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The one-year impact of an emotion regulation intervention on early adolescent health risk behaviors

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Abstract

Objective—Sexual activity often begins in early adolescence, and adolescents with mental health symptoms are at greater risk for sexual activity and other health risks. This study aimed to evaluate a developmentally targeted intervention designed to enhance early adolescents' emotion regulation competencies as a strategy for reducing health risk behaviors, including sexual initiation.

Method—Adolescents 12 to 14 years old (N = 420; 53% male) with mental health symptoms participated in either an Emotion Regulation (ER) or Health Promotion (HP) intervention consisting of twelve after-school sessions. Participants completed questionnaires on laptop computers at baseline, 2-, 6-, and 12-month follow-ups.

Results—Time to event analyses were used to compare intervention conditions on rate of initiation to vaginal sex. Results showed that participants in the Emotion Regulation (ER) condition were less likely to transition into vaginal sexual activity by one-year follow-up than those in the Health Promotion (HP) condition (adjusted hazard ratio = 0.58, 95% CI: 0.36 to 0.94, p = .01). However, those who were sexually active did not report differences in sexual risk behaviors (e.g., condomless sex). Participants in the ER condition were significantly less likely to report violence behaviors and showed improvement on a behavioral measure of emotion identification, however they did not differ from HP participants on self-reports of emotional competence.

Conclusions—Emotion regulation strategies can be used to delay sexual initiation among early adolescents with mental health symptoms and may have an important role in health education.

Keywords

emotion regulation; sexual initiation; risk behaviors; adolescents; intervention

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While sexuality in adolescence is a normative aspect of human development that has potentially positive consequences, it can also have negative ones. Data suggest that sexual intercourse in early adolescence is associated with significantly greater future sexual risk. Those who have sex before age 15 are more likely to engage in sexual risk as they age (e.g., more sexual partners, sexually transmitted infections (STIs)) than their peers who begin having sex at older ages (Capaldi, Stoolmiller, Clark, & Owen, 2002; Magnusson, Masho, & Lapane, 2012; Sandfort, Orr, Hirsch, & Santelli, 2008). They are seven times more likely to have multiple unintended pregnancies (Magnusson, Masho, & Lapane, 2011) and twice as likely to test positive for a STI at age 18 (Kaestle et al., 2005). Therefore, delaying sexual intercourse may have important health benefits throughout adolescence.

Early adolescence is an important time to intervene around values, cognitions, and emotions related to sex. Cognitions about sex change before adolescents engage in sexual behaviors (O'Sullivan & Brooks-Gunn, 2005), and sexual values and intentions in early adolescence are predictive of behavior in middle adolescence (Stanton et al., 1996). The relationship between positive feelings about sex and sexual initiation is strongest when adolescents are younger (Romer & Stanton, 2003), and these attitudes change more dramatically in early adolescence than mid-adolescence (O'Sullivan & Brooks-Gunn, 2005). Intervening early is therefore critical to targeting sexual values, cognitions, and feelings before they are well established.

Centers for Disease Control and Prevention surveys indicate that, depending on the state, between 6.5% and 19.4% of middle schoolers report ever having had sexual intercourse (http://nccd.cdc.gov/youthonline). Because of the relative infrequency of intercourse in this developmental period, and given the relationship between delay and the prevention of sexual risk outcomes (fewer partners, STIs, and later pregnancies), intervening on sexual delay is an important risk marker to impact among this population. Some group interventions for middle school youth have successfully targeted such delays (Tortolero et al., 2010; Coyle, Kirby, Marin, Gomez, & Gregorich, 2004; Jemmot, Jemmot, & Fong, 2010) by addressing knowledge, values, or behavioral skills such as communication or condom use. However, relatively little attention has been paid to intervening around feelings associated with sexual behavior (Jenkins, 2014; Bell & McBride, 2010) despite their importance in several theoretical models of risky decision making (e.g., Slovic, Peters, Finucane, & MacGregor, 2005; Tice, Bratslavsky, & Baumeister, 2001). Intervention approaches focused on values or skills may be incomplete without attention to the emotions (and their regulation) that influence how adolescents respond to potentially risky situations. Research suggests that when people experience high levels of negative emotion, they act impulsively to decrease this distress, prioritizing short-term soothing over other self-regulation strategies (Tice, Bratslavsky, & Baumeister, 2001). Consistent with this, poor emotion regulation in adolescence has been linked to risky health behaviors, including more sex partners (Hessler & Katz, 2010) and more substance use (Wills, Walker, Mendoza, & Ainette, 2006).

Emotion regulation is conceptualized as the process of "shaping which emotions one has, when one has them, and how one experiences or expresses these emotions" (Gross, 2014, pp. 6). Targeted emotions are often negative, though positive emotions can also require regulation, as when excitement or attraction to a partner leads to sex, and both emotional

states have been associated with adolescent sexual behavior (Fortenberry et al., 2005). Teens who engage in risk, such as condomless sex or substance use, are more likely to report difficulty with emotion regulation (Brown et al., 2012). These relationships have also been demonstrated longitudinally; studies show that self-regulation of emotions and behavior in early adolescence is associated with sexual risk taking and substance use in later adolescence (Hessler & Katz, 2010; Raffaelli & Crockett, 2003). In the context of research connecting emotions to sexual behavior among adolescents (Houck et al., 2014; Shrier, Koren, Ancja, & de Moor, 2010), these relationships may exist because adolescents' difficulties with emotion regulation increase the likelihood of impulsive self-soothing behaviors, such as sex. Interventions targeting emotion regulation in times of sexual decision making may assist young people in delaying onset of sexual activity (Brown et al., 2013).

Early adolescents with emotional and behavioral symptoms may be particularly vulnerable to deficits in emotion regulation when making decisions about sex. These symptoms are related to more sexual activity among early adolescents (Hipwell, Keenan, Loeber, & Battista, 2010; Schofield et al., 2008) and with sexual risk as teens get older (Brooks, Harris, Thrall, & Woods, 2002; Elkington, Bauermeister, & Zimmerman, 2010). Mental health symptoms can signal difficulties in emotion regulation skills, which may represent a path that places adolescents at risk for engaging in early sexual activity or other risk behaviors.

To examine the impact of teaching emotion regulation strategies on risk behaviors among early adolescents who may be at risk due to mental health problems, Project TRAC (Talking about Risk and Adolescent Choices) was developed. The model of adolescent risk behavior used to guide its development was The Social-Personal Framework (Donenberg et al., 2005), which emphasizes the coaction of individual and social factors for risk. The model proposes that adolescent sexual risk-taking is a function of the interplay of: 1) personal attributes; 2) peer and partner relationship concerns; 3) environmental conditions; and 4) family context. Emotion regulation represents a key personal attribute that may contribute to adolescent sexual behavior, and this represented the focus of the intervention. The most widely used and supported model of emotion regulation (Webb, Miles, & Sheeran, 2012) is Gross' process model (Gross, 2014). The process model identifies five families of emotion regulation strategies: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. Via these strategies, individuals can target emotion management at various points in the process of emotional experience (e.g., attending to a stimulus, appraising a stimulus). A meta-analysis of experimental studies of emotion regulation (primarily adult studies) demonstrated that strategies such as distraction and reappraisal have positive effects on emotional outcomes (Webb, Miles, & Sheeran, 2012), suggesting these approaches may be useful in real-world situations.

The developed intervention was conducted as a small group, after school program, in which participants were provided with emotion education and skill building focused on emotion regulation strategies for use in health risk situations, with an emphasis on sexual health. In an evaluation of the short-term outcomes immediately following the intervention, participants in the Emotion Regulation (ER) condition reported fewer health risk behaviors during the approximately two-month intervention period relative to those in a general Health Promotion (HP) condition (Houck et al., 2016). Adolescents in the HP condition were 2.5

times more likely to be sexually active than those who were taught emotion regulation strategies. HP adolescents were also significantly more likely to report violence-related behaviors (carrying a weapon and fighting), suggesting that adolescents in the ER condition may have generalized the principles taught to reduce other health risks. Indeed, ER participants reported using emotion regulation strategies when emotionally aroused more often than those in the HP condition.

While these immediate risk reductions are important and support the link between emotion regulation and risk, program impact on delaying engagement in risk over longer periods has even greater public health implications. The purpose of the current study was to assess the impact of the ER condition on the primary target, delay of vaginal sex initiation, at one-year follow-up. It was hypothesized that ER participants would be less likely to transition to vaginal sex over the one-year follow-up than those in the HP condition that did not contain emotion education. In addition, based on the short-term findings, it was hypothesized that ER participants who had engaged in vaginal or anal sex would report fewer risk behaviors than those in the HP condition. It was also hypothesized that the intervention effects may generalize to violence and substance use behaviors. Finally, it was expected that ER participants would perform better on measures of emotional competence (e.g., identifying emotions, self-reports of using regulation strategies).

Method

Participants

With institutional review board approval, 420 7th graders were recruited from five urban New England public schools between September 2009 and February 2012. Adolescents were eligible if they were in 7th grade, aged 12–14 years, spoke English, and were at-risk due to symptoms of emotional or behavioral problems or suspected sexual or substance use behavior. A form developed by one of the school districts, used for school staff to make counseling referrals, served as a guide to school personnel (e.g., counselors, administrators, nurses) for making referrals to program staff. It included common symptoms of emotional or behavioral concerns, such as hyperactivity, withdrawing, declining grades, erratic behavior/mood swings, or disruptive behavior. Students who were known to have a history of being sexually aggressive, be HIV-infected, have developmental delays, be currently pregnant, or have a sibling who had previously participated in the program were excluded. Exclusion criteria were re-assessed with parents prior to consent to confirm eligibility. Of note, symptoms of common internalizing and externalizing disorders of adolescence were assessed at baseline (after consent and assent) via seven selected subscales from the adolescent-report Youth Inventory-4 (YI-4) and parent-report Adolescent Symptom Inventory (ASI; Gadow & Sprafkin, 1995), screening instruments for child and adolescent psychiatric disorders based on *DSM-IV*. Seventy percent of participants had a T-score of 65 or greater on at least one subscale by either adolescent or parent report (Attention Deficit Hyperactivity Disorder (any type): 52%; Conduct Disorder: 27%; Oppositional Defiant Disorder: 26%; Generalized Anxiety Disorder: 23%; Major Depressive Disorder: 38%; Dysthymic Disorder: 44%; Bipolar Disorder: 39%).

Figure 1 details participant retention. About 1,283 students were attending seventh grade in the five schools each of the three study recruitment years (3,849 students). About 27% of students were referred to the program; this is consistent with national data (Merikangas et al., 2010) that indicate that 22.2% of adolescents have a mental health disorder causing severe emotional or behavioral symptoms (this study required only symptoms of a disorder). Forty percent of referred students enrolled in the study. Additional details regarding Project TRAC procedures, recruitment, and retention have been previously published (Houck et al., 2016).

Overall, the sample (N = 420) was 53% male, with a mean age of 13.0 years (SD = .55). The sample was 32% Caucasian, 28% African-American, 2% American Indian/Alaskan Native, 3% Hawaiian/Pacific Islander, 1% Asian and 18% multiple endorsements (16% did not endorse a race). The sample was 38% Latino, and 30% of parents reported a family income < $20,000 (18% did not endorse an income).

Interventions

Adolescents participated in either an Emotion Regulation (ER) or Health Promotion (HP) intervention condition; both were developed and piloted using focus groups with early adolescents during a pilot study (R34 MH078750). Each manualized intervention consisted of twelve, twice-weekly, hour-long sessions, run in single-gender groups of 4 to 8 adolescents. Booster sessions reviewing intervention content were offered for both conditions after participants completed questionnaires at 6 and 12 month follow-ups. Delivered in schools after the school day, groups were led by male-female pairs that included a mental health clinician (or clinician in training) and a research assistant. Both interventions used the same teaching techniques that relied on interactive games adapted to teach core concepts (e.g., quiz games, Jenga), as well as group discussions and workbook activities to personalize information learned. ER condition sessions were generally divided into two halves: emotion regulation education (e.g., recognizing feelings in self, strategies for reducing momentary arousal) and sexual health (e.g., puberty, STIs). Each session in the HP condition addressed a single topic (e.g., nutrition, smoking) and did not include emotion education or relate health decision making to emotions. Participants received $2 for being on time for each session, awarded at the end of the program.

To reduce contamination and avoid nesting conditions within schools, schools participated in one condition each school year. Participating schools were organized by grade, therefore 7th graders generally had limited contact with 8th graders. The five schools were randomly assigned to an order of conditions over two school years (i.e., ER in Year 1, HP in Year 2 or HP in Year 1, ER in Year 2); schools were re-randomized for the third year of recruitment.

Emotion regulation intervention—The ER intervention aimed to enhance ER skills to reduce poor decision making that can lead to unplanned sex or other health risk behaviors, such as substance use or physical aggression (see Table 1). The first half of the program presented the relationship between emotions and behaviors as well as emotion education, such as identifying emotional arousal in oneself through somatic cues, labeling these feelings, and recognizing their sources (“triggers”), such as feeling embarrassed or pressured

by partner requests for a sexual behavior. The second half taught developmentally appropriate strategies for regulating emotions (both positive and negative) during moments of decision making. Three strategies, identified during qualitative work in the development stage of the program, were presented: 1) getting away (physically or cognitively) from triggers for strong emotions, 2) releasing emotional energy in healthy ways (verbally or physically), or 3) changing cognitions and appraisals about emotional triggers. Referred to in the intervention as “Get Out,” “Let It Out,” and “Think It Out,” these strategies include four of the five “families” of ER processes in Gross’ process model: situation modification, attentional deployment, response modulation, and cognitive change. The fifth, situation selection, was discussed as a way to prevent experiencing dysregulated emotions, but was not emphasized because the unique focus of the intervention was on managing emotions as they occurred (instead of suggesting that adolescents prevent them in the first place).

Games and role plays were used to apply these strategies to a variety of risk situations. The program also presented connections between emotion regulation and peer relationships, media representations, and substance use. Given the focus on sexual risk, adolescents received sexual health education, including information about sexual development, STIs (including HIV), and disease/pregnancy prevention, which included positive discussion of youth engagement in non-penetrative sexual behaviors as an alternative to those more likely to involve fluid exchange.

Health promotion intervention—Loosely modeled after a comparison condition developed for another project (Brown et al., 2013), the aim of HP was to encourage healthy decision making through information on a breadth of topics, similar to the structure of many public school health education curricula. The HP intervention was matched for time and used similar activities to address topics such as substance use, internet safety, violence, nutrition, exercise, sleep, and cigarette smoking. The sexual health content of the ER intervention was also included, with modifications to eliminate discussion of emotions related to decision making.

Curriculum Training and Fidelity

A treatment manual was used to maintain treatment fidelity. Facilitators were trained through live, mock groups, practiced for each of the sessions. Project investigators annually directed these trainings, in which facilitators role played activities, discussed session goals, practiced behavior management, and discussed issues of fidelity to treatment delivery. Facilitator-completed adherence ratings demonstrated excellent (98%) adherence to the manual. Senior project staff observed 15% of sessions, which also indicated excellent (97%) adherence.

Data Collection and Measures

The current study used data from assessments completed at baseline, immediately after the intervention (posttest), 6 months post-baseline, and 12 months post-baseline. Data from the immediate posttest were used only for providing information for time to sexual initiation; short-term effects of the intervention have been published elsewhere (Houck et al., 2016). Adolescents completed an audio-assisted computer self-interview (ACASI). Parents also

completed baseline demographic and adolescent symptom questionnaires on laptops in the language of their choice (English, Spanish, or Portuguese). Participants received gift cards for completing assessments.

Sexual activity—The primary outcome of the study was time to vaginal sexual activity. To assess this, participants were asked at each assessment whether they had ever engaged in vaginal or anal sex. Those responding yes were asked more detailed questions about their sexual behavior in the last 6 months, including whether this was the first time they had vaginal sex, and if so, in which of the past 6 months their first time had occurred. Adolescents were also asked whether they had engaged in anal sex in the last 6 months, though not whether this was the first time. Those who endorsed vaginal or anal sex in the last 6 months were asked about number of sexual partners, number of vaginal and/or anal sex acts, and the number of times condoms were used (to calculate a proportion of acts protected by a condom). The abbreviated posttest was simplified to whether participants had had vaginal and anal sex since beginning the program. Behavioral definitions were used to ensure that participants understood vocabulary; definitions did not reference gender of partner so as to allow for both opposite- and same-sex encounters.

Other risk behaviors—Secondary behavioral outcomes of interest included substance use and violence behaviors. Substance use was assessed via four items that assessed frequency of use of alcohol, marijuana, inhalants, and “other drugs,” separately. Responses were summarized to whether participants had used any substance in the past 6 months or not. Similarly, to assess violence behaviors, two items adapted from the Youth Risk Behavior Surveillance System (Centers for Disease Control and Prevention, 2009) were used to assess the frequency of carrying a weapon to school or physical fighting in the past month. Information was dichotomized to identify those who had engaged in either form of aggression and those who had not.

Emotional competence—The Diagnostic Analysis of Nonverbal Accuracy – 2 (DANVA2; Nowicki & Carton, 1993) was administered at baseline, 6-months, and 12-months. The DANVA is a computer task that asks participants to identify the emotional expression conveyed through a series of photographs (Faces). The DANVA has shown one-month test-retest reliability over .8 (Nowicki & Carton, 1993). Adolescents completed two self-report subscales of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), in which statements of emotional competence were rated on a 5-point scale (1=almost never to 5=almost always). The Lack of Emotional Awareness subscale (LEA; 6 items) assessed self-perceived emotional awareness (e.g., “I pay attention to my feelings”). Higher scores indicate greater problems with awareness. The Limited Access to Emotion Regulation Strategies subscale (LAERS; 8 items) evaluated perceived abilities to manage negative emotions (e.g., “When I’m upset, I believe that there is nothing I can do to make myself feel better”). Higher scores indicate greater problems with accessing regulation strategies. The DERS has been previously validated in adolescent samples (Neumann, et al., 2010; Weinberg & Klonsky, 2009) and demonstrated strong reliability in the current sample (at baseline, LEA α= .88, LAERS α= .83).

Adolescents completed the 8-item Emotion Regulation Behaviors Scale (ERBS; Houck et al., 2016), created for the study to assess use of the specific emotion regulation strategies taught in the ER intervention. Using a scale of 1 ("never") to 5 ("all of the time"), teens responded to items such as "In the last week, when you were having a strong feeling (for example, really mad, really sad, or really excited) how often did you …get away from whatever was causing your feeling? …think about the situation differently?" Higher scores indicate more frequent use of the strategies taught. Internal consistency at baseline was .73 and at both 6- and 12-months was .85.

Statistical Analyses

Nesting of participants within schools—To account for participant nesting within the five schools, school was included in all statistical models as a categorical covariate.

Missing data—Depending on the outcome measure, missing data ranged from 1% to 5% at baseline, 8% to 14% at 6-months, and 12% to 17% at 12-months. There were no differences between conditions in number of participants who missed either the 6-month or 12-month assessment (ER: 14% [$n = 31$]; HP: 16% [31], $\chi^2(1) = 0.12$, $p = .73$). Participants who missed tended to be older than those with complete data ($F(1,417) = 7.98$, $p < .01$), with no other differences on baseline characteristics. Consequently, age was included in all statistical models, and multiple imputations (Su, Gelman, Hill, & Yajima, 2011) were used for all analyses to address potential bias due to dropout.

Imbalance in baseline characteristics—In accordance with current recommendations, propensity scores were used to adjust for potential imbalance between conditions on demographics, sexual behavior, violence, substance use, and emotional competence (Austin, & Stuart, 2015; Austin, 2014). Specifically, we used inverse probability of treatment weighting where the probability for being in the treatment condition was estimated for each participant by regressing treatment condition on all demographics and baseline characteristics. These probabilities (i.e., propensities) were then used to generate weights for each participant following procedures outlined in Austin (2014). These weights were then used in all statistical models, effectively adjusting for potential imbalance between conditions.

Delay of sexual initiation—A Cox-proportional hazard model was used to test differences between the ER and HP conditions. Time in months from beginning the study to the first vaginal event was calculated for every participant. Participants who reported vaginal sex prior to the beginning of the study (HP = 12%, $n = 24$, ER = 9%, $n = 20$; $\chi^2(1) = 0.75$, $p = .39$) were not included in the analysis. The Cox-proportional hazard model can accommodate censoring in the data (i.e., drop-out before sexual initiation; HP = 10%, $n = 18$; ER = 11%, $n = 21$; $\chi^2(1) = 0.06$, $p = .88$) so long as the drop-outs are comparable to those who remained in the analysis. In a test of this assumption, those who were censored were more likely to come from a home with annual household income less than $20,000 ($\chi^2(1) = 6.92$, $p = .01$), with no other differences on baseline characteristics. Consequently, household income was added as a covariate to the Cox-proportional hazard model, with

baseline age and school. Missing data in household income was addressed using multiple imputations following procedures by White and Royston (2009).

Risk and emotional competence outcomes—Logistic regressions were used for dichotomous data and analyses of covariance were used for continuous data. All models included participant school, participant age, and the baseline assessment as covariates. Sexual risk outcomes were modeled with the following differences. Models were only run for those who reported ever having vaginal or anal sex prior to the assessment of interest. Due to the small number of youth reporting vaginal or anal sexual activity, baseline assessments were not included as covariates.

Mediation—Causal mediation models (Imai, Keele, & Tingley, 2010) were run to evaluate the extent to which changes in each of the emotional competency outcomes mediated the proportion of youth ever endorsing vaginal/anal sex at 6 and 12 months. Proportion of the total treatment effect attributable to treatment-related change in the mediator was evaluated for each model. The following R packages were used to run the analyses: ‘mi v1.0' (Su, Gelman, Hill, & Yajima, 2011); ‘stats’ (R Core Team, 2014); and ‘MASS’ (Venables & Ripley, 2002); ‘survival’ (Therneau & Grambsch, 2000); ‘mediation’ (Tringley, Yamamoto, Hirose, Keele, & Imai, 2014).

Results

Baseline characteristics

There were no significant demographic differences between the Emotion Regulation (ER) and Health Promotion (HP) conditions. The conditions did differ in the number of participants reporting substance use at baseline (Table 2; $\chi^2(1) = 7.09$, $p < .01$), with no other significant differences on baseline measures of risk behavior. There was no significant difference between conditions on attendance at the 12 after school sessions (9.1 vs. 9.0), $t(418) = 0.20$, $p = .84$ or on attendance at the 6-month booster session (46% vs. 44%), $\chi^2(1) = .16$, $p = .69$). After weighting the conditions by the inverse treatment probability, there were no significant differences between conditions on any of the baseline characteristics.

Delay of sexual initiation

From baseline to the 12-month assessment, 42 participants in the HP and 35 in the ER reported initiating *vaginal* sex for the first time. Kaplan-Meier survival curves for both conditions are depicted in Figure 2. The hazard ratio for the difference between conditions indicated that after controlling for school, family income, and baseline age, participants in ER were significantly less likely than those in HP to transition into vaginal sexual activity (adjusted hazard ratio = 0.58, 95% CI: 0.36 to 0.94, $p = .01$).

Risk and emotional competence outcomes

Descriptive information about risk behaviors and emotional competence outcomes is reported in Table 2 and tests of differences between conditions in Table 3. Controlling for school and baseline age, there were differences between conditions in the number of participants who reported either vaginal or anal sex (lifetime) at both the 6-month (adjusted

odds ratio [AOR] = 0.58, 95% confidence interval [CI] = 0.40 to 0.84) and 12-month (AOR = 0.54, CI = 0.37 to 0.80) follow-ups. Among those who had had vaginal or anal sex, there were no other differences between conditions on risk behaviors.

Controlling for school, baseline age, and the baseline assessment, there was a significant difference on the violence risk composite at the 6-month (AOR = 0.66, CI = 0.44 to 0.98) but not 12-month follow-up. There was no difference between conditions on the substance use composite at either follow-up. There was a significant difference between conditions on the DANVA at the 6-month follow-up (unstandardized estimate [b] = 2.91, CI = 0.29 to 5.52), with the ER condition outperforming the HP condition, but this difference was no longer present at the 12-month follow-up. There were no differences between conditions on the ERBS or either of the DERS subscales.

Mediation

All emotional competency outcomes were evaluated as mediators of the proportion of youth ever endorsing vaginal or anal sex at 6 and at 12 months. Consistent with analysis of treatment effects reported in Table 3, treatment-related change in DANVA faces accounted for 9.32% (CI = 1.24 to 16.12) of the treatment effect at 6 months and 10.65% (CI= 4.07 to 17.04) at 12 months. No self-report measures of emotional competence were significant.

Discussion

Extending previous findings of the short-term efficacy of an emotion regulation intervention for early adolescents, the current study found that participants in the ER intervention who had not had vaginal sex at baseline were significantly less likely to have done so one year later than their counterparts in the HP intervention. These results are consistent with previous studies documenting a relationship between emotion regulation and risky health decision making (Brown et al., 2012; Hessler & Katz, 2010). This provides further support for the inclusion of emotion education in the context of health education as a mechanism critical to influencing decision making. Knowing strategies for monitoring emotions and managing strong feelings is key to achieving emotion regulation goals (Gross, 2014). In this case, it may help young people calm strong feelings at times of risk (such as sexual possibility situations), allowing them to integrate knowledge and values into their decision making and reduce the chance of making decisions based solely on feelings (or their avoidance).

These results for a program developed specifically for early adolescents in public schools with mental health symptoms are consistent with two sexual risk prevention programs that included emotion regulation components for older adolescents with more severe mental health problems. While neither examined transition to sex, both demonstrated that those who received emotion regulation training reported fewer sexual risk behaviors at 1-month (Brown et al., 2013) and 6-month (Brown et al., 2011) assessments. The present study found similar behavioral benefits of focused emotion regulation interventions on reducing targeted sexual behavior. Furthermore, it extended the length of the observed effect to 12 months, suggesting that earlier intervention with such strategies may have greater impact than waiting until later in development. However, it should also be noted that the lower level of severity with regard

to mental health symptoms in the current sample compared with those in the previous studies may also explain why the intervention sustained its effect on transition to vaginal sexual activity.

However, significant differences were not observed on other behavioral outcomes among those who were sexually active, such as having multiple partners or engaging in condomless sex. Due to the relatively small numbers of adolescents who were sexually active by the one-year follow-up (eighth grade), the study was underpowered to detect such effects. Greater ability to detect these differences may emerge as more adolescents become sexually active over longer term follow-up periods. Alternatively, it may be that those adolescents who were sexually active in the developmental period of this study may have differed from other teens in key characteristics that made them less responsive to the intervention. Finally, it may be that adolescents associated the message of emotion regulation more strongly with whether or not to have sex than with sexual safety.

Consistent with short-term findings that demonstrated intervention benefits related to violence behaviors (Houck et al., 2016), youth in the ER condition reported fewer violence-related behaviors at the six-month follow-up. This result is encouraging, as it suggests that the learning of emotion regulation strategies focused on sexual risk appears to have continued to generalize to other risk behaviors thought to be influenced by emotion regulation. However, this effect did not maintain to one year and was not observed for substance use outcomes. It may be that more concrete examples connecting emotion regulation to other specific risk behaviors are necessary to maintain changes in violence behaviors for a longer period of time or affect substance use.

While teens in the ER condition showed behavioral differences on emotion recognition and the primary target outcome of the study, sexual initiation, their self-reports of emotional competence did not differ between groups nor mediate treatment effects. Despite earlier findings that adolescents in the ER condition reported more frequent use of emotion regulation strategies during the intervention, this effect was not observed over longer follow-ups, nor did the groups perceive themselves as different in emotional awareness or in their ability to regulate their emotions. It is possible that the self-report tools used did not assess the emotional constructs by which this intervention had its impact. It may also be that these adolescents' abilities to describe their emotional competence, while reliable, may not be highly valid during this period of development, due to limits in abilities to recognize and label their own emotional experiences that might be more common among youth with mental health symptoms.

It is noteworthy that, in contrast to findings on self-reports, intervention differences were observed over time on a behavioral task of identifying feelings in others. This is one important skill for emotion regulation in social situations, such as sex, and these changes mediated the group differences in reports of vaginal or anal sex at both 6- and 12-month follow-ups. This objective, skills-based assessment indicated that ER youth improved in emotion identification following the intervention; HP adolescents remained generally stable in their performance. These data provide preliminary support that assessment strategies that do not rely on self-report may detect intervention effects in emotional competence that are

difficult for adolescents to recognize and that improvements in emotional competence relate to differences in sexual activity.

Strengths of the study include an innovative target for prevention (emotion regulation) with a challenging population (early adolescents with mental health symptoms) that was racially and ethnically diverse. The program used a strong comparison condition that employed the same engaging intervention style and sex education content rather than treatment as usual (i.e., “standard” school health education) or an attention control focused on a nonsexual health topic, which are most often used (Picot et al., 2012). Internal validity was further enhanced by excellent participant retention and rigorous training and supervision to ensure treatment fidelity.

There are also limitations. Most of the measures were self-report and are thus subject to potential bias; however, the use of ACASI to collect sensitive information is believed to increase honest reporting (Romer et al., 1997). Generalizability is limited by the fairly narrow age range, the emphasis on youth with mental health symptoms, and the single geographic region from which the population was drawn. This study also did not collect information regarding adolescents’ sexual identities, and fidelity ratings of intervention delivery lack inter-rater reliability. Finally, despite randomization, participants in the HP condition reported more risk behaviors at baseline than adolescents in the ER condition, however, lack of balance was addressed using propensity score methods.

This project had a one-year impact on reducing the transition to vaginal sexual activity among at-risk youth with mental health symptoms, which is notable in the adolescent risk prevention literature. It successfully recruited and engaged vulnerable youth at-risk due to mental health symptoms from public school settings, a population that can be difficult to reach. This suggests that early adolescents with multiple stressors are interested in programs addressing emotion education provided those programs are developmentally tailored. The addition of formal education about emotions and their role in decision making may be a key element to transforming current health education for early adolescents, particularly those who have symptoms of emotional and behavioral difficulties. By acknowledging the emotional context in which risk decisions are made and providing strategies for regulating these emotions, adolescents may have a better chance of using the facts that currently form the emphasis of health education in public schools. Future directions for research should include better understanding the influence of emotions on risk behavior as well as determining populations that can benefit most from such interventions.

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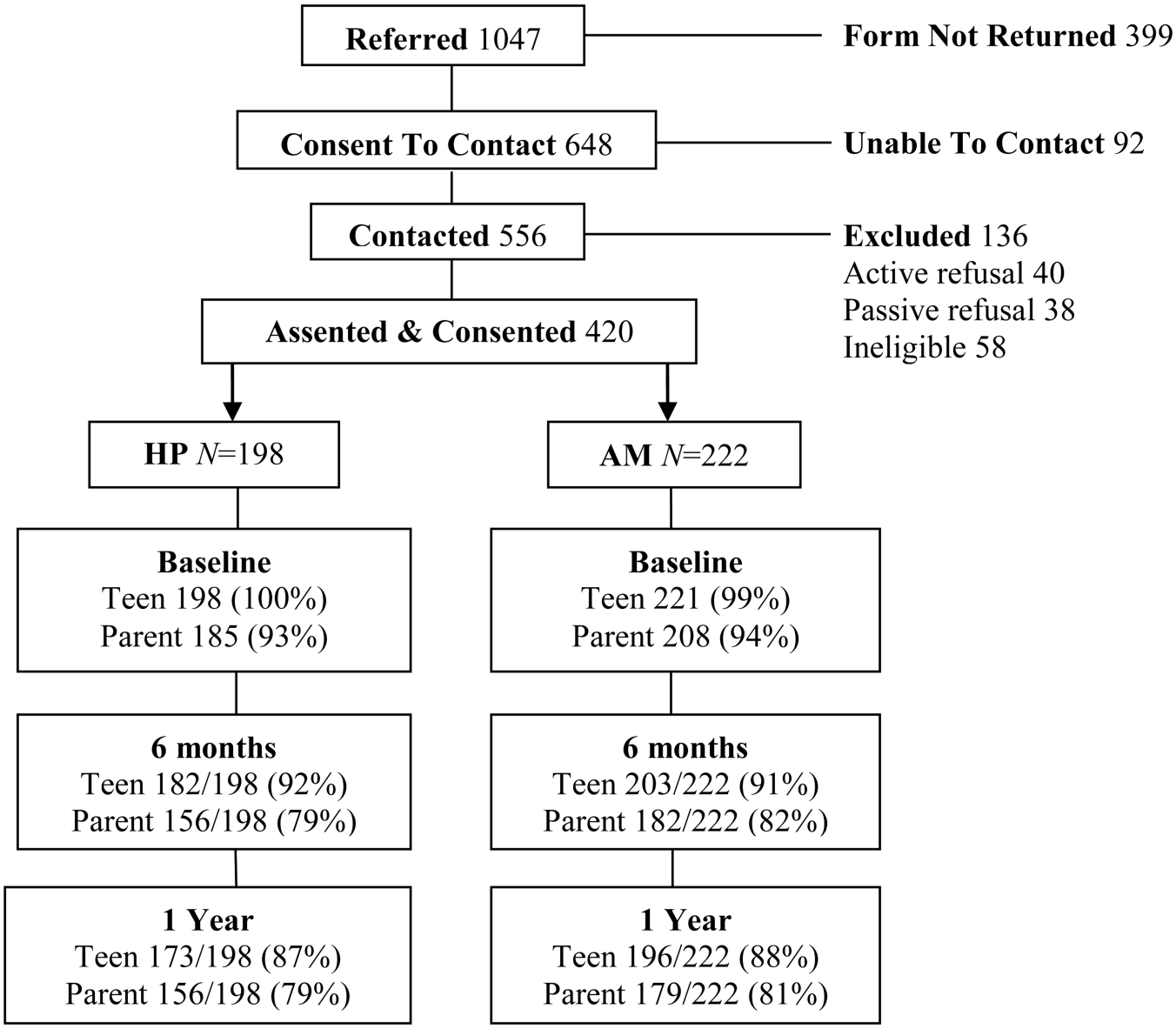

Figure 1.
CONSORT summary of participant retention.

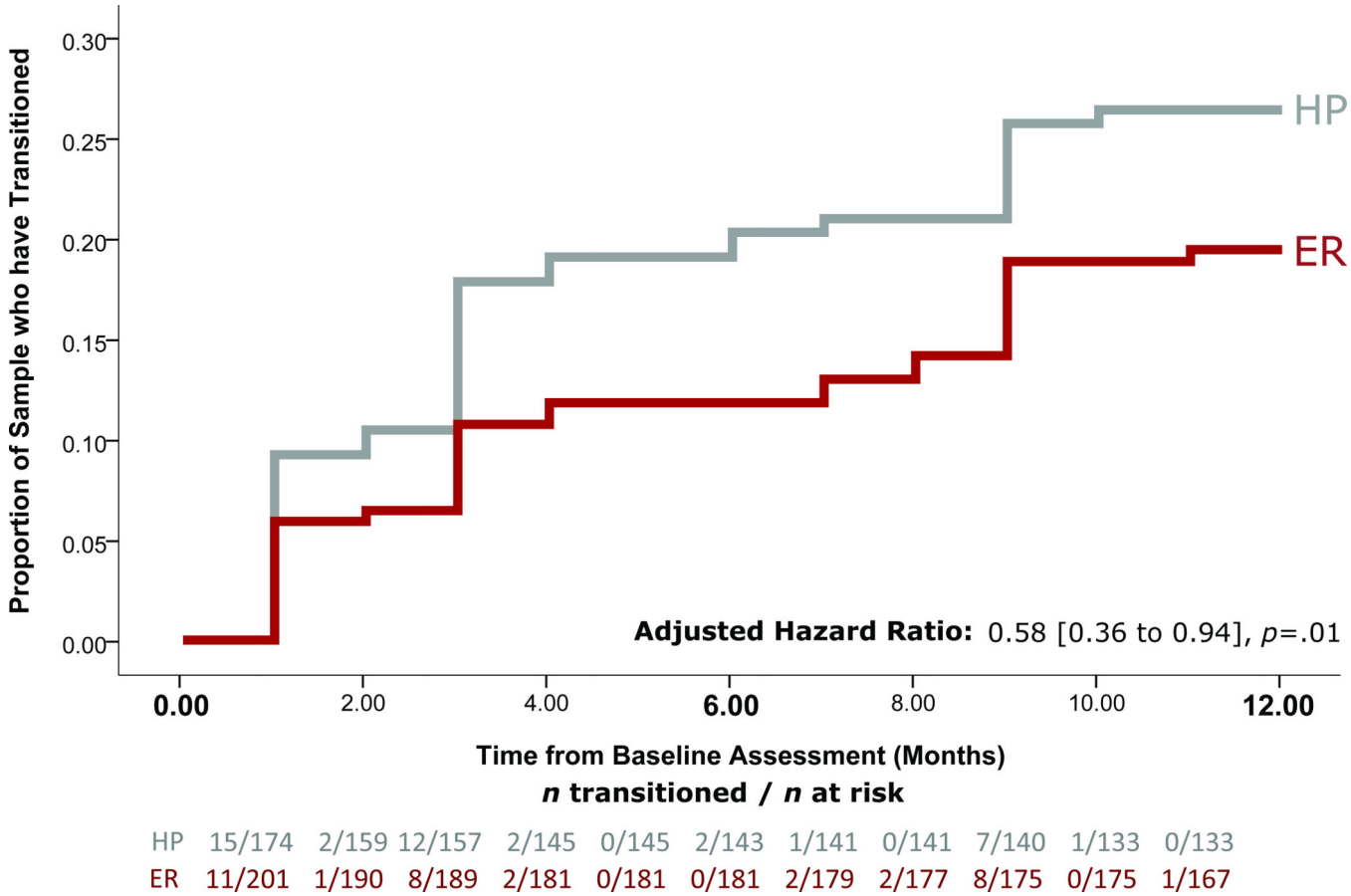

Figure 2.
Transition to vaginal sex over twelve months.

Table 1

Summary of the Emotion Regulation intervention

Session	Emotion Education	Sexual Health Education	Workbook Exercise
1	Introduction to emotion egulation model	Sexual health vocabulary	Identifying personal goals for program participation
2	Connection between feelings and behaviors		Identifying feelings that can lead to trouble for participant
3	Recognizing feelings in others	Male reproductive anatomy	Identifying observable cues for strong feelings in family/friends
4	Recognizing feelings in self	Female reproductive anatomy	Identifying personal somatic cues for strong feelings
5	Identifying triggers for feelings	Puberty and sexual development	Identifying personal triggers for strong feelings
6	“Get Out” and “Let It Out”	HIV/AIDS information	Identifying favorite “Get Out” and “Let It Out” strategies
7	“Think It Out”	Kinds of sexual behaviors and associated risks	Practice with “Think It Out”
8	Managing partner pressure	Pregnancy and STIs	Personalizing reasons for waiting to have sex
9	Managing peer pressure	Norms regarding frequency of adolescent sex	Applying emotion regulation to peer substance use scenario
10	Impact of media on feelings about sex	Condom use skills	Identification of a personalized risk situation (to which emotion regulation model is applied)
11	Practice with emotion regulation via role plays	Condom use practice with penis models	Developing role play dialogue for personalized risk situation
12	Review		“What I learned in TRAC”

Table 2

Observed Sample Proportions/ Sample Means

	Emotion Regulation (*N* = 222)			Health Promotion (*N* = 198)		
	Baseline	**6**	**12**	**Baseline**	**6**	**12**
Sexual Risk Outcomes						
Vaginal /anal sex (ever), % (n)	10% (21)	22% (43)	28% (55)	14% (27)	31% (56)	36% (62)
Vaginal/anal sex (6 mos.) [a]	68% (13)	52% (22)	47% (25)	54% (14)	47% (24)	45% (27)
> 1 partner [b]	39% (5)	50% (11)	57% (13)	33% (3)	39% (7)	40% (8)
Percent condom use [b]	73.18 (36.42)	75.70 (38.78)	66.18 (42.79)	64.18 (49.72)	90.79 (25.30)	64.59 (44.35)
Other Risk Outcomes						
Violence Risk (yes/no)	22% (47)	20% (41)	22% (43)	32% (62)	30% (55)	27% (47)
Substance Use (yes/no)	23% (50)	28% (56)	31% (61)	35% (69)	32% (58)	42% (72)
Emotional Competence						
DANVA Faces, Mean % correct (SD)	71.31 (13.51)	74.84 (12.51)	73.74 (13.75)	73.85 (12.59)	73.53 (11.94)	74.54 (13.05)
ERBS	1.76 (0.80)	1.93 (0.99)	1.89 (0.99)	1.76 (0.83)	1.92 (0.97)	1.87 (0.93)
DERS: LEA	3.00 (1.11)	3.03 (1.25)	2.90 (1.14)	3.12 (1.09)	3.08 (1.17)	3.01 (1.16)
DERS: LAERS	2.16 (0.89)	2.23 (0.96)	2.34 (0.91)	2.03 (0.76)	2.17 (0.85)	2.27 (0.91)

Notes: n = observed sample who endorsed the question.

[a] Evaluated for participants who reported vaginal or anal sex in their lifetime.

[b] Evaluated for participants who reported vaginal or anal sex in the past 6 months.

Abbreviations: DANVA=Diagnostic Assessment of Nonverbal Accuracy, ERBS=Emotion Regulation Behaviors Scale, DERS=Difficulties in Emotion Regulation Scale, LEA=Lack of Emotional Awareness, LAERS=Lack of Access to Emotion Regulation Strategies.

Table 3

Estimated Effects of the Emotion Regulation Intervention Relative to the Health Promotion Intervention

	6-months		12-months	
Sexual Risk Outcomes	**Estimate (95% CI)**	**Effect Size[c] (95% CI)**	**Estimate (95% CI)**	**Effect Size[c] (95% CI)**
Vaginal /anal sex (ever)	−0.55 (−0.92 to −0.18) *	0.58 (0.4 to 0.84) *	−0.61 (−0.99 to −0.23) *	0.54 (0.37 to 0.8) *
Vaginal/anal sex (6 mos.) [a]	0.30 (−0.51 to 1.11)	1.35 (0.60 to 3.03)	0.02 (−0.59 to 0.62)	1.02 (0.56 to 1.86)
> 1 partner [b]	0.37 (−0.98 to 1.72)	1.44 (0.37 to 5.57)	0.85 (−0.29 to 2.00)	2.35 (0.75 to 7.35)
Percent condom use [b]	−16.63 (−39.57 to 6.31)	−0.41 (−0.97 to 0.16)	8.84 (−18.60 to 36.29)	0.24 (−0.56 to 1.05)
Other Risk Outcomes				
Violence Risk (yes/no)	−0.42 (−0.82 to −0.02) *	0.66 (0.44 to 0.98) *	−0.09 (−0.47 to 0.30)	0.92 (0.63 to 1.35)
Substance Use (yes/no)	0.05 (−0.41 to 0.5)	1.05 (0.67 to 1.64)	−0.21 (−0.65 to 0.22)	0.81 (0.52 to 1.24)
Emotional Competence				
DANVA Faces % Correct	2.91 (0.29 to 5.52) *	0.20 (0.02 to 0.38) *	1.05 (−1.88 to 3.99)	0.07 (−0.13 to 0.27)
Emotion Regulation Behaviors Scale	−0.01 (−0.21 to 0.19)	−0.01 (−0.26 to 0.23)	0.03 (−0.19 to 0.25)	0.03 (−0.24 to 0.31)
DERS: LEA	0.08 (−0.17 to 0.32)	0.06 (−0.14 to 0.26)	0.04 (−0.20 to 0.29)	0.04 (−0.16 to 0.23)
DERS: LAERS	0.04 (−0.16 to 0.24)	0.05 (−0.18 to 0.28)	−0.01 (−0.21 to 0.19)	−0.01 (−0.24 to 0.21)

Notes: Estimates were generated from the 10 multiply imputed datasets compiled using Rubin's formulas (Rubin, 1987). Estimates were adjusted for school, participant age, and for all but the sexual risk outcomes, the baseline score of the measure.

[a] Evaluated for participants who reported vaginal or anal sex in their lifetime.

[b] Evaluated for participants who reported vaginal or anal sex in the past 6 months.

[c] Odds ratios were used for dichotomous outcomes and standardized difference scores were used for continuous outcomes.

CI=confidence interval, DANVA=Diagnostic Assessment of Nonverbal Accuracy, DERS=Difficulties in Emotion Regulation Scale, LEA=Lack of Emotional Awareness, LAERS=Lack of Access to Emotion Regulation Strategies.

* $p<.05$