 95% CIs.
[DOCX File (Microsoft Word File), 19 KB-Multimedia Appendix 8]

### Multimedia Appendix 9

Coding of open-ended postsurvey feedback into descriptive categories (33 respondents; 31 substantive comments), with verbatim responses.
[DOCX File (Microsoft Word File), 23 KB-Multimedia Appendix 9]

### Multimedia Appendix 10

Python code used to define the supervised study window and derive the in-game telemetry measures, event dictionary, and naloxone-exposure estimates, with a README describing the files, required inputs, and usage.
[ZIP File (ZIP archive File), 23 KB-Multimedia Appendix 10]

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## Abbreviations

**ED:** emergency department
**FCS:** Family and Consumer Sciences
**FMSP:** Family Medication Safety Plan
**GA4:** Google Analytics 4
**HIPAA:** Health Insurance Portability and Accountability Act
**IRB:** Institutional Review Board
**SG:** serious game


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