*Original Research*

# Do Violence Acceptance and Bystander Actions Explain the Effects of Green Dot on Reducing Violence Perpetration in High Schools?

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## Abstract

This study extends prior analyses from a 5-year multisite cluster-randomized controlled trial to examine how the previously reported effects of the Green Dot bystander-based prevention program worked to reduce violence perpetration. Bystander-based interventions are hypothesized to prevent violence by reducing violence acceptance and increasing trained participants' willingness and ability to actively engage others in violence prevention using safe and effective bystander actions to diffuse or avoid potentially violent situations. We tested this hypothesis by examining whether Green Dot worked to reduce violence through two mediators measured over time: reducing violence acceptance and increasing bystander actions. When accounting for changes in these mediators over time, the effect of this intervention on

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violence perpetration was hypothesized to be attenuated or explained. At baseline (spring 2010) and annually (2011-2014), all students in recruited high schools (13 intervention, 13 control) completed an anonymous survey (response rate = 83.9%). Student responses were aggregated as school-level counts for the analysis. Path analyses estimated direct and indirect effects at specific points in the implementation of the intervention. Longitudinal models were used to determine if changes in violence acceptance and bystander actions could explain or attenuate the effect of the intervention. Time-framed path model analyses indicated that the intervention worked as expected to increase bystander behaviors and reduce violence acceptance; both potential mediators were significantly associated with sexual violence perpetration. In addition, after adjusting intent-to-treat models for the hypothesized mediators, the intervention was no longer associated with violence perpetration. In conclusion, these findings indicate that this bystander intervention worked as hypothesized to reduce sexual violence perpetration by creating theory-based changes in students' violence acceptance and bystander actions.

## Introduction

Bystander approaches to violence prevention were recognized as promising strategies by the White House Task Force to Protect Students from Sexual Assault (2014). Given this promise, bystander-based sexual violence prevention programming is now required of all institutions of higher learning receiving Title IX funding as part of the reauthorization of the Violence Against Women Act in 2013 ("Violence Against Women Act," 1994). The bystander approach to violence prevention is unique in that it engages program participants as possible witnesses to violence rather than potential victims or perpetrators. Bystander training provides individuals with skills to reduce risk for violence by (a) recognizing situations that may become violent, (b) intervening both safely and effectively to reduce the likelihood of violence, and (c) speaking out against attitudes that support violent behavior. Bystander programming is hypothesized to reduce violence by changing social norms, such as reducing sexual and dating violence acceptance and increasing bystander intentions and actions (Banyard, Moynihan, & Plante, 2007).

Evaluations of bystander programs, such as Bringing in the Bystander (Banyard et al., 2007), SCREAM (Students Challenging Realities and
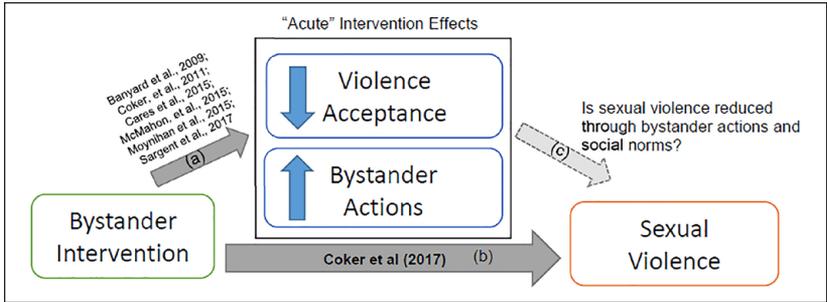
**Figure 1.** Hypothesized relationship of bystander intervention programming, bystander actions, violence acceptance, and sexual violence. Literature supports that bystander interventions have (a) short-term direct effects on violence acceptance and bystander actions and (b) longer-term total effects on sexual violence, but have only hypothesized that (c) the effect of the intervention occurs through changes in violence acceptance and bystander actions.

Educating Against Myths; McMahon et al., 2015), The Men's Project (Gidycz, Orchowski, & Berkowitz, 2011), TakeCARE (Sargent, Jouriles, Rosenfield, & McDonald, 2017), and *Green Dot* (Coker et al., 2019), have shown increases in bystander intentions, bystander actions, and positive attitudes toward bystander behaviors, or reductions in violence acceptance (Figure 1a) (Banyard, Moynihan, & Crossman, 2009; Cares et al., 2015; Coker et al., 2011; McMahon et al., 2015; Moynihan et al., 2015). Rigorous intervention trials conducted in high schools and colleges also provide evidence for the effectiveness of bystander programs to reduce dating violence perpetration (Miller et al., 2013) and sexual violence perpetration and victimization (Coker et al., 2017; Gidycz et al., 2011). Although bystander programs were designed to change the social norms of violence acceptance and increase bystander actions (Figure 1a) and evidence exists that they can reduce sexual violence over time (Figure 1b) (Coker et al., 2017), research has yet to examine the role of violence acceptance and bystander actions as potential mediators in reducing violence perpetration (Figure 1c).

A prior multisite randomized controlled trial (RCT; Coker et al., 2017) found that the *Green Dot* bystander-based prevention program (https://alteristic.org/) reduced sexual violence perpetration over time in an intent-to-treat (ITT) effectiveness analysis with high school students. *Green Dot* engages both males and females as potential bystanders to reduce forms of sexual and interpersonal violence (Coker et al., 2011; Coker et al., 2015). The *Green Dot* program trains students to recognize potential violent situations and
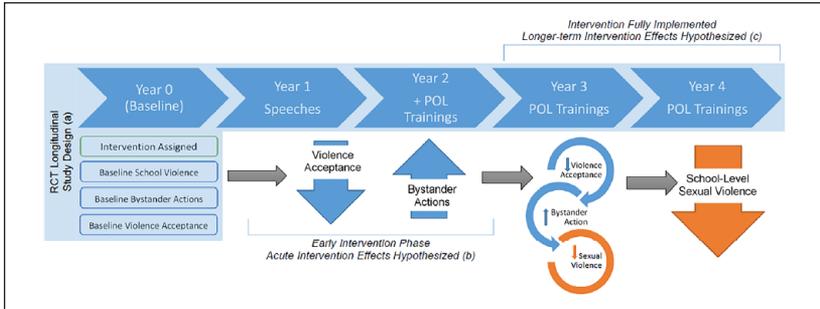
**Figure 2.** Hypothesized effect of bystander intervention on violence acceptance, bystander actions, and sexual violence over time.
*Note.* RCT = randomized controlled trial; POL = Popular Opinion Leader intensive bystander training.

behaviors that could contribute to violence (known as red dots) with skills to safely intervene (known as green dots) and reduce sexual violence. Originally created for college students, this study examines Green Dot as adapted for high school students (Cook-Craig et al., 2014).

This study extends the findings of Coker et al. (2017) by examining whether and how this intervention worked, as hypothesized, to reduce sexual violence perpetration by estimating indirect effects on violence acceptance and/or engaged bystander actions (Figure 1c). The current analysis included the full range of sexual and dating violence perpetration outcomes measured. We hypothesized that the intervention works to reduce violence at the school level by reducing violence acceptance and increasing bystander actions (hypothesized mediators) at the student level, such that the direct effect of the intervention on violence perpetration would be attenuated or explained by these potential mediators (Figure 2).

The goal of this analysis was to determine whether the hypothesized mediators, reductions in violence acceptance and increases active bystanding behaviors associated with the *Green Dot* intervention as implemented over time, explained the observed reductions in violence perpetration and victimization (primary outcomes) among high school students.

## Method

### Study Design

This analysis extends the findings of a cluster-randomized trial that examined the effectiveness of the *Green Dot* intervention to reduce violence perpetration

among high school students (Coker et al., 2017). Two demographically similar high schools based on size and free and reduced lunch rates were identified based on existing relationships in each of Kentucky's 13 Rape Crisis Center service regions. Schools were randomized within each region. The schools ranged in size from 453 to 1,690 students, with 45% reporting free and reduced lunch, 17% non-White race, and 57% female gender. The trial was conducted with 26 public high schools across Kentucky randomized to the Green Dot intervention ($n = 13$) or the control condition ($n = 13$).

Primary data collection for the trial was conducted at the school level with all students (Grades 9-12) completing an annual, anonymous survey starting spring 2010 (baseline, Y0) and throughout the implementation period (spring 2011, Y1—spring 2014, Y4). The University of Kentucky Institutional Review Board (09-0680-F1V) approved the study protocol. Passive parental consent was employed. Each year, all parents were mailed a letter describing the study and asked to contact research staff if they did not want their child to participate. At each administration, all students were given the option of refusing to complete the anonymous survey. As reported elsewhere (see Coker et al., 2017, for a full description of methods), response rates (83.9%: 89,707 total completed surveys/106,867 students present on survey days) did not vary by condition but, as anticipated, declined over time (baseline to Year 4). The parent refusal rate was consistently low (0.5%); the student refusal rate was 13.6%. Two high schools dropped out of the study, one randomized to the control group (Y2) and one from the intervention group (Y4). As described elsewhere (Coker et al., 2017), missing school-level data were imputed using single imputation (last-observation-carried-forward) because the school-level sample size ($n = 26$) was small for multiple imputation. Moreover, students with missing data on demographics (grade, gender, race, relationship status) or violence outcomes were excluded ($n = 12,029$) along with mischievous responders ($n = 6,025$); 71,653 responses over 5 years of data collection representing 26 schools were included as the final analytic sample.

The goal of *Green Dot* bystander intervention training was to reduce sexual violence perpetration in high schools by changing violence acceptance and bystander behaviors among those trained. In this study, we examine whether this previously reported reduction in sexual violence perpetration (Coker et al., 2017) can be explained by changes in violence acceptance and bystander actions, as hypothesized (Figure 2).

## Measures

*Violence outcomes.* Each spring, students were asked to report the frequency of their own use and experience of violence (two sets of questions) over the

past 12 months. A range of interpersonal violence forms were separately queried including sexual violence, sexual harassment, stalking, and both psychological and physical dating violence. The specific items used and psychometric properties were published elsewhere (Coker et al., 2017; Cook-Craig et al., 2014). In the parent RCT (clinicaltrials.gov, NCT01878097), the primary outcome was school-level, perpetrated sexual violence defined by three sexual assault victimization items from the National Intimate Partner and Sexual Violence Survey (Black et al., 2011). These were adapted to measure the perpetration of coerced, physically forced, and/or drug/alcohol-facilitated sex. The response options were frequencies of "0 times," "1-2 times," "3-5 times," 6-9 times," and "More than 10 times." For primary analyses, response categories were scored as the minimum value in each response range (0, 1, 3, 6, and 10) to err toward undercounting versus overcounting incidents. For each year and for each school, frequency sum scores were created by sexual violence perpetration. The number of sexually violent events used (perpetrated) by students was summed over each school at the school level and represent the outcome variable. Given the primary outcome defined within the parent RCT, this analysis focused exclusively on this primary outcome, school-level sexual violence perpetration totals.

*Hypothesized mediators.* Violence acceptance and bystander actions were the two hypothesized and measured mediators. Sexual violence acceptance was assessed annually with an abbreviated short of the *Illinois Rape Myth Acceptance Scale* (IRMA; Payne, Lonsway, & Fitzgerald, 1999) and of the *Acceptance of Couple Violence* (Foshee et al., 1998). Two measures of bystander actions, developed by Banyard, Plante, and Moynihan (2005) for college-based studies, were adapted for this high school sample.

The *IRMA* was reduced to seven items and found to have adequate internal consistency (Cronbach's α = .75; range = 0-21). Students were provided with the prompt, "This section asks your opinion about sexual and dating violence. Thinking about your own feelings and beliefs, please indicate how much you personally agree or disagree with each statement. There are no right or wrong responses." The following questions were included (using response options: 0 = *strongly disagree*, 1 = *disagree*, 2 = *agree*, 3 = *strongly agree*):

1.  Girls should have sex with their boyfriend or guy they are dating when he wants;
2.  If a guy spends money on a date, the girl should have sex with him in return;

3. Guys should respond to dates' or girlfriends' challenges to authority by insulting them or putting them down;
4. If a girl is sexually assaulted while she is drunk, she is to blame for letting things get out of control;
5. Sexual assault charges are often used as a way of getting back at guys;
6. Many girls lead a guy on and then they claim sexual assault;
7. When girls are sexually assaulted, it is often because the way they said "no" was unclear.

Similarly, the eight-item *Acceptance of Couple Violence* was reduced to five items (Cronbach's α = .73) and was introduced with the header, "This next section asks about your opinion about dating and sexual violence. The following are beliefs that some people have about how guys and girls should act." The following questions were included:

1. There are times when dating violence between couples is okay;
2. A girlfriend or boyfriend who makes their girlfriend or boyfriend jealous on purpose deserves to be hit;
3. Sometimes violence is the only way to express your feelings;
4. Some couples have to use violence to solve their problems;
5. Violence between couples is a private matter and others should not get in the way or get involved.

*Bystander action by engaging peers in violence prevention* (a form of proactive bystander action) was assessed with items asking how often students communicated with friends about the dangers of alcohol/drug use or how to recognize controlling behaviors in a dating or sexual relationship, and how often they engaged in school or community efforts to address dating or sexual violence (see Cook-Craig et al., 2014, for the specific measure items; Cronbach's α = .77, five items, range = 0-15). Using frequency response options of *0 times* (=0), *1-2 times* (=1), *3-5 times* (=3), and *6+ times* (=6) over the past 12 months, students were asked to recall the following:

1. How many times has someone talked with you about what you can do to stop dating violence or unwanted sexual activity?
2. How many times have you and your friends ever talked about activities you could do or join them in activities that might help prevent dating violence or unwanted sex in your school or your community?
3. How many times have you and your friends ever text messaged, instant messaged, blogged, emailed each other, or used other technology to

discuss activities or things you could do to prevent dating violence or unwanted sexual activity?

4. How many times have you talked with your friends about what you can do to keep yourself or others safe from dating violence or unwanted sexual activity?
5. How many times have you talked with your friends about being safe in dating relationships?

In contrast, *bystander actions* were contingent on a student recognizing and actively responding to a potentially violent situation, if the opportunity arose. To measure bystander behaviors, students were asked to recall the number of times they observed and engaged in positive bystander behaviors in response to seven scenarios in the past 12 months (e.g., "How often did you ask someone that looked very upset at a party if they were okay or needed help?"). This brief measure was found to have good internal consistency (Cronbach's $\alpha$ = .86; seven items, range = 0-21). With frequency response options of *0 times* (=0), *1-2 times* (=1), *3-5 times* (=3), *6-9 times* (=6), and *10+ times* (=10), bystander actions were assessed using responses to "How often did YOU"

1. Tell someone to stop talking down to, harassing, or messing with someone else;
2. Speak up when you heard that someone who was forced to have sex or hurt by a boyfriend/girlfriend was to blame;
3. Talk to a friend who was being physically hurt by a boyfriend/girlfriend;
4. Ask someone that looked very upset at a party if they were okay or needed help;
5. Ask a friend if they needed to be walked or driven home from a party if they looked upset;
6. Spoke up to someone who was bragging or making excuses for forcing someone to have sex with them;
7. Got help for a friend because they had been forced to have sex or were physically hurt by a boyfriend/girlfriend.

## Intervention

As described elsewhere (see Cook-Craig et al., 2014, for more details), the *Green Dot* program is a theory-based bystander training program that draws on research from bystander psychology (Latané & Darley, 1970), diffusion of innovation theory (Rogers & Cartano, 1962), and on sexual violence perpetrator characteristics (Johnson et al., 2006). Participants are trained to recognize

situations and behaviors that can contribute to violence and identify actions they can safely take to reduce the likelihood or impact of violence. *Green Dot*'s high school curriculum was delivered in two phases by trained Rape Crisis Center educators (hereafter "educators," $n = 28$, all female).

## Implementation and Hypothesized Effects

Figure 2 describes the phased approach to implementation of *Green Dot* over the 4-year trial. In Phase 1, implemented in fall 2010 (Figure 2a, Year 1), educators delivered a 50-min introductory "persuasive speech" to all students. These speeches introduced students to the concept of engaged bystanders using examples. Educators also shared their personal experiences in violence prevention and addressed barriers to bystander actions. In Phase 2, which was implemented each year from spring 2011 through 2014 (Figure 2a, Years 2-4), students were recruited using the Popular Opinion Leader (POL) selection strategy popularized in other prevention fields (Kelly, 2004). POL is a strategy targeting influential students to accelerate the pace at which an innovation is diffused in a population (Valente & Davis, 1999). Green Dot uses the POL strategy based in the HIV prevention literature (Kelly et al., 1991; Kelly et al., 1992) to nominate persons based on a set of name-generator questions (Cook-Craig et al., 2014). Based on intervention schools' selection of influential students, Phase 2 training was provided to 2,600 students in smaller groups during 4- to 6-hr training sessions held during school hours. The POL literature suggested targeting 15% of influential students to shift social norms to reduce victimization and perpetration of sexual violence (Cook-Craig et al., 2014). The primary focus on this training was helping students recognize situations that may lead to violence (prevention opportunities) and acquire skills needed to safely and effectively intervene.

The phased approach was based on the idea that bystander intervention programs universally involve the community (defined here as high school) and provide strategic training for effective bystander intervention (Banyard et al., 2009; Cares et al., 2015). As depicted in Figure 2a and 2b, we hypothesize acute effects and longer-term effects of this intervention to result in reductions in sexual violence perpetration. Specifically, this intervention was hypothesized to reduce school-level violence (Figure 2b, Years 3 and 4) by reducing violence acceptance and increasing bystander actions within schools (Figure 2a, Years 1-4).

## Statistical Analysis

The primary outcome for all analyses represents the annual school totals for the number of reported sexual violence events perpetrated; this is a measure

summed across students to create a school-level count. Histograms and quantile plots were used to assess distributional assumptions, and violations to normality were not observed.

*Analysis of potential mediators.* To frame the investigation of potential mediators, the methodology from the parent study was used, that is, Model 1 was based on ITT analysis. Model 1 provided an estimated difference of the mean number of events for intervention and control schools using the condition × time (CxT) interaction effect from a linear mixed model, adjusting only for school size and baseline violence. A test of the hypothesized attenuating effect of the intervention over time on sexual violence perpetration through sexual violence acceptance and bystander actions was conducted building on this primary linear mixed model (Model 1).

Model 1 estimated the direct effect of the intervention on sexual violence perpetration (PROC GLIMMIX with an AR1 R matrix and bias-corrected empirical *SE* estimates; SAS 9.3, 9.4; SAS Institute; Cary, NC). Using an ITT approach, Model 1 included condition, time, and CxT interaction. Because mean school-level sexual violence perpetration counts (yearly totals) represented the estimated outcome, school size was included in Model 1 to address difference in individual school sizes. The corresponding estimates of sexual violence perpetration was presented by condition (and 95% confidence interval [CI]) with absolute differences (intervention–control [I–C]; 95% CI).

In Models 2 to 4, we tested mediation by adding potential mediators to Model 1. Sexual violence acceptance measures were added in Model 2, bystander actions were added in Model 3, and Model 4 contained all hypothesized mediators. The CxT interaction term was examined across all models as the indicator of changes in violence perpetration, over time, and after adjustments for mediator(s). If the addition of the mediator(s) resulted in the CxT interaction term no longer being significantly associated with reductions in violence perpetration, then evidence of mediation of the intervention effect was suggested. Because effectiveness was previously defined as CxT interactions using a significance level of $p < .01$ in Coker et al. (2017), these analyses also used this significance level ($p < .01$) for statistical analyses that correspond to the original, effectiveness RCT study.

*Estimating direct and indirect effects.* To further investigate findings from longitudinal models, a path analysis was used to explore and visualize results. Direct and indirect effects of the intervention on sexual violence perpetration were estimated via a path analysis using Mplus. Due to the small sample size ($n = 26$), only IRMA, total bystander behaviors, and engaging peer scores were included with the direct and indirect effects associated with

the intervention alone (i.e., effects between potential mediators were not modeled). Standardized regression estimates were provided within the diagrams. Diagrams are presented in Figure 3 to correspond with intervention phases (3a) prior to the intervention (baseline; no effects hypothesized), (3b) after motivational speeches (Year 2; hypothesized acute effect or changes in bystander actions and social norms), and (3c) after full implementation (Year 4; hypothesized changes in sexual violence).

## Results

As described elsewhere (Coker et al., 2017), no statistically significant differences in students' sociodemographic or violence risk characteristics were observed by condition at baseline, indicating that randomization resulted in comparable schools across conditions.

### Results From Model 1: Replication of Coker et al.'s (2017) Effectiveness Analysis

For sexual violence perpetrated, the school-level totals were significantly lower in the intervention relative to control schools over time, CxT, $F(3, 72)$ = 7.12, $p$ = .0003, with an average of 121 (95% CI: [−206, −36]) and 88 (95% CI: [−160, −15]) fewer sexually violent events perpetrated when the intervention was fully implemented (in both Years 3 and 4, respectively; see Table 1). The CxT interaction term indicated a significant ($p < .001$) reduction in perpetration in the intervention versus control schools over time for sexual violence perpetration.

### Results From Models 2 to 4: Mediational Analyses

When adjusting for violence acceptance (Model 2), the CxT interaction term was no longer statistically significant (at $p < .01$) for sexual violence perpetration, $F(3, 72) = 3.53, p = .02$. This observation suggested that intervention-associated changes in violence over time were mediated, to a degree, by changes in violence acceptance. In contrast, findings for the model that added only bystander actions (Model 3) did not indicate mediation for sexual violence perpetration because the interaction term remained statistically significant, $F(3, 72) = 5.03, p = .003$. Results from the inclusion of all hypothesized mediators (Model 4) indicated no association between condition and sexual violence perpetration, $F(3, 72) = 2.26, p = .09$, thus indicating that intervention-associated reductions in violence over time were mediated by changes in
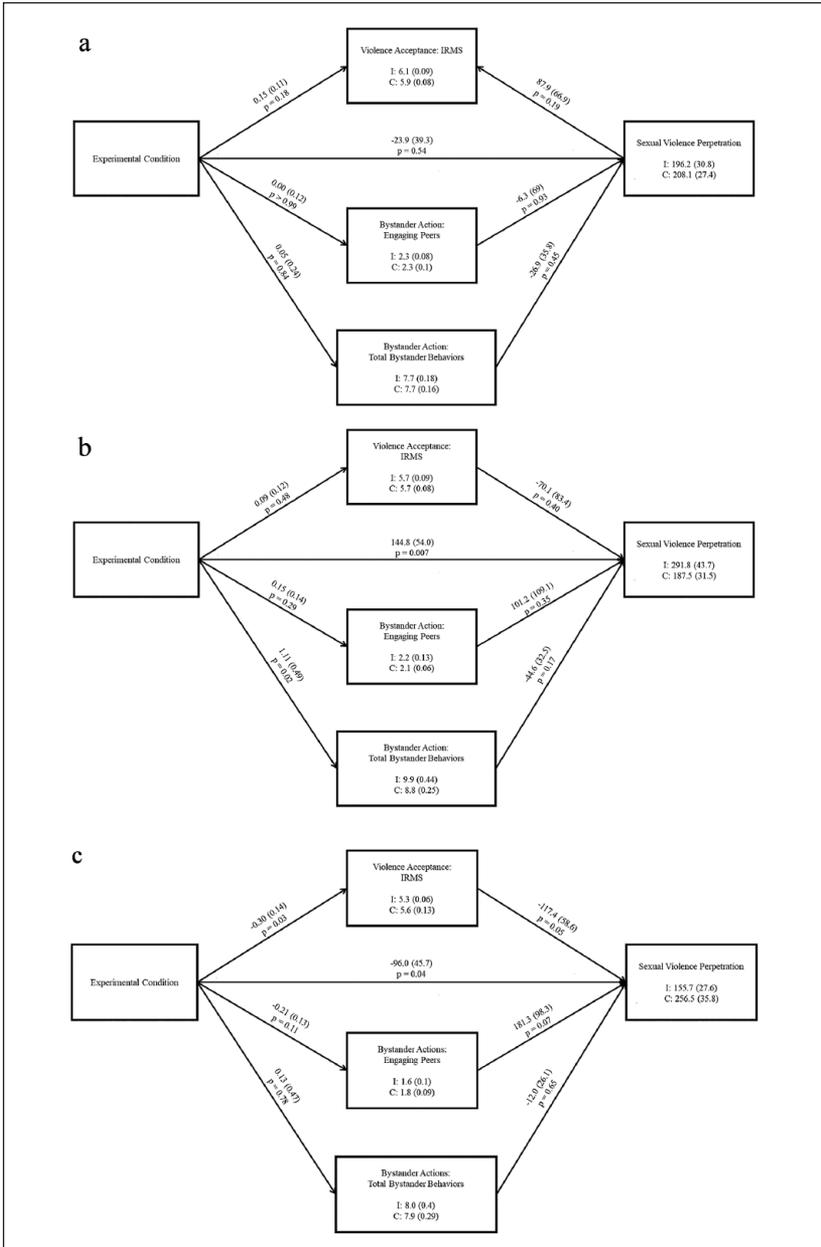
**Figure 3.** *(continued)*

**Figure 3.** Path analysis for potential mediators by time point: (a) prior to intervention condition (baseline); (b) after motivational speeches (acute effect); and (c) after full intervention (longer term).

Note. Standardized regression estimates are provided with SE, and p values are provided on pathway arrows. Within the variable boxes, results are presented as means (SE) by condition. I = intervention; C = control; IRMA: Illinois Rape Myth Acceptance Scale.

hypothesized intermediate or mediators: violence acceptance and bystander behaviors.

## Results From Path Analyses Across Time

At baseline, there were no significant direct or indirect effects of the intervention on school-level sexual violence perpetration counts (Figure 3a). Although not statistically significant, higher violence acceptance (IRMA) scores were correlated with higher sexual violence perpetration counts (87.9, $p = .19$). After speeches (Phase 1) were delivered, the intervention was associated with increasing total bystander behaviors (1.1, $p = .02$; Figure 3b). There was a direct increase in sexual violence in the intervention condition (144.8, $p = .0007$) and a possible indirect reduction in violence through total bystander behaviors ($-44.6$, $p = .17$). Note that, in the "acute effect" time frame depicted in Figure 3b, only motivational speeches had been implemented. Speeches were designed to increase awareness and identification of violence thus observing an increase in violence was not unexpected in this acute effect time frame. Finally, after both phases of the intervention were fully implemented (Figure 3c), the intervention was directly associated with a reduction in sexual violence perpetration ($-96.0$, $p = .04$) and a reduction in violence acceptance scores ($-0.30$, $p = .03$). In addition, there was a significant negative association of violence acceptance and sexual violence perpetration counts ($-117.4$, $p = .05$); engaging peers was associated with an increase in sexual violence perpetration counts (181.3, $p = .07$).

## Discussion

Consistent with our hypothesis, we found evidence that this bystander intervention works to reduce sexual violence perpetration *through* changes to violence acceptance and bystander behaviors caused by the intervention training.

We found that when adjusting for, and thereby accounting for, changes in the hypothesized intervention mediators of violence acceptance and bystander

**Table 1.** Mean Number of Violent Events Used (Perpetrated), by Condition Over Time, Adjusting for Hypothesized Mediators.

| | Estimated Mean Difference in Number of Violent Events in Schools for Intervention—Control | | | |
|---|---|---|---|---|
| Potential Mediators Included | Model 1 None | Model 2 Violence Acceptance | Model 3 Bystander Actions | Model 4 All |
| All forms combined | | | | |
| Year 1, mean difference [95% CI] | 521 [34, 1,009] | 436 [−86, 957] | 391 [30, 753] | 259 [−84, 602] |
| Year 2, mean difference [95% CI] | 174 [−205, 552] | 66 [−344, 477] | 145 [−97, 386] | −17 [−289, 255] |
| Year 3, mean difference [95% CI] | −696 [−1,162, −229] | −479 [−1,023, 65] | −428 [−656, −199] | −230 [−533, 73] |
| Year 4, mean difference [95% CI] | −450 [−860, −41] | −253 [−652, 147] | −365 [−647, −84] | −198 [−531, 135] |
| CxT, $F(3, 72)$, $p$ value | $F = 7.17, p = .0003$ | $F = 3.62, p = .02$ | $F = 5.85, p = .001$ | $F = 2.43, p = .07$ |
| Sexual violence (unwanted sex) | | | | |
| Year 1, mean difference [95% CI] | 84 [12, 157] | 77 [−0, 154] | 76 [16, 137] | 63 [7, 118] |
| Year 2, mean difference [95% CI] | 25 [−47, 97] | 11 [−63, 85] | 35 [−15, 84] | 14 [−37, 65] |
| Year 3, mean difference [95% CI] | −121 [−206, −36] | −72 [−169, 25] | −68 [−122, −15] | −22 [−86, 42] |
| Year 4, mean difference [95% CI] | −88 [−160, −15] | −45 [−119, 29] | −66 [−127, −6] | −28 [−97, 40] |
| CxT, $F(3, 72)$, $p$ value | $F = 7.12, p = .0003$ | $F = 3.53, p = .02$ | $F = 5.03, p = .003$ | $F = 2.26, p = .09$ |
| Sexual harassment | | | | |
| Year 1, mean difference [95% CI] | 111 [−25, 246] | 97 [−54, 248] | 72 [−20, 164] | 62 [−28, 151] |
| Year 2, mean difference [95% CI] | 68 [−38, 173] | 49 [−76, 173] | 58 [−16, 132] | 42 [−37, 121] |
| Year 3, mean difference [95% CI] | −165 [−304, −26] | −118 [−264, 27] | −90 [−165, −15] | −69 [−145, 7] |
| Year 4, mean difference [95% CI] | −110 [−222, 2] | −67 [−171, 37] | −87 [−158, −16] | −68 [−141, 4] |
| CxT, $F(3, 72)$, $p$ value | $F = 5.56, p = .002$ | $F = 2.75, p = .05$ | $F = 3.92, p = .01$ | $F = 3.45, p = .02$ |
| Stalking | | | | |
| Year 1, mean difference [95% CI] | 78 [−12, 167] | 71 [−19, 161] | 63 [−19, 145] | 57 [−21, 134] |
| Year 2, mean difference [95% CI] | −3 [−83, 77] | −11 [−94, 71] | −3 [−66, 61] | −12 [−77, 53] |

**Table 1. (continued)**

| | | Estimated Mean Difference in Number of Violent Events in Schools for Intervention–Control | | |
|---|---|---|---|---|
| Potential Mediators Included | Model 1 None | Model 2 Violence Acceptance | Model 3 Bystander Actions | Model 4 All |
| Year 3, mean difference [95% CI] | −126 [−209, −42] | −102 [−197, −7] | −82 [−138, −27] | −62 [−125, 0] |
| Year 4, mean difference [95% CI] | −65 [−140, 11] | −42 [−116, 33] | −48 [−104, 9] | −30 [−95, 34] |
| CxT, F(3, 72), p value | F = 4.20, p = .009 | F = 2.64, p = .06 | F = 2.59, p = .06 | F = 1.84, p = .15 |
| Physical dating violence | | | | |
| Year 1, mean difference [95% CI] | 54 [25, 82] | 48 [23, 74] | 47 [21, 73] | 41 [22, 60] |
| Year 2, mean difference [95% CI] | 22 [−7, 52] | 14 [−14, 43] | 22 [−1, 44] | 12 [−7, 31] |
| Year 3, mean difference [95% CI] | −53 [−81, −24] | −36 [−69, −2] | −36 [−55, −17] | −25 [−50, −0] |
| Year 4, mean difference [95% CI] | −41 [−67, −16] | −27 [−54, 0] | −36 [−57, −14] | −25 [−51, −0] |
| CxT, F(3, 72), p value | F = 10.89, p < .0001 | F = 7.91, p = .0001 | F = 11.21, p < .0001 | F = 6.66, p = .0005 |
| Psychological dating violence | | | | |
| Year 1, mean difference [95% CI] | 200 [0, 399] | 153 [−49, 356] | 129 [−13, 271] | 74 [−49, 197] |
| Year 2, mean difference [95% CI] | 66 [−65, 198] | 13 [−133, 160] | 32 [−64, 128] | −38 [−127, 51] |
| Year 3, mean difference [95% CI] | −227 [−396, −57] | −156 [−345, 33] | −141 [−212, −71] | −84 [−188, 19] |
| Year 4, mean difference [95% CI] | −142 [−307, 23] | −77 [−225, 71] | −124 [−237, −10] | −72 [−192, 48] |
| CxT, F(3, 72), p value | F = 6.69, p = .0005 | F = 3.23, p = .03 | F = 5.98, p = .001 | F = 2.06, p = .11 |

*Note.* The response variable for all models is the number of events reported by students summed over each school each year. Model 1 uses an intent-to-treat (ITT) analysis using linear mixed models, which adjusts only for school size and baseline violence. Model 2 uses Model 1 and adds two measures of violence acceptance: sexual violence acceptance and dating violence acceptance in each year. Model 3 uses Model 1 and adds two measures of bystander actions: engaging peers and bystander actions in each year. Model 4 uses Model 1 and adds all potential mediators, that is, those included separately in Models 2 and 3. CI: confidence interval.

actions, the remaining effect of the intervention over time on sexual violence perpetration was no longer significant. Findings from this analysis assessing how the intervention worked, in combination with prior effectiveness analyses (Coker et al., 2017) within the RCT, provide additional evidence of the program's ability to reduce sexual violence perpetration among high school students as *Green Dot* was implemented by training phases.

These results represent a significant contribution to the existing bystander intervention effectiveness literature because these analyses address both direct and indirect pathways for the intervention to reduce violence rates. If the primary test of intervention effectiveness over time (CxT) had remained significantly associated with sexual violence perpetration after adjusting for the two hypothesized mediators, then the mechanism by which this intervention should work to reduce sexual violence perpetration would be unclear. Instead, we observed through these analyses that this intervention does have an effect on reducing sexual violence perpetration over time, particularly during Intervention Years 3 to 4 (Model 1), but that this effect was explained by changes in the hypothesized routes by which the intervention was supposed to work, that is, to decrease violence acceptance and increase bystander behaviors.

These results were supported and confirmed by the path analysis, which attributes the intervention effect to both direct effects and indirect effects on sexual violence perpetration through both increased bystander behaviors and decreased violence acceptance. These results also confirm what has been found in other studies where increases in bystander actions are observed as an acute effect of these types of interventions (Figure 2b). Here, we additionally showed that increases in bystander behaviors were associated with reductions in sexual violence counts (Figure 2c). Within Phase 1 (motivational speeches) of the trial, observed changes in violence acceptance scores associated with the intervention were not observed. After full implementation and POL intensive bystander training, however, violence acceptance was reduced and the intervention directly reduced sexual violence perpetration.

The path analysis also provided unexpected results. The effect of the intervention on bystander behaviors was no longer observed at later stages of the trial, that is, after full implementation of the intervention. Increases in bystander behaviors may be an acute or proximal effect alone or reductions in violence at the school level may reduce the need or opportunities for bystander behaviors. The potential positive association with engaging peers supports this explanation. If violence rates are higher in a school when training is provided, the salience of that training to address violence through engaging peers in conversations about violence prevention may be higher than in schools when or where violence rates are lower.

Similarly, we observed a significant negative association between violence acceptance and sexual violence perpetration, but anticipated a reduction in violence acceptance to correlate with a reduction in violence perpetration. It is important to recall that these analyses reflect school averages and not individual scores. This finding may have been a function of when the surveying occurred relative to training and over what time frame. For example, schools with higher violence acceptance scores have more opportunities for changes in violence perpetration over time. Having annual measurement of intervention indicators may not have been sufficient to track how and when the intervention worked to affect intermediate outcomes.

The current analyses demonstrating the mechanism for school-level effectiveness of a bystander program on perpetrated sexual violence were consistent with other studies investigating how primary prevention programs reduced violence. Although the following two reports from violence prevention interventions were not bystander based, they were comparable in their evaluation of mediators of the intervention's hypothesized effect on violence outcomes. In a study of communities in Uganda, Abramsky et al. (2016) found that community-level norms for intimate partner violence and gender roles mediated an intervention effect (*SASA!*) on male violence perpetration. Likewise, Foshee and colleagues (1998) found that intervention effects (*Safe Dates*) on psychological abuse and sexual violence perpetration in rural public schools were mediated by changes in gender stereotyping, dating violence norms, and awareness of services. The current analyses addressed the mediating impact of sexual violence acceptance, but also added an assessment of bystander actions as an explanation for interaction effectiveness to reduce violence perpetration. The inclusion of both sets of mediators, based on how *Green Dot* was hypothesized to reduce sexual violence perpetration, suggested that this intervention, as implemented in this cluster-randomized trial, worked to reduce sexual violence perpetration *through* changes in violence acceptance and bystander actions.

Mediation was observed for sexual violence perpetration. Violence acceptance did appear to be the more influential mediator relative to bystander actions in longitudinal linear models. This finding for bystander actions may be a function of how bystander interventions may work to increase bystander actions and, over time with effective bystander actions, may reduce the "need" or "opportunity" for bystander actions because violent events decline. Use of a conservative significance level ($p = .01$) may also explain finding only a modest mediation by bystander actions.

Despite the use of a rigorous experimental study design, there are limitations. Study findings hinge on the accuracy of students' anonymous self-reports of their own behaviors. The school-level approach limits the sample

size ($n = 26$) and may prevent direct linkage for individual behaviors performed, a student's violence acceptance, and experiences of perpetrated sexual violence. Results from this population of public high schools across Kentucky may not generalize to other settings. Replications with similar designs in other settings are recommended. Investigating the effectiveness of the intervention by age group would be another important approach given differences in the student maturity by age. Further exploration differentiating the differences between bystander opportunities from bystander actions and mediating effects would be a contribution to the bystander intervention field. Measuring changes at both the school and individual levels would have been a significant contribution to our understanding of how this intervention works. School-level measures offer an indication of how the intervention impacts the violence rates of the community. However, longitudinal, individual-level data would provide data by training received by the individual and would indicate how the intervention did or did not change violence acceptance and bystander intention or behaviors for the student to ultimately reduce violence at the school level. Although this was conducted as a school-based study, the measurement of individual-level changes over time would also allow for an increased understanding of how and to what degree these interventions impact specific, vulnerable populations, for example, race, ethnicity, sex, gender identity, and sexual orientation. Including shorter-term measures of intermediate outcomes of violence acceptance and bystander behavior would be an important addition to improving bystander intervention evaluation.

Limitations notwithstanding, these results provided evidence that this intervention appeared to reduce sexual violence perpetration over time with program implementation through hypothesized and theory-based mediators. As hypothesized, this reduction in sexual violence perpetration was attributable to reductions in violence acceptance and increases in bystander actions. These findings from a trial using a rigorous, randomized design indicated that bystander training was effective in reducing sexual violence perpetration *by* also reducing violence acceptance and increasing bystander actions.

## Declaration of Conflicting Interests

## Funding

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## References

Abramsky, T., Devries, K. M., Michau, L., Nakuti, J., Musuya, T., Kiss, L., . . . Watts, C. (2016). Ecological pathways to prevention: How does the SASA! Community mobilisation model work to prevent physical intimate partner violence against women? *BMC Public Health*, *16*, Article 339. doi:10.1186/s12889-016-3018-9

Banyard, V. L., Moynihan, M. M., & Crossman, M. T. (2009). Reducing sexual violence on campus: The role of student leaders as empowered bystanders. *Journal of College Student Development*, *50*, 446-457.

Banyard, V. L., Moynihan, M. M., & Plante, E. G. (2007). Sexual violence prevention through bystander education: An experimental evaluation. *Journal of Community Psychology*, *25*, 463-481.

Banyard, V. L., Plante, E. G., & Moynihan, M. M. (2005). *Rape prevention through bystander education: Bringing a broader community perspective to sexual violence prevention*. Retrieved from https://www.ncjrs.gov/pdffiles1/nij/grants/208701.pdf

Black, M. C., Basile, K. C., Breiding, M. J., Smith, S. G., Walters, M. L., Merrick, M. T., . . . Stevens, M. R. (2011). *The National Intimate Partner and Sexual Violence Survey (NISVS): 2010 summary report*. Retrieved from https://www.cdc.gov/violenceprevention/pdf/nisvs_report2010-a.pdf

Cares, A. C., Banyard, V. L., Moynihan, M. M., Williams, L. M., Potter, S. J., & Stapleton, J. G. (2015). Changing attitudes about being a bystander to violence: Translating an in-person sexual violence prevention program to a new campus. *Violence Against Women*, *21*, 165-187. doi:10.1177/1077801214564681

Coker, A. L., Bush, H. M., Brancato, C. J., Clear, E. R., & Recktenwald, E. A. (2019). Bystander program effectiveness to reduce violence acceptance: RCT in high schools. *Journal of family violence*, *34*(3), 153-164.

Coker, A. L., Bush, H. M., Cook-Craig, P. G., DeGue, S. A., Clear, E. R., Brancato, C. J., . . . Recktenwald, E. A. (2017). RCT testing bystander effectiveness to reduce violence. *American Journal of Preventive Medicine*, *52*, 566-578. doi:10.1016/j.amepre.2017.01.020

Coker, A. L., Cook-Craig, P. G., Williams, C. M., Fisher, B. S., Clear, E. R., Garcia, L. S., & Hegge, L. M. (2011). Evaluation of Green Dot: An active bystander intervention to reduce sexual violence on college campuses. *Violence Against Women*, *17*, 777-796. doi:10.1177/1077801211410264

Coker, A. L., Fisher, B. S., Bush, H. M., Swan, S. C., Williams, C. M., Clear, E. R., & DeGue, S. (2015). Evaluation of the Green Dot bystander intervention to reduce interpersonal violence among college students across three campuses. *Violence Against Women*, *21*, 1507-1527. doi:10.1177/1077801214545284

Cook-Craig, P. G., Coker, A. L., Clear, E. R., Garcia, L. S., Bush, H. M., Brancato, C. J., . . . Fisher, B. S. (2014). Challenge and opportunity in evaluating a diffusion-based active bystanding prevention program: Green Dot in high schools. *Violence Against Women*, *20*, 1179-1202. doi:10.1177/1077801214551288

Foshee, V. A., Bauman, K. E., Arriaga, X. B., Helms, R. W., Koch, G. G., & Linder, G. F. (1998). An evaluation of safe dates, an adolescent dating violence prevention program. *American Journal of Public Health*, *88*, 45-50.

Gidycz, C. A., Orchowski, L. M., & Berkowitz, A. D. (2011). Preventing sexual aggression among college men: An evaluation of a social norms and bystander intervention program. *Violence Against Women*, *17*, 720-742. doi:10.1177/1077801211409727

Johnson, R., Gilchrist, E., Beech, A. R., Weston, S., Takriti, R., & Freeman, R. (2006). A psychometric typology of U.K. domestic violence offenders. *Journal of Interpersonal Violence*, *21*, 1270-1285. doi:10.1177/0886260506291655

Kelly, J. A. (2004). Popular opinion leaders and HIV prevention peer education: Resolving discrepant findings, and implications for the development of effective community programmes. *AIDS Care*, *16*, 139-150. doi:10.1080/095401204100 01640986

Kelly, J. A., St Lawrence, J. S., Diaz, Y. E., Stevenson, L. Y., Hauth, A. C., Brasfield, T. L., . . . Andrew, M. E. (1991). HIV risk behavior reduction following intervention with key opinion leaders of population: An experimental analysis. *American Journal of Public Health*, *81*, 168-171.

Kelly, J. A., St Lawrence, J. S., Stevenson, L. Y., Hauth, A. C., Kalichman, S. C., Diaz, Y. E., . . . Morgan, M. G. (1992). Community AIDS/HIV risk reduction: The effects of endorsements by popular people in three cities. *American Journal of Public Health*, *82*, 1483-1489.

Latané, B., & Darley, J. M. (1970). *The unresponsive bystander: Why doesn't he help?* New York, NY: Appleton-Century-Crofts.

McMahon, S., Winter, S. C., Palmer, J. E., Postmus, J. L., Peterson, N. A., Zucker, S., & Koenick, R. (2015). A randomized controlled trial of a multi-dose bystander intervention program using peer education theater. *Health Education Research*, *30*, 554-568. doi:10.1093/her/cyv022

Miller, E., Tancredi, D. J., McCauley, H. L., Decker, M. R., Virata, M. C. D., Anderson, H. A., . . . Silverman, J. G. (2013). One-year follow-up of a coach-delivered dating violence prevention program: A cluster randomized controlled trial. *American Journal of Preventive Medicine*, *45*, 108-112. doi:10.1016/j.amepre.2013.03.007

Moynihan, M. M., Banyard, V. L., Cares, A. C., Potter, S. J., Williams, L. M., & Stapleton, J. G. (2015). Encouraging responses in sexual and relationship violence

prevention: What program effects remain 1 year later? *Journal of Interpersonal Violence*, *30*, 110-132. doi:10.1177/0886260514532719

Payne, D. L., Lonsway, K. A., & Fitzgerald, L. F. (1999). Rape myth acceptance: Exploration of its structure and its measurement using the Illinois Rape Myth Acceptance Scale. *Journal of Research in Personality*, *33*, 27-68.

Rogers, E. M., & Cartano, D. G. (1962). Living research: Methods of measuring opinion leadership. *Public Opinion Quarterly*, *26*, 435-441.

Sargent, K. S., Jouriles, E. N., Rosenfield, D., & McDonald, R. (2017). A high school-based evaluation of TakeCARE, a video bystander program to prevent adolescent relationship violence. *Journal of Youth and Adolescence*, *46*, 633-643. doi:10.1007/s10964-016-0622-z

Valente, T. W., & Davis, R. L. (1999). Accelerating the diffusion of innovations using opinion leaders. *Annals of the American Academy of Political and Social Science*, *566*, 55-67.

Violence Against Women Act, 42 C.F.R. § 13701-14040 (1994).

White House Task Force to Protect Students From Sexual Assault. (2014). *Not alone: The first report of the White House Task Force to protect students from sexual assault*. Retrieved from https://www.justice.gov/archives/ovw/page/file/905942/download

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