

Adolescent Sexual Health Communication and Condom Use: A Meta-Analysis

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Objective: Condom use is critical for the health of sexually active adolescents, and yet many adolescents fail to use condoms consistently. One interpersonal factor that may be key to condom use is sexual communication between sexual partners; however, the association between communication and condom use has varied considerably in prior studies of youth. The purpose of this meta-analysis was to synthesize the growing body of research linking adolescents' sexual communication to condom use, and to examine several moderators of this association. **Method:** A total of 41 independent effect sizes from 34 studies with 15,046 adolescent participants ($M_{\text{age}} = 16.8$, age range = 12–23) were meta-analyzed. **Results:** Results revealed a weighted mean effect size of the sexual communication-condom use relationship of $r = .24$, which was statistically heterogeneous ($Q = 618.86$, $p < .001$, $I^2 = 93.54$). Effect sizes did not differ significantly by gender, age, recruitment setting, country of study, or condom measurement timeframe; however, communication topic and communication format were statistically significant moderators ($p < .001$). Larger effect sizes were found for communication about condom use ($r = .34$) than communication about sexual history ($r = .15$) or general safer sex topics ($r = .14$). Effect sizes were also larger for communication behavior formats ($r = .27$) and self-efficacy formats ($r = .28$), than for fear/concern ($r = .18$), future intention ($r = .15$), or communication comfort ($r = -.15$) formats. **Conclusions:** Results highlight the urgency of emphasizing communication skills, particularly about condom use, in HIV/STI prevention work for youth. Implications for the future study of sexual communication are discussed.

Keywords: adolescent sexual health, sexual communication, sexual assertiveness, condom use, safer sex

Consistent condom use among sexually active adolescents and young adults is of paramount importance for sexual health. Condoms are the most effective method to prevent sexually transmitted infections (STIs) and HIV for sexually active youth, and condoms can also prevent unwanted pregnancy (Centers for Disease Control and Prevention [CDC], 2010; Holmes, Levine, & Weaver, 2004). Although new prevention options and strategies for curbing HIV have advanced, such as preexposure prophylaxis (Baeten et al., 2012) and treatment as prevention (Cohen et al., 2011), condoms remain a critical, cost-effective, and accessible HIV/AIDS preven-

tion tool, particularly for adolescents who engage in multiple short-term sexual relationships. Despite the risk of STIs, HIV, and unwanted pregnancy, nearly half of sexually active youth in the U.S. do not use condoms consistently (CDC, 2010). Such risk behavior results in serious health consequences: There are currently over 9 million STIs and 8,300 new cases of HIV among adolescents and young adults each year (CDC, 2013).

Identifying those factors that are proximally associated with condom use and potentially modifiable has been a top priority for research and prevention efforts seeking to improve adolescent health (House, Bates, Markham, & Lesesne, 2010). Increasingly, one factor that has been associated with safer sexual behavior is sexual communication, defined as the ability to discuss and negotiate safer sex with a partner (Noar, 2007). The link between communication and condom use is understandable given the interpersonal nature of sexual activity and the need for sexual partners—particularly girls—to negotiate safer sexual practices if they are to occur (Amaro, 1995). Yet, open communication about sexual health topics often does not take place during sexual encounters (DiClemente, 1991; Ryan, Franzetta, Manlove, & Holcombe, 2007).

Conversations about sexual health are sensitive and potentially embarrassing for adolescents who are still learning to develop and maintain intimate relationships and are often negotiating intimate experiences for the first time (Collins, Welsh, & Furman, 2009; Diamond & Savin-Williams, 2009). Discussing sexual health topics also may violate cultural norms for indirectness around sexual behavior, especially for adolescent girls who are not socialized to

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assert their sexual desires or preferences in relationships (Lear, 1995; Metts & Spitzberg, 1996; Tolman, 2005). Further, compared with adults, adolescents are in a developmental period during which immaturity in the prefrontal cortex contributes to heightened impulsivity and a lower likelihood to plan ahead and consider the future consequences of risky behavior (Steinberg, 2007, 2008). For these reasons, it is perhaps no surprise that many adolescents—more than half in some studies (DiClemente, 1991; Ryan et al., 2007; Welch Cline, Johnson, & Freeman, 1992)—report that they have not discussed condoms or other safer sex topics with their sexual partners.

Sexual communication has been increasingly recognized in health behavior theories that explain condom use behavior (for review, see Noar, 2007). Historically, condom use has pushed the limits of behavioral theories because, unlike most health behaviors that are enacted by individuals, condom use requires the cooperation of two people. In some cases, new theories have been developed that include a dyadic communication component, such as the Information-Motivation-Behavioral Skills Model (Fisher & Fisher, 1992), which posits that both perceived and actual sexual communication skills are key behavioral skills required for condom use. Other theories, such as the Reasoned Action Model (Fishbein & Ajzen, 2009) and Social Cognitive Theory (SCT; Bandura, 1999), have been expanded to incorporate the role of sexual communication as an intervening variable that can account for the roles of other, more distal predictors of condom use, such as condom attitudes and intentions (Bryan, Fisher, & Fisher, 2002; Widman, Golin, & Noar, 2013; Zimmerman et al., 2007).

Among adults, the empirical literature largely supports the theoretical proposition that partner sexual communication is associated with condom use (Allen, Emmers-Sommer, & Crowell, 2002; Noar, Carlyle, & Cole, 2006; Sheeran, Abraham, & Orbell, 1999). A meta-analysis of over 40 psychosocial predictors of condom use found that sexual communication between partners was the most robust indicator of condom use (Sheeran et al., 1999). A second, more recent meta-analysis confirmed the significant overall association between communication and condom use and found several factors moderated this relationship, including communication topic and format (Noar, Carlyle, & Cole, 2006). Specifically, the strongest relationship between communication and condom use was found in studies that specifically assessed communication about condoms as well as those that assessed communication behaviors, rather than communication self-efficacy or intentions to communicate.

Although the results in largely adult populations are promising, prior reviews have included only a small subset of studies of adolescents and these studies were not analyzed separately; thus, it is not clear if sexual communication is equally as likely—or perhaps more or less likely—to influence condom use among youth. It is known, however, that adolescents' patterns of both communication and sexual risk behaviors differ from those patterns shown in adults. For example, adolescents are less likely to be sexually active than adults, but their sexual practices are often riskier. Condom use is typically sporadic, and the transient nature of adolescent relationships can result in multiple sexual partnerships over short periods of time (CDC, 2010). Additionally, youth often lack the appropriate skills and prior experience needed to successfully negotiate safer sexual behavior (Metts & Spitzberg, 1996), and as noted previously, they may also lack the appropriate

brain maturity to make deliberate, rational choices that will impact their long-term sexual health (Steinberg, 2007, 2008). This brain immaturity may result in less thoughtful planning around sexual activity and less communication with partners, as compared with adults.

When it comes to the link between adolescent sexual communication and condom use, there is some inconsistency in the literature. Whereas many studies of youth find strong positive associations between communication and condom use (Brown et al., 2008; Grossman et al., 2008; Harrison et al., 2012), others report no significant relationships (Maxwell, Bastani, & Yan, 1995; Roye, 1998), or even *negative* relationships (Deardorff, Tschann, Flores, & Ozer, 2010; Hart & Heimberg, 2005). For example, in an ethnically diverse sample of over 1,200 youth, Brown et al. (2008) found that sexual communication was associated with a greater likelihood of condom use at last sex; whereas in a sample of 839 Latino youth, Deardorff, Tschann, Flores, and Ozer (2010) found that comfort with sexual communication was associated with significantly *less* consistent condom use in the past month. Despite this inconsistency, the sexual communication field is burgeoning and scores of sexual health intervention programs for youth have been targeting communication skill building as key program components (DiClemente et al., 2009; Tortolero et al., 2010). The lack of a systematic meta-analysis of adolescent communication is a key gap in the literature; such a synthesis could provide much needed guidance to future intervention efforts as well as health behavior theories that are specific to adolescent condom use.

Thus, the primary purpose of the current study was to conduct a meta-analysis that synthesizes the current evidence to determine the degree to which sexual communication between adolescent partners is associated with condom use. Given the heterogeneity in effects of communication observed in the literature, a second goal was to examine the possible influence of several potential moderators. These included gender, age, recruitment setting, study location, topic of communication (i.e., communication about condoms specifically, partner sexual history, or safer sex more generally), and format for communication measurement (i.e., behavior, self-efficacy, intentions, fear, or comfort). Finally, due to the variability in the way in which condom use has been assessed in past studies (for a discussion of this issue, see Noar, Cole, & Carlyle, 2006), we also examined the timeframe of condom use as an additional moderator.

Method

Search Strategy

A detailed search for published studies was undertaken to locate studies applicable to this meta-analysis. Comprehensive searches of *MEDLINE*, *PsycINFO*, and *Communication & Mass Media Complete* databases were conducted through April 2013 using the following combination of key words, with asterisks used as “wild cards” to find multiple variations of each word: (*adolescenc** OR *teen** OR *youth* OR *middle school* OR *high school*) AND (*communicat** OR *discuss** OR *negotiat** OR *assert** OR *talk* OR *influence* OR *compliance gain*) AND (*condom** OR *contracept** OR *unprotected sex* OR *safe* sex* OR *sex* risk*). Additional studies of potential relevance were located by examining review articles

and meta-analyses related to sexual communication (Allen et al., 2002; Bastien, Kajula, & Muhwezi, 2011; Casey, Timmermann, Allen, Krahn, & Turkiewicz, 2009; Commendador, 2010; DiIorio, Pluhar, & Belcher, 2003; East, Jackson, O'Brien, & Peters, 2007; Guilamo-Ramos et al., 2012; Jaccard, Dodge, & Dittus, 2002; Kotchick, Shaffer, & Forehand, 2001; Miller, Benson, & Galbraith, 2001; Noar, Carlyle, & Cole, 2006; Sheeran et al., 1999). This search produced an initial 4,611 scientific articles.

Selection Criteria

Studies were included if they met the following criteria: (a) sampled adolescents, defined as a mean sample age of 18 or younger and no participants over 24 years of age; (b) measured partner sexual communication (studies of only parent or friend communication were excluded); (c) measured condom use or unprotected sex (studies that measured condom intentions or other sexual health outcomes such as use of contraception were excluded); and (d) were published in English. These selection criteria resulted in a final sample of 34 articles (see Figure 1).

In most cases, studies assessed sexual communication using a single measure. However, in five studies (Crosby et al., 2003; Donald, Lucke, Dunne, O'Toole, & Raphael, 1994; Overby & Kegeles, 1994; Tschann, Flores, de Groat, Deardorff, & Wibbelsman, 2010; Wilson, Kastrinakis, D'Angelo, & Getson, 1994), more than one sexual communication measure was assessed and reported. Given that each study could only contribute one effect size to the meta-analysis, a random number generator was used to select one communication measure from each study to include in analyses. Similarly, four studies provided data for both the frequency of condom use and condom use at last sex (Brown et al., 2008; Crosby et al., 2002; Crosby et al., 2008; Overby & Kegeles, 1994). In these cases, the frequency variable was used to calculate effect sizes, as this outcome is likely to be more representative of the overall pattern of condom use (Noar, Cole, & Carlyle, 2006). Finally, seven articles reported analyses separately for boys and girls (Bryan et al., 2002; Deardorff et al., 2010; Donald et al., 1994; Gallupe, Boyce, & Fergus, 2009; Gutierrez, Oh, & Gillmore, 2000; Harrison et al., 2012; Troth & Peterson, 2000). In these cases, effect sizes were calculated separately by gender, resulting in a total of 41 independent effect sizes from 15,046 participants.

Data Extraction

Two of the authors independently coded the primary studies. The following data were abstracted: (a) demographic and sample characteristics; (b) sexual communication measurement characteristics (i.e., topic, format); and (c) condom use measurement (i.e., timeframe of assessment). Communication topic was coded into one of three categories, using the definitions provided by Noar, Carlyle, and Cole (2006): (a) condom use (i.e., communication specifically about condom use); (b) sexual history (i.e., communication about sexual history, including items related to past sexual experience, number of sexual partners, STIs, and HIV); and (c) safer sex topics (i.e., communication about general safer sex issues, which could include a variety of items related to condom use, sexual history, STIs, HIV, sex, and safer sex). Additionally, communication format was coded into one of five categories, also using definitions similar to those provided by Noar, Carlyle, and Cole (2006): (a) past behavior (i.e., extent to which one had communicated or insisted on safer sex with a sexual partner); (b) self-efficacy (i.e., perceived ability to communicate about or insist on safer sex with a sexual partner); (c) intention (i.e., extent to which one planned on communicating about or insisting on safer sex with a sexual partner); (d) fear/concern (i.e., perceived fear, concern, or stress over communicating with a partner); and (e) communication comfort (i.e., perceived comfort communicating with a partner). The mean percentage agreement across all coding categories was 94%. Discrepancies between coders were resolved through discussion with all authors.

Calculation of Effect Sizes

The Pearson correlation coefficient, r , was used as the indicator of effect size (range = -1.0 – $+1.0$; Rosenthal, 1991). According to Cohen (1992), effect sizes based on correlations can be interpreted as small (.10), medium (.25), or large (.40). When r s were reported in an article, they were directly extracted. If r s were not reported, other statistics that could be converted to r s (e.g., t test, summary statistics) were converted using appropriate formulas (Rosenthal, 1991). When none of the statistics in the study could be converted to an r , the authors were contacted and appropriate data were requested. To keep effect sizes consistent and interpretable, higher values always indicate a positive relation between communication and condom use.

Once study characteristics were coded and effect sizes were extracted, a Fisher r to z transformation was performed (Rosenthal, 1991). These values then were weighted by their inverse variance and combined. We used random effects meta-analytic procedures for the primary analyses (Lipsey & Wilson, 2001). Once analyses were complete, the effect sizes and confidence intervals were transformed back to r s for presentation. The Q statistic and I^2 were used to examine whether significant heterogeneity existed among the effect sizes. Effect sizes for hypothesized moderators were calculated along with their 95% confidence intervals, and those effect sizes were statistically compared using the Q_b statistic. For these analyses, mixed effects models were utilized to allow for the possibility of differing variances across subgroups (Lipsey & Wilson, 2001). In addition, in the case of continuous (i.e., interval level) moderator variables, correlations were calculated between particular moderator variables and the effect size. All analyses

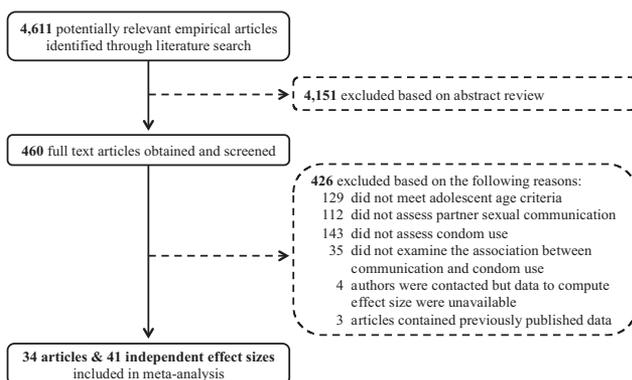


Figure 1. Study flow diagram.

were conducted using Comprehensive Meta-Analysis software, Version 2.2.046, and SPSS Version 19.

Results

Study Characteristics

Table 1 provides a summary of the 34 studies included in the meta-analysis, including sample characteristics, potential moderator variables, and effect sizes. Participants (cumulative $N = 15,046$) ranged in age from 12–23, with a mean age of 16.77 ($SD = 1.41$) years across studies. Samples were drawn from schools ($k = 15$), health clinics ($k = 12$), jails/detention centers ($k = 4$), community settings ($k = 3$), or other/mixed sites ($k = 7$). Many studies used combined samples of boys and girls ($k =$

16); however, other studies analyzed data from boys ($k = 10$) and girls ($k = 15$) independently. The majority of studies were conducted in the United States ($k = 30$); 11 studies used non-U.S. samples.

Magnitude and Direction of Effects

Although individual study effect sizes ranged from $-.35$ to $.78$, the overall weighted mean effect size for the sexual communication-condom use relationship was $r = .24$, 95% CI $[0.17, 0.30]$. This overall effect size indicates that sexual communication has a statistically significant association with condom use behavior among youth (see Figure 2). To examine the possibility of publication bias, a fail-safe N value was calculated and the trim and fill procedure was applied (Lipsey & Wilson, 2001). Orwin's

Table 1
Study Characteristics and Effect Sizes Included in Meta-Analysis

Study	Sample characteristics						Communication			Effect size r
	N	% girls	Age M	Age range	Population	Location	Topic	Format	Condom use Timeframe	
Abraham et al. (1992) ^{mix}	351	55	17.1	16–18	Community	Scotland	History	Intent	Not specified	0.010
Baele et al. (2001) ^{mix}	163	61	17.0	<i>nr</i>	School	Belgium	Condoms	Self-eff	Not specified	0.400
Barthlow et al. (1995) ^{mix}	328	16	<i>nr</i>	12–19	Incarcerated	U.S.	History	Behavior	Not specified	0.162
Basen-Engquist et al. (1999) ^{mix}	1,718	<i>nr</i>	<i>nr</i>	14–18	School	U.S.	Condoms	Self-eff	3 month	0.225
Brown et al. (2008) ^{mix}	1,218	57	<i>nr</i>	15–21	Other/mix	U.S.	Condoms	Behavior	3 month	0.334
Bryan et al. (2002) ^{boys}	170	0	15.0	13–19	School	U.S.	Condoms	Behavior	1 month	0.710
Bryan et al. (2002) ^{girls}	123	100	15.0	13–19	School	U.S.	Condoms	Behavior	1 month	0.780
Crosby et al. (2002) ^{girls}	522	100	16.0	14–18	Other/mix	U.S.	Safe sex	Behavior	Other	0.102
Crosby et al. (2003) ^{girls}	144	100	17.8	14–20	Clinic	U.S.	Safe sex	Behavior	1 month	0.218
Crosby et al. (2008) ^{girls}	566	100	17.8	15–21	Clinic	U.S.	Condoms	Low fear	2 month	0.175
Deardorff et al. (2010) ^{boys}	377	0	18.8	16–22	Clinic	U.S.	Safe sex	Comfort	1 month	-0.150
Deardorff et al. (2010) ^{girls}	462	100	18.3	16–22	Clinic	U.S.	Safe sex	Comfort	1 month	-0.140
DePadilla et al. (2011) ^{mix}	701	100	17.6	14–20	Clinic	U.S.	Safe sex	Mix	Other	0.535
DiClemente (1991) ^{mix}	79	23	<i>nr</i>	14–21	Incarcerated	U.S.	Safe sex	Behavior	Not specified	0.418
DiClemente et al. (1996) ^{mix}	116	51	<i>nr</i>	12–21	Community	U.S.	Condoms	Self-eff	6 month	0.311
DiIorio et al. (2001) ^{mix}	116	44	13.9	13–15	Community	U.S.	History	Self-eff	Not specified	0.177
Donald et al. (1994) ^{boys}	395	0	16.8	13–20	School	Australia	Safe sex	Behavior	Last sex	0.054
Donald et al. (1994) ^{girls}	505	100	16.8	14–20	School	Australia	Safe sex	Behavior	Last sex	0.098
Gallupe et al. (2009) ^{boys}	863	0	15.8	13–21	School	Canada	Condoms	Intent	Last sex	0.112
Gallupe et al. (2009) ^{girls}	1,143	100	15.8	13–21	School	Canada	Condoms	Intent	Last sex	0.298
Grossman et al. (2008) ^{mix}	446	62	18.2	15–21	Other/mix	U.S.	Condoms	Behavior	3 month	0.498
Gutiérrez et al. (2000) ^{boys}	148	0	16.0	14–19	Other/mix	U.S.	Condoms	Self-eff	3 month	0.140
Gutiérrez et al. (2000) ^{girls}	185	100	16.0	14–19	Other/mix	U.S.	Condoms	Self-eff	3 month	0.290
Guzmán et al. (2003) ^{mix}	34	52	13.3	11–17	School	U.S.	Safe sex	Comfort	Not specified	-0.334
Harrison et al. (2012) ^{boys}	91	0	15.4	14–17	School	South Africa	Condoms	Self-eff	Last sex	0.491
Harrison et al. (2012) ^{girls}	64	100	15.4	14–17	School	South Africa	Condoms	Self-eff	Last sex	0.377
Hart & Heimberg (2005) ^{boys}	100	0	18.8	16–21	Other/mix	U.S.	Condoms	Behavior	6 month	-0.070
Magura et al. (1994) ^{boys}	421	0	17.8	16–19	Incarcerated	U.S.	Condoms	Behavior	Not specified	0.400
Maxwell et al. (1995) ^{mix}	100	56	18.5	14–19	Clinic	U.S.	Safe sex	Behavior	Past year	0.000
Overby & Kegeles (1994) ^{girls}	60	100	16.9	13–19	Clinic	U.S.	Condoms	Behavior	Not specified	0.414
Rickman et al. (1994) ^{mix}	1,439	15	<i>nr</i>	12–17	Incarcerated	U.S.	History	Behavior	Not specified	0.226
Roye (1998) ^{girls}	452	100	18.0	12–21	Clinic	U.S.	Safe sex	Self-eff	1 month	0.000
Shoop & Davidson (1994) ^{mix}	45	50	<i>nr</i>	15–18	Other/mix	U.S.	Safe sex	Self-eff	Past year	0.514
Shrier et al. (1999) ^{girls}	22	100	17.2	14–22	Clinic	U.S.	Condoms	Self-eff	Last sex	0.492
Small et al. (2010) ^{girls}	189	100	18.0	13–23	Clinic	U.S.	Safe sex	Behavior	Last sex	0.329
Troth & Peterson (2000) ^{boys}	26	0	17.5	16–19	School	Australia	Safe sex	Low fear	Not specified	0.280
Troth & Peterson (2000) ^{girls}	50	100	17.5	16–19	School	Australia	Safe sex	Low fear	Not specified	0.230
Tschann et al. (2010) ^{mix}	393	61	18.5	16–22	Clinic	U.S.	Condoms	Behavior	1 month	0.068
van Empelen et al. (2006) ^{mix}	108	34	15.0	14–16	School	Netherlands	Condoms	Behavior	Past year	0.070
Whitaker et al. (1999) ^{mix}	372	<i>nr</i>	<i>nr</i>	14–17	School	U.S.	Safe sex	Behavior	Last sex	0.077
Wilson et al. (1994) ^{boys}	241	0	16.2	13–19	Clinic	U.S.	Safe sex	Behavior	Not specified	0.012

Note. N = sample size used in analysis; *nr* = not reported; Effect size r = correlation coded from study; Self-eff = self-efficacy; ^{mix} = mixed gender sample, ^{boys} = all male sample or subsample, ^{girls} = all female sample or subsample.

method (Lipsey & Wilson, 2001) to calculate fail-safe N indicated that 423 studies with nonsignificant findings would need to exist to reduce the $r = .24$ effect to a trivial effect size of $r = .02$. Also, funnel plots of the effect sizes were symmetrical, and the trim and fill analysis suggested no adjustment to the mean effect size (Duval & Tweedie, 2000). In sum, there appeared to be no evidence of publication bias in this literature.

Heterogeneity and Effect Size Moderators

Next, we examined heterogeneity of effect sizes. Statistical testing indicated significant heterogeneity among the studies with regard to the condom use outcome ($Q = 618.86, p < .001, I^2 = 93.54$). Thus, we examined the potential impact of several moderating variables on sexual communication and condom use.

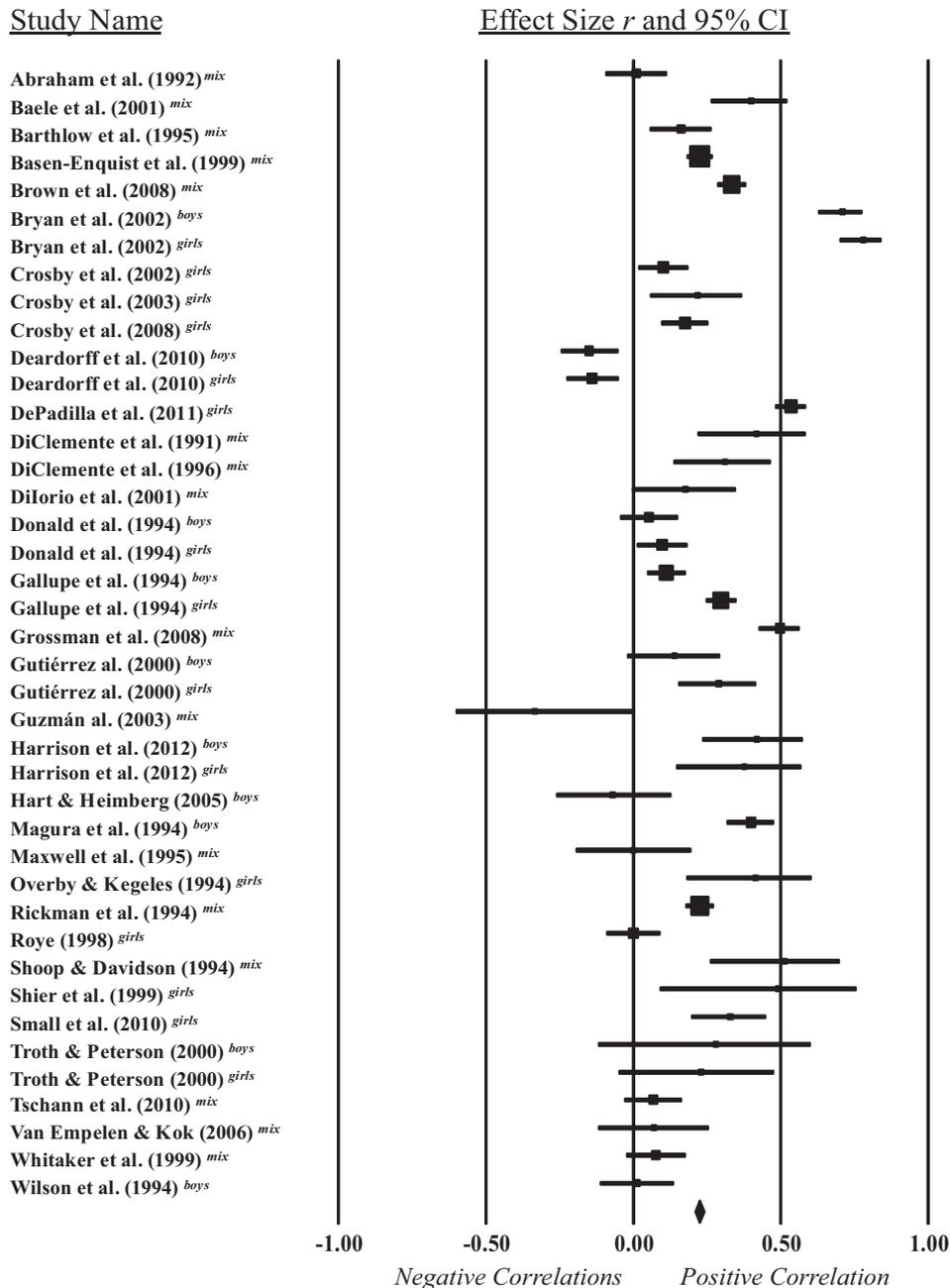


Figure 2. Forest plot displaying effect sizes and 95% confidence intervals. *mix* = mixed gender sample; *boys* = all male sample/subsample; *girls* = all female sample/subsample. The size of marker in the forest plot indicates the weight of the study. The diamond indicates the overall weighted mean effect size ($r = .24$).

Demographic moderators were examined first (see Table 2). Across studies, correlations between condom use effect size and gender (% girls), $r(24) = 0.19$, $p = 0.38$, and age, $r(34) = -0.07$, $p = 0.71$, failed to reach significance. The trends, however, suggested larger effects for girls and for those of younger age. Effect sizes for sexual communication were somewhat larger in studies of girls ($r = .29$) than for studies of boys ($r = .21$). Effect sizes also were somewhat larger for studies of younger teens ($r = .25$) than for studies of older teens ($r = .20$); however, none of these differences were statistically significant. Further, as shown in Table 2, no significant differences were found by recruitment setting (e.g., school, clinic, incarcerated) or study location (i.e., U.S. samples, non-U.S. samples).

Next, we examined communication topic and format as potential moderators (see Table 2). The relationship between sexual communication and condom use significantly differed by the communication topic discussed, $Q_B(2) = 11.21$, $p = .004$, with larger

effect sizes for communication about condom use ($r = .34$) than communication about sexual history ($r = .15$) or general safer sex ($r = .14$). Similarly, the relationship between sexual communication and condom use significantly differed by the communication format that was used, $Q_B(4) = 85.84$, $p < .001$, with the largest effects found for behavioral ($r = .27$) and self-efficacy formats ($r = .28$), compared with fear/concern ($r = .18$), future intention ($r = .15$), and communication comfort formats ($r = -.15$). Of note, greater comfort with communicating about sexual topics was associated with *less* condom use among sexually active youth.

Finally, we examined the timeframe of condom use measurement as a potential moderator (see Table 2). We found the relationships between sexual communication and condom use did not significantly differ depending on the timeframe that was used to assess condom use, $Q_B(5) = 2.58$, $p = .77$; however, trends suggest a somewhat larger effect size when condom use was assessed in the past 3 months ($r = .31$) than when it was assessed

Table 2
Weighted Mean Effect Sizes by Categorical Moderator Variables

Variable	N	k	r	95% CI	p	Between groups	
						Q_B	p
Gender							
Female	5,188	15	.29	[0.16, 0.41]	.000		
Male	2,832	10	.21	[0.03, 0.37]	.019		
Total	8,020	25	—	—	—	0.61	ns
Age							
Sample mean age < 17	6,579	18	.25	[0.16, 0.34]	.000		
Sample mean age \geq 17	4,963	17	.20	[0.06, 0.32]	.004		
Total	11,542	35	—	—	—	0.44	ns
Recruitment setting							
School	5,825	15	.29	[0.18, 0.39]	.000		
Clinic	3,707	12	.16	[0.00, 0.31]	.051		
Incarcerated	2,267	4	.29	[0.17, 0.40]	.000		
Community	583	3	.16	[-0.03, 0.34]	.106		
Mixed/other	2,664	7	.27	[0.12, 0.40]	.000		
Total	15,046	41	—	—	—	3.32	ns
Study location							
U.S.	11,287	30	.25	[0.17, 0.33]	.000		
Outside U.S.	3,759	11	.20	[0.11, 0.29]	.000		
Total	15,046	41	—	—	—	0.64	ns
Communication topic							
Condom use	8,118	20	.34	[0.25, 0.41]	.000		
Sexual history	2,234	4	.15	[0.04, 0.25]	.008		
Safer sex	4,694	17	.14	[0.01, 0.26]	.030		
Total	15,046	41	—	—	—	11.21	.004
Communication format							
Past behavior	7,353	20	.27	[0.17, 0.35]	.000		
Self-efficacy	3,120	11	.28	[0.19, 0.36]	.000		
Intention	2,357	3	.15	[-0.02, 0.31]	.091		
Fear/concern	642	3	.18	[0.11, 0.26]	.000		
Comfort	873	3	-.15	[-0.22, -0.09]	.000		
Total	14,345	40	—	—	—	85.84	.000
Condom use timeframe							
No time specified	3,308	12	.21	[0.12, 0.31]	.000		
Past year	253	3	.19	[-0.10, 0.45]	.203		
Past 6 months	216	2	.13	[-0.25, 0.47]	.515		
Past 3 months	3,715	5	.31	[0.20, 0.41]	.000		
Past 1 month	2,121	7	.26	[-0.02, 0.51]	.070		
Last sex	3,644	9	.22	[0.12, 0.30]	.000		
Total	13,257	38	—	—	—	2.58	ns

Note. N = sample size; k = number of studies; r = weighted mean effect size; CI = confidence interval; ns = not significant. Mixed effects models are presented for moderator analyses.

in the past year ($r = .19$), 6 months ($r = .13$), 1 month ($r = .26$), last sex ($r = .22$), or with no specified timeframe ($r = .21$).

Discussion

In the U.S., youth under the age of 24 represent 25% of the sexually experienced population, yet they acquire a full 50% of STIs (CDC, 2013). The ability to communicate and negotiate with a sexual partner about sexual health has received attention as one critical protective factor that may be associated with more consistent condom use (Noar, Carlyle, & Cole, 2006); however, until now, the body of evidence on sexual communication among adolescents had yet to be synthesized. Results support the conclusion that communication is important for youth: pooling data from just over 15,000 adolescents and 41 effect sizes, results demonstrated a medium-size association between communication and condom use, with youth who engaged in more sexual communication with their dating partners reporting more condom use in their sexual encounters. This effect is consistent with prior reviews in primarily adult populations (Allen et al., 2002; Noar, Carlyle, & Cole, 2006; Sheeran et al., 1999), and suggests that communicating with a sexual partner is a critical determinant of safer sexual behavior across the life span. Importantly, the significant link between communication and condom use was evident for boys and girls, younger and older adolescents, within U.S. and international samples, and across a variety of timeframes for assessing condom use, providing strong evidence for the robustness of this effect.

Although the communication–condom use link was generally consistent across groups, there were two moderators of this association that warrant significant attention and further consideration in future research in this area. First, across studies, the relationship between sexual communication and condom use was moderated by the communication topic that was discussed, with the greatest effect found for communication that specifically focused on condom use, and weaker effects noted for communication about sexual history or other more general sexual topics. Although general sexual communication may still be important for other aspects of relationship development, such as enhancing sexual or relationship satisfaction (Byers & Demmons, 1999; MacNeil & Byers, 2005; Widman, Welsh, McNulty, & Little, 2006), the current results suggest that a specific focus on *condom* negotiation and assertiveness may prove most beneficial for consistent condom use over time. Thus, although interventionists may spend some time helping youth develop skills for communicating about sexual health more generally, these results suggest that youth would be best served by training that is specific to talking about condoms. This might include discussion of *how* to bring up the topic of condoms, *when* to introduce the topic, and *what* condom negotiation strategies may be most successful (Noar, Morokoff, & Harlow, 2002), including strategies used in response to pressure *not* to use condoms (Oncale & King, 2001).

Second, we found the association between sexual communication and condom use significantly differed depending on the way communication was operationalized and measured (i.e., communication format). The strongest effects were noted when communication was assessed with a behavioral format (i.e., asking about actual communication practices) or a self-efficacy format (i.e., asking how confident individuals felt about communication), compared with when the assessment captured communication inten-

tions, fear/concern, or the degree of comfort with communication. The importance of both self-efficacy and the behavioral enactment of communication—as opposed to communication intentions or comfort—fits nicely with recent advances in health behavior theory that emphasize the importance of preparatory behaviors for safer sex (Bryan et al., 2002; de Vet et al., 2011; Zimmerman et al., 2007). These preparatory behaviors may include purchasing and carrying condoms, as well as openly and confidently talking with a partner about one's desires to practice safer sex. The current results support these new theoretical frameworks and suggest additional attention to both self-efficacy and communication behaviors in theories of adolescent sexual decision-making are warranted.

It is worth noting that perceived comfort with sexual communication was significantly *negatively* associated with condom use, such that adolescents who were more comfortable communicators reported *less* condom use than youth who were not as comfortable communicating about sex with their partners (Deardorff et al., 2010; Guzman et al., 2003). The reason for this seemingly counterintuitive and perhaps concerning finding is not immediately clear, although it is possible that this effect can be partially explained by the duration and/or quality of the relationship. Specifically, it is possible that adolescents may feel more comfortable about communicating in more committed or established relationships (Herold & Way, 1988), and perhaps the negative relationship between communication comfort and condom use reflects the fact that condoms are used less frequently in established relationships than in new relationships (Katz, Fortenberry, Zimet, Blythe, & Orr, 2000; Ku, Sonenstein, & Pleck, 1994). These results highlight the importance of focusing on the broader relationship context when examining interpersonal aspects of sexual decision-making. Researchers should carefully consider the specific content and operationalization of communication when constructing measures of sexual communication, as these factors may substantially impact the outcome of investigation.

Implications for Intervention Efforts

Results of this study confirm that a focus on sexual communication is justified in future intervention efforts with youth. By its very nature, condom use requires some level of cooperation or agreement between partners. This is particularly true for adolescent girls who may wish to initiate condom use but have less direct behavioral control over condoms than boys and are thus more reliant on verbal negotiation strategies (Amaro, 1995; Amaro & Raj, 2000). Effective interventions that increase adolescent girls' sexual agency and assertiveness, and counteract those socialization forces that may serve to silence their voices in relationships, remain urgently needed. However, it would be wise to maintain an emphasis on communication and negotiation skills in future intervention efforts with all youth—not just girls. In fact, these interpersonal skills may be a major factor that distinguishes successful from unsuccessful intervention work (Johnson, Carey, Marsh, Levin, & Scott-Sheldon, 2003; Pedlow & Carey, 2004). The intervention literature would benefit from more systematic attention to communication skills, including the utilization of experimental designs that examine the incremental validity of adding communication components to an intervention (Kalichman et al., 2005). This literature would also benefit from additional attention to the

various ways that communication skills could best be imparted to youth (Edgar, Noar, & Murphy, 2008). For example, studies should examine the relative efficacy of interpersonal formats such as role-plays, versus eHealth strategies such as online, computer-tailored, virtual decision-making, and mobile interventions (Noar, Pierce, & Black, 2010; Noar & Willoughby, 2012).

Limitations and Future Directions

Future work might address a number of issues that are not currently well addressed in the literature. Two notable limitations of current research on adolescent communication and condom use is that this body of work is relatively small—only 34 independent studies could be located, many with sample sizes less than 300—and entirely cross-sectional; no studies included a longitudinal examination of sexual health communication and condom use. The small samples may have limited power in this meta-analysis, although we believe this limitation was offset by the many significant findings, as well as the use of a fail-safe N (i.e., an additional 423 nonsignificant findings would be needed to reduce the observed correlation between communication and condom use to a trivial level). Yet, it remains possible that some of the nonsignificant moderating effects (e.g., the timeframe during which condom use was measured or the type of population that was sampled) would have been significant had we had more power to detect such effects. Additionally, although the correlational results of this meta-analysis suggest that adolescents' sexual communication may serve a health protective role by promoting or facilitating the use of condoms, it also is possible that using condoms increases adolescents' likelihood of communicating about sex, or that third variables (e.g., safer sex self-efficacy, parental attitudes, characteristics of the sexual relationship) contribute to both sexual communication and condom use. Although the results of this meta-analysis are a necessary first step in understanding the strength of the association between adolescents' sexual communication and condom use (as well as moderators of this association), longitudinal designs will be necessary to unpack the directionality of the communication-condom use link. Following adolescent relationships over time can be difficult because these relationships are often short-lived; even still, attempts to use prospective designs and uncover patterns of communication and condom use over time and across various types of relationships would significantly advance the field. Event-level analyses, common to the study of alcohol and sexual risk behavior (Kiene, Barta, Tennen, & Armeli, 2009; Leigh, 2002), have been infrequently applied to sexual communication but also could be fruitful in offering a much more nuanced understanding of the way in which adolescents negotiate sexual situations.

In addition to helping address the issues raised above, event-level analyses could shed light on the instances in which sexual communication is *not* associated with condom use. Although sexual communication accounts for significant variance in condom use, the relationship between communication and condom use is far from perfect. Perhaps in some cases communication fails, whereas in other cases sexual communication is, in fact, an attempt to persuade partners *not* to use condoms (Oncale & King, 2001). In still other instances, communication may lead adolescents to feel more safe and secure in having unprotected intercourse, for example if the partners have discussed sexual history or HIV/STI testing and determined the risk of current infection to be low (Civic, 2000). More nuanced assessments—both quantitative and qualitative—are needed to better un-

derstand those instances when communication about sexual health is not positively related to safer sexual behavior.

Additionally, with the advent of cell phones and social media, it is clear that adolescent communication is increasingly mediated through technology (Uhls, Espinoza, Greenfield, Subrahmanyam, & Šmahel, 2011); yet, the empirical literature on sexual communication has not kept pace. More work is needed to understand if and how youth use technology to discuss sexual health issues with their partners, and whether this form of communication influences their sexual decision-making processes (Widman, Nesi, Choukas-Bradley, & Prinstein, 2014). Finally, future research might consider additional moderators of the communication-condom use relationship that were not examined in the current group of studies. These could include individual characteristics, such as level of communication competence or personality traits (Noar, Zimmerman, Palmgreen, Lustria, & Horosewski, 2006), as well as relationship dynamics, such as the sexual experiences of the dyad, relationship trust or conflict, and the balance of relationship power (Amaro & Raj, 2000; Manning, Flanigan, Giordano, & Longmore, 2009; Tschann, Adler, Millstein, Gurvey, & Ellen, 2002).

When interpreting results of this meta-analysis, it should also be noted that the primary focus was on communication between adolescent partners and condom use. A broader literature also exists on communication between youth and their parents and peers/friends (Commendador, 2010; DiIorio et al., 2003; Miller et al., 2001; Short, Yates, Biro, & Rosenthal, 2005; Widman, Choukas-Bradley, Helms, Golin, & Prinstein, 2014). This literature generally shows communication is positively associated with youth condom use, regardless of the source of communication (Aspy et al., 2007; DiIorio, Kelley, & Hockenberry-Eaton, 1999; Guzman et al., 2003; Henrich, Brookmeyer, Shrier, & Shahar, 2006; Hutchinson & Montgomery, 2007), although there is some inconsistency across studies (Busse, Fishbein, Bleakley, & Hennessy, 2010; Hovell et al., 1994; L'Engle & Jackson, 2008). Additional empirical reviews that synthesize the literature on sexual communication between youth and their parents and/or friends would be a nice complement to the current study and enhance our understanding of the interpersonal factors that contribute to adolescent sexual decision-making. Additionally, our focus on condom use was chosen because condoms are the most effective means of reducing STIs among sexually active youth and they also offer protection from pregnancy (Holmes et al., 2004). However, there are a number of studies that have examined the associations between sexual communication and other forms of contraceptive use (Manlove, Ryan, & Franzetta, 2003, 2004; Stone & Ingham, 2002; Widman et al., 2006). It remains to be determined if communication has a similar impact on hormonal birth control use or dual-method use.

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- References marked with an asterisk indicate studies included in the meta-analysis.
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