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A Randomized-Controlled Trial of the Effects of Online Training on Implementation Fidelity

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Introduction and Background

HIV Risk among Youth

HIV infection is still a serious issue with young people in the United States (CDC, 2015). Although the overall number of new HIV infections has been declining since a peak in the mid-1980s, the number of newly diagnosed HIV cases among youth has not shown a comparable decline. Indeed, youth continue to make up a considerable number of new HIV infections in the United States. In 2010, an estimated 26% of all new HIV infections were among youth ages 13 to 24 (CDC, 2015). Of particular concern is that more than 50% of youth infected with HIV in the United States may be unaware that they are infected (CDC, 2015). Many of these adolescents are acquiring HIV by participating in risky sexual behavior. According to CDC's Youth Risk Behavioral Survey (YRBS), significant numbers of young people in the United States begin having sexual intercourse at early ages: 47% of high school students reported having had sexual intercourse, and 5.6% of them reported first sexual intercourse before age 13 (Kann et al., 2014).

In the past several decades, extensive research has been devoted to developing and testing evidence-based prevention programs aimed at reducing HIV transmission among youth (Coyle et al., 2001; Coyle et al., 2006; Jemmott, Jemmott, & Fong, 1992; Jemmott, Jemmott, & Fong, 1998; Kirby, Barth, Leland & Fetro, 1991; Main et al., 1994; Stanton et al., 1996; St. Lawrence et al., 1995). Significant progress has been made, and new federal and state policies are actively promoting these programs (Dusenbury, Brannigan, & Hansen, 2003). As a result, many research-based programs that have been shown to be effective in decreasing adolescent sexual risk-taking behavior are now being disseminated (Coyle et al., 2001; Kirby et al., 1991; Jemmott et al., 1992; Jemmott et al., 1998; Main et al., 1994; St. Lawrence et al., 1995; Stanton et al., 1996).

Challenges in Implementing Evidence-Based Interventions

While rigorous experimental studies have documented the effectiveness of some programs at reducing HIV transmission, their full effects often are not realized in the real world due to challenges encountered by educators in implementing the programs (Collins, Harshbarger, Sawyer, & Hamdallah, 2006; Wang et al., 2015a, 2015b) and instructional support is

warranted (Fagan, Hanson, Hawkins, & Arthur, 2008; Kam, Greenberg, & Walls, 2003). Schools are complex organizational settings and no evaluation can account for all the differences in structures, players, and cultures (Jaycox et al., 2006). Variations in educator preparedness, years of experience, self-efficacy, and enthusiasm; system-level support; available resources; socioeconomic environments; and student backgrounds all can impact implementation and outcome results (Dane & Schneider, 1998; Jaycox et al., 2006; Kam et al., 2003; Wandersman & Florin, 2003). While several frameworks delineate multiple factors that impact program implementation (Durlak & DuPre, 2008; Ennett et al., 2011; Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Horner, Blitz, & Ross, 2014), the focus of our training was to effect educator preparedness and skills that relate to program implementation fidelity.

Implementation fidelity is the faithfulness with which a curriculum is implemented and includes curriculum adherence and quality of delivery (Dusenbury et al., 2003). Fidelity can be reflected in both *how much* of the curriculum is taught (adherence) and *how well* (quality) a curriculum is taught (i.e., how well particular learning activities are carried out) and has been shown to be associated with the success or failure of a program to result in the desired outcomes of a program (Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995; Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990; Hanson, 2001; Kalafat, Illback, & Sanders, 2007; Pentz et al., 1990; Rohrbach, Graham, & Hansen, 1993; Rohrbach, Gunning, Sun, & Sussman, 2010). Fidelity to specific key activities associated with the core content elements are particularly important. Deleting or changing parts of the curriculum can threaten fidelity and the effects of implementation. In implementing some evidence-based programs, this can lead to omission of key program elements, some of which may include important strategies for increasing students' skills and sense of self-efficacy—potentially critical for achieving desired behavior change (Kirby, personal communication, 2007). For example, researchers found that removing what seemed like minor condom-related activities from an evidence-based sexual risk reduction program resulted in significantly less impact on condom-related perceptions (Stanton et al., 2005 as cited in Harshbarger et al., 2006).

Common obstacles to fidelity when implementing sexual health curricula often relate to educator discomfort with or lack of skill (Wang et al., 2015b) in certain activities such as managing time, directing role-plays, or leading group discussions focused on sensitive subjects. Training can address implementation problems by providing educators with the knowledge and skills needed to implement with fidelity. Online training, in particular, bridges scheduling and cost barriers; is quick to acquire; can be used anytime and anywhere there is an internet connection; allows for repeat use, reinforcement of information, and practice; and can provide ongoing implementation support (Killion, 2002; National Staff Development Council, 2001; Means, Toyama, Murphy, Bakia, & Jones, 2009).

Challenges in Implementing *Reducing the Risk*

Reducing the Risk: Building Skills to Prevent Pregnancy STD & HIV (RTR) (Barth, Leland, Kirby, & Fetro, 1992) is a popular, evidence-based curriculum distributed by Education Training Research (ETR), a national private non-profit. RTR was designed to reduce teenage pregnancy, STDs, and HIV infection by decreasing teen sexual risk-taking behaviors. Four

studies in several states have evaluated the effectiveness of RTR and found that it reduced sexual risk-taking behavior (Barth et al., 1992; Hubbard, Giese, & Rainey, 1998; Kirby et al., 1991; Zimmermann et al., 2003; Zimmermann et al., 2008). RTR has been shown to delay the onset of intercourse among abstinent students by 24%; reduce the rate of unprotected intercourse at 18-month follow-up by 40%; increase parent-child communication about abstinence and birth control; and increase knowledge about abstinence, contraceptives, pregnancy risk and STD prevention (Kirby et al., 1991). RTR is recognized as an evidence-based HIV and pregnancy prevention program by multiple federal health agencies, most notably by the Office of Adolescent Health (Office of Adolescent Health, 2010; U.S. Department of Health & Human Services, n.d.).

RTR contains 16 interactive lessons with an emphasis on role-play and large group discussion on sensitive topics, both of which can present challenges to implementation fidelity (Kirby, personal communication, 2007). While face-to-face trainings have been developed to enhance RTR's implementation fidelity, many RTR participants are not able to access these because they may lack resources and time to attend in-person trainings. Furthermore, in-person trainings do not offer participants ongoing access to skill-building and other training activities such as video examples. In response to these challenges, an online training program, *RTRworks!*, was developed to provide skills-based implementation instruction and ongoing support in a cost-effective manner.

The *RTRworks!* Program

RTRworks! was designed to improve educator implementation of RTR by increasing implementation knowledge and fidelity. It provides online, skills-based instruction in a gated sequence to be completed before beginning implementation as well as ongoing support as needed during the implementation of each RTR lesson. *RTRworks!* is self-paced and highly interactive. Training features include: 1) Skills modules (directed pathways with interactive and video simulation-based learning) on leading role-plays (keeping role-plays on track, student engagement), adapting role-plays, giving core messages (abstinence & protection), creating a safe and inclusive classroom, and answering sensitive questions; 2) Ask the Expert/Discussion Board—where participants were able to request assistance from a virtual expert via the discussion board; 3) Polls—to prepare for, reflect on, or personalize the learning; and 4) Grab-and-Go style resources and training for leading each RTR lesson, including: implementation tips, video modeling, digital enhancements to RTR to share with youth, printable resources from the curriculum, and role-play adaptation resources.

The skill modules are video-rich and allow for simulation-based practice of key skill steps. Educator skills were taught through a unique video-driven process which includes modeling, educator practice, and reinforcement. The training also provided video clips to be shown to the youth (such as clips modeling the student skills) to enhance the activity or replace an educator demonstration that might otherwise be omitted (such as the condom demonstration).

The training was developed to be fully functional on standard computers with internet connectivity so that it could be used in schools without requiring additional information or

technology infrastructure expenses. *RTRworks!* was designed to take about five hours to complete, depending on how much time is dedicated to online discourse.

Purpose

This paper presents results from a randomized controlled trial to evaluate the effectiveness of the *RTRworks!* training intervention with respect to improving educators' implementation fidelity of the RTR program in middle and high school classroom settings. The e-learning company, Monarch Media, was funded by an NIH Small Business Innovation Research (SBIR) grant to create and evaluate the training, and ETR (Education Training Research – a private, non-profit) served as the evaluation partner. ETR distributes the RTR curriculum and *RTRworks!* For the purpose of this study, our primary definition of implementation fidelity referred to the degree of similarity between the RTR curriculum, as specified by its developers, and the actual implementation of the curriculum (Backer, 2002; Ringwalt et al., 2003), with a particular emphasis on role-playing activities.

Method

Design

The *RTRworks!* intervention was evaluated using a pre-test/post-test randomized controlled trial, randomizing at the educator level to one of two arms: 1) the online training intervention arm; or 2) the community standard (self-preparation) control arm. Randomization was stratified by state and completed using an online random number generator. Educators in the control condition were provided with the RTR curriculum materials and did not receive other instructions or training, which is consistent with standard practice for this curriculum given that the program developer does not require training for program use and most participants do not seek outside training for a variety of reasons (e.g., lack of resources or time, prior experience, etc.). Control group educators were provided access to the online training only after all participants had completed their post-tests. The implementation period spanned November 2010 to April 2012.

We hypothesized that educators participating in the online *RTRworks!* training would be more likely to report implementation fidelity compared to educators in the control (self-preparation) group. We also hypothesized that educators receiving the online training would report greater improvements on a number of mediating variables (e.g., sense of preparedness to implement the curriculum; perceived importance of curriculum fidelity; knowledge of the curriculum, implementation tips, reproductive health basics, and key educator skills; perceived and actual skill in answering sensitive questions, managing role-plays, and leading group discussions) relative to those in the control group.

Recruitment

The target population for this study was high school classroom-based and community-based educators who had the willingness and capacity (e.g., had access to a group of youth in grades 9–12, is responsible for teaching or would be allowed to teach sexual health education, had the time to teach RTR, had necessary approval) to teach the RTR curriculum in grades 9–12 throughout the U.S. In order to participate in the study, educators were

required to sign and submit a participant agreement form (PA). Each PA detailed the required tasks, timelines, and a stipend payment schedule and required a supervisor signature indicating that the educator may participate in the study and implement the curriculum in the given timeframe. As is ETR's standard practice, educators' voluntary contact information, collected via email/online, was kept separate from other study data in order to protect educator confidentiality. Requirements for educator participation included their ability to:

- Teach the *RTR* curriculum in a classroom-type setting (e.g., have a place to post information, space for students to complete paper and pencil work) during the normal school day;
- Teach the *RTR* curriculum to a group of at least 10 students enrolled in grades 9–12;
- Teach the entire *RTR* curriculum to the same group of students;
- Give students homework assignments; Teach the lessons 1–3 times per week (ideally twice a week); and
- Have regular access to a computer with the minimum system requirements for the training and have internet access.

To reach our sample recruitment goal, we employed both a “top-down” approach through outreach to school superintendents, administrators and principals, as well as a “direct” approach through outreach to educators and their professional organizations. For a third approach we contacted those one step removed from the classroom but responsible for curriculum decisions, such as Substance Abuse Coordinators, AIDS Awareness Coordinators and Curriculum Coordinators.

Key recruitment activities included two phases – 1) developing the recruitment strategy and materials and 2) actively recruiting and screening participants for inclusion into the study. We developed recruitment promotional materials and an informational project website. We also developed materials and systems to track and support potential recruits, including a toll-free phone number and an online “Interest Survey” for accessing information about potential participants. In preparation for recruitment, we identified appropriate sources of contacts for potential study participants (some from purchased lists), including: public school districts, private and charter schools, after-school programs, professional organizations (such as Advocates for Youth and the American School Health Association), and state and federal agencies with mandates on this topic. We also identified places/methods to advertise the project, such as health and education journals and e-newsletters (e.g., HExtra of the American Association of Health Educators or the American Journal of Health Education), direct mail campaigns to health educators, exhibit booths and program ads at education conferences (such as the National High School Association and the American Association of School Administrators), and email announcements to an extensive database of contacts.

A team of three staff engaged in active recruitment activities, which included responding to all email, phone and web-based requests for information, conducted individual telephone interviews (30–60 minutes), and sent out informational packets and curricula for review.

Recruitment staff conducted telephone and email outreach to networks including state and federal health and education departments, and non-profit organizations with missions related to teen sexual health and pregnancy prevention. Recruitment staff also posted project announcements multiple times on several listservs.

Incentives for educator participation in the study included: 1) free curriculum materials; 2) \$450–\$600 in stipends based on the following: \$25 for the pre-test, \$25 per each of 16 lesson logs (\$400), \$25 for the post-test, \$25 for each of four audio-observations (\$100), \$25 for face-to-face observation (if selected), and \$25 for a follow-up interview (if selected). No incentives were provided for completing sections of the *RTRworks!* training.

Instrumentation

Pre-/Post-Test—Educators completed a pre-test survey prior to training and implementation and a post-test survey after implementing all 16 RTR lessons. The questionnaire was created online using Survey Monkey. Educators were emailed the pre- and post-test links and sent several reminders to complete them. The pre-test included questions focused on personal demographic information; education and training; computer use and attitudes; student and school characteristics; experience (current work, related teaching experience, evidence/science-based experience, RTR experience); knowledge about implementing RTR; related attitudes; knowledge of and comfort with STD/pregnancy prevention education; and experiences with and attitudes toward role-play. The post-test included items focused on knowledge about implementing RTR; related attitudes; knowledge of and comfort with STD/pregnancy prevention education; attitudes toward role-plays; student participation; and attitudes toward RTR. Some items asked how educators felt they changed on certain skills between pre-and post-test. The online training group was asked for their reaction to and feedback on the online training. Participants were emailed the link to the post-test as soon as they completed their lesson 16 implementation log.

Implementation Logs—Educators were asked to complete implementation logs for all 16 lessons. The logs were created online and housed on the ETR server. Participants could access the logs through a web portal. They were asked to complete their logs whether or not they implemented the lesson and asked to fill them out within 24 hours after completing the lesson or skipping it. Twelve of the implementation logs were “short” logs and asked about 20 items, including whether they implemented each lesson activity completely, partially, or not at all. Additional items about student engagement and educator comfort also were included. We developed more detailed logs for four key role-play lessons (4, 5, 10, and 11). These logs went into more depth on activity implementation, role-plays, and use of the online training. Each log was created specifically for the corresponding lesson; thus, logs were similar in the structure of the questions but varied on specific content.

Lesson Observation Protocols—In addition, we developed observation protocols for use in the four key role-play lessons. They asked observers to report on the same items as the implementation logs did for these lessons. Four observers who were very familiar with the RTR curriculum, including the two *RTRworks!* developers, completed all observations and worked together to improve consistency of ratings. For instance, the two primary

observers conducted the first two observations together and thoroughly discussed their findings and discrepancies and determined a common approach to prevent further discrepancies. The primary observers trained the other two observers, and met with them after their first observations (with the aid of audio-recordings of the classes) to discuss findings, discrepancies and a course of action to reduce discrepancies. The purpose of the observations was to validate the information from the implementation log for that lesson.

Audio Recording Coding Guides—We developed coding guides that mirrored the four key lesson implementation logs to code audio recordings of each of the four role-play lessons. Items that relied on visual cues (e.g., how students were physically arranged during role-play) were eliminated. Three of the four in-person observers conducted the coding and worked to eliminate discrepancies as discussed above.

Interview protocol—Finally, we conducted interviews at the end of implementation with a small sample of participants. Interviewees were asked about their use of the curriculum guide and online training, how they responded to certain training-related incidents (e.g., LGBT inclusion issues, sensitive questions being asked) that might have come up during implementation, and, for the online training group, a series of feedback questions on the training. The two training developers conducted all the final interviews with participants in the online training group. One project evaluation staff member completed the interviews with the participants from the control group.

Web metrics—Lastly, web-based data that tracked the level and range of use by the training group provided information on the length of time participants spent on the online training and number of times the training was accessed.

Measures

Primary Outcome: Implementation Fidelity—The primary outcome variable was educator implementation fidelity of RTR for which, by definition, there could be no baseline measure. This construct has been used consistently in prior research on fidelity to evidence-based HIV education programs and substance abuse prevention programs (Dusenbury, Brannigan, Falco, & Hansen, 2003; Galbraith et al., 2009; Kelly et al., 2000; McKleroy et al., 2006; Melde, Esbensen, & Tusiniski, 2006; Rohrbach et al., 2010). The primary operational definition for this study was the proportion of RTR lesson activities implemented completely.

Implementation fidelity was measured through self-report via the lesson implementation logs. Each lesson was broken down into its sequential key activities (e.g., have students discuss characteristics of refusals, divide into groups, demonstrate role-play), and educators were asked whether they implemented the activity as intended. For each activity, educators could indicate that they: 1) implemented the activity completely; 2) implemented the activity partially or with changes; or 3) did not implement the activity at all (see Figure 1.)

Full completion was coded as “1,” and both partial completion and no completion were coded as “0” since our focus was on complete fidelity. In total, 100 activities were assessed for educator fidelity across the 16 lesson logs. A percent fidelity score was computed for a

given lesson if at least 80% of activities for that lesson log were filled in (i.e., not missing – only 2 participants were dropped due to missing data). An average fidelity percent across all lessons was then computed for each participant who was not missing percent fidelity scores for more than 20% (3) of all lesson logs. As described above, in-person observations and audio-recordings of select lessons also were made to obtain data that could be used to assess the validity of the main fidelity outcome.

Secondary Outcomes—Data were collected on multiple secondary outcome variables (e.g., experience teaching evidence/science-based health curricula, RTR experience; experiences with and attitudes toward role-play; preparedness to implement RTR; knowledge and comfort delivering sex education) via the pre- and post-tests. These also included items related to the quality of role-play implementation.

Data Analysis

Traditional “intention-to-treat” analysis includes all participants enrolled in the study in outcome analysis models as they were randomized – i.e., regardless of exposure to the intervention. In this study, 52 of the 220 participants originally enrolled could not be included in the outcome analyses because they never began implementing the RTR program and therefore, by definition, had no fidelity outcome scores. An additional six enrolled participants were excluded from final analyses because of missing covariate and/or secondary outcome data. Logistic regression models were used to assess the significance of the relationship between whether an educator initially recruited for the study was included in the final analyses and various demographic and available baseline characteristics.

Outcome Analysis Models—Separate linear regression models were used to address the study hypotheses for each outcome variable. The average fidelity main outcome was transformed using a square root function in order to reduce skewness. Each model included the following independent variables: intervention group indicator (online training or control), baseline outcome (for secondary outcomes for which items were asked both at baseline and follow-up), and demographic and other covariates (e.g., health education degree and length of time teaching STD/pregnancy prevention topics) that met the covariate screening criteria. Variables were included as potential covariates for a particular outcome if they were imbalanced across intervention conditions and were related to the outcome at baseline ($p \leq 0.15$ for both criteria). A covariate was retained in the model if it remained significant in the final regression model (Wald test $p \leq 0.05$). Effect sizes are reported using adjusted means by group from the regression models and Cohen’s d (Cohen, 1988) SPSS was used for all analyses.

Dosage Analysis Models—Exploratory dosage analyses were conducted on data from the online training group only. Linear regression models were used in which the outcome variable was regressed on the following independent variables: baseline outcome (for applicable secondary outcomes), dosage variable measured as number of minutes spent in online training as captured through our tracking data, and covariates meeting the screening criteria described above.

Results

Participant Demographics and Profile

A total of 262 individuals met the entry criteria described earlier and completed a Participant Agreement for enrollment into the study. Of these 262 participants, 221 completed a pre-test. One participant dropped out after completing the pre-test and before randomization. Table 1 shows the number of these 220 educators randomized to each group, and their flow through the study. Seventy-six percent (168) of the educators who completed a pre-test started implementation of RTR and completed a log for Session 1. Of those 168, 162 completed a post-test (74% of those who completed a pre-test). Of the 162 participants in our final analyses (i.e., completed the pre-test, at least 1 log, and post-test), 131 (81%) actually completed all 16 RTR lessons; 159 (98%) completed at least 10 of the RTR classes. There was no statistically significant difference in attrition between treatment arms.

Table 2 shows the demographic and other characteristics of the study sample included in the final analyses. The sample was overwhelmingly female (86%). Ages were fairly evenly distributed from 20 to over 50 years old. The online training group was slightly younger than the control group. Over 80% of the sample was Caucasian. Almost all of the participants had at least a Bachelor's degree, and close to two-thirds had a graduate degree. Ninety percent held a teaching credential and currently taught health as one of their topics. An overwhelming majority of our sample were classroom educators (91%). Our sample was fairly experienced; close to 80% of educators had been teaching students in grades 8–12 for *five or more years*, and just over two-thirds reported having taught health or pregnancy/STD prevention topics for *five or more years*. Less than 20% of the educators reported having any prior experience with RTR. Grade levels for the study classes ranged from 8th to 12th, with most classes being in grades 9 and 10 (we allowed just a few 8th grade classes into our study). Typically, the study class was a health class (69%).

Assessment of Attrition Bias—There was no significant differential attrition by treatment arm, age, gender, or any baseline value of the nine educator variables on the pre-test. The only variable for which there was differential attrition was the educator position (classroom educator or not): significantly more non-classroom educators dropped out prior to completing the study; however, this significant differential dropout rate was not different across treatment arms.

Primary Fidelity Outcome—Table 3 shows that the online training group reported significantly higher implementation fidelity to the activities than the control group. Overall, across 16 lessons, they reported complete implementation for 78% of the activities, compared to 73% for the control. Wang and colleagues (2015b) consider educators who implement 80% of core activities in their “high implementation” category. Durlak and DuPre (2008) conclude that expecting perfect or near perfect implementation is unrealistic and that few studies have attained levels greater than 80%. When fidelity scores were compared for just the *42 core activities that were a specific focus within the online training and for which we would expect to see significant differences between groups*, implementation fidelity for the training group was significantly higher than the standard group (see Table 3).

In all except two lessons, fidelity scores for the training group were consistently higher than for the non-training group; the difference was statistically significant in one lesson in favor of the training group, and no statistical significances were detected in the undesired direction.

Results of all secondary outcomes tested also are presented in Table 3. Only four were significant: three knowledge outcomes and one perception of skill outcome. Specifically, for three knowledge content areas (knowledge of role-play management, other skill steps and adaptations consistent with published adaptation guidelines for RTR) participants in the online training group reported significantly larger gains from pre- to post-test relative to those in the control group ($p \leq .01$). Pre-test knowledge scores were not significantly different.

Participants also were asked to self-assess their improvement in facilitating role-plays after participation in the study. On the post-test, significantly more educators in the online training group expressed that their *skill level in facilitating role-plays had improved* ($p < 0.01$). On average, 82% of participants in the online training group expressed that their skill level in key role-play techniques had moderately or greatly improved, compared to 58% of participants in the standard group.

None of the other psychosocial variables, such as comfort level delivering sex education, management of students who were off-track during role-play (off-trackers), or attitudes towards role-play or fidelity, were significantly different for the online training group compared to the control group. However, mean post-test scores (adjusted for pre-test scores) for the online training group were, on the whole, higher than the standard group. Additionally, all pre/post differences were in the desired direction for both groups. In interviews with 15 participants (10 from the online training group and 5 from the control group), several individuals mentioned that their comfort in implementing the RTR role-plays grew over time.

Dosage Analyses—“Dosage” was defined as the total number of minutes a participant spent using the online training, as captured through our web-based tracking data. On average, tracking data revealed that an educator spent just over two hours utilizing the online training. Even with this fairly short amount of time, regression analyses showed significant dosage effects for three of the secondary outcomes (see Table 4). None of the other outcomes, including the primary fidelity outcome, showed significant dose effects.

Validity of Fidelity Outcome—Fidelity scores were calculated for a subsample of educators from both groups who either returned audio recordings or were observed while implementing RTR sessions. Educators consistently rated themselves as having higher fidelity scores than observers or scorers of the audio-tape recordings. However, there was no significant difference in the amount by which they overrated themselves between intervention and control group participants. Overall, fidelity scores across both groups were consistently lower when based on observation and audio-recordings than when based on self-report. The mean fidelity score for the treatment group was 79% (self-report) versus 48% (observations) and 73% (self-report) versus 42% (observations) for the control group.

For participants who submitted audio recordings that were scored, their fidelity scores were closer to the observation scores, but still lower than the self-report scores (53% for audio vs. 46% for observations and 66% for self-report). The level of agreement between observers and self-report was also explored at the activity level. For both groups, the agreement between self-report and observations hovered around fifty-percent (53% for the treatment group and 46% for the control group). The sample size for the audio recordings was too small to be split by group, therefore, combined across groups, the level of agreement between audio scores and self-report was a little higher, at 61%. However, the conclusions based on the small sample of in-person and audio observations seemed to support the conclusions based on self-report; although this was not statistically significant because of the small sample size. Further details of these analyses are being prepared for a forthcoming paper on measurement issues surrounding implementation fidelity.

Limitations

This study had several limitations. First, it relied on educator self-report of implementation fidelity. Our validity assessment through classroom observations and review of recorded lessons showed that educators from both study arms were equally likely to over-report implementation fidelity. Therefore, although results indicate study conclusions might be the same, overall implementation fidelity reports from this study may be inflated when compared to in-person and audio observations. Additionally, while participants were asked to fill out implementation logs within 24 hours after a lesson was completed or skipped, many did not. This may also have affected the accuracy of educator recall. Despite these internal threats to the validity of self-reported data, there was no reason to believe systematic differences existed in recall between the two groups. Second, the study sample was not necessarily representative of the “average” educator who may be implementing RTR; most participants in this study had over five years’ experience teaching reproductive health, with over two-thirds holding a Master’s degree. Therefore, our findings cannot be generalized to include less experienced educators. Third, this study used a control condition that represented “standard of care” in the field for RTR training to address the research hypothesis that an online training would result in higher fidelity to the curriculum than the current standard of care; given the study did not instead use an attention control condition the results cannot address whether increases in fidelity were due to the actual content in the online training or to the additional online “attention” the participants in the experimental condition received. Finally, the study sample was relatively small and did not allow for exploration of effects among subgroups of participants. Future studies should utilize a larger sample size and consider more objective measures of implementation fidelity if resources permit.

Discussion

The *RTRworks!* online training had modest, positive effects on educators’ self-reported implementation fidelity to the RTR curriculum when compared to educators who received no training. Educators who participated in the online training also reported modest increases in knowledge of managing role-plays—a key area of focus of the training program and the RTR curriculum. The statistically significant effects of the training on mediating variables

also were positive: knowledge of role-plays, other skill steps and acceptable adaptations were higher in the group of educators receiving the online training intervention than in those who did not. Finally, educators' perceptions of their ability to lead role-play activities were significantly more positive than those in the control group.

Despite the positive results, we found the low effect sizes and lack of significance on many mediator variables of interest. Three factors may have contributed to this. First, educators in the online training group on average spent only two hours on the training – less than half of the minimum expectation of five hours. Most of this time was spent prior to the first class. Furthermore, on average, they logged on to the training on only nine separate days. Given that the curriculum is a 16-lesson curriculum, many of the educators did not log on to the training prior to every lesson. Half reported that they went through all of the online training in just a few sessions, and almost one in five said they went through all of the online training in only one session. Although educators spoke positively about the training, they did not or could not find the time to use it thoroughly, the way it was intended. Given the lower than expected rate of use, we recommend using incentives or mandates for similar online trainings aimed at building educator fidelity. Future projects of this sort need to take into account the limited time educators have outside the work day.

Second, the educators who ultimately participated in this study were highly educated and experienced. Almost all of them were credentialed health educators. Two-thirds had graduate degrees. Most had been teaching health for five or more years and had prior training in using role-plays. Attitudes toward and comfort teaching sex education and using role-play were very positive at baseline. Studies like this likely attract more confident and experienced educators who likely have less to learn from the online training. It is more difficult to attract (or obtain administrator permission for) educators who are less confident or experienced and who can benefit from more training. The fact that we found significant effects among such experienced educators and with such limited use of the online training speaks well for the effects we did find.

Finally, the higher level of attrition among the control participants, although not statistically significant, also could have tempered the observed effects if educators in the control arm dropped out because they had more difficulty implementing the curriculum with fidelity. The online training support also may have promoted retention in the study, and, perhaps, in the implementation of RTR.

Another point worth repeating is that educators in this study did seem to overinflate fidelity on their self-report when compared to in-person and audio observations. A paper comparing the methods of measuring fidelity for this study is forthcoming. However, the results from the in-person and audio observations, although under-powered, appeared to validate the results that there was higher overall fidelity among the online training group.

Given that face-to-face training has been a primary mode to train educators to implement RTR and other evidenced-based programs with fidelity, the fact that as little as two hours of online training can significantly enhance adherence aspects of educator fidelity is noteworthy. In-person trainings are generally two-days in length and may require some

travel time and costs. This study shows that fewer hours of participation in an online training could result in positive fidelity results that could shift the practice of training for evidence-based programs. Online training allows for distributive learning – learning over time as critical information is needed for use – so educators could return many times to access the information from the videos, tips, and other resources as needed. Our study was not able to follow participants longitudinally to determine long-term impact of *RTRworks!* Some researchers (e.g., Mowbray, Holter, Teague, & Bybee, 2003) have noted that fidelity wanes over time. Access to an online training program after initial use might prevent this.

Additionally, *RTRworks!* did improve knowledge related to leading the core role-play activities and leading role-plays and other key activities with appropriate adaptations. We believe this improvement is related to the quality of implementation which positively impacted adherence to the curriculum. When educators have the knowledge of how to lead activities correctly and feel comfortable and confident to lead the activities, they generally lead them with higher quality and therefore higher adherence fidelity. For instance, educators who are not comfortable to lead role-plays are more likely to change the activity or truncate it. An educator skilled in leading role-plays is more likely to lead them well, finish on time, and have time for other activities in the lesson. With incentives for thorough completion of the training in place, educators might realize more positive benefits.

The participating educators found the training both accessible and valuable. Several aspects of the online training were noted as being especially appealing. In particular, educators who used the online training found the videos to be most compelling and useful and wanted more of them. Often, educators used the videos in the classroom to show the students “effective” role-playing. Indeed, many educators who did not have access to the online training mentioned a desire for video modeling. Other aspects that the training participants found valuable were ready access to resources and tips as well as 24/7 access to the training itself. As a result of the feedback from study participants, the online training was improved with the addition of a high level discussion board and a printable certificate of completion.

The limited training use and the modest positive effects led the researchers to consider realistic real world uses for *RTRworks!* or comparable online trainings. *RTRworks!* and similar programs could be used to meet funder requirements for implementation (fidelity) training and ongoing implementation support. It could be used as a stand-alone training or combined in a variety of ways with in-person training for enhanced impact and be accessible for future implementations. “Booster” use could be encouraged and possibly tied to online chat features. This blended training approach as it relates to fidelity warrants investigation. Further research is needed into how to increase use of the online training in educators who have access to it and how to make it more potent. In particular, a blended learning model utilizing online training in conjunction with some face-to-face opportunities should be investigated.

Conclusions

Online training with video demonstrations enhanced implementation fidelity of educators teaching the RTR curriculum for high school students. Increasing implementation fidelity is

important to ensuring positive youth outcomes. School systems across the nation are being forced to look for ways to cut back in response to the current economic and political climate – including cutting back on face-to-face trainings. Online training can provide educators and administrators a less costly and time effective alternative to face-to-face training. In addition, the “anytime, anywhere” nature of online training allows participants to participate in the training when it is most convenient for them. They can choose the length of each sitting and repeat sections or the entire training as needed or desired. Administrators can monitor training use and implementation fidelity and assign sections of the online training to educators or review sections with the educators. The affordability and convenience of the online training delivery mode combined with the positive fidelity outcomes with relatively low dosage is noteworthy and worth further investigation.

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1. Did you implement each of the following activities of this class (Please refer to your RTR curriculum (yellow and blue book) when completing this.)?	Implemented Completely as Outlined in Yellow and Blue Book	Implemented Partially or with Changes	Did not Implement	Describe changes or reason for not implementing
Have students complete Refusals independently, discuss as group, and list 5 characteristics of effective refusals as students recall	☐	☐	☐	
Discuss difficult refusals and have students come up with and practice responses	☐	☐	☐	
Have 2 students act out At a Party (4.2), have other students fill out Observer Checklist, and discuss	☐	☐	☐	
Explain role-play At a Party (4.3) and have students write down responses for unscripted part	☐	☐	☐	
Divide students into groups and have all students within a group rotate through both role-play roles and observer, including small group discussion	☐	☐	☐	
Discuss role-plays in large group using the 5 questions listed in the RTR curriculum	☐	☐	☐	

Figure 1.
Sample fidelity items.

RTRworks! Project Participation Rates

Table 1

Teacher Training Group	Completed Pretest	Completed Class 1 Log ^b	Completed Posttest (%) ^c	Implemented all 16 classes ^d	Implemented at least 10 classes ^d
Online Training	110	90 (82%)	85 (77%)	71 (84%)	84 (99%)
Standard	110	78 (71%)	77 (70%)	60 (78%)	75 (97%)
Total	220 ^a	168 (76%)	162 (74%)	131 (81%)	159 (98%)

^aAn additional participant completed the pre-survey but dropped out before being randomized.

^bThese were the participants who actually started implementation. All other participants dropped out before beginning implementation of RTR.

^cOne additional participant from each study group completed the post-test but had dropped out of the study before they were able to implement all 16 lessons. They were not included in final analyses.

^dPercentages based on all of those who completed the post-test.

Table 2

Educator Demographics (Based on Pre-test Survey Information)

	Online Training	Standard	Total
Gender			
<i>Male</i>	12%	16%	14%
<i>Female</i>	88%	84%	86%
Age			
20–30	20%	18%	19%
31–40	25%	22%	24%
41–50	31%	27%	29%
Over 50	24%	33%	28%
Ethnicity ¹			
<i>Caucasian</i>	88%	80%	84%
<i>Other</i>	12%	20%	16%
Education			
<i>BA</i>	32%	36%	34%
<i>Graduate Degree</i>	62%	65%	63%
Teaching Credential			
<i>Yes</i>	93%	90%	91%
Current Position ²			
<i>Classroom Teacher</i>	95%	87%	91%
Subjects Taught			
<i>Health Topics</i>	91%	91%	91%
Number of years teaching 8–12 grades			
<i>Five or more years</i>	72%	84%	78%
Number of years teaching health			
<i>Five or more years</i>	66%	72%	69%
Number of years teaching pregnancy/STD prevention topics			
<i>Five or more years</i>	62%	69%	65%
Prior RTR experience			
<i>No</i>	86%	77%	82%
Grade levels (check all that apply)			
<i>8th grade</i>	18%	20%	19%
<i>9th grade</i>	55%	62%	59%
<i>10th grade</i>	54%	56%	55%
<i>11th grade</i>	45%	46%	45%
<i>12th grade</i>	41%	46%	42%
Type of class implementing RTR			
<i>Health</i>	68%	70%	69%
<i>Other</i>	32%	30%	31%

¹Participants were asked to “check all that apply.” Response options were later recoded into single primary race variable.

²This was entered as a covariate in our final models where appropriate; $\chi^2(1, n=162) = 3.51, p = 0.061$.

Table 3
Parameter Estimates for Regression Models of Outcome and Psychosocial Variables at Post-test (Data source: Implementation logs)

Variable	Online Training Group		Standard Group		p-Value	Estimated effect size (Cohen's d)
	Sample size	Group Estimate ^a (SE)	Sample size	Group Estimate (SE)		
Primary outcome						
Average fidelity score across all 16 classes (0–100%)	85	78.30 (1.91)	77	72.84 (2.01)	0.051	0.31
Average fidelity score (transformed: squared)	85	6421.74 (256.35)	77	5629.29 (269.34)	0.035 *	0.33
Average fidelity percent for 42 core activities (0–100%)	84	80.40 (1.93)	77	73.97 (2.02)	0.023 *	0.36
Secondary outcomes						
Knowledge of the curriculum, implementation tips, reproductive health basics, and key educator skills						
1. Knowledge of RTR Theory–Background (0–1)	84	0.69 (0.05)	77	0.68 (0.05)	0.83	0.03
2. Knowledge of General RTR Content (0–100%)	85	50.98 (3.04)	77	48.91 (3.04)	0.64	0.07
3. Knowledge of Role Play Management (0–100%)	85	67.72 (2.29)	77	56.42 (2.40)	0.001 **	0.53
4. Knowledge of Other Skill Steps (0–100%)	85	62.34 (2.41)	77	50.34 (2.53)	0.001 **	0.54
5. Knowledge of Adaptations Consistent with Greenlight Guidelines (0–100%)	85	58.83 (2.86)	76	48.35 (3.03)	0.013 *	0.40
Preparation and pre-planning for lesson activities						
6. Time spent preparing for each class (1–7)	83	4.18 (0.11)	77	4.32 (0.11)	0.35	–0.15
Sense of preparedness to implement the curriculum						
7. Sense of preparedness (1–5)	83	4.30 (0.06)	76	4.35 (0.06)	0.58	–0.09
8. Overall sense of preparedness to teach RTR (1–5)	85	4.40 (0.06)	77	4.39 (0.07)	0.91	0.02
Perceptions of knowledge and skill						
9. Role play improvement (1–4)	84	3.19 (0.08)	76	2.71 (0.09)	<0.001 **	0.62
10. Knowledge with delivering sex education and using skills (1–5)	80	4.00 (0.05)	70	3.98 (0.05)	0.68	0.07
11. Comfort with delivering sex education and using skills (transformed antilog), (1–4)	77	42.54 (1.17)	73	40.56 (1.20)	0.24	0.19
12. Effectiveness in Implementing Role Plays(1–5)	85	4.24 (0.06)	77	4.12 (0.06)	0.16	0.22
13. Perceived knowledge or skill change in teaching sex education (1–4)	83	3.32 (0.06)	73	3.21 (0.07)	0.22	0.20
14. Perceived comfort change in teaching sex education (1–4)	84	3.40 (0.05)	71	3.30 (0.06)	0.22	0.20
15. Comfort in using role play/role play management (1–4)	84	3.30 (0.06)	75	3.22 (0.06)	0.28	0.17

Variable	Online Training Group		Standard Group		p-Value	Estimated effect size (Cohen's d)
	Sample size	Group Estimate ^a (SE)	Sample size	Group Estimate (SE)		
16. Management of role play off-trackers (1–5)	85	4.12 (0.06)	77	3.97 (0.07)	0.11	0.25
17. Current level of skill in using role play with students (1–5)	83	3.70 (0.07)	77	3.57 (0.07)	0.19	0.21
Attitudes towards evidence-based curriculum and role play						
18. Attitude that using an evidence-based sexuality education curriculum is important and effective (1–5)	82	4.41 (0.06)	77	4.39 (0.07)	0.81	0.04
19. Attitudes towards role play (1–5)	80	4.25 (0.06)	74	4.17 (0.06)	0.35	0.15

* p value < .05

** p value < .01

^aCovariate-adjusted mean for the group

Table 4

Significant Dosage Outcomes for Online Training Group Only

Change Scores from Pre to Post	n	t value	p value
Attitude that using an evidence-based sexuality education curriculum is important and effective	82	3.19	0.002
Knowledge of role play management	85	2.46	0.016
Attitudes towards role play	80	2.51	0.014