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A randomized trial of a peer resistance skill building game for Hispanic early adolescent girls: Impact and feasibility of DRAMA-RAMA™

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Abstract

BACKGROUND—Research suggests that adolescents can use peer resistance skills to avoid being pressured into risky behavior, such as early sexual behavior. Avatar-based Virtual Reality (AVR) technology offers a novel way to build these skills.

OBJECTIVES—Study aims were to: evaluate the feasibility of an AVR peer resistance skill building game (DRAMA-RAMA™); explore the impact of game play on peer resistance self-efficacy; and assess how positively the game was perceived.

METHOD—45 low income early adolescent Hispanic girls were randomly assigned to either the intervention (DRAMA-RAMA™) or comparison game (Wii Dancing with the Stars™ [Wii DWTS™]) condition. All participants were offered a 5 session curriculum that included peer resistance skill content before playing their respective game for 15 minutes, once a week, for two weeks. Participants completed electronic surveys assessing demographics, peer resistance self-efficacy, and sexual behavior at baseline, after game play, and at 2 months. They also completed a paper-pencil game experience questionnaire immediately after playing their game. Data were analyzed using descriptive statistics, chi-square, and analyses of covariance.

RESULTS—The separate analyses of covariance showed a significant game effect at post-test for the peer resistance self-efficacy measure ($F = 4.21$, $p < 0.05$), but not at follow-up ($F = 0.01$, $p = 0.92$). DRAMA-RAMA™ was rated as positively as the Wii DWTS™ ($p = .26$).

DISCUSSION—This randomized control trial provides initial support for the hypothesis that playing an AVR technology game can strengthen peer resistance skills, and early adolescent Hispanic girls will have a positive response to this game.

Keywords

Adolescence; Hispanic Americans; Peer Group

Early initiation of intercourse is a risk factor for teenage pregnancy (CDC, 2010) and girls who become pregnant before the age of 15 are at greater risk for having a pre-term birth (Ventura, Curtin, & Mathews, 2000). The teen pregnancy rate within the Hispanic community is nearly double that of non-Hispanic whites, both nationally and in Central

Florida (Martin, et al, 2007). Adolescent birth rates are particularly high for Hispanic girls who prefer speaking English over Spanish (i.e., are highly acculturated; McDonald, Manlove & Ikramullah, 2009; Peragallo, 1996). These data highlight the need to create pregnancy prevention interventions that effectively delay sexual initiation for early adolescent Hispanic girls. This paper reports the results for a randomized control, feasibility trial of a gender specific, developmentally and culturally tailored intervention that involves a computer-based role-playing game created with Avatar-based Virtual Reality (AVR) technology. The intervention was designed to supplement a traditional abstinence plus, middle school sex education program for Hispanic girls.

BACKGROUND

Early adolescence is an opportune, but challenging time to intervene to delay initiation of intercourse. Kirby (2001) has identified skill building as a key component of effective pregnancy prevention interventions, and typically role-play is used for this purpose. Unfortunately, there are 3 reasons why the use of role play is problematic in early adolescence. First, the strong need for peer approval and self-consciousness that emerge in early adolescence (Bakan, 1972) create unease with role play and can result in socially desirable responses during debriefing discussions (Horn, 2003). Second, anxiety elicited by concerns about peer approval creates difficulty in focusing attention and problem solving (Lachman, Lachman, & Butterfield, 1979), further limiting the quality of the learning experience. Third, sexually related topics are less likely to be processed with formal operations thinking, given the lack of open discussion of sexual health and sexual behaviors in U.S. society (Cvetkovich, Grote, Bjorseth, & Sarkissian, 1975). And, the early adolescent's use of concrete thinking makes it difficult for her to generalize from one example to another (Piaget, 1960). This creates the possibility that skills learned in role play in the intervention setting may not be used beyond that setting.

Hispanic cultural values such as *Marianismo* ("Good girls" are not supposed to know about, much less discuss sex; Faulkner, 2003) and *Respeto* (girls need to honor their family by behaving with dignity in public; Castillo, Perez, Castillo, & Ghosheh, 2010) exacerbate developmental challenges to effective intervention by making it difficult for Hispanic girls to discuss sexually related topics. This increases the potential for anxiety to interfere with learning and for these girls to use concrete operations thinking.

Avatar-based Virtual Reality (AVR) technology is a revolutionary change in gaming technology that offers a powerful alternative to role play which can overcome the challenges posed by early adolescent development and Hispanic cultural values. This technology can be used to create an interactive multi-sensory, simulation experience in which a player can literally (but not actually) talk with a group of early adolescent avatars in private (Wirth, Norris, Mapes, Ingraham & Moshell, 2011). This allows girls to "play" themselves, not a character in a hypothetical situation, closely simulating every day early adolescent interpersonal encounters. The result is a higher sense of perceived realness that in turn fosters skill generalization (Piaget, 1960). The use of avatars also minimizes developmental concerns about observing peers and maximizes the quality of the simulated skill building interaction.

The AVR application tested here uses a combination of artificial intelligence (AI) and human based digital puppetry to create verbal and non-verbal behavior for a set of 3D avatars. For example, AI is used to create a movement sequence (e.g., hair flip, eye roll) that is triggered by a human puppeteer who also provides all the avatar voices. This combination allows: (a) tailoring game play experience to skill level, (b) varying avatar responses, and (c) providing real time scoring information that allows the adolescent player to adjust her responses and earn more points. The adolescent player is presented with a series of novel, interpersonal situations (i.e., peer pressure situations) and points are earned for socially competent and effective responses to these situations. The challenge of finding the best way to respond to a novel and changing interpersonal context makes game play fun and engaging (Koster, 2005).

Theoretical Framework

The theoretical framework driving game design integrates the communication competence model (CCM) with an understanding of Hispanic cultural values, social cognitive theory (SCT), and game design. The CCM argues that youth are less likely to engage in risky behaviors if they have the communication skills to resist peer pressure without jeopardizing peer relationships (Spitzburg & Hecht, 1984).

The CCM has been used to guide the design of a substance abuse program for middle school youth, “*keepin’ it REAL*,” where REAL stands for four resistance skills (i.e., Refuse, Explain, Avoid, and Leave; Hecht, Graham, & Elek, 2006; Hecht & Miller-Day 2007). The program has been selected as an “evidence-based program” by the National Registry of Effective Programs based on its efficacy among adolescents, including Hispanic youth (Hecht, et al, 2006).

The current intervention focused on two REAL skills, Avoid and Refuse. These skills can be used to resist pressure to engage in sexual behavior or to be in social situations in which other teens may be engaging in sexual behavior. Refuse requires consistent and persistent saying “no” under pressure from one or more peers, and Avoid requires creativity under pressure.

The literature regarding Hispanic cultural values supports extending the *keepin’ it REAL* intervention model to the prevention of early initiation of intercourse. The REAL typology was developed for a multicultural audience including Hispanics, and a focus on communication competence is highly congruent with the Hispanic cultural value of *Personalismo* (preference for warm personal relationships, an emphasis on interactions that preserve social harmony, and avoidance of conflict whenever possible; Castillo, et al, 2010; Galanti, 2003; Marin & Marin, 1991). A desire to avoid conflict is congruent with the use of Avoid for peer resistance because it does not require direct confrontation.

Encouraging early adolescent girls to resist peer group pressure to engage in or be around others who are engaging in sexual behavior is consonant with the Hispanic cultural values, *Marianismo* and *Respeto*. However, even highly acculturated girls (girls who are more likely to embrace broader mainstream cultural values over Hispanic cultural values) are likely to view resisting pressure to engage in sexual intercourse as desirable. The National Campaign

to Prevent Teen and Unplanned Pregnancy survey (2002) found that 63% of teens aged 12–19 wished they had waited longer before having sex, and most young teens (85 percent of those aged 12–14) reported that it is *not* okay for teens in high school to have sex (Albert, 2007).

SCT argues that providing early adolescent girls an opportunity to practice socially competent peer resistance skills with virtual peers (early adolescent avatars) will build their peer resistance self-efficacy which in turn results in future use of these skills (i.e., changes in behavior; Bandura, 2006). The effectiveness of “self-efficacy based,” skill training interventions for pregnancy and STI prevention in high school youth is well established, (Kirby, Laris, & Roller, 2006; Peragallo & Gonzalez, 2007) and self-efficacy has been identified as a factor influencing adolescent Hispanic girls’ decision making regarding timing of sexual initiation (Gilliam, Berlin, Kozloski, Hernandez, & Grundy, 2007).

The aim of this study was to test the feasibility of an AVR peer resistance skill building prototype (DRAMA-RAMA™), explore the impact of game play on peer resistance self-efficacy; and assess how positively the game was perceived. The game tested here was culturally tailored or grounded (Hecht & Krieger, 2006; Peragallo, et al, 2005) through focus group work, field work, and inclusion of two female, Hispanic high school students on the team of inter-active performers who developed characters and built the game prototype story’ script. The name for the game, DRAMA-RAMA™ is a takeoff on the word “drama” which was used frequently in the focus groups to describe interpersonal experiences with peers. More details about game development are available from the first author.

METHODS

Design and Sample

The game was tested in a randomized control trial involving a convenience sample of English-speaking girls, ages 11 to 14 who had at least one parent of Hispanic origin (born in, or born of a parent born in a Spanish speaking Latin American country), and were attending the afterschool program at the study site during Spring 2010. A total of 45 girls were enrolled in the study (see Figure 1). Attrition was estimated to be 35% and an a priori power analysis estimate called for a sample size of 34 to detect a large interaction effect (Cohen’s $f = .55$) in a traditional analysis of variance for repeated measures (ANOVA RM), assuming a power of .80, an alpha of .05, and standard error rates observed in the published literature.

The median age of participants was 12 years (range: 11 to 14 years). Puerto Rico was the most common country of origin (48%) with 46% of the sample born in the United States. Most participants (67%) scored as highly acculturated on Norris, Ford and Bova’s (1996) brief language-based measure of acculturation, lived in a two adult headed household (76%), and received free or reduced price school lunches (91%).

All participants were offered a 5 session Mighty Girls® curriculum (see Curriculum in Procedure section) before randomization to the intervention game (DRAMA-RAMA™) or attention control game condition (Wii Dancing with the Stars™, hereafter referred to as Wii DWTST™). A repeated measures design was used with data collected via electronic survey at

baseline, post-intervention, and 2 months later. Data assessing game play experience were also collected immediately after the game play session. Participants were naïve to game condition prior to their first of two 15-minute game play sessions.

Procedure

After receiving study approval from the university institutional review board, participants were recruited over a four-week period through an afterschool program offered at a public middle school in the Southeastern United States. Afterschool program staff distributed study packets to girls of Hispanic origin to take home to their parents or legal guardian. These packets contained a flyer about the parent information nights, a letter of support from afterschool program administrators, and consent forms. The principal investigator (PI) and research team presented the study to parents during parent information nights.

All study activities were conducted afterschool on school property. Young, CITI trained female college students served as research assistants (RAs). None had any affiliation with the afterschool program or the school at the study site.

Survey Completion—All surveys were administered electronically using a SSL web interface (LimeSurvey). Participants completed them either before or after school in a computer lab under adult supervision, after first having the voluntary nature of research explained and obtaining their verbal assent. Participants were seated so they could not view each other's computer screens. Surveys were constructed so that questions could either be skipped or a respondent could check "I do not wish to respond." The latter response was used for any questions that required an answer to advance the survey (e.g., sexual orientation question used to tailor gender references in subsequent questions). Each survey took approximately 15 to 20 minutes to complete. Participants received a \$10 gift card after completing an electronic survey and an additional \$10 gift card for completing all electronic study surveys.

Game Experience Questionnaire Completion—Participants completed a paper game experience questionnaire after each game play session while sitting at individual desks in a space apart from where other girls were waiting their turn to play their respective game. This questionnaire took about 5 minutes to complete.

Curriculum—The Mighty Girls[®] curriculum was developed in response to parent concerns about study participation and served as a means for teaching peer resistance skill (Avoid, Refuse) content. Two middle school education experts reviewed the curriculum and determined that it was developmentally appropriate. Curriculum content and teaching approaches were critiqued and approved by public school administrators, and Planned Parenthood sex educators responsible for sex and HIV prevention education of middle school youth.

The curriculum consisted of 5 sessions, each lasting 45 minutes. These sessions were comprised of didactic-class discussion components and one or more group activities. Covered topics included: goal setting, choices and their effects, defining risky behaviors, avoid and refuse peer resistance skills, and media messages. Content and activities for the

Avoid and Refuse peer resistance skill sessions were adapted from *keepin' it REAL* (Hecht & Miller-Day, 2007).

Game Play—Study participants were asked to come to a “waiting room” (classroom furnished with magazines, art supplies, a radio, card table and chairs in one end and individual desks in the other) to wait for their turn to play their game. Game play occurred in a separate private room using a 42” TV monitor positioned on top of a 3’ by 4’ or 5’ table. Each monitor had a small web camera attached to the top of the screen. At the beginning of each game play session, a female research assistant (RA) announced the participant’s ID code to the monitor. Each game was played, one person at a time, for 15 minutes.

The DRAMA-RAMA™ (Intervention Condition) game prototype uses the Object-oriented Graphics Rendering Engine (OGRE) game engine. Audio interaction and video observation of the participant by the puppeteer are delivered over the internet using a Skype connection. Digital puppetry of the avatars occurs at a remote, University-based location by specially trained inter-actors (actors trained in use of technology, inter-active performance [Wirth, 1994], performance for children, project goals and content, and CITI). The unique Geppetto interface (Mapes, Tonner & Hughes, 2011) allows the game to be played by talking (no keyboard input occurs on the player side).

Players earn points by using Avoid or Refuse to verbally and non-verbally resist peer pressure at 3 different challenge points. This peer pressure is exerted by avatars representing early adolescents at varying stages of pubertal development (advanced, on time, delayed). More points are earned if players resist in a socially competent way. Verbal and non-verbal responses (including consistency between verbal and non-verbal messages) are scored in real time with summative verbal and numerical feedback provided at the end of the game.

Fidelity of game delivery was assessed using a checklist of direction content and game story elements. A review of fidelity checklists indicated that all key game elements (e.g., directions, practice opportunity, character personality elements, peer pressure) were delivered during the first game play session with two minor exceptions. One participant did not receive explicit “Refuse” directions during a practice opportunity and another was pressured by only two of the three game characters at one point in the game. All pressure was delivered as scripted in the second play session. Hence, all data for the intervention game condition were retained.

The Wii DWTST™ (Attention Control Condition) game is the October 2007 release version of this commercially available video game, delivered locally using a Nintendo Wii console. Points are earned for how well a player moves the Wii remote and nunchuk controllers in time to music, according to particular patterns of movement (i.e., “dance” moves). Moves are scored in real time with summative verbal and numerical feedback given at the end of the game.

Survey Measures

The demographic and peer resistance self-efficacy items were embedded in a larger survey that assessed control group contamination, sexual intentions, sexual experiences, and other

variables potentially related to sexual behavior (e.g., social norms). All survey items were extensively pre-tested with members of the target population using cognitive interviewing techniques (Knafl, et al, 2007) prior to data collection (Torres-Thomas & Norris, 2012). Only survey items relevant to the analyses reported on in this paper are discussed here.

Demographics items included age in years, puberty status, country of birth, years in the US, Hispanic subgroup(s) identified with, acculturation, whether participants receive a reduced or free lunch, number of adult figures raising the child, and involvement in sexual behavior.

Puberty status was measured by asking girls to click which physical changes in their body they had experienced: getting taller, growing hair under your arms, getting breasts, having a period, and “I don’t wish to answer.” Hair growing under the arms (axillary hair; yes/no) was used to as a measure of puberty status because this physical change is androgen-mediated and has been linked to the development of libido in adolescents (Smith, Udry, & Morris, 1985).

Acculturation was measured using scores for Norris, et al, 1996) language use based, brief (4 item) measure of acculturation. This measure is an adaption of Marin, Sabogal, Marin, Otero-Sabogal, and Perez-Stable’s (1987) language use based measure, and has established reliability and validity (see Norris, et al, 1996). Cronbach’s α was .90 in this study sample. Scores were used to classify participants as either low (uses Spanish more than or as frequently as English) or high (uses English more than Spanish) in acculturation.

Sexual Behavior (“making out,” heavy petting, sexual intercourse) was measured using items from Barnett’s (2006) 11-item measure of involvement in specific sexual behaviors in the previous month, ranging from kissing to sexual intercourse. Item response options range from 0 (“never”) to 4 (“ten times or more”). Most participants chose the 0 response option, resulting in a highly skewed variable that could not be normalized by square root or log transformation. Hence, for analysis purposes, responses for the “making out” and sexual intercourse items were each dichotomized, collapsing all non-zero responses into a single “yes” category. Non-zero responses to any of the 8 items used to assess heavy petting were similarly collapsed into a single “yes” category to create a single item measure of heavy petting.

Peer Resistance Self-Efficacy (PRSE) was measured using a six-item scale. Two items came from DiIorio, Dudley, Kelly, et al’s (2001) resistance self-efficacy scale because they appeared sensitive to the expected effects of DRAMA-RAMA™ in combination with the Mighty Girls® curriculum: you can refuse to kiss a boy if you are not ready to; you can refuse to go to your friend’s house if the parents are not home. Four items were developed to be sensitive to the game-curriculum effects: stop someone who is pressuring you to do sexual things without making them angry; leave a party or dance club where sexual things are going on without being made fun of; avoid situations where you know other people will be making out; say “no” in a serious way and stick to it when someone you like is pressuring you to do sexual things.

PRSE response options formed a 5-point Likert scale ranging from 0 to 4 in which only the end (‘Not at all sure I can do this;’ ‘Completely sure I can do this’) and mid-points

(‘Moderately sure I can do this’) were labeled. Pre-testing indicated that early adolescents were able to understand and use a response scale that contained a single unlabeled point, but could not manage a response scale with two contiguous unlabeled points such as the one used by DiIorio, et al, 2001; Torres-Thomas & Norris, 2012).

PRSE validity is supported by correlations with the 10 remaining items in Dilorio, et al’s (2001) 12-item measure of resistance self-efficacy completed at the same time points ($r = .72$ to $.84$). PRSE internal consistency reliability was good (Cronbach’s alpha ranged from $.86$ to $.89$).

Control group contamination was assessed by asking all participants how often they talked with other kids about DRAMA-RAMA™. Response options were: never (0), once in a while (1), often (2), very often (3), all the time (4).

Game Experience Questionnaire

The game experience questionnaire was designed to evaluate DRAMA-RAMA™ and Wii DWTS™ game play experiences. Three items measured perceived realness and were parallel in construction, but tailored to be game relevant: (1) Talking with the game kids felt real to me/The dancing in the game felt real to me; (2) I could see people my age getting into situations like the ones in this game/I could see people my age doing dances like the ones in this game; (3) The game kids remind me of kids at my school/The judges reminded me of adults at my school. Nine items assessed: fun (I had fun playing this game); predictability (I could tell what was going to happen next in this game); engagement (I was so involved in the game that I lost track of time; Time went by quickly when I was playing this game); difficulty (This game was too easy to play; This game was too hard to play); negative affect (I was bored during this game); positive affect (The game was interesting; I would like to play this game again). Response options (strongly disagree, disagree, agree, strongly agree) were collapsed into dichotomous agree/disagree categories for purpose of analysis due to skewed and multi-modal distributions. These close ended items were followed by a single open ended item which asked participants to list one thing they would like to change about the game.

Data Analysis

Missing data were present for at least one survey or study activity for 35% (16 girls) and were distributed as follows: baseline (2 girls, 4%), game play (5 girls; 11%), post-test (5 girls; 11%); and 2 month follow-up (11 girls; 24%), but these missing data (35% or 16 girls in total) did not appear systematic. Data analyses reported here were conducted for the 41 (89% of original sample) participants who completed the game play sessions. A majority 88% (36) of the 41 game-playing study participants attended one or both avoid and refuse classes. See also Figure 1 for flow of participants throughout the study.

Missing post-test and follow-up data were imputed based on puberty status and acculturation level for the 11 girls who played the game but did not complete these surveys. Being missing at the post or follow-up time points was not related to puberty status, acculturation level, age, or game condition ($p = .10$).

Prior to testing for a game effect, girls in the two game conditions were compared with respect to age, puberty, acculturation, and baseline involvement in sexual behavior using chi-square and t-test analyses. Differences in sexual behavior from baseline to the two month follow-up were not expected due to the short (approximately 4 month) time window captured by these data, but were assessed with McNemar Chi-square and logistic regression. The efficacy of the game was tested using a targeted approach in which separate analyses of covariance were used to test the efficacy of DRAMA-RAMA™ compared with control (Wii DWTS™) at posttest and at follow-up, with baseline PRSE scores serving as the covariate in each case. This targeted approach was used because the standard errors of the adjusted posttest means were much smaller than those at follow-up. This inflated the standard error term in the Game by Time interaction and decreased the sensitivity of the more traditional analysis of variance for repeated measures approach. A square-root transformation was also applied to improve the normality of the PRSE scores. Both numbers of game and curriculum sessions attended had too limited variability to be included in analyses of game effects.

Group differences in game experience were assessed with Chi-square or Fisher's exact tests, depending on expected frequencies. Answers to the open-ended game experience item were content analyzed (100% inter-rater agreement achieved).

RESULTS

Feasibility

The measures of feasibility were: (1) return for second game play, and (2) frequency of technological or personnel problems preventing game delivery. Only one 12 year old girl (highly acculturated, axillary hair present, menses started) did not play the game twice. She was in the DRAMA-RAMA™ condition and also did not complete the post-test and follow-up surveys. There were no technological or personnel problems that occurred during the trial.

Contamination of Control Group

A majority of participants in both the Wii DWTS™ (65%) and the DRAMA-RAMA™ (72%) reported talking about DRAMA-RAMA™ at least "once in a while" (response option value = 1), and there were no differences in the mean response for DRAMA-RAMA™ (Mean = 1.28; *sd* = 1.13) as compared to Wii DWTS™ participants (Mean = 1.15; *sd* = 1.14; *t* = .12, *df* = 36, *p* = .73). Responses to the contamination measure were not moderately or strongly correlated with post game play PRSE (*r* = .15, *p* = .34).

Description of participants at baseline

The two study conditions were fairly comparable. There were no significant differences with respect to age, puberty, acculturation, and baseline involvement in "making out," heavy petting, sexual intercourse, and self-efficacy (see Table 1).

No study participant reported engaging in sexual intercourse over the course of the study. Sexual behavior at the two month follow-up was similar to sexual behavior observed approximately 4 months earlier at the study baseline data collection with one exception:

Heavy petting behavior decreased significantly at follow-up (McNemar Chi-square $p < .01$). Group differences in proportions suggest this significant decrease was due to changes in the DRAMA-RAMA™ condition. However, the game effect was not statistically significant in a logistic regression approach to analyzing repeated measures designs ($p = .38$).

Peer Resistance Self-Efficacy (PRSE)

The separate analyses of covariance showed a significant game effect at post-test for the peer resistance self-efficacy measure ($F = 4.21, p < 0.05$) but not at follow-up ($F = 0.01, p = 0.92$). Adjusted and unadjusted mean PRSE scores for the DRAMA-RAMA™ and Wii DWTS™ game conditions are depicted in Table 1.

Game Play Experience

Game play experience data are displayed in Table 2. These data indicated that participants felt the DRAMA-RAMA™ game was fun and had a high degree of perceived realism. Ratings for the commercially successful Wii DWTS™ game are provided for comparison purposes. Note that DRAMA-RAMA™ participants were more likely to rate key aspects of their game (talking, interpersonal situations) as feeling real than Wii DWTS™ participants (dancing, dances; Fisher's Exact, $p < .05$), but the two groups did not differ in other aspects, including fun, engagement and positive affect ($p = .14$).

Responses to the open-ended question were consistent with the data in Table 2. More DRAMA-RAMA™ (57%, 12 girls) than Wii DWTS™ (30%, 6 girls) participants wrote not to change anything about their respective game (Chi-square = 3.06, $df = 1, p < .05$, one-tailed test).

DISCUSSION

Study findings support feasibility of the DRAMA-RAMA™ prototype. Girls who played the prototype perceived it as fun. They also rated their game's social situations as more real than the girls who played the Wii DWTS™ game rated their game's dances. These findings are particularly significant given the commercial success of the Wii game. They argue for validity of the DRAMA-RAMA™ prototype because unlike the dances and movements with the Wii game controllers, the DRAMA-RAMA™ prototype story and method of play were designed to simulate real life experiences.

Group differences in self-efficacy suggest that game play improves peer resistance self-efficacy. While these effects did not persist, they demonstrate promise given the brevity of game play tested here. Additionally, there is no evidence that game play was harmful. Sexual behavior did not increase for DRAMA-RAMA™ participants over the course of the study.

This study does have three limitations. First, all participants came from the same middle school afterschool program. This design did not allow examination of DRAMA-RAMA™ effects independent of the curriculum or the school/afterschool setting, and did not control for contaminating interactions that occurred between intervention and control participants.

However, such interactions would have worked against rather than for finding an effect for playing this game.

Second, all data were self-report and it is possible that participants over or underreported their self-efficacy beliefs and sexual behavior. However, three strategies were used to enhance validity of self-report data: (1) electronic data collection; (2) allowing participants to skip these questions; and (3) stressing importance of honest answers and that answers would be kept private were used to enhance validity of self-report. Also, the low reports of sexual behavior observed are consistent with reports from other studies of low income, early adolescent Hispanic girls (e.g., Santelli, et al, 2004). However, it is still possible that over or underreporting of these data may have occurred.

Last, the sample was small and missing data were present. Participants with and without missing data were compared and no systematic differences were found, but it is possible that these analyses were underpowered or that these two types of participants differed in ways that were not measured. Hence, replication of these findings and demonstration of intervention efficacy in a larger sample is needed.

CONCLUSION

Despite study limitations, findings from this feasibility trial support conducting an efficacy trial of DRAMA-RAMA™. Study findings suggest that additional game play may be necessary to sustain intervention effects. It is possible that prolonged play or play over time may be essential to creating sustainable game effects, or effects that might grow over time. These possibilities will be explored in subsequent studies.

A research question for the subsequent efficacy trial is whether a player's choice to interact with a particular avatar game character corresponds to differences in pubertal development, given differences in avatar gender and puberty (advanced, on time, delayed). Additional questions relate to sustained interest in game play over time and whether playing at different time points in early adolescence would create stronger and more intervention effects.

If future research supports game efficacy for early adolescent Hispanic girls, it is likely that this type of game will be useful in other ethnic groups, given the success of *keepin' it REAL* in multi-ethnic samples of youth (Hecht, et al, 2006). Training of teachers, guidance counselors, school psychologists or school nurses in digital puppetry in combination with increased artificial intelligence for more aspects of avatar verbal and non-verbal behavior could be used to disseminate the game to a broader population of early adolescents at relatively low cost.

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Figure 1.
Flow of study participants

Table 1Game participant characteristics, sexual behavior, and mean peer resistance self-efficacy¹

	DRAMA-RAMA™ (n=21)	Wii DWTS™ (n=20)
Median Age	11yrs. (11–14)	12 yrs. (11–14)
Puberty Status (axillary hair present) ²	33% (7)	35% (7)
Acculturation (high level)	83% (15)	79% (15)
Country of Origin ³		
Puerto Rico	52% (11)	65% (13)
Dominican Republic	24% (5)	20% (4)
Colombia	10% (2)	15% (3)
Other	33% (7)	25% (5)
Sexual Behavior		
Baseline		
Made Out	38% (8)	45% (9)
Involved in heavy petting	33% (7)	45% (9)
Had Intercourse	0% (0)	0% (0)
2 month follow-up		
Made out	43% (9)	40% (8)
Involved in heavy petting	9.5% (2)	40% (8)
Had Intercourse	0% (0)	0% (0)
Peer Resistance Self-Efficacy Means (SD)		
Baseline	15.8 (0.041)	16.8 (0.034)
Post-test (adjusted)	19.8 (0.005)	17.9 (0.006)
2 month follow-up (adjusted)	18.9 (0.010)	19.0 (0.012)

¹ All data from baseline time point unless otherwise indicated.² If onset of menses is used as puberty indicator, the two groups are not significantly different (38% (8) vs. 60% (12)) p=16.³ Participants could select more than one country of origin so percents do not sum to 100.

Table 2

Presence of game play experience quality reported for each game type.¹

	DRAMA-RAMA™	Wii DWTS™
Perceived Realness:		
Talking/Dancing *	(n=21)	(n=20)
	90.5% (19)	55.0% (11)
Situations/Dances *	(n=19)	(n=20)
	94.7% (18)	60.0% (12)
Kids/adults at school	(n=21)	(n=20)
	81.0% (17)	60.0% (12)
Fun	(n=21)	(n=20)
	100% (21)	95.0% (19)
Predictability	(n=21)	(n=20)
	28.6% (6)	50.0% (10)
Engagement:		
Lost track of time	(n=21)	(n=19)
	71.4% (15)	63.2% (12)
Time went quickly	(n=20)	(n=20)
	65.0% (13)	65.0% (13)
Difficulty:		
Too easy	(n=21)	(n=20)
	52.4% (11)	40.0% (8)
Too hard	(n=21)	(n=20)
	9.5% (2)	10.0% (2)
Negative Affect (Boring)	(n=21)	(n=20)
	4.8% (1)	5.0% (5)
Positive Affect		
Interesting	(n=21)	(n=20)
	90.5% (19)	95.0% (19)
Want to play again	(n=21)	(n=20)
	90.5% (19)	100% (20)

¹ Chi-square analyses compared rates of agreement (strongly agree, agree) vs. disagreement (strongly disagree, disagree). Results provided for the percent of agreement.

*
 $p < .05$